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Firm-Level Political Risk and Accounting Conservatism

Abstract: In this study, we examine the relationship between firm-level political risk and accounting conservatism using a novel measure developed by Hassan et al. (2019). Based on 18,727 US firm-year observations from 2010 to 2021, we find that firms facing elevated political risk exhibit higher levels of accounting conservatism, supporting the political cost hypothesis and stakeholder theory. We further document that the positive relationship between firm-level political risk and accounting conservatism is strengthened in firms with strong governance structures, including larger boards, greater board independence, and high corporate governance scores. This relationship is also stronger in firms with high financial constraints and high leverage and those operating in industries with high litigation risk, suggesting that creditors perceive political risk as necessitating more conservative financial practices. Overall, our results are robust to a battery of sensitive checks and alternative measures of main variables.

Keywords: firm-level political risk, accounting conservatism, stakeholder theory, political cost hypothesis.

1. Introduction

Accounting conservatism is one of the most prominent features of financial reporting (Zhong & Li, 2017). It suggests that firms should be cautious in recognizing gains, but quick to recognize losses (Ferdous et al., 2024). Previous studies argued that accounting conservatism is valued by external stakeholders. By promoting the timely recognition of bad news and delaying the recognition of good news, accounting conservatism plays a pivotal role in enhancing transparency, reducing information asymmetry, and then protecting stakeholders' interests in volatile conditions (Basu, 1997). Watts (2003) Also, stakeholders expect companies to be conservative because this reduces their contractual, litigation, tax, and political costs. Accordingly, this accounting practice should be particularly valuable in politically risky environments where firms must navigate heightened stakeholder scrutiny, regulatory unpredictability, and potential litigation.

The current global business environment is characterized by several uncertainties. One of the most significant uncertainties facing businesses around the world is political risk. Political risk encompasses a wide array of factors, including government instability, regulatory shifts, changes in taxation policy, trade restrictions, and geopolitical conflicts. All of these risks can have a significant impact on business practices and decisions, as the link between political issues and business decisions has been documented in many previous studies (Gross et al., 2016; Han & Wang, 1998; Lemma et al., 2019; Yung & Root, 2019). These risks often force firms to implement financial reporting practices that mitigate potential adverse impacts on stakeholders, such as creditors and investors.

Traditionally, political risk has been measured at the country or industry level using macro-level indices such as the Economic Policy Uncertainty Index or geopolitical risk ratings (Huynh et al., 2024). While these metrics provide a broad overview, they fail to capture the heterogeneity of political risk exposure across firms. Factors such as a firm's business model, regulatory exposure, supply chain dependencies, and lobbying activities significantly influence its unique political risk profile (Gupta et al., 2024). Recognizing this limitation, Hassan et al. (2019) introduced the concept of Firm-Level Political Risk (hereafter, FLPR)**,** a granular measure derived from natural language processing of earnings call transcripts. This innovative approach captures the proportion of conversations focused on political issues, including trade policy, taxation, healthcare regulations, and environmental

laws. By focusing on firm-specific narratives, FLPR provides a more accurate understanding of how political uncertainty affects individual firms.

Political risk is not confined to developing economies, and firms in developed markets also encounter political risks. For instance, the political risk faced by individual US firms arising from uncertainty in government regulations, taxation, legislations, trade policies, and labor relations has significant effects on firm-level decisions (Baker et al., 2016; Hassan et al., 2019). In the United States, firms operate within a dynamic and complex political and regulatory landscape, where political risk can arise from shifts in government policies, trade relations, or macroeconomic instability (Holburn & Zelner, 2010). Such risks can increase future cash flow uncertainty, intensify stakeholder demands for reliable financial reporting, and influence managerial behavior in risk-laden environments. Meanwhile, conservatism has been observed in the accounting reports of US firms for centuries (Basu, 1997; Sterling, 1967), and the supply of conservatism among US firms is even higher than in other developed countries (Ball et al., 2000; Chung & Wynn, 2008).

Despite extensive research on the drivers of accounting conservatism, the specific role of political risk at the firm level remains underexplored. This paper addresses this gap by examining the relationship between FLPR and accounting conservatism. Using 18,727 US firm-year observations from 2010 to 2021, we find a positive relationship between FLPR and accounting conservatism, supporting the stakeholder theory and the political cost hypothesis. Specifically, firms facing higher political risk adopt conditional conservatism practices, such as asymmetric timeliness of loss recognition, to present a cautious financial position to stakeholders and mitigate political costs. This relationship is particularly pronounced in firms with strong governance structures, including larger boards, greater board independence, and high corporate governance scores. In addition, this relationship is also stronger in firms with high financial constraints and high leverage and those operating in industries with high litigation risk. These findings highlight the strategic role of accounting conservatism in navigating political uncertainty and addressing stakeholder concerns.

Our study makes several significant contributions to the existing literature. First, our work is related to the growing stream of studies investigating the factors influencing accounting conservatism (Ferdous et al., 2024; Lonare, 2024; Zeyun Chen et al., 2024). While previous studies have highlighted the impact of market uncertainty and legal enforcement on accounting conservatism (Ball et al., 2000; La Porta et al., 1998), the interaction between

political risk and conservatism has received limited attention, except for some recent studies that have examined the impact of political connections, political shifts or political elections on accounting conservatism (Bu et al., 2020; Baloria, 2022; Mohammed et al., 2017; Dai & Ngo, 2021). To the best of our knowledge, our study is the first to contribute to this literature by focusing on whether firm-level political risk - as perceived by participants in earnings calls - is associated with accounting conservatism.

Second, we also contribute to the growing literature examining the consequences of firm-level political risk (Ahmad et al., 2023; Gad et al., 2024; Gupta et al., 2024; Hoang et al., 2023) by offering new insights into the intersection of political risk and conservative accounting practices and enriching the existing literature on the impact of political issues on accounting conservatism (Bu et al., 2020; Baloria, 2022; Mohammed et al., 2017; Dai & Ngo, 2021). Our work differs from these studies in the variable of interest and the measure of political uncertainty. Using data from conference calls, our work improves our understanding of how firms respond to political risk and sheds light on the implications for standard setters, investors, policymakers, regulators, and corporate decision-makers, highlighting the need for cautious financial strategies in politically volatile environments.

The remainder of this paper is organized as follows. Section 2 reviews the relevant political risk and accounting conservatism literature, highlighting theoretical underpinnings and prior empirical findings. Section 3 details the methodology and data sources used in the study. Section 4 presents the empirical results, Section 5 describes robustness checks, and Section 6 concludes with recommendations for future research and practical applications.

2. Literature Review and hypothesis development

2.1.Firm-Level Political Risk

Political risk represents a significant source of uncertainty that influences business decision-making processes (Shaffer & Russo, 1998). It encompasses risks arising from political events, such as changes in government policies, unstable political environments, geopolitical conflicts (e.g., wars, terrorism, inter-nation conflicts, etc.), and regulatory shifts, all of which have a direct impact on firms' operations, investments, and financial practices. Previous research has shown that firms undertake more suboptimal investments (Kong et al., 2022), invest less in intellectual capital, especially for high-tech firms (Huynh et al., 2024),

hoard more cash (Duong et al., 2020), and increase the cost of debt financing during times of economic policy uncertainty. These studies stem from a macroeconomic political risk perspective (Huynh et al., 2024). However, this broad metric fails to capture firm-specific nuances, such as differences in business models, operating characteristics, and competitive technologies, which influence each firm's unique exposure to political risk (Gupta et al., 2024). The risks associated with political events vary across firms. This lack of firm-level data on political risk exposure has historically hampered research efforts in understanding the specific impact of political risk on firms (Hassan et al., 2019).

Hassan et al. (2019) developed a novel measure of firm-level political risk (FLPR) to address this issue. The measure is constructed by using a computational linguistics method that analyzes the transcripts of individual firms' quarterly earnings conference calls and identifies the share of the conversation devoted to political risk. This innovation in risk measurement allows for a granular examination of how firms perceive and respond to political uncertainties individually. By using this proxy, a range of studies have found that FLPR has a significant impact on various types of financial decisions and firm value by influencing the business environment, such as connections with politicians or political lobbyists (Hassan et al., 2019), as well as the uncertainty associated with monetary policies, fiscal policies, or regulatory conditions. This uncertainty exposes firms to increased information asymmetry (Yu et al., 2022) and serious agency conflicts (Ahmad et al.,2023). In this same vein, recent studies have demonstrated that the negative impact of political risk provides an incentive for managers to manipulate financial reporting through earnings management (Gupta et al.,2024; James et al.,2023) or income smoothing (Jung & Yang, 2024).

In times of higher political risks, firms are more inclined to obscure financial information, particularly in the presence of big agency problems or reliance on external financing (Timbate & Asrat, 2024), to reduce stakeholder attention. Similarly, Hoang et al., (2023) document that higher levels of political risk are linked to greater corporate earnings opacity, mainly through channels such as market scrutiny, political proximity, and conflicting business objectives. In this opaque situation, firms are also compelled to gain attention from stakeholders. In this context, Ahmad et al., (2023) demonstrate that firms use the dividend payouts to signal their future earnings expectations, despite the uncertainty caused by the current high firm-level political risk. Eventually, Hassan et al., (2019) and Banerjee and Dutta, (2022), suggest that firms reduce planned capital expenditures and capital investments, which are often irreversible, and allocate resources into more flexible operating activities

during periods of heightened political risk. This behavior reflects firms' desire to maintain financial flexibility and reduce exposure to potentially negative political outcomes (Banerjee & Dutta, 2022).

Furthermore, it is essential to note that informational uncertainty related to firm-level political risk influences stakeholder behavior and decisions. For example, Gad et al., (2024) demonstrate that in the private debt market, lenders assess their borrowers' political risks. Mishra, (2023) reveals that the significant risks associated with FLPR can deteriorate stock market liquidity and analyst coverage due to the worsening of the information environment, resulting in increased equity financing costs. According to Hossain et al., (2023) document that auditors are more inclined to extend audit report lags, increase audit fees, and provide more frequent going-concern opinions when firms are exposed to political risk. In fact, higher FLPR engenders potential instability, leading auditors to spend more time assessing the firm's financial health and risks.

2.2.Accounting Conservatism

Basu, (1997) conceptualizes conservatism as an "asymmetric recognition" standard, where accountants apply a more rigorous verification process to gains than losses. This mismatch in financial reporting leads to conservative outcomes prioritizing early recognition of losses over unrealized gains. Indeed, conservatism involves an underestimation of the book-to-market value of equity due to an underestimation of assets and revenues and/or an overestimation of liabilities and expenses (Ruch & Taylor, 2015). The importance of accounting conservatism has been extensively explored in previous research.

One stream of research has shown mainly that this cautious accounting approach can be used to improve the quality of the information environment. In fact, conservatism can help to monitor managerial discretionary behavior, reducing information asymmetries between managers and shareholders (García Lara et al., 2011; Ruch & Taylor, 2015). For instance, LaFond & Watts, (2008) have shown that adopting a conservative approach to preparing accounting numbers offers a tool for limiting managers' incentives to manipulate earnings and consequently to reduce information asymmetry. Earlier empirical evidence has shown that managers avoid prudent accounting choices, especially when they are involved in investments with a negative net present value (Ettredge et al., 2016) or performance plans tied to earnings performance (Kim et al., 2013).

Moreover, stakeholders and other users of financial reporting can also benefit from accounting conservatism. Related to this, numerous studies (Ahmed et al., 2002; Zhang, 2008) have demonstrated that access to debt financing is easier when firms adopt accounting conservatism. Ball et al., (2008) argue that conservatism contributes to increased transparency and preserves value in the event of business failure. LaFond and Watts (2008) highlight the significance of conservative accounting for equity market participants to mitigate the effects of information asymmetry and address the negative response to unfavorable events (Francis et al., 2013), such as the stock price crash risk (Kim & Zhang, 2016) and seasoned equity offerings (Kim et al., 2013). Accordingly, García Lara et al., (2014) have found a negative association between conservatism accounting at the firm level and dispersion of earning forecast.

The second stream of research supports the notion that conservatism contributes to introducing bias into accounting numbers (FASB,2018; IASB,2018). This leads to a potential bias in the information that is communicated to investors, which in turn is tied to the firm value (Kothari et al., 2009). In fact, the long process to verify the gain compared to loss under the conservatism accounting approach enhances the information asymmetry about the firm's future performance (García Lara et al., 2014)[1].

Furthermore, accounting conservatism depends on the nature of the relationship between corporate insiders and outsiders. In other words, the information environment affects the degree of adoption of prudent accounting choices and, consequently, the level of accounting conservatism. For instance, Bushman and Piotroski (2006) document that conservatism is more prevalent in countries with high-quality legal systems, extensive use of private bonds, and dispersed ownership structures. More precisely, Anagnostopoulou et al., (2021) show that financial constraints and unfavorable macroeconomic conditions enhance the pressure from debtholders and equity holders to provide more conservative financial reporting.

[1] Guay and Verrecchia (2007) and LaFond and Watts (2008) suggest that managers can find other channel to signal the firm's future perspective to investors.

2.3.Political Risk and Accounting Conservatism

Based on the information environment induced by high exposure to political risk and the need for accounting conservatism, the literature suggests two competing views on the nature of the association between these two concepts. The first view posits a positive relationship between FLPR and accounting conservatism, drawing on the political cost hypothesis and stakeholder theory. The political cost hypothesis suggests that firms facing higher levels of political risk will adopt conservative accounting practices to minimize political visibility and avoid potential government intervention, regulatory scrutiny, or adverse policy changes. Thus, accounting conservatism becomes a tool to reduce perceived profitability, shielding the firm from regulatory attention (Watts & Zimmerman, 1986). In line with this perspective, research has found that firms facing increased political risk tend to reduce reported income, presenting a more cautious financial position to external stakeholders to mitigate potential political costs (Hassan et al., 2019). According to Dai and Ngo, (2021), firms increase their accounting conservatism during the U.S. gubernatorial election cycle. This effect is more pronounced for firms with greater leverage, lower managerial ownership, and stronger corporate governance mechanisms.

Additionally, stakeholder theory reinforces this perspective by emphasizing that firms seek to align their financial practices with the interests of key external stakeholders, including regulators, investors, and society. In politically risky environments, stakeholders—especially those concerned with regulatory or reputational matters—tend to value conservative accounting because it reduces the risk of overstatement and enhances transparency. This alignment with stakeholder interests may lead firms to adopt more conservative accounting policies as a means of addressing both direct regulatory concerns and broader stakeholder expectations (Zhong & Li, 2017). Using the volatility of the economic policy uncertainty index (EPU) as a proxy for uncertainty of uncertainty (UOU), Cui et al., (2023) find an increase in creditor demands for accounting conservatism. Therefore, under the assumptions of the political cost hypothesis and stakeholder theory, which view accounting conservatism as a risk mitigation strategy, we hypothesize the following:

H1: Firm-level political risk is positively associated with accounting conservatism.

In contrast to the positive relationship hypothesis, the second view suggests a negative relationship between FLPR and accounting conservatism, based on the principles of agency theory. According to this theory, political risk can exacerbate the information asymmetry

between managers (agents) and shareholders (principals), as managers have incentives to protect their positions and may prioritize strategies that demonstrate stability or growth rather than conservatism. In politically volatile environments, managers may engage in income-enhancing strategies, such as reducing conservatism, to signal resilience and reassure investors, thereby preserving their own job security and avoiding additional scrutiny from shareholders (Gupta et al., 2024).

In line with agency theory, firms under significant political pressure may choose to minimize conservatism to maintain flexibility in financial reporting, potentially engaging in earnings management to demonstrate favorable performance and maintain access to capital (Cheng et al., 2024). This approach enables managers to project stability and, at times, growth, even in uncertain political climates, in line with their personal incentives to protect their roles and limit shareholder interference. As Zhong and Li (2017) note, managers possess significant discretion in implementing conservatism and may exercise this discretion less in high-risk political environments to serve their own interests. Moreover, Baloria (2022) has shown that stakeholders, such as creditors and litigants, are less likely to demand conservatism from firms with political ties. These firms may have access to alternative channels to deal with potential political threats. For example, politically connected firms can often lobby for favorable policies or receive preferential treatment when regulations change, which lessens the need to adopt conservative financial practices. Therefore, based on the assumptions of agency theory that managers seek flexibility in financial reporting to project stability in uncertain political environments, we hypothesize the following:

H2: Firm-level political risk is negatively associated with accounting conservatism.

3. Research Methodology

3.1. Data and sample

Our sample is drawn from all firm-year observations in the Compustat North America database from 2010 to 2021. Our sample starts in 2010 to avoid the period of the financial crisis and to provide a more stable context for examining accounting conservatism. We then merged it with the stock return data from the Center for Research in Security Prices (CRSP) databases to compute the proxies for accounting conservatism. Next, we extracted FLPR data,

[2]which is available online from the FLPR website. Following previous literature, we exclude financial firms (SIC codes 6000-6999) and utilities (SIC codes 4900-4999) due to their specific regulations. Finally, we remove observations with missing data. To avoid the effects of outliers, we winsorize all continuous variables at the 1% and 99% levels. Our final sample consists of 18,727 firm-year observations from 2010 to 2021. In some regressions, the number of observations is reduced due to the additional data requirements.

3.2.Measure of firm-level political risk

We use a novel measure of political risk at the firm level developed by (Hassan et al., 2019). The FLPR is constructed by adapting simple tools from computational linguistics. More precisely, this proxy is based on the transcripts of earnings conference calls of U.S. listed firms devoted to political risk. Authors employ an algorithm to identify and account for the frequency of words associated with risk and political matters. Motivated by previous studies (Hoang et al., 2023), FLPR (***PRisk)*** is calculated as the natural logarithm of one plus the FLPR measure.

Furthermore, additional components of FLPR are employed following the methodology proposed by Hassan et al., (2019). In particular, Hassan et al., (2019) This measure can be divided into eight distinct sub-indicators, each focusing on a specific area, including economics, institutions, technology, trade, taxes, environment, health, and security.

3.3.Measure of accounting conservatism

We use the modified conditional conservatism model developed by Basu (1997) and adapted by Badia et al. (2021) to capture accounting conservatism as follows:

$$
\begin{aligned}
U\_Earnings_{it} = {} & \beta_0 + \beta_1 URT_{it} + \beta_2 D_{it} + \beta_3 URT_{it} \times D_{it} + \beta_4 SDRET_{it} + \beta_5 URT_{it} \\
& \times SDRET_{it} + \beta_6 D_{it} \times SDRET_{it} + \beta_7 URT_{it} \times D_{it} \times SDRET_{it} + \beta_8 MTB_{it} \\
& + \beta_9 URT_{it} \times MTB_{it} + \beta_{10} D_{it} \times MTB_{it} + \beta_{11} URT_{it} \times D_{it} \times MTB_{it} \\
& + \beta_{12} SIZE_{it} + \beta_{13} URT_{it} \times SIZE_{it} + \beta_{14} D_{it} \times SIZE_{it} + \beta_{15} URT_{it} \times D_{it} \\
& \times SIZE_{it} + \varepsilon_{it}
\end{aligned}
$$

[2] The firm-level political data is available through this link: https://www.firmlevelrisk.com/download .

Where:

$\boldsymbol{U\_Earnings_{it}}$ is the unpredicted net income which is equal to earnings minus predicted earnings[3], divided by the market capitalization; $\boldsymbol{URT_{it}}$ refers to the unpredicted stock return which is calculated as the difference between the annual stock return and the predicted stock return. The predicted stock return captures the value-weighted average return for the given portfolio in 25 portfolios formed each accounting year by first sorting companies into quintiles based on the beginning market value of equity and then sorting each of these quintiles into quintiles based on the starting book-to-market ratio of equity; $\boldsymbol{D_{it}}$ denotes the bad news, equal to 1 if URT <0 and, 0 otherwise; $\boldsymbol{SDRET_{it}}$ reflects the variance of daily returns during the fiscal year; $\boldsymbol{MTB_{it}}$ is the market to book ratio; $\boldsymbol{SIZE_{it}}$is the natural logarithm of market value of equity.

In the aforementioned equation, the initial coefficient β_1 captures the timeliness with which favorable news is integrated into earnings or alternatively, the timely recognition of gains. In contrast, the coefficient $\beta_1 + \beta_3$ reflects the timeliness with which unfavorable news is incorporated into earnings or timely loss recognition. The β_3 coefficient serves as an indicator of conditional conservatism. Consequently, when the β_3The coefficient of URT x D remains positive, which implies that the incorporation of unfavorable information into earnings occurs more slowly than that of favorable news.

3.4. Model specification

In order to examine the relationship between FLPR and accounting conservatism, we employ the aforementioned model, which has been adapted by Badia et al. (2021) by incorporating the proxy of political risk (***PRisk***) into the estimation model:

[3] According to Ball et al.(2013a), the predicted earnings refer to the residuals from the estimation for two-digit SIC industries of this formula:

$X_{it} = \beta_0 + \beta_1 I(X_{it-1} < 0) + \beta_2 X_{it-1} + \beta_3 I(X_{it-1}) \times X_{it-1} + \varepsilon_{it}$; X_{it} : income before extraordinary items scaled by market value of equity at t−1.

$$U\_Earnings_{it} = \beta_0 + \beta_1 URT_{it} + \beta_2 D_{it} + \beta_3 URT_{it} \times D_{it} + \mu_1 PRisk_{it} + \mu_2 PRisk_{it} \times URT_{it} + \mu_3 PRisk_{it} \times D_{it} + \boldsymbol{\mu_4 PRisk_{it} \times URT_{it} \times D_{it}} + \beta_4 SDRET_{it} + \beta_5 URT_{it} \times SDRET_{it} + \beta_6 D_{it} \times SDRET_{it} + \beta_7 URT_{it} \times D_{it} \times SDRET_{it} + \beta_8 MTB_{it} + \beta_9 URT_{it} \times MTB_{it} + \beta_{10} D_{it} \times MTB_{it} + \beta_{11} URT_{it} \times D_{it} \times MTB_{it} + \beta_{12} SIZE_{it} + \beta_{13} URT_{it} \times SIZE_{it} + \beta_{14} D_{it} \times SIZE_{it} + \beta_{15} URT_{it} \times D_{it} \times SIZE_{it} + \varepsilon_{it}$$

Following previous research (Liu et al., 2024; Lonare, 2024), we place particular emphasis on the $\boldsymbol{\mu_4}$ coefficient in order to explore the relationship between FLPR and accounting conservatism. More specifically, we capture the impact of FLPR on the asymmetric timeliness of loss recognition, also called as conditional accounting conservatism, through the three-way interaction term for $PRisk\ x\ URTx\ D$. Additionally, the coefficient on $\boldsymbol{\mu_2}$ on $PRisk\ x\ URT$ reflects the effect of FLPR on timely gains recognition.

4. Empirical Results

4.1. Descriptive statistics

Table 1 provides the descriptive statistics for all the main variables used in the study. The mean (median) of the FLPR measure *(PRisk)* is 4.2504 (4.3569), with a standard deviation of 1.1443. This finding is consistent with previous literature (Hoang et al., 2023). Furthermore, the lowest value is 0, while the highest value is 8.6567, indicating a large variation across firms in terms of political risk. The mean value of the unpredicted earnings *(U_EARNINGS)* is 0.0367 with a standard deviation of 0.1970, indicating a relatively low level of volatility. Regarding the unpredicted stock return *(URT)*, the mean (median) is 1.97% (2.18%), aligning with the findings reported by Lonare, (2024).

[Insert Table 1 about here]

Table 2 presents the Pearson correlation matrix of our variables. The correlation coefficients between the control variables used in our main analysis are relatively small, ranging from -0.510 to 0.183. This finding suggests that multicollinearity is not an issue in our analysis.

[Insert Table 2 about here]

4.2. Firm-level political risk and accounting conservatism: Main results

Table 3 reports the results of our baseline regression estimation examining the impact of FLPR on accounting conservatism. Column 1 includes only the main variables without, control variables. Column 2 includes all control variables presented on the baseline model. Column 3 includes all control variables after controlling for year fixed effects. Column 4 includes all control variables after controlling for industry fixed effects. Finally, column 5 includes all control variables, firm, and year fixed effects.

The three-way interaction coefficients on *(Prisk x URT x D)* are statistically significant and positive at the 1% level for all specification, indicating that firms with higher political risk tend to exhibit higher levels of accounting conservatism. This supports the political cost hypothesis and stakeholder theory and corroborates our primary hypothesis (H1), which posits a positive association between FLPR and accounting conservatism. This is consistent with the findings of Dai and Ngo, (2021), who have documented that an increase in political uncertainty leads to a greater demand for accounting conservatism. Overall, an increase in a firm's exposure to political risk will result in the use of asymmetric timeliness of loss recognition, also known as conditional conservatism practices. This encourages a more cautious financial position to be presented to external stakeholders to offset potential political costs (Hassan et al., 2019).

Turning to control variables, the coefficient on *(SIZE x URT x D)* is negative and statistically significant, indicating that accounting conservatism tends to decrease with greater firm size. This finding aligns with the conclusions of prior studies (Zeyun Chen et al., 2024). Furthermore, we find also that the coefficient on *(URT x D)* is not statistically significant in all specifications. This corroborates the approach proposed by Badia et al., (2021), that controlling for the return variance can help to mitigate bias (Lonare, 2024).

[Insert Table 3 about here]

Table 4 presents the results of the baseline regression, in which the general FLPR has been replaced by the eight distinct sub-indicators developed by Hassan et al., (2019). Each component was focused on a specific area, including economics, institutions, technology, trade, taxes, environment, health, and security. The results indicate that FLPR arising from economics, institutions, taxes, environment, health, and security are positively and statistically significantly associated with accounting conservatism. This suggests that the main finding is

generally upheld across additional components of FLPR. Hence, the FLPR related to trade and to technology are not associated with accounting conservatism.

[Insert Table 4 about here]

4.3. Additional tests

4.3.1. Controlling for internal monitoring mechanisms

To expand our understanding of the primary findings, we examine whether the relationship between FLPR and accounting conservatism is shaped by internal monitoring mechanisms. Previous studies (García Lara et al., 2009; Leventis et al., 2013) posit that well-governed firms exhibit a heightened degree of conditional conservatism in their financial reporting practices. Accordingly, the full sample was divided into two subsamples according to high (above the median) and low (below the median) levels of several internal monitoring mechanisms, including board size, board independence, corporate governance, and board gender diversity. We present this set of results in Table 5. The coefficient on *(PRisk x URT x D)* is positive and statistically significant only for well-governed firms. More specifically, this result indicates that accounting conservatism tends to increase with greater FLPR in groups with large board sizes, high board gender diversity, more independent members, and higher corporate governance scores. This implies that for firms with effective governance structures, higher levels of FLPR encourage the adoption of conservative accounting practices.

[Insert Table 5 about here]

4.3.2. Controlling for external monitoring mechanisms

Whether external governance mechanisms, namely institutions and financial analysts, demand prudent financial reporting is an empirical question that has prompted previous literature over the past decade (Ramalingegowda & Yu, 2012; Sun & Liu, 2011). Therefore, in this subsection, we focus on whether the association between FLPR and accounting conservatism varies across different levels of external monitoring mechanisms, such as analyst following and institutional ownership. Previous studies document that greater institutional ownership and financial analysts call for more conservative financial reporting to monitor managers. However, this positive association is more pronounced for firms with higher information asymmetry and when internal monitoring is weaker. In Table 6, we split the full sample into two subsamples according to high (above the median) and low (below the median) levels of two external monitoring mechanisms, such as the percentage of institutional ownership and the number of analysts following. The coefficient on *(PRisk x URT x D)* is

positive and statistically significant only for firms with lower institutional ownership and analyst followings. These types of monitoring mechanisms may rely more on direct monitoring and less on monitoring through accounting numbers (Ramalingegowda & Yu, 2012).

[Insert Table 6 about here]

4.3.3. Controlling for Firm Characteristics

To gain further insight into our findings, we investigate whether firm characteristics influence the relationship between FLPR and accounting conservatism. Firstly, the extant literature documents that accounting conservatism can reduce agency problems and thus facilitate the alleviation of financial constraints (García Lara et al., 2016). Furthermore, Biddle et al., (2022) posit that conditional accounting conservatism diminishes bankruptcy risk. Accordingly, our sample was divided into two subsamples according to the median of the financial constraints proxy, as measured by the KZ index developed by Kaplan and Zingales. The results of the baseline model are presented separately for high (above median) and low (below median) financially constrained firms in columns (1) and (2) of Table 6. The coefficient on *(PRisk x URT x D)* is positive and statistically significant, indicating that accounting conservatism tends to increase with greater FLPR in the highly financially constrained group.

Secondly, FLPR may impact the demand for conservatism from creditors (Lonare, 2024). We divided our full sample into low and high-leverage firms based on the leverage ratio falling below (low) or above (high) the median. Again, the coefficient on *(PRisk x URT x D)* is positive and statistically significant, indicating that accounting conservatism tends to increase with greater FLPR in the high-leverage group. This finding is consistent with our expectations that creditors perceive the risks related to political risk as a factor to increase the need for conservatism.

Finally, existing studies (e.g., Basu, 1997; Zeyun Chen et al., 2024) document that litigation risk is positively associated with conditional accounting conservatism. Following (Zeyun Chen et al., 2024), we create a dummy variable that takes 1 if a firm belongs to litigious industries[4], and zero otherwise. This allows us to control for litigation risk. By doing so, we split our sample into two subsamples based on high- and low-litigation-risk industries.

[4] Firms with the following SIC codes: 2833–2836, 3570–3577, 3600–3674, 5200–5961, and 7370.

Again, the coefficient on (PRisk x URT x D) is positive and statistically significant, indicating that accounting conservatism tends to increase with greater FLPR in the high-litigation-risk industry.

[Insert Table 7 about here]

5. Robustness checks

5.1. Alternative measures of accounting conservatism

To mitigate the measurement error problem, in this subsection, we present results using three additional measures of accounting conservatism. First, we use the accrual-based model developed by Ball and Shivakumar (2005) as an alternative measure of accounting conservatism (ACC). This proxy assesses whether the firm recognizes losses in a timely manner relative to economic gains through accruals. Second, we apply the model of conditional conservatism (Basu, 1997), which captures the incremental timeliness of earnings revisions following bad news relative to good news. Finally, we employ the C-score developed by Khan and Watts, (2009) as an alternative proxy for accounting conservatism. This model builds on Basu's (1997) model of conditional conservatism to estimate the timeliness of earnings changes in response to bad news.

Panel A of Table 7 presents the results after using the accrual-based model developed by Ball and Shivakumar (2005). The coefficient of the interaction *(DCF x CF x PRisk)* is positive and statistically significant at the 5% level. Similarly, in Panel B of Table 7, the coefficient of the interaction of the Basu's (1997) model *(D15 x RET15 x PRisk)* is positive and statistically significant at the 1% level. Likewise, we present results using Khan and Watts (2009) proxy for accounting conservatism in Panel C. The FLPR (PRisk) coefficient on the C-score is positive and statistically significant at the 1% level. Overall, we continue to document a positive relationship between FLPR and accounting conservatism after using several proxies for accounting conservatism.

[Insert Table 8 about here]

5.2. Addressing endogeneity

To address the endogeneity concerns, we use the following three approaches: (i) the propensity score matching (PSM) method, (ii) the entropy balancing method, and the two-

stage least squares (2SLS) instrumental variables approach. Firstly, we estimate our model using the propensity score matching (PSM) approach, which estimates the propensity scores in a probit model. Accordingly, we create a dummy variable for political risk, which equals one if the firm-level political risk is higher than the industry median political risk and zero, otherwise. Subsequently, each high firm-level political risk dummy is matched with a non-firm-level political risk with the closest score. Finally, we perform the regression analysis using the matched PSM sample and reveal that the relationship between firm-level political risk and accounting conservatism remains unchanged.

Next, in Column 2 of Table 8, the entropy balancing technique was employed to control for any potential sample selection bias. This later is a quasi-matching technique that assigns weights to each observation after the matching, the treated and control samples are identical in all distributional properties (Liao et al., 2023). The results were consistent with those of the baseline regression results, indicating that accounting conservatism is higher for firms with high levels of political risk.

Finally, we undertake a two-stage least squares (2SLS) instrumental variables approach because we expect that firms' reaction to political risk may be endogenous to their corporate behavior, affecting their levels of accounting conservatism. Motivated by previous studies (Hasan et al., 2022), we use the Partisan Conflict Index as an exogenous instrumental variable (IV). This proxy reflects policy disagreements between and within political parties and discrepancies between Congress and the President at a specific time. The results of the first stage are displayed in column 3 of Table 8, where FLPR is the dependent variable. Our results indicate that the Partisan Conflict Index is statistically significant with political risk. We report the results of the second stage of the 2SLS regressions in column 4 of Table 8. The results demonstrate that the instrumented political risk proxy is positive and statistically significant with accounting conservatism. Therefore, our baseline results are robust after addressing the issue of endogeneity.

[Insert Table 9 about here]

5.3. Alternative sample construction

In this section, we have taken into account the impact of both the Trump presidency (2017-2020) and the global pandemic caused by the SARS-COV-2 virus. During the Trump presidency period, several trade policies were introduced by the Trump administration which

have increased the exposure of firms to political risks (Hossain et al., 2023). Accordingly, Table 9 has been designed to ensure that these events did not impact our results. In column 1 of Table 9, we exclude observations from the Trump Era, starting from 2017 until 2020. The three-way interaction coefficients on *(Prisk x URT x D)* are statistically significant and positive at the 1% level, indicating that our main finding holds after excluding the observations from the Trump Era. Similarly, observations collected during the COVID-19 pandemic period are excluded in column 2 of Table 9. The three-way interaction coefficients on *(Prisk x URT x D)* are statistically significant and positive at the 1% level. Overall, our findings are in line with the main results.

[Insert Table 10 about here]

6. Conclusion

In this study, we examine the relationship between FLPR and accounting conservatism using a novel measure developed by Hassan et al. (2019). Based on 18,727 US firm-year observations from 2010 to 2021, our empirical analyses provide evidence that firms facing elevated political risk exhibit higher levels of accounting conservatism, supporting the political cost hypothesis and stakeholder theory. Specifically, firms facing higher political risk adopt conditional conservatism practices, such as asymmetric timeliness of loss recognition, to present a cautious financial position to stakeholders and mitigate political costs. We further document that the positive relationship between FLPR and accounting conservatism is strengthened in firms with effective governance structures (e.g., larger board size, greater board independence, greater board gender diversity, and higher corporate governance scores). Additionally, we document that more highly leveraged and financially constrained firms adopt conditional conservatism practices in response to greater political risk. Moreover, this positive relationship is also pronounced in industries with high litigation risk, suggesting that creditors perceive political risk as necessitating more conservative financial practices. Overall, our results remain consistent after applying a battery of sensitive tests, including entropy, propensity score matching (PSM), 2SLS, alternative measures, and other robustness checks.

The literature highlighted the complex relationship between political risk-related issues and accounting conservatism. For instance, Bu et al. (2020) found that political turnover in China reduced conservatism, especially in firms with strong government ties. Similarly, Baloria (2022) showed that U.S. firms with political connections exhibit lower conservatism

as they rely on alternative mechanisms to manage political risks. Mohammed et al. (2017) observed that political ties weaken the link between board independence and conservatism in Malaysia. Conversely, Dai and Ngo (2021) demonstrated that political uncertainty increases conservatism, while Cheng et al. (2024) found that Republican-leaning CEOs adopt more conservative accounting than Democratic-leaning ones. (Bu et al., 2020; Baloria, 2022; Mohammed et al., 2017; Dai & Ngo, 2021). Our findings enrich this existing literature by focusing on accounting conservatism at the firm level and demonstrating how earnings call participants influence financial reporting behavior. They also have important implications for policymakers, regulators, and corporate decision-makers by highlighting how political uncertainty shapes adopting conservative accounting practices to address stakeholder concerns and mitigate political costs. In addition, understanding the impact of political risk at the firm-level can help current and potential investors to assess the specific risk that their firms may face and narrow the range of their uncertainties about future earnings.

Finally, future research can explore additional monitoring mechanisms to better understand the link between FLPR and accounting conservatism. For example, examining the role of CEO compensation, different types of ownership structures, or analyst coverage could provide a deeper understanding of how firms respond to political risk through accounting conservatism. In addition, future studies could extend this design by including more countries in the analysis, which could provide a broader view of accounting conservatism practices across different institutional and cultural environments.

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Tables

Table 1. Descriptive statistics of key regression variables

Variables	Mean	Std. Dev.	Min	Max	Median	Q1	Q3
U_EARNINGS	0.0367	0.1970	-0.9620	0.9539	0.0310	-0.0117	0.0819
URT	0.0197	0.4414	-1.4339	1.6404	0.0218	-0.2073	0.2357
D	0.4333	0.4955	0	1			
PRisk	4.2504	1.1443	0	8.6567	4.3569	3.6800	4.9736
SDRET	0.0298	0.01563	0.0089	0.1120	0.0262	0.0189	0.0366
MTB	3.8846	7.809	-24.5575	49.397	2.4182	1.3301	4.4846
SIZE	7.2003	1.9716	1.830148	11.8586	7.1657	5.8702	8.4876

Note: Table 1 reports descriptive statistics for all variables used in main analysis. All continuous variables are winsorized at the 1st and 99th percentiles. Variables definitions and sources are presented in the Appendix A.

Table 2. Pairwise Correlation

Variables	U_EARNINGS	URT	D	PRisk	SDRET	MTB	SIZE
U_EARNINGS	1.000						
URT	0.104*	1.000					
D	-0.059*	-0.715*	1.000				
PRisk	-0.001	-0.029*	0.040*	1.000			
SDRET	-0.083*	0.056*	0.026*	0.074*	1.000		
MTB	0.030*	0.147*	-0.079*	0.019*	-0.032*	1.000	
SIZE	0.090*	0.170*	-0.124*	0.044*	-0.510*	0.183*	1.000

Note:Table 2 reports pairwise correlations coefficients among the variables used in our analysis. All continuous variables are winsorized at the 1st and 99th percentiles. Variables definitions and sources are presented in the Appendix A.

Table 3. FLPR and accounting conservatism

Variables	**Dependent Variable: U_EARNINGS**				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
URT	0.119***	0.198***	0.212***	0.194***	0.210***
	(5.282)	(5.365)	(5.762)	(5.331)	(5.796)
D	0.0316**	0.0807***	0.0806***	0.0852***	0.0856***
	(1.976)	(2.967)	(2.983)	(3.165)	(3.201)
URT x D	-0.0470	-0.0346	-0.0560	-0.0131	-0.0317
	(-1.388)	(-0.585)	(-0.949)	(-0.225)	(-0.546)
PRisk	0.00637**	0.00778***	0.00618**	0.00684***	0.00504**
	(2.497)	(3.005)	(2.396)	(2.671)	(1.977)
Prisk x URT	-0.0243***	-0.0191***	-0.0185***	-0.0194***	-0.0190***
	(-4.847)	(-3.693)	(-3.612)	(-3.805)	(-3.759)
Prisk x D	-0.00738**	-0.00577	-0.00535	-0.00663*	-0.00636*
	(-2.044)	(-1.566)	(-1.461)	(-1.818)	(-1.755)
Prisk x URT x D	**0.0256*** **	**0.0225*** **	**0.0221*** **	**0.0203*** **	**0.0202*** **
	(3.392)	**(2.908)**	**(2.881)**	**(2.666)**	**(2.668)**
SDRET		-0.325	-0.365	-0.662***	-0.878***
		(-1.488)	(-1.541)	(-3.045)	(-3.713)
SDRET x URT		-1.240***	-1.297***	-1.106***	-1.118***
		(-4.702)	(-4.913)	(-4.244)	(-4.284)
SDRET x D		-0.796**	-0.788**	-0.846**	-0.839**
		(-2.383)	(-2.374)	(-2.562)	(-2.557)
SDRET x URT x D		0.188	0.209	-0.145	-0.265
		(0.332)	(0.366)	(-0.259)	(-0.470)
MTB		1.68e-05	6.34e-05	-5.06e-05	-1.28e-05
		(0.0489)	(0.186)	(-0.149)	(-0.0381)
MTB x URT		-0.000589	-0.000622	-0.000494	-0.000522
		(-1.043)	(-1.108)	(-0.888)	(-0.943)
MTB x D		-0.000239	-0.000245	-0.000287	-0.000316
		(-0.433)	(-0.447)	(-0.526)	(-0.584)
MTB x URT x D		-0.00178	-0.00159	-0.00211*	-0.00196
		(-1.415)	(-1.276)	(-1.708)	(-1.595)
SIZE		0.00420**	0.00521***	0.00296*	0.00312*
		(2.337)	(2.826)	(1.684)	(1.732)
SIZE x URT		-0.00134	-0.00273	-0.00177	-0.00348
		(-0.361)	(-0.738)	(-0.482)	(-0.956)
SIZE x D		-0.00370	-0.00393*	-0.00366	-0.00390*
		(-1.552)	(-1.662)	(-1.553)	(-1.664)
SIZE x URT x D		-0.0135**	-0.0115**	-0.0120**	-0.00989*
		(-2.392)	(-2.032)	(-2.164)	(-1.788)
Constant	0.00439	-0.0197	-0.0123	-0.00493	0.0133
	(0.126)	(-1.021)	(-0.601)	(-0.135)	(0.359)
Year FE	Yes	No	Yes	No	Yes
Industry FE	Yes	No	No	Yes	Yes
Observations	18,727	18,727	18,727	18,727	18,727
Number of firms	3,649	3,649	3,649	3,649	3,649
R-Squared	0.2134	0.0540	0.0566	0.2381	0.2446

Note: Table 3 reports the panel regression results of the association between FLPR and accounting conservatism. Standard errors are in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. See Appendix A for variable definitions.

Table 4. firm-level political risk and accounting conservatism: using alternative components of FLPR

Variables	**Economic**	**Environment**	**Trade**	**Institutions**	**Health**	**Tax**	**Security**	**Technology**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
URT	0.200***	0.217***	0.160***	0.228***	0.239***	0.203***	0.242***	0.166***
	(4.493)	(5.156)	(4.087)	(5.422)	(5.800)	(4.805)	(5.496)	(4.169)
D	0.0600*	0.0574*	0.0634**	0.0912***	0.0844***	0.0560*	0.0847***	0.0653**
	(1.843)	(1.873)	(2.234)	(2.986)	(2.787)	(1.824)	(2.663)	(2.200)
URT x D	-0.0668	-0.100	0.00664	-0.0610	-0.0637	-0.0978	-0.102	0.0293
	(-0.954)	(-1.521)	(0.108)	(-0.932)	(-0.979)	(-1.480)	(-1.481)	(0.483)
PRisk	0.00116	0.00201	0.000993	0.00322	0.00253	0.00139	0.00340	-0.000498
	(0.484)	(0.922)	(0.522)	(1.411)	(1.161)	(0.640)	(1.451)	(-0.267)
Prisk x URT	-0.00858*	-0.0115***	-0.00275	-0.0140***	-0.0155***	-0.00953**	-0.0152***	-0.00352
	(-1.800)	(-2.645)	(-0.716)	(-3.041)	(-3.609)	(-2.129)	(-3.203)	(-0.942)
Prisk x D	0.000435	0.000931	3.02e-05	-0.00460	-0.00328	0.000970	-0.00336	-0.000160
	(0.129)	(0.301)	(0.0112)	(-1.436)	(-1.074)	(0.317)	(-1.015)	(-0.0559)
Prisk x URT x D	**0.0157****	**0.0214*****	0.00549	**0.0164****	**0.0167*****	**0.0210*****	**0.0214*****	0.00201
	(2.228)	**(3.352)**	(0.976)	**(2.467)**	**(2.648)**	**(3.239)**	**(3.073)**	(0.380)
Other Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	18,727	18,727	18,727	18,727	18,727	18,727	18,727	18,727
Number of firms	3,649	3,649	3,649	3,649	3,649	3,649	3,649	3,649
R-Squared	0.2430	0.2441	0.2424	0.2452	0.2442	0.2446	0.2454	0.2420

Note: Table 4 reports the panel regression of the association between different individual components of FLPR and accounting conservatism. Standard errors are in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. See Appendix A for variable definitions.

Table 5. firm-level political risk and accounting conservatism: Controlling for internal monitoring mechanisms

Variables	Board size		Board gender		Board independence		Corporate governance score	
	High	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
URT	0.197***	0.448***	0.226***	0.452***	0.223***	0.430***	0.235***	0.349***
	(3.755)	(4.008)	(4.429)	(3.540)	(4.212)	(3.926)	(4.307)	(3.707)
D	0.0511	0.148*	0.0947**	-0.0302	0.0738*	0.0130	0.0433	0.109
	(1.349)	(1.732)	(2.474)	(-0.384)	(1.837)	(0.201)	(1.141)	(1.398)
URT x D	-0.183**	-0.190	-0.175*	-0.396*	-0.168*	-0.603***	-0.295***	-0.0824
	(-2.001)	(-0.894)	(-1.944)	(-1.748)	(-1.794)	(-3.058)	(-3.147)	(-0.463)
PRisk	0.000616	0.00357	0.00235	5.73e-05	0.00147	-5.57e-05	0.000307	0.00478
	(0.194)	(0.523)	(0.709)	(0.00983)	(0.424)	(-0.0108)	(0.0944)	(0.806)
Prisk x URT	-0.00644	-0.0213	-0.00636	-0.0292*	-0.00771	-0.0143	-0.00918	-0.0150
	(-0.953)	(-1.426)	(-0.938)	(-1.956)	(-1.107)	(-1.023)	(-1.284)	(-1.235)
Prisk x D	0.000986	-0.0123	-0.000569	-0.00996	-4.80e-05	-0.00439	-0.00154	0.00221
	(0.206)	(-1.254)	(-0.116)	(-1.122)	(-0.00932)	(-0.570)	(-0.323)	(0.227)
Prisk x URT x D	**0.0329*** **	0.00301	**0.0329*** **	0.00215	**0.0322*** **	0.00307	**0.0294** **	0.0383*
	(2.870)	(0.121)	**(2.875)**	(0.0852)	**(2.719)**	(0.136)	**(2.521)**	(1.674)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,316	1,937	8,472	2,781	8,333	2,92	8,937	2,316
Number of firms	2,122	573	2,115	753	2,047	820	2,078	1,047
R-Squared	0.2127	0.3898	0.2072	0.4524	0.1598	0.5138	0.2321	0.2670

Note: Table 5 presents the results of the association between FLPR and accounting conservatism, where we divide the full sample into high (above the median) versus low (below the median) based on several internal monitoring mechanisms. Standard errors are in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. See Appendix A for variable definitions.

Table 6. firm-level political risk and accounting conservatism: Controlling for external monitoring mechanisms

Variables	Institutional ownership		Analyst following	
	High	**Low**	**High**	**Low**
URT	0.206***	0.187***	-0.0305	0.302***
	(3.797)	(3.351)	(-0.439)	(5.462)
D	0.116***	0.0548	0.0200	0.102**
	(2.837)	(1.322)	(0.502)	(2.322)
URT x D	0.0505	-0.0696	0.0739	-0.159
	(0.560)	(-0.813)	(0.674)	(-1.633)
PRisk	0.00650*	0.00945**	0.00118	0.00513
	(1.705)	(2.364)	(0.347)	(1.309)
Prisk x URT	-0.0168**	-0.0192**	-0.00609	-0.0123*
	(-2.237)	(-2.408)	(-0.676)	(-1.692)
Prisk x D	-0.0104*	-0.00930	-0.00368	-0.00263
	(-1.869)	(-1.641)	(-0.746)	(-0.473)
Prisk x URT x D	0.00598	**0.0228****	0.00305	**0.0258****
	(0.524)	**(1.982)**	(0.227)	**(2.201)**
SDRET	-0.245	-0.622*	-0.534	-0.561
	(-0.744)	(-1.887)	(-1.606)	(-1.472)
SDRET x URT	-1.665***	-0.494	-0.547	-1.441***
	(-4.381)	(-1.185)	(-1.232)	(-3.757)
SDRET x D	-1.252**	0.0180	-0.308	-0.580
	(-2.514)	(0.0353)	(-0.673)	(-1.085)
SDRET x URT x D	-0.299	0.564	3.649***	0.716
	(-0.355)	(0.666)	(3.680)	(0.742)
MTB	-0.000529	0.000782	-9.15e-05	-0.00106
	(-1.079)	(1.413)	(-0.270)	(-1.564)
MTB x URT	2.84e-05	-0.00140	0.000681	0.000309
	(0.0385)	(-1.451)	(1.009)	(0.340)
MTB x D	0.000185	-0.00113	4.55e-05	0.000341
	(0.223)	(-1.308)	(0.0833)	(0.294)
MTB x URT x D	-0.00275	-0.00118	-0.00249*	-0.00509**
	(-1.525)	(-0.593)	(-1.697)	(-2.069)
SIZE	0.00349	0.00277	0.000885	0.00835**
	(1.337)	(1.061)	(0.348)	(2.294)
SIZE x URT	-0.00335	-0.00196	0.0114*	-0.0197***
	(-0.629)	(-0.338)	(1.777)	(-2.926)
SIZE x D	-0.00412	-0.000993	-0.000337	-0.0106**
	(-1.151)	(-0.269)	(-0.0976)	(-2.274)
SIZE x URT x D	-0.00990	-0.0137	-0.0239**	0.00145
	(-1.164)	(-1.645)	(-2.426)	(0.129)
Constant	-0.0470	-0.0122	0.0537	-0.0901
	(-0.912)	(-0.429)	(0.905)	(-1.371)
Observations	8,210	8,065	8,245	6,916
Number of firms	2,256	2,331	1,764	2,004
R-Squared	0.1820	0.0768	0.3058	0.2250

Note: Table 6 presents the results of the association between FLPR and accounting conservatism, where we divide the full sample into high (above the median) versus low (below the median) based on two external monitoring mechanisms (institutional ownership and analyst following). Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. See Appendix A for variable definitions.

Table 7. firm-level political risk and accounting conservatism: Controlling for firm characteristics

Variables	Dependent Variable: U_EARNINGS					
	Financial constraints		Leverage		Litigation risk	
	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
URT	0.205**	0.218***	0.207***	0.219***	0.304***	0.152***
	(2.564)	(5.428)	(3.863)	(4.773)	(6.203)	(2.732)
D	0.109*	0.0786***	0.0606	0.124***	0.139***	0.0433
	(1.669)	(2.725)	(1.515)	(3.736)	(3.491)	(1.183)
URT x D	0.0874	-0.112*	-0.151*	0.150**	-0.00883	-0.113
	(0.710)	(-1.710)	(-1.790)	(2.001)	(-0.109)	(-1.320)
PRisk	0.0116*	0.00320	0.00430	0.00688**	0.0172***	-0.000648
	(1.866)	(1.194)	(1.125)	(2.201)	(4.416)	(-0.188)
Prisk x URT	-0.0327***	-0.0140**	-0.0166**	-0.0213***	-0.0392***	-0.00143
	(-2.774)	(-2.560)	(-2.186)	(-3.431)	(-5.793)	(-0.182)
Prisk x D	-0.0148	-0.00358	-0.00251	-0.0124***	-0.0169***	0.00230
	(-1.625)	(-0.929)	(-0.455)	(-2.824)	(-3.085)	(0.469)
Prisk x URT x D	**0.0394****	0.0132	**0.0309*****	0.00245	**0.0351*****	0.0137
	(2.367)	(1.560)	**(2.760)**	(0.260)	**(3.386)**	(1.213)
SDRET	-1.567***	-0.492*	-1.291***	-0.200	0.0849	-0.997***
	(-3.108)	(-1.884)	(-3.750)	(-0.663)	(0.252)	(-2.997)
SDRET x URT	-1.090**	-1.151***	-1.055***	-1.265***	-1.460***	-1.085***
	(-1.982)	(-3.879)	(-2.712)	(-3.922)	(-4.186)	(-2.709)
SDRET x D	-0.891	-0.885**	-0.624	-1.320***	-1.312***	-0.348
	(-1.230)	(-2.390)	(-1.308)	(-3.101)	(-2.688)	(-0.766)
SDRET x URT x D	-2.322**	1.069	0.132	-1.049	-1.334	1.081
	(-2.048)	(1.604)	(0.164)	(-1.403)	(-1.583)	(1.373)
MTB	2.67e-05	4.24e-05	-0.000164	4.90e-05	1.94e-05	-0.000197
	(0.0403)	(0.109)	(-0.328)	(0.117)	(0.0442)	(-0.380)
MTB x URT	-0.000112	-0.00109	-0.000381	-0.000424	3.11e-05	-0.00131
	(-0.114)	(-1.553)	(-0.498)	(-0.548)	(0.0448)	(-1.438)
MTB x D	-0.000947	-0.000147	-0.000211	-0.000241	-0.000212	-7.93e-05
	(-0.889)	(-0.229)	(-0.262)	(-0.352)	(-0.300)	(-0.0953)
MTB x URT x D	-0.00220	-0.00201	-0.00129	-0.00269*	-0.00228	-0.000567
	(-0.961)	(-1.348)	(-0.724)	(-1.685)	(-1.466)	(-0.286)
SIZE	-0.000607	0.00361**	0.00403	0.00166	0.00415	0.00567**
	(-0.144)	(1.983)	(1.533)	(0.746)	(1.525)	(2.293)
SIZE x URT	0.00680	-0.00749*	-0.00203	-0.00629	-0.00349	-0.00449
	(0.866)	(-1.856)	(-0.375)	(-1.375)	(-0.710)	(-0.808)
SIZE x D	-0.000142	-0.00507**	-0.00267	-0.00515*	-0.00398	-0.00405
	(-0.0245)	(-2.020)	(-0.747)	(-1.806)	(-1.132)	(-1.272)
SIZE x URT x D	-0.0297**	-0.000536	-0.00258	-0.0197***	-0.0186**	-0.00169
	(-2.518)	(-0.0878)	(-0.321)	(-2.786)	(-2.395)	(-0.209)
Constant	0.0755	-0.00140	0.0179	-0.00382	-0.0281	0.00781
	(0.858)	(-0.0400)	(0.370)	(-0.0751)	(-0.928)	(0.284)

Observations	4,559	14,151	10,586	8,124	7,624	11,103
Number of firms	3,244	3,035	3,537	2,138	1,514	2,135
R-Squared	0.1292	0.2565	0.1631	0.2200	0.0561	0.0790

Note: Table 7 presents the results of the association between FLPR and accounting conservatism, where we divide the full sample into high (above the median) versus low (below the median) based on several firm characteristics. Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. See Appendix A for variable definitions.

Table 8. firm-level political risk and accounting conservatism: Alternative measures of accounting conservatism

Panel A: Alternative measure of accounting conservation using the accruals-based model developed by Ball and Shivakumar (2005)

Variables	**Dependent Variable: ACCRUALS (ACC)**	
	Baseline Model	**Political Risk effects**
	(1)	**(2)**
CF	-0.368***	-0.349***
	(-33.121)	(-10.232)
CF_{it-1}	0.040***	0.040***
	(8.824)	(8.905)
CF_{it+1}	0.044***	0.045***
	(9.748)	(9.976)
$\Delta SALES_{it}$	0.087***	0.059***
	(26.012)	(5.057)
$GPPE_{it}$	-0.064***	-0.060***
	(-19.936)	(-9.342)
DCF	**0.384*** **	0.270***
	(25.746)	(5.869)
PRisk		0.000
		(0.024)
ΔSALES x PRisk		0.007**
		(2.513)
GPPE x PRisk		-0.001
		(-0.836)
DCF x PRisk		0.002***
		(2.847)
CF x PRisk		-0.001
		(-0.094)
DCF x CF x PRisk		**0.023****
		(2.314)
Constant	0.023	0.019
	(0.960)	(0.795)
Observations	20.650	20.650
Number of firms	3.678	3.678
Industry Effect	YES	YES
Year Effect	YES	YES
R-Squared	0.244	0.244

Panel B: Alternative measure of accounting conservation using the Basu model

Variables	**Dependent variable: NI**	
	Baseline Model	**Political risk_effects**
	(1)	**(2)**
D15	-0.025***	0.001
	(-4.483)	(0.083)
RET15	-1.091***	0.093
	(-8.927)	(0.417)
D15 x RET15	**4.102*** **	3.139***
	(17.716)	(7.619)
PRisk		0.007***
		(3.087)
D15 x RET15 x PRisk		**0.216****

		(2.331)
D15 x PRisk		-0.006
		(-1.602)
RET15 x PRisk		-0.268***
		(-5.490)
Constant	-0.062	-0.092***
	(-1.119)	(-2.888)
Observations	24.810	24.810
R-squared	0.160	0.161
Industry Effect	YES	YES
Year Effect	YES	YES

Panel C: Alternative measure of accounting conservation using the C-Score developed by Khan and Watts (2009)

Variables	**Dependent variable: C_SCORE**	
	(1)	**(2)**
PRisk	**0.031*** **	**0.044*** **
	(2.628)	(4.622)
SIZE		-0.581***
		(-67.375)
CASH		-0.161**
		(-2.292)
LEVERAGE		1.039***
		(19.031)
MTB		-0.029***
		(-10.573)
Growth		0.014
		(0.620)
SDSALES		-0.000
		(-0.688)
Constant	2.544***	5.806***
	(4.775)	(30.810)
Observations	24.382	24.382
Number of firms	3.919	3.919
Industry Effect	YES	YES
Year Effect	YES	YES
R squared	0.112	0.352

Note: Table 8 presents the results of the association between FLPR and accounting conservatism using several proxies of accounting conservatism. In Panel (A), the results are presented by using the accruals-based model developed by Ball and Shivakumar (2005). In column (2), the results are presented by using the Basu model. In column (3), the results are presented by using the C-Score developed by Khan and Watts (2009). The results of the second stage are reported in column (4). Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. See Appendix A for variable definitions.

Table 9. firm-level political risk and accounting conservatism: addressing endogeneity

Variables	**C_SCORE15**	**C_SCORE15**	**PRisk**	**C_SCORE15**
	PSM	**ENTROPY**	**2SLS**	
			First stage	**Second stage**
	(1)	**(2)**	**(3)**	**(4)**
PRisk	**0.040*** **	**0.049*** **		
	(4.034)	(4.497)		
Partisan Conflict Index			-0.006***	
			(-14.388)	
PRisk Instrumented				**0.036*** **
				(3.721)
SIZE	-0.579***	-0.589***	0.016***	-0.579***
	(-58.025)	(-54.298)	(3.223)	(-59.121)
CASH	-0.163**	-0.178**	0.249***	-0.156*
	(-1.979)	(-2.017)	(5.411)	(-1.922)
LEVERAGE	1.037***	1.023***	0.006	1.041***
	(17.565)	(16.290)	(0.189)	(17.876)
MTB	-0.028***	-0.028***	-0.000	-0.029***
	(-8.435)	(-8.083)	(-0.394)	(-8.838)
Growth	0.008	0.004	-0.069***	0.008
	(0.311)	(0.152)	(-4.192)	(0.316)
SDSALES	-0.000	0.000	0.000***	-0.000
	(-0.423)	(1.256)	(8.306)	(-0.455)
Constant	5.813***	5.563***	4.818***	5.981***
	(21.448)	(21.383)	(25.937)	(22.184)
Observations	23.378	24.382	24.382	24.382
R-squared	0.350	0.357	0.113	0.352
Industry Effect	YES	YES	YES	YES
Year Effect	YES	YES	YES	YES

Note: Table 9 presents the results of the association between FLPR and accounting conservatism. In column (1), the results are presented by using the Propensity Score Matching (PSM) approach. In column (2), the results are presented by using the entropy model. In column (3), the results of the first stage of 2SLS approach are presented in column (3), where we use the Partisan Conflict Index (PCI) as the instrumental variable and the dependent variable is the proxy for political risk (PRisk). The results of the second stage are reported in column (4). Standard errors are in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. See Appendix A for variable definitions.

Table 10. firm-level political risk and accounting conservatism: Alternative sample construction

Variables	**Dependent Variable: U_EARNINGS**	
	Exclude Trump Era (2017-2020)	**Exclude Covid-19 Pandemic**
	(1)	**(2)**
URT	0.286***	0.257***
	(5.597)	(6.003)
D	0.148***	0.137***
	(4.103)	(4.362)
URT x D	-0.0660	-0.0709
	(-0.843)	(-1.048)
PRisk	0.00843***	0.00483*
	(2.627)	(1.790)
Prisk x URT	-0.0246***	-0.0228***
	(-3.558)	(-4.048)
Prisk x D	-0.0107**	-0.00655*
	(-2.312)	(-1.696)
Prisk x URT x D	**0.0260*** **	**0.0219*** **
	(2.626)	**(2.616)**
SDRET	-0.0849	0.0520
	(-0.261)	(0.170)
SDRET x URT	-2.032***	-2.330***
	(-4.957)	(-6.543)
SDRET x D	-1.819***	-2.016***
	(-3.864)	(-4.680)
SDRET x URT x D	0.539	1.123*
	(0.673)	(1.651)
MTB	-0.000179	-1.57e-05
	(-0.412)	(-0.0406)
MTB x URT	-0.000105	-0.000595
	(-0.129)	(-0.891)
MTB x D	-0.000496	-0.000629
	(-0.671)	(-1.003)
MTB x URT x D	-0.00412**	-0.00235*
	(-2.401)	(-1.667)
SIZE	0.00644***	0.00559***
	(2.892)	(2.786)
SIZE x URT	-0.00632	-0.00300
	(-1.227)	(-0.660)
SIZE x D	-0.00664**	-0.00669**
	(-2.153)	(-2.456)
SIZE x URT x D	-0.0133*	-0.0105
	(-1.824)	(-1.590)
Constant	-0.0394	-0.00882
	(-0.928)	(-0.221)
Observations	11,845	15,077
Number of firms	3,44	3,302
R-Squared	0.2665	0.2566

Note: Table 10 presents the results of the association between FLPR and accounting conservatism. In column (1), we exclude Trump-Era observations from 2017 to 2020.In column 2, we exclude COVID19 observations from 2020 to 2021; Standard errors are in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. See Appendix A for variable definitions.

Appendix A: Variables definitions

Variables	Definition
PRisk	The natural logarithm of the average of proportion of each firm's quarterly earnings conference calls devoted to political risk each year (Hassan et al.2019).
Economic	The natural logarithm of the average proportion of each firm's quarterly earnings conference calls devoted to economic policy-related political risk each year (Hassan et al.2019).
Environment	The natural logarithm of the average proportion of each firm's quarterly earnings conference calls devoted to environmental policy-related political risk each year (Hassan et al.2019).
Trade	The natural logarithm of the average proportion of each firm's quarterly earnings conference calls devoted to trade policy-related political risk each year (Hassan et al.2019).
Institutions	The natural logarithm of the average proportion of each firm's quarterly earnings conference calls devoted to political risk related to the institutions and political processes each year (Hassan et al.2019).
Health	The natural logarithm of the average proportion of each firm's quarterly earnings conference calls devoted to health care policy-related political risk each year (Hassan et al.2019).
Tax	The natural logarithm of the average proportion of each firm's quarterly earnings conference calls devoted to tax policy-related political risk each year (Hassan et al.2019).
Security	The natural logarithm of the average proportion of each firm's quarterly earnings conference calls devoted to security and defense policy-related political risk each year (Hassan et al.2019).
Technology	The natural logarithm of the average proportion of each firm's quarterly earnings conference calls devoted to political risk related to technology each year (Hassan et al.2019).
U_EARNINGS	Unpredicted earnings = (earnings - predicted earnings)/market capitalization Where: predicted earnings are the residual from the estimation for Two-Digit SIC industry of the equation bellow: $X_{it} = \beta_0 + \beta_1 I(X_{it-1} < 0) \quad + \beta_2 X_{it-1} + \beta_3 I\,(X_{it-1}) \times X_{it-1} \quad + \varepsilon_{it}$ With: X_{it} : income before extraordinary items scaled by market value of equity at t−1.
URT	Unpredict return= Return – predicted return
D	denote the bad news, equal to 1 if URT <0; and 0 otherwise
SDRET	denotes the variance of daily returns during the fiscal year
MTB	market to book ratio
SIZE	log of market value of equity

ACC	Total accruals (ACC) are computed as income before exceptional minus cash from operating activities, divided by average of total assets. This proxy was used as the dependent variable in the model developed by Ball and Shivakumar (2005) as follows: $ACC_{it} = \alpha_0 + \beta_1 CF_{it} + \beta_2 CF_{it-1} + \beta_3 CF_{it+1} + \beta_4 CHSALES_{it} + \beta_5 GPPE_{it} + \beta_6 DCF_{it} + + \beta_7 DCF \times CF + \beta_8 PRisk + \beta_9 CHSALES \times PRisk + \beta_{10} GPPE \times PRisk + \beta_{11} DCF \times PRisk + \beta_{12} CF \times PRisk + \boldsymbol{\beta_{13}\, DCF \times CF \times PRisk} + \varepsilon_{it}$
CF	Cash flow from operating activities divided by average of total assets.
ΔSALES	Change in sales revenues divided by average of total assets.
GPPE	The ratio of Gross property, plant and equipment divided by average of total assets.
DCF	A dummy variable that takes one if CF <0 and zero, otherwise.
NI	This proxy was used as the dependent variable in the model developed by Basu. NI is the net income divided by the market value of equity in year t.
D15	A dummy variable that takes 1 if RET<0; 0 otherwise
RET15	Return of equity in year t (year t+125 days)
C_SCORE	This proxy developed by Khan and Watts (2009) was used as the dependent variable. They develop and the timeliness of good news (G-score) and bad news (C-score). The G-score and C-score are calculated from the following equation: $NI_{it} = \alpha_0 + \beta_1 D_{it} + \beta_2 RET_{it} + \boldsymbol{\beta_3} RET_{it} \times D_{it} + \varepsilon_{it}$ (Basu 's Model) (1) where NI is the net income before extraordinary items deflated by the market value of equity in year t; RET: Return of equity in year t (year t+125 days); D: equal 1 if RET<0; 0 otherwise Replacing β2 and β3 by: $G - Score = \beta_2 = \theta_0 + \theta_1 SIZE + \theta_2 MTB + \theta_3 LEV$ (2) $C - SCORE = \beta_3 = \delta_0 + \delta_1 SIZE + \delta_2 MTB + \delta_3 \text{LEV}$ (3) LEV: total liabilities divided by total assets in year t. We obtain the equation (4) for estimate equation (3) $NI_{it} = \alpha_0 + \beta_1 D_{it} + RET_{it} \times (\theta_0 + \theta_1 SIZE + \theta_2 MTB + \theta_3 LEV) + RET_{it} \times D_{it} \times (\delta_0 + \delta_1 SIZE + \delta_2 MTB + \delta_3 \text{LEV}) + \omega_1 SIZE + \omega_2 MTB + \omega 3\text{LEV} + \omega 4D \times SIZE + \omega 5D \times MTB + \omega 6D \times LEV + \varepsilon it$ (4)
Growth SDSALES	
Board size	A dummy variable that takes one if the total number of directors on the boards is higher than the median sample and zero, otherwise
Board independence	A dummy variable that takes one if the total number of independent directors on the boards is higher than the median sample and zero, otherwise
Board gender	A dummy variable that takes one if the total number of female directors on the boards is higher than the median sample and zero, otherwise
Corporate governance score	A dummy variable that takes one if the corporate governance score is higher than the median sample and zero, otherwise. Corporate governance score was extracted from ASSET4 database.
Analyst following	The number of analysts following at the end of the year

Institutional ownership	The percentage of institutional ownership at the end of the year
Financial constraints	A dummy variable that takes one if a firm's KZ is higher than the sample median. $KZ_{i,t} = -1.002\ (CF_{i,t}/TA_{i,t}) - 39.368\ (DIV_{i,t}/TA_{i,t}) - 1.315\ (CA_{i,t}/TA_{i,t}) + 3.129\ (Debt_{i,t}/TA_{i,t}) + 0.283\ Q_{i,t}$ where $TA_{i,t}$ is lagged total assets, $CF_{i,t}$ is cash flow, $DIV_{i,t}$ is cash dividend, $CA_{i,t}$ is cash balance, $Debt_{i,t}$ is total debt, and $Q_{i,t}$ is the market value of equity over total assets. A higher value on the KZ index means that the firm is more financially constrained.
Leverage	A dummy variable that takes one if long-term debt to total assets ratio is higher than the median sample and zero, otherwise.
Litigation Risk	A dummy variable that takes 1 if a firm belongs to litigious industries (SIC codes: 2833–2836, 3570–3577, 3600–3674, 5200–5961, and 7370).
Partisan Conflict Index	An index reflects policy disagreements between and within political parties as well as between Congress and the President at a given point in time.

Climate Disclosure in Buyer-Supplier Relationships: A Story of Alignment

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Abstract: We provide first large-sample evidence on the relationship between buyers' and suppliers' climate-related disclosures in their 10-K filings. Using a comprehensive set of measures that capture disclosure style and content, we document that buyers and suppliers are closely aligned in their disclosure practices. One key mechanism through which alignment arises is the supplier's imitation of its buyer's disclosures, indicating spillover effects of climate disclosure practices within supply chains. Moreover, we show that buyers and suppliers tend to exhibit similar disclosure practices already before entering the relationship, suggesting that firms actively seek partners who demonstrate a shared orientation toward climate change. Fostering such a mutual orientation enhances the performance of the buyer-supplier relationship, leading to real improvements in the supplier's emissions performance. Overall, our study improves our understanding of the dynamics of disclosure in buyer-supplier relationships and demonstrates the importance of considering firms' nonfinancial disclosure choices within the context of their supply chain.

Keywords: climate disclosure, supply chains, buyer-supplier relationships, textual analysis

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1. Introduction

Amidst ever-growing concerns of greenwashing (Montgomery et al., 2024), an extensive body of research has been exploring the drivers, determinants, and consequences of managers' climate disclosure choices (e.g., Ben-Amar et al., 2023; Bingler et al., 2024; Bui et al., 2020; Cohen et al., 2023; Ding et al., 2023; Fabrizio & Kim, 2019; Flammer et al., 2021; Hahn et al., 2015; Ilhan et al., 2023; Matsumura et al., 2014).[1] However, in doing so, prior studies have primarily taken a firm-centric perspective and have largely neglected studying disclosure within the wider institutional context of the firm and its supply chain relationships.[2] Nevertheless, in business environments characterized by increasingly complex and interconnected supply chains, corporate customers emerge as an important group of stakeholders, both as potential users of disclosures (Darendeli et al., 2022; De Meyst et al., 2023) and as influential actors who can shape the focal firm's disclosure behavior (Dai et al., 2021; Diebel et al., 2024; Jira & Toffel, 2013; Villena & Dhanorkar, 2020). Therefore, the goal of our paper is to explore the dynamics of climate disclosure in buyer-supplier relationships. Specifically, we aim to provide large-sample empirical evidence on whether and by which mechanisms suppliers adopt similar disclosure practices as their buyers, and whether this has implications for the performance of their relationship.

To do so, we analyze a large sample of climate disclosures in buyers' and suppliers' 10-K filings, covering 75,637 relationship-years involving 2,496 unique buyers and 2,847 unique suppliers. We focus on disclosures made in firms' regulatory filings rather than in stand-alone corporate social responsibility (CSR) or sustainability reports, since, globally, regulators are increasingly emphasizing the annual report as the preferred disclosure format. For example, the EU's Corporate Sustainability Reporting Directive (CSRD) requires firms to include CSR

[1] For brevity, we use "climate disclosure" and "disclosure" interchangeably.
[2] Notable exceptions are the studies by Jira and Toffel (2013) and Villena and Dhanorkar (2020). However, they focus on the voluntary disclosure of emissions information to the CDP. Our focus is on climate disclosure more broadly and on disclosures made directly in firms' annual reports.

information in a dedicated section in the annual management report (Directive 2022/2464). Similarly, the SEC has recently adopted new rules regarding the enhancement and standardization of climate disclosures in firms' 10-K filings (SEC, 2024a). Given regulators' emphasis on annual reports as the primary disclosure format, developing a better understanding of how disclosures in these reports are influenced by a firm's supply chain relationships is both timely and relevant.

To analyze buyers' and suppliers' climate disclosure practices, we develop a set of measures that capture both a firm's disclosure style and the thematic content of its disclosures. In particular, we use ClimateBERT, a large language model trained to handle complex climate-related natural language processing tasks (Webersinke et al., 2022), to develop three measures that characterize style: (1) the overall extent of climate disclosure, (2) the extent to which a firm discloses tangible commitments and actions, and (3) the specificity of a firm's disclosures. To characterize content, we use a set of topic-specific climate change dictionaries that capture discussions about regulatory climate risks, physical climate risks, and climate-related opportunities (Sautner et al., 2023). This broad set of disclosure measures allows us to capture in sufficient detail the various ways firms are talking about climate change in their annual reports.

We begin our analysis by exploring whether a firm's disclosure practices are influenced by its supply chain relationships. To do so, we examine the relationship between buyer and supplier disclosure at the level of the buyer-supplier dyad. We find that, across all dimensions of disclosure, supplier disclosure in the next period is positively and significantly associated with buyer disclosure in the current period. These results remain robust across different specifications and when controlling for a set of variables known to influence a firm's disclosure behavior. Overall, these results indicate that suppliers are likely to adopt similar disclosure practices as their buyers, leading to buyer-supplier relationships characterized by a substantial

degree of alignment in disclosure. In our next set of tests, we subsequently explore two mechanisms through which alignment can arise, namely imitation and matching.

Imitation occurs when suppliers consider their buyers as influential referents when making their own disclosure choices (e.g., Diebel et al., 2024; DiMaggio & Powell, 1983; Haunschild & Miller, 1997), leading to spillovers in disclosure from buyers to suppliers. Drawing on neoinstitutional theory, we hypothesize that the extent to which a buyer can influence a supplier's adoption of specific disclosure practices depends on the size of the total pool of potential referents (e.g., Haunschild, 1993), which arguably increases with the size of the supplier's customer base (H1) and the level of competition (H2). For instance, Diebel et al. (2024) show that when suppliers serve multiple, heterogeneous buyers, they only selectively imitate the environmental disclosure practices of their most influential buyers. Moreover, Villena and Dhanorkar (2020) show that mimetic pressures arising from industry peers also influence suppliers' disclosure practices. Our results reveal that both the size of a supplier's customer base and its number of competitors significantly and negatively moderate the association between buyer and supplier disclosure. This suggests that imitation is a key mechanism through which alignment in buyer and supplier disclosure arises and demonstrates that buyers are important stakeholders who can influence the diffusion of disclosure practices throughout the supply chain.

Alternatively, alignment in disclosure can also result from the supplier selection process if buyers and suppliers already share similar disclosure practices before entering the relationship (e.g., Becker, 1973; Dai et al., 2021). We explore this matching channel by examining the association between buyer and supplier disclosure in the year before the buyer-supplier relationship was first established. Across all dimensions of disclosure, we still find a positive and significant association between buyer and supplier disclosure, providing strong support for matching as an alternative channel driving alignment in disclosure. These findings

suggest that climate disclosure is relevant in buyer-supplier relationships. Either because it is used directly in the matching process, or because it signals a firm's orientation toward climate change. For instance, if buyers and suppliers seek out matches with peers who share a similar orientation toward climate change, this will lead to similarities in disclosure only if buyers' and suppliers' disclosures credibly signal their orientation toward climate change.

In our final set of tests, we examine whether alignment in disclosure is desirable, and thus something buyers and suppliers should strive for. Specifically, we examine whether greater alignment in disclosure can have implications for the environmental performance of suppliers. Theoretically, if disclosure signals a firm's orientation toward climate change (e.g., Connelly et al., 2011), alignment in disclosure implies that a buyer and supplier share a mutual orientation toward climate change, which can improve collaboration and foster trust in the buyer-supplier relationship (Ertug et al., 2022; Liu et al., 2021; Luo & Zheng, 2013). This can influence the effectiveness of a buyer's initiatives to manage the supplier's environmental performance, leading to improvements in the supplier's emissions performance (H3)(Eggert & Hartmann, 2021). To test this, we limit our sample to include only those relationships with buyers that have mechanisms in place to improve their suppliers' environmental performance and examine whether greater alignment in disclosure influences suppliers' emissions intensity. Overall, we find that greater alignment in terms of style is positively associated with suppliers' emissions performance. This suggests that sharing a mutual orientation toward climate change in general, although not necessarily to the same specific climate-related issues (as captured by the content dimension), can influence the performance of the buyer-supplier relationship.

The central contribution of our paper is to provide comprehensive evidence on the relationship between buyers' and suppliers' climate disclosures in their regulatory filings. In doing so, we add to the CSR disclosure literature, which has primarily been studying these disclosures from the perspective of the focal firm (e.g., Ben-Amar et al., 2023; Berkman et al.,

2024; Bingler et al., 2024; Ding et al., 2023; Griffin et al., 2023; Kim et al., 2023; Matsumura et al., 2024; Nagar & Schoenfeld, 2024). Our findings illustrate that corporate customers are important stakeholders who can influence a firm's disclosure behavior, leading to the diffusion of climate disclosure practices in supply chains – even when these disclosures are primarily investor-oriented. An important implication of our findings is that developing a better understanding of managers' disclosure choices requires adopting a broader systems perspective that considers the firm's relationships with its supply chain partners.

We also contribute to a growing body of research studying the relevance of climate disclosures. While there exists evidence that climate risk disclosures in firms' 10-K filings trigger a reaction from capital markets (e.g., Ben-Amar et al., 2023; Berkman et al., 2024; Kölbel et al., 2024; Matsumura et al., 2024), prior studies have repeatedly expressed concerns that current disclosures are often generic, imprecise and prone to greenwashing (e.g., Bingler et al., 2022, 2024; Ilhan et al., 2023). We show that the alignment in disclosure between buyers and suppliers is partly driven by matching, which demonstrates that disclosure can serve as credible signal of a firm's orientation toward climate change and illustrates its usefulness for corporate decision-making.

Additionally, we add to the literature investigating CSR in supply chains. Prior literature investigating the diffusion of CSR practices in supply chains has pointed toward either matching (Dai et al., 2021) or imitation (Diebel et al., 2024) as a key mechanism in their explanations for why buyers and suppliers adopt similar CSR practices. We provide a more nuanced perspective, showing that imitation and matching can occur simultaneously. Moreover, we provide evidence that fostering a shared orientation toward climate change among supply chain partners can improve the effectiveness of a buyer's initiatives to manage its suppliers' environmental performance.

Finally, our findings are also relevant for policymakers, as they show that implementing disclosure regulation might lead to spillovers from regulated buyers to unregulated suppliers. In their ex-post evaluations of disclosure regulation, policymakers should thus consider how changes in disclosure by one firm affect disclosures by other firms in its supply chain.

2. Background and motivation

Prior research in accounting and finance has predominantly studied firms' climate disclosure practices from the perspective of the focal firm. In doing so, studies have provided evidence on how managers' disclosure decisions are influenced by investors' nonfinancial preferences (e.g., Cohen et al., 2023; Flammer et al., 2021; Ilhan et al., 2023), the presence of effective governance mechanisms (e.g., Ben-Amar & McIlkenny, 2015; Bui et al., 2020; Liao et al., 2015), and the trade-off between the costs and benefits of providing disclosure (Christensen et al., 2021). Additionally, researchers have studied the relevance of disclosure in capital markets and its relationship with firm performance (e.g., Ben-Amar et al., 2023; Berkman et al., 2024; Bingler et al., 2024; Ding et al., 2023; Matsumura et al., 2014, 2024).

However, in today's business environment, firms typically do not operate in isolation but are embedded in complex, global supply chains, which constitute diverse networks of inter-organizational relationships. Within such networks, firms are likely to observe the disclosure practices of their peers, which, in turn, could influence their own disclosure behavior. This is especially true for the disclosure of climate-related information, where firms are inherently dependent on information from supply chain partners, and primarily suppliers. For example, suppliers' emissions disclosures can help buyers estimate their upstream scope 3 emissions more accurately, and understanding suppliers' vulnerabilities to adverse weather events can help buyers identify their own exposure to supply chain disruptions.

Against this backdrop, a few studies have shifted from taking a firm-centric view of CSR to examining its dynamics within inter-organizational relationships. For instance, Dai et

al. (2021) examine the adoption of CSR practices in buyer-supplier relationships and find evidence of "collaborative CSR efforts" (p. 601), where suppliers align their CSR practices with those of their buyers. Focusing on disclosure specifically, Jira and Toffel (2013) and Villena and Dhanorkar (2020) find that suppliers are more likely to disclose high-quality emissions information to the CDP when more buyers request it, demonstrating suppliers' sensitivity to coercive pressures from buyers. Diebel et al. (2024) provide evidence of imitation as an alternative mechanism through which buyers can exert influence on suppliers by showing that suppliers selectively imitate buyers' environmental disclosure practices, depending on the prevailing institutional logic.[3] More specifically, they find that suppliers primarily imitate their largest or most transparent buyers, reflecting a market and sustainability logic shaping suppliers' disclosure choices (Diebel et al., 2024).

Overall, these studies illustrate how buyers can influence the adoption of CSR practices in supply chains, leading to buyer-supplier relationships characterized by a substantial degree of alignment in CSR. This emphasizes the importance of considering a supplier's relationships with its customers when studying its disclosure choices. Our paper, therefore, aims to contribute to the current nonfinancial disclosure literature by adopting a broader perspective and analyzing the relationship between buyers' and suppliers' climate disclosure practices. Specifically, we examine whether buyer-supplier relationships are characterized by alignment between buyers' and suppliers' climate disclosures, and if so, how such alignment arises.

3. Institutional context

Regulation S-K of the US Securities Act imposes an affirmative duty on managers to include all material information, including information about climate-related risks and opportunities, in a firm's filings with the SEC (Matsumura et al., 2024). The principle of

[3] Evidence of "selective imitation" in supply chains has also been provided outside the context of CSR, for instance in the adoption of management control practices (e.g., Reusen et al., 2020).

materiality is a key concept in corporate reporting and the cornerstone of the SEC's disclosure regime (Christensen et al., 2021). Information is defined as material when "disclosure of the omitted fact would have been viewed by the reasonable investor as having significantly altered the 'total mix' of information made available" (TSC Industries, Inc. v. Northway, Inc., 426 U.S. 438 1976). This suggests that the main goal of disclosure is to fulfill the informational demands of investors. The latter is also reflected in the SEC's motivation for adopting stricter climate disclosure rules, emphasizing the need to "respond to investors' demand for more consistent, comparable, and reliable information about the financial effects of climate-related risks" (SEC, 2024b). In line with these arguments, prior literature has shown that shareholder activism and institutional investors' demand for climate-related information significantly influence firms' disclosure behavior (Cohen et al., 2023; Flammer et al., 2021; Ilhan et al., 2023), demonstrating managers' sensitivity to investor pressures. Combined, these findings illustrate that investors are powerful stakeholders who can influence a supplier's disclosure decisions, potentially making alignment in buyer and supplier disclosure less likely.

Nevertheless, although the SEC already issued guidance on the disclosure of climate-related risks in 2010, prior research argues that disclosure remains essentially voluntary due to a lack of enforcement, limited stakeholder engagement, and the difficulties investors face in evaluating the potential financial consequences of climate risks (Matsumura et al., 2024). This provides managers with significant discretion in their disclosure choices (e.g., Beyer et al., 2010; Christensen et al., 2021; Healy & Palepu, 2001). This complex institutional context creates an environment where suppliers must carefully balance pressures from various stakeholder groups when deciding what and how much climate-related information to report (e.g., Reimsbach et al., 2020). However, whether suppliers also consider pressures arising from their buyers in such a context characterized by ambiguity in disclosure, remains an open question.

4. Theory and hypothesis development

In the next sections, we explore two key mechanisms through which alignment in buyer and supplier disclosure can arise, namely imitation and matching, and discuss its potential implications for the performance of the buyer-supplier relationship.

4.1. Imitation

Imitation occurs when a buyer's use of specific climate disclosure practices increases the likelihood of the supplier adopting similar practices (Haunschild & Miller, 1997).[4] The concept of imitation is rooted in institutional theory, which posits that firms adopt shared organizational practices and beliefs due to pressures emanating from their institutional environment (DiMaggio & Powell, 1983). Traditionally, institutional theory emphasizes social influences and the need to establish a firm's legitimacy as important drivers of imitation (DiMaggio & Powell, 1983; Reusen et al., 2020). More recent developments in institutional theory, however, argue that imitation is driven by a set of institutional logics,[5] and that different institutional logics can coexist at the same time (e.g., Diebel et al., 2024; Haunschild & Miller, 1997), giving rise to institutional complexity (Greenwood et al., 2011). According to the institutional logics perspective, a supplier could selectively imitate the disclosure practices from only a subset of buyers, depending on the prevailing institutional logic (Diebel et al., 2024).[6]

Although the different institutional perspectives vary in their expectations of how imitation occurs, they all recognize that uncertainty enhances imitation (e.g., DiMaggio &

[4] Prior literature uses imitation and contagion interchangeably (e.g., Greve, 1998; McFarland et al., 2008). For instance, Greve (1998) argues that contagion occurs between firms "When one organization's adoption of a practices increases the likelihood that other organizations will adopt" (p. 970).
[5] Institutional logics can be defined as the sets of rules that guide and constrain decision makers in achieving the organization's goals (Greenwood et al., 2011; Thornton & Ocasio, 1999).
[6] For example, a supplier following a market logic, characterized by a strong focus on profitability and operational efficiency, is more likely to imitate the climate disclosure practices of its most profitable buyer. Conversely, a supplier following a sustainability logic is more likely to imitate the disclosure practices of its most environmentally sustainable buyer.

Powell, 1983; Haunschild & Miller, 1997). The underlying rationale being that ambiguity about a firm's best course of action strengthens the importance of its social ties, and imitating peers' behavior presents a low-cost solution to overcome that ambiguity (Henisz & Delios, 2001; McFarland et al., 2008). Given that climate disclosure is inherently multidimensional (e.g., Christensen et al., 2021; Ilhan et al., 2023; Matsumura et al., 2024) and that the economic consequences of climate risks are highly ambiguous (e.g., Barnett et al., 2020; Giglio et al., 2021; Pindyck, 2013; Sautner et al., 2023), we postulate that suppliers are likely to consider the disclosure practices of their peers when making their own disclosure choices (Diebel et al., 2024; Liu et al., 2021). Since prior research has demonstrated the importance of buyer leadership in suppliers' CSR engagements (Dai et al., 2021; Diebel et al., 2024; Jira & Toffel, 2013; Song et al., 2023; Villena & Dhanorkar, 2020), we would expect suppliers to consider buyers as influential referents, potentially influencing their disclosure behavior.[7]

This notion of "referents" is central to the concept of imitation (e.g., Greve, 1998; Haunschild, 1993). Haunschild (1993) argues that in order for imitation to arise, three conditions need to be fulfilled: (1) there exists a model firm (i.e., a referent) that has adopted the specific practice at time *t*, (2) decision-makers at the imitating firm are exposed to the practices adopted by the model firm, and (3) the imitating firm demonstrates the same practice with a time lag. Consistent with these criteria, we argue that imitation arises when a supplier adopts the past disclosure practices of an influential buyer, if the buyer's disclosure practices are easily observable (Greve, 1998; Henisz & Delios, 2001; McFarland et al., 2008).

This conceptualization of imitation implies that a supplier's willingness to imitate depends on how easily observable a buyer's prior climate disclosures are and how much the supplier considers the buyer a legitimate referent. The former condition always holds, as all

[7] This also closely aligns with Galaskiewicz and Wasserman (1989), who argue that firms are more likely to imitate the behavior of peers with which they have a direct relationship through boundary spanning personnel.

10-K filings filed with the SEC are publicly available and centralized in the EDGAR database. As such, a supplier's tendency to imitate a buyer is primarily a function of that buyer's legitimacy toward the supplier. This, in turn, is arguably influenced by the strength of the buyer-supplier relationship (Tate et al., 2013). Corroborating this argument, prior literature has shown that imitation is more likely to occur when suppliers are more closely connected to their buyers (Reusen et al., 2020). Similarly, McFarland et al. (2008) illustrate that the degree of interdependence influences imitative behavior in supply chain triads. Hence, if imitation drives alignment in disclosure between buyers and suppliers, we would expect alignment to be influenced by the size of the supplier's customer base, assuming that suppliers tied to fewer buyers are more closely connected to those buyers. Moreover, when suppliers face greater diversity in their customer base, they might only selectively imitate their buyers' disclosure practices (Diebel et al., 2024), leading to more heterogeneous disclosure practices and, consequently, a lower degree of alignment. We therefore hypothesize the following:

Hypothesis 1: Consistent with imitation, alignment in climate disclosure between a buyer and a supplier will be higher when there is less diversity in the supplier's customer base.

Furthermore, we argue that the willingness of a supplier to imitate the disclosure practices of a specific buyer also depends on the presence of other stakeholders that can affect the supplier's disclosure behavior. Prior literature has shown that imitative pressures do not only arise from a firm's customer base, but also from its relationships with partners and competitors, among others (e.g., Aerts et al., 2006; Haunschild & Miller, 1997; Henisz & Delios, 2001; Villena & Dhanorkar, 2020). This might be especially true in the context of climate disclosure, where the materiality of specific climate-related issues is highly industry-

specific (e.g., Aerts et al., 2006; Sautner et al., 2023).[8] For instance, Villena and Dhanorkar (2020) show that normative pressures from industry peers influence a firm's tendency to disclose high-quality emissions information publicly. Additionally, Aerts et al. (2006) demonstrate that a focal firms' tendency to imitate the environmental disclosure practices of its peers in the same industry and country is influenced by these peers' own tendency to imitate others. These findings clearly illustrate that competitors are key stakeholders who can influence the focal firm's disclosure behavior. We therefore argue that the total "pool" of potential referents increases with the number of competitors, reducing the likelihood that a supplier will imitate the disclosure practices of a single buyer. This leads us to formulate the following hypothesis:

Hypothesis 2: Consistent with imitation, alignment in climate disclosure between a buyer and a supplier will be lower when the level of competition for the supplier is higher.

4.2. Matching

An alternative mechanism through which alignment in disclosure can arise is assortative matching. Positive assortative matching occurs when buyers (suppliers) actively seek matches with suppliers (buyers) that exhibit similar disclosure practices (Becker, 1973; Dai et al., 2021).[9,10] As a result, alignment in disclosure stems from the supplier selection process rather than from imitation during the relationship.[11] In line with this argument, Dai et

[8] This is also reflected in efforts of sustainability reporting standard setters. For instance, both the International Sustainability Standards Board's standards as well as the European Sustainability Reporting Standards provide industry-specific guidance on sustainability reporting and materiality assessment.
[9] The central tenet of positive assortative matching is closely related to the concept of homophily, which is defined as the "tendency to associate with similar others" (Ertug et al., 2022, p. 38).
[10] The supplier selection process can be seen as a "two-sided selection market", in which both the buyer and the supplier individually decide to enter the relationship, and each partner contributes to some extent to how the relationship is structured.
[11] Matching and imitation are not mutually exclusive. Imitation might still occur even if buyers and suppliers already demonstrate similarities in disclosure before entering the relationship. Moreover, matching might even stimulate imitation, as it implies that suppliers match with similar buyers. For instance, Greve (1998) argues that "for a previous adoption to influence a potential adopter, the previous adopter and its context must be viewed as similar to the potential adopter […]" (p. 970).

al. (2021) show that a potential mechanism underlying the adoption of shared CSR practices in buyer-supplier relationships is the buyer's tendency to establish relationships with suppliers that ex ante demonstrate similar CSR performance. Darendeli et al. (2022) further corroborate these findings by showing that buyers benchmark suppliers' CSR performance in the contracting process.

Hence, matching indicates that disclosure is either used directly in the supplier selection process or that buyers and suppliers match based on some climate-related criteria, which are indirectly reflected in their disclosures. For example, a buyer could consider a supplier's exposure to climate risk in its selection process and use the supplier's disclosures directly to obtain information about its recognition of climate risk. Alternatively, the buyer can obtain the same information through direct conversations with the supplier's management. If, in the latter scenario, the supplier's disclosures reflect its recognition of climate risk, then this will lead to buyer and supplier disclosures that are closely aligned, assuming the buyer also reports on climate risk.

We argue that if assortative matching is the mechanism that drives alignment in buyer and supplier disclosure, then this implies that disclosure, at least to some extent, signals a firm's orientation toward climate change. This closely aligns with a signaling theory perspective on disclosure, which argues that managers provide disclosure to reduce information asymmetries between the firm and the users of its disclosures (e.g., Connelly et al., 2011). Therefore, if managers believe that outside stakeholders require information about the firm's exposure to climate change, signaling theory suggests that they will disclose this information accurately. This, in turn, implies that disclosure can be seen as a credible signal of a firm's orientation toward climate change (Ditillo & Lisi, 2016; Song et al., 2023), since it not only reveals information about the firm's recognition of climate risks and how they are managing them, but also reflects the manager's belief that this information is relevant to the firm's stakeholders.

Consistent with a signaling theory perspective on disclosure, Song et al. (2023) provide evidence that customers' environmental disclosures are associated with a reduction in suppliers' emissions. The authors interpret this as evidence that environmental disclosure serves as signal of a buyer's environmental commitment, which influences the supplier's motivation to invest in, often costly, initiatives to reduce its emissions (Song et al., 2023).

However, it remains unclear whether buyers and suppliers are likely to use disclosure in their selection process and whether a firm's disclosures truly reflect its orientation toward climate change. For example, concerns about greenwashing are at an all-time high (Montgomery et al., 2024), and prior studies have shown that current climate disclosures are often very generic, boilerplate, and contain substantial cheap-talk (e.g., Bingler et al., 2022, 2024). Whether assortative matching will occur in buyer-supplier relationships, and whether this will be reflected in the disclosures of buyers and suppliers therefore remains an open question.

Research question: Is alignment in climate disclosure between a buyer and a supplier driven by positive assortative matching?

4.3. Implications of alignment in disclosure

As previously discussed, signaling theory argues that climate disclosure can serve as a signal of a firm's orientation toward climate change (e.g., Connelly et al., 2011; Song et al., 2023). This suggests that alignment in buyer and supplier disclosure indicates a buyer-supplier relationship characterized by a mutual understanding of how the risks and opportunities associated with climate change matter for the firm. In turn, when buyers and suppliers are similar in their "climate orientation", this can foster communication, improve coordination, and establish mutual trust in the buyer-supplier relationship (Ertug et al., 2022; Liu et al., 2021). This closely aligns with prior research, that has shown that achieving congruence in CSR

orientation in supply chain relationships improves the performance of the relationship, ultimately leading to financial gains for the buyer (Liu et al., 2021; Luo & Zheng, 2013; Yang & Jiang, 2023).

At the same time, extant research illustrates buyers' ability to manage and monitor their suppliers' CSR performance (e.g., Dai et al., 2021; Delmas & Montiel, 2009; Eggert & Hartmann, 2021; Foerstl et al., 2015; Jira & Toffel, 2013; Villena & Dhanorkar, 2020). For instance, Dai et al. (2021) find that buyers influence the adoption of CSR practices by their buyers, leading to the diffusion of CSR practices in supply chains. Focusing on climate change specifically, Eggert and Hartmann (2021) show that the comprehensiveness of a buyer's environmental, purchasing, and supplier management system is associated with a significant decrease in supply chain emissions.

Taken together, we posit that when buyers actively engage with supply chain partners to improve their environmental performance, the extent to which buyers and suppliers are mutually oriented toward climate change can influence the effectiveness of the buyer's initiatives, leading to improved environmental outcomes for the supplier (Luo & Zheng, 2013). Therefore, we hypothesize the following:

Hypothesis 3: The degree of alignment in buyer and supplier disclosure is positively associated with the effectiveness of the buyer's initiatives to manage the environmental performance of its supplier, leading to improvements in the supplier's emissions performance.

5. Data and sample

We obtain data on buyer-supplier relationships from the FactSet Revere database. FactSet Revere arguably provides the most comprehensive coverage of buyer-supplier relationships available today, with information for over 20,000 firms globally dating back to 2003 (Dai et al., 2021; Darendeli et al., 2022; Gofman et al., 2020; She, 2022). FactSet collects

this information from company disclosures and several other publicly available sources, such as websites, press releases, and investor presentations. For each identified buyer-supplier relationship, FactSet includes data on the start and end of the relationship, allowing us to track each supplier's position within its supply network over time (Lin et al., 2023). Additionally, for each buyer and supplier, we collect financial information from Compustat and environmental performance data from Refinitiv.

Our data collection starts by retrieving all buyer-supplier relationships reported in FactSet between January 2010 and June 2021, the most recent period for which we have the data available. We only include relationships as of 2010 onward, as this marks the year when the SEC implemented rules guiding the disclosure of climate-related matters in firms their Forms 10-K, which brought about a substantial change in the disclosure of climate-related information (Kim et al., 2023). We subsequently limit our sample to relationships between publicly listed U.S. firms and exclude financial firms following prior literature on climate risk disclosure (e.g., Ben-Amar et al., 2023; Berkman et al., 2024). After merging these data with data from all other sources and removing observations with missing values for our main variables, we obtain a final sample of 75,637 relationship-years involving 2,496 unique buyers and 2,847 unique suppliers between 2010 and 2020. Our final sample consists of a diverse set of firms from a broad range of industries that exhibit significant variation in disclosure (see Tables 1 and 2).

6. Measuring disclosure

We collect the raw text from firms' 10-K filings using the SEC API.[12] Given that we expect most climate-related discussions to appear in the Business (Item 1), Risk Factors (Item 1A), and Management's Discussion and Analysis (Item 7) sections of the 10-K (Ho, 2020;

[12] See https://sec-api.io/.

Matsumura et al., 2024; Rouen et al., 2024) we limit our analysis to these sections only. After removing any remaining HTML code and tables, we obtain a clean sample of textual 10-K disclosures, which serves as the basis for our analysis. In all our tests, we focus on several dimensions of disclosure, thereby providing a comprehensive overview of what climate-related information buyers and suppliers report (i.e., disclosure content) and how they report (i.e., disclosure style).

6.1. Disclosure style

We focus on three dimensions of disclosure style: the overall extent to which a firm discloses climate-related information (*Extent*), the specificity of a firm's disclosures (*Specificity*), and the extent to which a firm discloses tangible commitments and actions (*Commitment*).

Ln(Extent) indicates how much climate-related information a buyer or supplier discloses, which we measure as the natural logarithm of the number of climate-related paragraphs identified by ClimateBERT (plus one) (Müller et al., 2024). ClimateBERT is a large language model developed by training an extension of Google's BERT model (Devlin et al., 2019) on a large corpus of climate-related texts, including several news sources, abstracts of climate-related research articles, and climate disclosures in annual and sustainability reports (Webersinke et al., 2022). Due to this extensive training procedure, ClimateBERT has developed an accurate representation of the complex climate-related vocabulary, making it particularly suited for applications in the domain of climate change (Webersinke et al., 2022). We use the ClimateBERT model that has been finetuned on the task of classifying paragraphs as climate-related or not to identify all paragraphs containing any climate-related information in a firm's annual report.[13]

[13] Before applying the ClimateBERT algorithm, we split the raw text into paragraphs and apply a few cleaning steps. Specifically, we remove any paragraphs containing less than 15 words or paragraphs without punctuation,

However, the extent of a firm's disclosures does not necessarily indicate their informativeness. Therefore, we analyze two additional dimensions of disclosure that arguably better reflect the informativeness of the reported information, namely whether disclosure is specific or reflects tangible commitments and actions (Bingler et al., 2024). We measure the specificity of a firm's disclosures using a variant of ClimateBERT that has been trained to identify whether a climate-related paragraph is specific or not (Bingler et al., 2024). A paragraph is typically considered to be specific when it contains detailed information, such as the names of specific entities, organizations, locations, or persons, and if it contains detailed, often numeric, information about the firm's performance (Bingler et al., 2024; Hope et al., 2016). *Ln(Specificity)* is then measured as the natural logarithm of the number of climate-related paragraphs classified as specific by the ClimateBERT algorithm (plus one).

Similarly, we measure whether a paragraph discusses tangible commitments and actions using a variant of ClimateBERT that has been trained to identify paragraphs containing communication about specific commitments and actions (Bingler et al., 2024). A paragraph generally gets labeled as discussing commitments when it contains information about the actions the firm has undertaken to manage and reduce its exposure to climate change (Bingler et al., 2024). *Ln(Commitment)* is then measured as the natural logarithm of the number of climate-related paragraphs that are classified as commitment by the ClimateBERT algorithm (plus one).

Appendix A provides a set of example paragraphs and their labels as determined by the ClimateBERT model. These examples clearly illustrate the model's ability to distinguish between the different types of disclosure and the various ways firms talk about climate change (see also Table 2).

since the latter are likely to be (sub)titles. We also strip extra whitespaces and remove empty strings from our final set of paragraphs.

6.2. Disclosure content

To analyze disclosure content, we develop a set of measures that capture the prevalence of three distinct climate-related topics in a firm's annual report: discussions about regulatory climate risks (*DisclReg*), physical climate risks (*DisclPhys*), and the opportunities arising from climate change (*DisclOpp*). Disaggregating the climate change discourse into these three topics allows us to capture firms' varying exposures to climate change and the extent to which this is reflected in their disclosures (Sautner et al., 2023).

To develop our measures, we use a set of topic-specific climate change dictionaries created by Sautner et al. (2023). These dictionaries are the result from an extensive procedure that combines several machine learning algorithms trained on a large set of conference call transcript to select bigrams (i.e., two-word co-occurrences) that optimally distinguish climate-related text from general text. Specifically, for each topic, Sautner and coauthors first use transcripts from research reports by the Intergovernmental Panel on Climate Change (IPCC) to identify an initial set of bigrams that are unambiguously related to the topic, and subsequently use them to create a reference set of related sentences from conference call transcripts. They then fit several machine learning models to this reference set and apply them to obtain a prediction for more than 70 million sentences from previously unseen transcripts. In a final step, they reverse engineer the predictions of the models to create a comprehensive dictionary of topic-specific bigrams that accurately capture the vocabulary used in discussions about each of the topics. As such, the method addresses some of the challenges simpler dictionary-based approaches face in dealing with the complex and fast-evolving nature of the climate change language (Sautner et al., 2023).

We then use these dictionaries to compute our measures of topic prevalence. Specifically, for each 10-K filing and topic, we scale the frequency of climate change bigrams

by the total number of bigrams in the filing.[14,15] Hence, our measures of disclosure content essentially reflect the attention managers devote to each of the three topics in the annual report (Sautner et al., 2023). Appendix B presents the top 10 bigrams per topic as per the suppliers' disclosures and their frequency of appearance in buyers' and suppliers' annual reports.

7. Empirical model

To examine whether suppliers adopt similar disclosure practices as their buyers, we follow prior research investigating CSR dynamics in supply networks and estimate the following model at the dyad-level (e.g., Dai et al., 2021; Diebel et al., 2024): [16]

$$Disclosure_{s,t+1} = \beta_0 + \beta_1 Disclosure_{b,t} + \sum_{k=2}^{n} \beta_k Controls_{s,t} + Industry\ FE + State\ FE + Year\ FE + \varepsilon_{s,t}, \quad (1)$$

where subscripts s and b denote the supplier and buyer respectively. $Disclosure$ reflects the set of measures capturing either disclosure style (*Ln(Extent)*, *Ln(Specificity)*, or *Ln(Commitment)*) or content (*DisclReg*, *DisclPhys*, or *DisclOpp*). We measure the supplier's disclosure in year t + 1 and the buyer's disclosure in year t to account for spillovers in disclosure due to imitation (Aerts et al., 2006; Diebel et al., 2024).[17]

Controls is a vector of control variables typically used in prior research on supply chain CSR (e.g., Bellamy et al., 2020; Dai et al., 2021; Darendeli et al., 2022; Diebel et al., 2024).

[14] Simpler word count methods require more advanced text preprocessing steps. Here, we first replace any variant of CO2 (e.g., CO_2 or Co2) with 'carbon dioxide'. Subsequently, we remove any non-alphabetic characters and lemmatize and lowercase all words. Finally, following Hassan et al. (2019), we remove all bigrams that contain pronouns or bigrams consisting of two adverbs.

[15] Following Sautner et al. (2023), measures of disclosure content (*DisclReg*, *DisclOpp*, *DisclPhys*) are multiplied by 10^3.

[16] Estimating our model at the dyad-level not only allows to exploit variation at the supplier-level, but also at the buyer- and relationship-level of analysis. This is relevant, since it has been shown that buyer characteristics can influence suppliers' imitation of buyers' disclosure practices (Diebel et al., 2024). Although we only control for supplier characteristics in our main tests, our results are robust to including a set of buyer-level controls (untabulated).

[17] Matching would imply that already at t, buyers and suppliers adopt similar disclosure practices. However, assuming that these effects persist over time, this would also lead to a relationship between a supplier's disclosure at t + 1 and a buyer's disclosure at t. As such, measuring the supplier's disclosure at t + 1 allows to capture both matching and imitation effects.

Specifically, we control for return on assets (*ROA*), defined as net income before extraordinary items scaled by total assets; firm size (*Size*), measured as the natural logarithm of total assets; leverage (*Leverage*), defined as the sum of short- and long-term debt scaled by total assets; sales growth (*Growth*), defined as the year-on-year percentage change in net revenues; Tobin's Q (*TQ*) defined as the market value scaled by total assets; and the market-to-book ratio (*MB*), which is the ratio of the market value of equity to its book value. We also include a dummy variable indicating whether the buyer and supplier operate in the same industry (*Same Industry*) or are headquartered in the same state (*Same State*). While the former aims to control for similarities in disclosure driven by the prevailing industry-specific standards and norms, the latter aims to control for the influence of state-specific disclosure regulations. When the dependent variable is an unscaled measure of disclosure, we also control for the filing length using the total number of words in the filing (*Filing length*). In a subset of analyses, we additionally include a set of variables that aim to capture a firm's underlying emissions performance and the quality of corporate governance, since both have been shown to influence a firm's disclosure behavior (e.g., Ben-Amar & McIlkenny, 2015; Bui et al., 2020; Ding et al., 2023; Gao et al., 2016).[18] In particular, we control for a firm's emissions performance by including its emissions intensity (*Emissions Intensity*) as the ratio of scope 1 and 2 emissions to net sales. We also control for corporate governance using Refinitiv's governance (*Governance*) and CSR committee (*CSR Committee*) scores. Finally, we control for the market's expectations of the materiality of climate risk by including a dummy variable (*Materiality*) indicating whether climate risk is material to the firm. Variable definitions and summary statistics are provided in Appendix C and Table 3, respectively. In all our models, we

[18] Despite the expanding coverage of environmental, social, and governance (ESG) data providers, we still lack emissions and governance data for about half of our observations. Therefore, to preserve as much variation in our data as possible, we do not include them in our main set of tests.

include supplier-industry, supplier-state, and supplier-year fixed effects. Standard errors are double clustered at the supplier-industry and supplier-year level.

8. Results

8.1. Descriptive statistics

Table 2 presents the distribution of our disclosure variables for suppliers (Panel A) and buyers (Panel B) across the different industries (two-digit GICS classification) in our sample. The table clearly illustrates the variation in firms' disclosure practices, both within and across industries, and demonstrates the effectiveness of our measures in capturing this variation. For instance, the table shows that firms operating in more environmentally sensitive industries (i.e., Utilities, Energy, Materials, and Industrials) not only report more extensively about climate change, but also provide relatively more detailed information (*Ln(Specificity)*) and more information about their actions and commitments (*Ln(Commitment)*). Table 3 further illustrates that although nearly all firms in our sample report at least some climate-related information, more than 25% of observations lack specific disclosures or disclosures about commitments and actions. Content-wise, the average firm in our sample reports most about regulatory climate risks and the least about physical climate risks.

Table 4 also shows that all our disclosure measures are highly correlated. This is not surprising, since firms that report more extensively about climate change also have more opportunities to provide specific information and information about their actions and commitments. Interestingly, we also find strong correlations between a firm's emissions intensity and all our measures of disclosure (values range from 0.19 for *DisclOpp* to 0.51 for *Ln(Specificity)*). This closely aligns with prior literature that has shown that firms with higher levels of emissions report more climate-related information (Ding et al., 2023).

8.2. Analyzing alignment in buyer and supplier disclosure

We begin our analysis by examining whether buyer-supplier relationships are characterized by the adoption of similar climate disclosure practices. Table 5 presents the results of estimating equation (1) for each disclosure dimension. Panel A reports results for regressions where the dependent variable is one of our measures of disclosure style, while Panel B reports results for regressions where the dependent variable is one of our measures of disclosure content. Overall, we find a positive and significant association between a buyer's disclosure and a supplier's disclosure across all specifications (coefficient values range from 0.0259, p-value = 0.0262, for $DisclPhys_b$ to 0.1478, p-value = 0.0004, for $Extent_b$). These results hold when controlling for the quality of the supplier's governance and its emissions performance. Our findings are also economically significant. For instance, a one percent increase in a buyer's extent of disclosure ($Extent_b$) is associated with an 0.15% increase in a supplier's extent of disclosure. In terms of content, a one standard deviation increase in a buyer's disclosure of regulatory information is associated with an average 12.56% increase in a supplier's disclosure of regulatory information (12.56% = 0.0639 x 0.8955/0.4556).

Taken together, these findings imply that in supply chains, buyers and suppliers exhibit a significant degree of alignment in their disclosure practices, both in the way they talk about climate change and in the topics they prioritize. Therefore, in the next set of tests, we explore our theoretical predictions regarding the mechanisms through which alignment in disclosure can arise, specifically imitation and matching.

8.2.1. Imitation

Our first hypothesis predicts that if imitation is the mechanism driving our results, greater diversity in a supplier's customer base is negatively associated with the supplier's tendency to imitate a particular buyer's disclosure practices. To test this, we compute for each supplier in our sample the number of buyers it serves (*Size Customer Base*) and rerun equation (1), introducing *Size Customer Base* as a moderator in the relationship between a buyer's

disclosure at time *t* and a supplier's disclosure at time *t+1*. Introducing this time lag in our modeling approach is critical to satisfy Haunschild's (1993) third condition for imitation, i.e., the imitating firm adopts the practice with a time lag. Our choice to measure supplier disclosure at t+1 follows the standard-approach in the literature (Aerts et al., 2006; Dai et al., 2021; Diebel et al., 2024).

Table 6, Panel A, presents the results. Except for the disclosure of physical climate risks and climate-related opportunities, we find that the relationship between buyer and supplier disclosure is moderated by the size of the supplier's customer base. This is evidenced by the negative and significant interaction term on $Buyer\ Disclosure_t$ *x Size Customer Base*$_t$ in models (1) to (4). These results thus provide support for our first hypothesis, especially for suppliers' imitation of buyers' disclosure style.

Additionally, our second hypothesis predicts that, consistent with imitation, the level of competition in a supplier's customer base is negatively associated with the supplier's tendency to imitate a particular buyer's disclosure practices. This is because higher competition decreases the likelihood of that buyer being considered as a potential referent by the supplier.

Following Song et al. (2023) we measure a supplier's number of competitors (*Nr. of Competitors)* using the FactSet Revere database. Like with buyer-supplier relationships, FactSet identifies competitive relationships when a firm discloses another firm as its competitor, using a broad range of sources such as SEC filings, company websites, and news articles. The advantage of this approach over using a firm's industry to measure competition is that it allows to capture competitive relationships between firms operating in different industries (Song et al., 2023). We then test whether *Nr. of Competitors* moderates the relationship between buyer and supplier disclosure. Table 5, Panel B, presents the results. We find a negative and significant interaction effect of $Nr.of\ Competitors_t$ on $Buyer\ Disclosure_t$, but only for the variables capturing disclosure style. This suggests that although content

imitation might occur, suppliers seem to be more likely to imitate their buyers' disclosure style, providing partial support to our second hypothesis.

Combined, these findings indicate that imitation is a key mechanism through which alignment in buyer and supplier disclosure arises. This implies that, even in a context where disclosure is regulated and primarily targeted toward investors, buyers are important stakeholders who can influence their suppliers' disclosure practices, ultimately leading to the diffusion of disclosure practices in supply chains.

8.2.2. Matching

We argue that a second key mechanism through which alignment in buyer and supplier disclosure can arise is positive assortative matching, where buyers and suppliers pair with those who have adopted similar disclosure practices. If matching is at play, this implies that the buyer's and supplier's disclosures should already be aligned before entering the relationship. To test this, we analyze the relationship between buyer and supplier disclosure in the year before the purchasing contract was signed. Therefore, we limit our sample to include only those observations for which the contract was signed in the current year (t) for both the buyer and the supplier and estimate the following model:

$$Disclosure_{s,t-1} = \beta_0 + \beta_1 Disclosure_{b,t-1} + \sum_{k=2}^{n} \beta_k Controls_{s,t-1} + Industry\ FE + State\ FE + Year\ FE + \varepsilon_{s,t-1}, \quad (2)$$

where all variables are defined as in model (1). A positive and significant coefficient on $Disclosure_{b,t-1}$ would indicate that matching is an alternative mechanism through which alignment in disclosure arises.

Table 7 presents the results. Across all specifications, we find a positive and significant association between buyer and supplier disclosure, providing strong evidence in favor of a matching effect. These results suggest that in buyer-supplier relationships, firms either use

disclosure directly in the matching process or match based on each other's orientation toward climate change. Overall, this reflects the idea that climate disclosures are relevant in buyer-supplier relationships, either directly or as a signal of a firm's orientation toward climate change (Song et al., 2023).

Taken together, these findings shed more light on the mechanisms through which alignment in disclosure arises. Prior literature has primarily focused on either imitation or matching to explain the adoption of (shared) CSR practices in interorganizational relationships (Dai et al., 2021; Diebel et al., 2024; Villena & Dhanorkar, 2020). Our study reveals a more nuanced perspective, demonstrating that both imitation and matching simultaneously influence alignment in buyer and supplier disclosure.

8.3. The implications of alignment

In this section, we examine whether alignment in disclosure is desirable by analyzing its implications for the performance of the buyer-supplier relationship. Our third and final hypothesis states that alignment in buyer and supplier disclosure signals a mutual orientation toward climate change, which, in turn, is expected to influence the effectiveness of a buyer's initiatives to manage the environmental performance of its suppliers, ultimately leading to improvements in the suppliers' emissions performance.

To test this, we first identify all buyers in our sample who have pledged to collaborate with suppliers to reduce their environmental impacts, following a similar approach as in Eggert and Hartmann (2021). More specifically, we use an indicator variable from Refinitiv that equals one when a firm has a policy in place to include the supply chain in its efforts to reduce the firm's overall environmental impact, and zero otherwise.[19] We then limit our sample to include

[19] This includes firms collaborating with suppliers toward reducing the suppliers' environmental impacts.

only the relationship-years for which these buyers had such a policy in place and estimate the following model:

$$Emissions\ Intensity_{s,t+1} = \beta_0 + \beta_1 Disclosure\ Misalignment_{b,s,t} + \sum_{k=2}^{n} \beta_k Controls_{s,t} + Industry\ FE + + State\ FE + Year\ FE + \varepsilon_{s,t}, \quad (3)$$

where the dependent variable is the supplier's sum of scope 1 and scope 2 carbon equivalent emissions (in tCO2eq) scaled by net revenues (Aswani et al., 2024), which captures the supplier's emissions performance. Our main independent variable of interest, *Disclosure Misalignment*, is an inverse measure of alignment that captures the degree of misalignment between buyer and supplier disclosure. For each dimension of disclosure, we operationalize this as the absolute difference between the buyer's disclosure and the supplier's disclosure. For the style dimensions, we take the natural logarithm (plus one) to mitigate the influence of outliers. Summary statistics for the misalignment variables are presented in Table 8. To avoid alignment to be driven by the absence of both buyer and supplier disclosure, we remove all observations with perfect alignment (*Disclosure Misalignment* = 0) due to non-disclosure ($Disclosure_b$ = 0 and $Disclosure_s$= 0).

Controls is a vector of control variables. Specifically, we use the same set of financial controls as in model (1) (*Size*, *ROA*, *Leverage*, *Growth*, *MB*, and *TQ*) and control for the supplier's quality of corporate governance by including *Governance Score* and *CSR Committee Score*. We also control for the suppliers' investments and actions to reduce future emissions using Refinitiv's Emissions Score (*Emissions Score*). Finally, for each disclosure dimension, we also control for the actual level of supplier disclosure by including the supplier's value for the variable capturing that specific dimension. As in models (1) and (2), we include supplier-

industry, supplier-state, and supplier-year fixed effects, with standard errors double clustered at the supplier-industry and supplier-year level.

Table 9 presents the results of estimating equation (3) for each disclosure dimension. We find a significantly positive coefficient on *Disclosure Misalignment* for the style dimensions (coefficient values range from 13.39, p-value = 0.0025, for misalignment in the overall extent of disclosure to 15.93, p-value = 0.0062, for misalignment in the disclosure of specific information). Interestingly, while we do not find a significant effect for alignment in the disclosure of regulatory and physical climate risks, we find that alignment in the disclosure of opportunities positively and significantly (coefficient value = 6.67, p-value = 0.0015) affects a supplier's emissions performance. This suggests that buyers' and suppliers' mutual recognition of the opportunities presented by climate change is an important factor that influences the effectiveness of a buyer's initiatives to manage the environmental performance of its suppliers.

Overall, our findings corroborate our hypothesis and support the idea that disclosure reflects a firm's underlying orientation toward climate change, and that a mutual orientation toward climate change between buyers and suppliers can influence the buyer's effectiveness in managing the environmental performance of its upstream supply chain, ultimately leading to tangible improvements in the performance of its suppliers.

9. Conclusion

Understanding a firm's exposure to climate change requires adopting a global approach that considers information beyond the firm's boundaries. However, prior literature on climate disclosure has primarily taken a firm-centric perspective, largely neglecting the pressures from peers that can influence a manager's disclosure choices. Our paper addresses this gap by examining the interrelationships between supply chain partners' climate disclosure practices. To do so, we develop a comprehensive set of measures that capture the various ways firms

discuss climate change in their 10-K filings and use these to examine buyers' and suppliers' disclosure practices in a large sample of 75,637 buyer-supplier relationship-years.

Our results reveal that buyer-supplier relationships are characterized by the mutual adoption of disclosure practices, leading to significant alignment in disclosure. We further show that a key mechanism driving alignment is suppliers' imitation of buyers' disclosure practices (e.g., Diebel et al., 2024), suggesting that buyers are important stakeholders who can influence their suppliers' disclosure behavior, potentially leading to the diffusion of disclosure practices throughout the entire supply chain (Dai et al., 2021). Hence, our study adds to the disclosure literature by underscoring the importance of considering a firm's relationships with peers when studying its nonfinancial disclosure choices.

Additionally, we demonstrate that buyers and suppliers tend to exhibit similarities in disclosure already before entering the relationship, implying that buyers and suppliers actively seek matches with peers who demonstrate similar disclosure practices (Becker, 1973; Ertug et al., 2022). These findings are interesting as they speak to the relevance of disclosure. While prior literature has demonstrated that current climate disclosures are value-relevant (e.g., Ben-Amar et al., 2023; Kölbel et al., 2024; Matsumura et al., 2024), studies have also criticized these disclosures for being imprecise and prone to greenwashing (e.g., Bingler et al., 2022, 2024). Our findings illustrate that disclosure is either used directly in the contracting process, or that buyers and suppliers match based on a shared orientation toward climate change, which, in turn, is credibly reflected in their disclosures.

Finally, our evidence suggests that fostering a mutual orientation toward climate change can be beneficial for the performance of the buyer-supplier relationship, ultimately leading to real improvements in suppliers' environmental outcomes. These results should be of interest to practitioners and also add to the literature studying CSR in supply chains (e.g., Dahlmann et al., 2023; Dai et al., 2021; De Stefano & Montes-Sancho, 2024; Diebel et al., 2024; Jira &

Toffel, 2013; Liu et al., 2021; She, 2022; Song et al., 2023; Spence & Rinaldi, 2014; Villena & Dhanorkar, 2020).

Despite these contributions, we also acknowledge some limitations. First, we study climate disclosure at the level of the buyer-supplier dyad. Although this aligns with the standard approach in the literature examining CSR in supply chains (e.g., Dai et al., 2021; Diebel et al., 2024), it might fail to capture the full complexity of the network of supply chain relationships within which firms are embedded. Social Network Analysis (SNA) might provide an interesting way forward to better capture such network dynamics in future research (for an interesting overview of SNA in accounting and finance, see Bianchi et al., 2023). Second, we only consider disclosure in buyer-supplier relationships. Although this already reveals interesting insights, firms arguably have many other types of relationships (such as competitive relationships, join ventures, licensing agreements, etc.) whose characteristics might influence their disclosure behavior. FactSet Revere also provides comprehensive data about these types of relationships, which provides interesting opportunities for future research.

Appendix A.
Examples of climate-related paragraphs and their labels as provided by the ClimateBERT algorithm

Paragraph	Commitment	Specific	Source
'The occurrence of a natural disaster, closure of a facility, or other unanticipated problems at our data centers could result in lengthy interruptions in our service. In addition, our products and services are highly technical and complex and may contain errors or vulnerabilities, which could result in interruptions in or failure of our services or systems.'	No	No	Alphabet Inc.
'The long-term effects of climate change on the global economy and the IT industry in particular are unclear. Environmental regulations or changes in the supply, demand or available sources of energy or other resources may affect the availability or cost of goods and services, including natural resources, necessary to run our business. Changes in climate where we operate may increase the costs of powering and cooling computer hardware we use to develop software and provide cloud-based services.'	No	No	Microsoft Corp.
'Driving to the lowest environmental footprint possible helps us achieve efficiency, lower costs, and respond to the needs of our stakeholders. We invest in conservation projects and set company-wide environmental targets, seeking to drive reductions in greenhouse gas emissions, energy use, water use, and waste generation. We focus on building energy efficiency into our products to help our customers lower their own emissions and energy costs. We also collaborate with policymakers and other stakeholders to identify opportunities to apply technology to environmental challenges such as climate change and water conservation.'	Yes	No	Intel Corp.
'Across Google, we're focused on continually innovating in areas where technology can have an impact on peoples lives. Our work in AI is helping to produce earlier and more precise flood warnings. Were also working hard to make sure that our products are accessible to the more than one billion individuals around the world with a disability. For example, Android 10 has automatic Live Captions for videos, podcasts and voicemails to make it easier to consume information on the phone.'	Yes	No	Alphabet Inc.

‘Environmental reserves were $74 million and $80 million in 2019 and 2018, respectively. The Company is a party to various proceedings related to environmental issues, including administrative and judicial proceedings involving private parties and regulatory agencies. The Company has been identified as a potentially responsible party at approximately 220 environmentally impaired sites. The Company reviews its potential liability with respect to each site identified, giving consideration to a number of factors such as:’	No	Yes	CSX Corp.
‘[…] We have accrued an environmental reserve in the amount of $259 million as of December 31, 2019. Our aggregate reserve estimate ranges in value from approximately $259 million to approximately $428 million, and we recorded our liability equal to the low end of the range, as we did not identify any amounts within the range as a better estimate of the liability. For additional information related to environmental matters, see Note 18 Litigation and Environmental to our consolidated financial statements.’	No	Yes	Kinder Morgan Inc.
‘In 2019, 3M expended approximately $59 million for capital projects related to protecting the environment. This amount excludes expenditures for remediation actions relating to existing matters caused by past operations that do not contribute to current or future revenues, which are expensed. […] The Company places consistent emphasis on environmental responsibility. While capital expenditures (other than for remediation projects) for known projects are presently expected to be approximately $150 million to $220 million over the next two years for new or expanded programs to build facilities or modify manufacturing processes to minimize waste and reduce emissions, 3M cannot predict with certainty whether future costs of such cleanup activities, capital expenditures or operating costs for environmental compliance will have a material effect on its capital expenditures, earnings or competitive position.’	Yes	Yes	3M Co.
‘Use 30% post-consumer recycled content plastic (RCP) across our personal systems and print portfolio by 2025 (which refers to RCP as a percentage of total plastic used in all HP personal systems, printer hardware, and print cartridges shipped during the reporting year);’	Yes	Yes	HP Inc.

Appendix B

Frequency of top ten reported bigrams, as disclosed by suppliers, for each topic

	Frequency (supplier)	Frequency (buyer)
Regulatory bigrams		
'greenhouse gas'	4,339	4,032
'comply environmental'	3,196	2,691
'gas emission'	2,896	2,778
'agency epa'	2,653	2,391
'carbon dioxide'	2,607	2,315
'air pollution'	1,265	1,178
'global climate'	1,165	1,161
'emission air'	1,090	969
'relate climate'	1,054	952
'water pollution'	1,026	777
Opportunity bigrams		
'renewable energy'	1,655	1,489
'state environmental'	1,194	1,192
'clean energy'	685	620
'electric vehicle'	528	516
'solar energy'	489	432
'policy mandate'	489	354
'innovation act'	401	331
'kyoto protocol'	370	332
'emission electric'	355	323
'wind power'	355	296
Physical bigrams		
'water act'	2,181	1,932
'air water'	1,887	1,580
'water discharge'	1,447	1,251
'storm water'	1,004	890
'sea level'	810	695
'quality water'	384	432
'snow ice'	313	278
'supply water'	306	269
'coastal area'	197	144
'provide water'	156	142

This table presents the ten most frequently reported bigrams based on the disclosures of all suppliers in our sample. It presents the frequency of occurrence across all supplier disclosures (column 1) and all buyer disclosures (column 2).

Appendix C
Variable definitions and source

Variable	Definition	Source
Disclosure variables		
Extent	The total number of climate-related paragraphs in the 10-K as classified by the ClimateBERT algorithm.	Self-constructed, based on Webersinke et al. (2022)
Specificity	The number of climate-related paragraphs classified as specific by the ClimateBERT algorithm.	Self-constructed, based on Bingler et al. (2024)
Commitment	The number of climate-related paragraphs classified as discussing tangible commitments and actions by the ClimateBERT algorithm.	Self-constructed, based on Bingler et al. (2024)
DisclReg	Frequency of regulatory bigrams scaled by the total number of bigrams in the filing.	Self-constructed, based on Sautner et al. (2023)
DisclOpp	Frequency of opportunity bigrams scaled by the total number of bigrams in the filing.	Self-constructed, based on Sautner et al. (2023)
DisclPhys	Frequency of physical bigrams scaled by the total number of bigrams in the filing.	Self-constructed, based on Sautner et al. (2023)
Filing length	Total number of words in the 10-K.	Self-constructed
Control variables		
Size	Natural logarithm of total assets (plus one).	Compustat
ROA	Net income before extraordinary items scaled by total assets.	Compustat
Leverage	Sum of short-term debt and long-term debt scaled by total assets.	Compustat
Growth	Year-on-year percentage change in net revenues.	Compustat
TQ	Tobin's Q, measured as the market value of common equity plus total assets minus the book value of common equity scaled by total assets.	Compustat

MB	Market-to-book ratio, measured as the ratio of the market value of equity to its book value.	Compustat
Same Industry	Dummy variable indicating whether a buyer and supplier operate in the same 4-digit GICS industry.	Compustat
Same State	Dummy variable indicating whether a buyer and supplier are headquartered in the same state.	Compustat
Emissions Intensity	Sum of scope 1 and scope 2 emissions (expressed in tCO2eq) scaled by net revenues.	Refinitiv and Compustat
Governance Score	Refinitiv's governance pillar score.	Refinitiv
CSR Committee Score	Refinitiv's CSR committee score. Measures whether the firm has a CSR committee and, if so, its effectiveness (on a scale of 0-100).	Refinitiv
Emissions Score	Refinitiv's Emissions score. Measures a firm's commitment and effectiveness toward reducing environmental emissions in the production and operational processes (on a scale of 0-100).	Refinitiv
Materiality	Dummy variable indicating the market's expectations about the materiality of climate change to the firm (1 if climate risks are considered to be material, 0 otherwise).	Self-constructed, based on Matsumura et al. (2022)

This table presents an overview of all variables used in our analyses, their definition, and their source. *Extent*, *Specificity*, *Commitment*, *DisclReg*, *DisclOpp*, *DisclPhys*, *ROA*, *Leverage*, *Growth*, *TQ*, and *MB* are winsorized at the 1st and 99th percentiles. *Emissions Intensity* is winsorized at the 1st and 98th percentiles. Following Sautner et al. (2023) measures of disclosure content (*DisclReg*, *DisclOpp*, *DisclPhys*) are multiplied by 10^3.

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Table 1. Sample description

Panel A. Sample distribution by year			
	Relationship-Years	Unique Buyers	Unique Suppliers
2010	4,777	968	1,115
2011	4,906	983	1,169
2012	6,102	1102	1,305
2013	6,418	1,148	1,318
2014	6,022	1,085	1,276
2015	6,657	1,146	1,326
2016	7,531	1,229	1,404
2017	8,205	1,284	1,422
2018	8,331	1,268	1,379
2019	8,555	1,255	1,305
2020	8,133	1,173	1,314
Total	75,637	2,496	2,847

Panel B. Sample distribution by industry		
	Relationship-Years	Unique Firms
Supplier		
Energy	7,211	313
Materials	4,036	157
Industrials	15,056	476
Consumer Discretionary	6,975	302
Consumer Staples	2,214	129
Health Care	6,353	494
Information Technology	20,151	613
Telecommunication Services	6,224	138
Utilities	1,942	70
Real Estate	5,475	155
Buyer		
Energy	8,111	254
Materials	2,743	137
Industrials	12,534	382
Consumer Discretionary	12,773	334
Consumer Staples	6,332	115
Health Care	8,479	417
Information Technology	12,819	567
Telecommunication Services	7,010	136
Utilities	4,148	75
Real Estate	688	79

This table presents our sample of observations. Panel A presents the distribution by year, while Panel B presents the distribution by industry (2-digit GICS classification) for buyers and suppliers separately.

Table 2. Distribution disclosure variables by industry

	Disclosure Style						Disclosure Content					
	Ln(Extent)		*Ln(Commitment)*		*Ln(Specificity)*		*DisclReg*		*DisclOpp*		*DisclPhys*	
	Mean	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**
Panel A. Supplier industry												
Energy	4.291	0.658	2.642	0.924	3.371	0.917	1.820	1.213	0.529	0.772	0.347	0.772
Materials	3.273	0.767	1.849	1.055	2.294	1.074	0.772	0.796	0.350	0.489	0.104	0.489
Industrials	2.786	0.932	1.180	1.013	1.688	1.130	0.518	0.682	0.743	1.339	0.066	1.339
Consumer Discretionary	1.968	0.933	0.861	0.971	0.962	1.040	0.238	0.448	0.411	1.074	0.028	1.074
Consumer Staples	2.466	0.743	0.963	0.867	1.163	0.886	0.299	0.320	0.090	0.172	0.072	0.172
Health Care	1.444	0.763	0.343	0.543	0.423	0.625	0.094	0.134	0.065	0.114	0.011	0.114
Information Technology	1.581	0.863	0.499	0.733	0.512	0.761	0.111	0.225	0.216	0.725	0.018	0.725
Telecommunication Services	1.240	0.756	0.382	0.563	0.384	0.601	0.030	0.062	0.174	0.518	0.018	0.518
Utilities	4.809	0.371	3.690	0.497	4.261	0.431	1.711	1.224	4.408	2.442	0.261	2.442
Real Estate	2.335	0.653	0.813	0.743	1.110	0.777	0.191	0.328	0.143	0.336	0.061	0.336
Panel B. Buyer industry												
Energy	4.188	0.753	2.692	0.938	3.308	1.039	1.942	1.250	0.632	0.736	0.277	0.227
Materials	3.639	0.731	2.309	0.975	2.863	0.973	1.143	1.010	0.415	0.383	0.178	0.257
Industrials	2.728	0.769	1.113	0.913	1.704	0.940	0.540	0.660	0.407	0.684	0.067	0.125
Consumer Discretionary	2.076	0.895	1.020	1.086	1.033	1.107	0.340	0.568	0.539	1.233	0.040	0.090
Consumer Staples	2.172	0.627	0.558	0.707	0.728	0.740	0.265	0.305	0.088	0.219	0.045	0.091
Health Care	1.398	0.721	0.295	0.470	0.372	0.527	0.081	0.121	0.071	0.099	0.013	0.041
Information Technology	1.579	0.813	0.496	0.691	0.444	0.679	0.110	0.222	0.134	0.503	0.017	0.046
Telecommunication Services	1.315	0.655	0.378	0.530	0.411	0.527	0.032	0.067	0.142	0.252	0.011	0.038
Utilities	4.840	0.364	3.713	0.505	4.310	0.439	1.687	1.048	4.019	2.179	0.276	0.223
Real Estate	2.421	0.802	1.037	0.912	1.169	0.861	0.339	0.650	0.219	0.472	0.061	0.095

This table presents summary statistics of our disclosure variables by industry for suppliers (Panel A) and buyers (Panel B). All variables are defined in Appendix C.

Table 3. Descriptive statistics

	Mean	Std.	P25	Median	P75	N
Panel A. Supplier disclosure (t+1)						
Ln(Extent)	2.3580	1.2656	1.3863	2.3026	3.1355	75,637
Ln(Commitment)	1.0715	1.1543	0.0000	0.6931	1.7918	75,637
Ln(Specificity)	1.2988	1.3420	0.0000	1.0986	2.0794	75,637
DisclReg	0.4556	0.7910	0.0000	0.1138	0.5582	75,637
DisclOpp	0.4773	1.1766	0.0000	0.1044	0.3449	75,637
DisclPhys	0.0763	0.1553	0.0000	0.0000	0.0910	75,637
Panel B. Buyer disclosure (t)						
Ln(Extent)	2.3992	1.2925	1.3863	2.1972	3.1781	75,637
Ln(Commitment)	1.1410	1.2519	0.0000	0.6931	1.9459	75,637
Ln(Specificity)	1.3785	1.4401	0.0000	1.0986	2.3026	75,637
DisclReg	0.5452	0.8955	0.0000	0.1214	0.7058	75,637
DisclOpp	0.5149	1.2109	0.0000	0.1038	0.3820	75,637
DisclPhys	0.0789	0.1570	0.0000	0.0000	0.0898	75,637
Panel C. Control variables						
Size	21.5898	2.3675	19.9353	21.4952	23.1615	75,637
ROA	0.0022	0.1429	-0.0117	0.0322	0.0684	75,637
Leverage	0.2870	0.2095	0.1141	0.2808	0.4268	75,637
Growth	0.0802	0.2509	-0.0346	0.0522	0.1579	75,637
MB	3.8142	6.8022	1.4259	2.3706	4.2075	75,637
TQ	2.0442	1.3170	1.2211	1.6020	2.3316	75,637
Filing length (t+1)	25,544.7583	10,164.8941	18,5440	24,2520	31,0590	75,637
Emissions Intensity	120.3377	242.8150	14.8117	32.6715	77.4194	46,314
Governance Score	52.1260	22.4895	34.4229	53.3926	69.5655	46,314
CSR Committee Score	40.2399	42.1966	0.0000	0.0000	83.0662	46,314
Same industry dummy	0.3274	0.4693	0.0000	0.0000	1.0000	75,637
Same state dummy	0.1451	0.3522	0.0000	0.0000	0.0000	75,637
Materiality dummy	0.2860	0.4519	0.0000	0.0000	1.0000	68,404

This table presents summary statistics for the variables used in our main regression analyses. All variables are defined in Appendix C.

Table 4. Correlation table

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Buyer disclosure (t+1)												
(1) Ln(Extent)	1											
(2) Ln(Commitment)	0.86	1										
(3) Ln(Specificity)	0.91	0.91	1									
(4) DisclReg	0.64	0.62	0.64	1								
(5) DisclOpp	0.46	0.53	0.51	0.35	1							
(6) DisclPhys	0.55	0.49	0.53	0.57	0.19	1						
Supplier disclosure (t)												
(7) Ln(Extent)	0.6	0.52	0.6	0.5	0.31	0.42	1					
(8) Ln(Commitment)	0.55	0.49	0.55	0.48	0.32	0.39	0.88	1				
(9) Ln(Specificity)	0.59	0.51	0.59	0.51	0.32	0.42	0.93	0.93	1			
(10) DisclReg	0.47	0.41	0.48	0.42	0.22	0.35	0.64	0.64	0.64	1		
(11) DisclOpp	0.34	0.34	0.36	0.29	0.38	0.2	0.51	0.58	0.55	0.44	1	
(12) DisclPhys	0.4	0.35	0.41	0.35	0.22	0.33	0.55	0.51	0.52	0.61	0.34	1
Control variables												
(13) Size	0.23	0.18	0.16	0.13	0.07	0.1	-0.02	0.02	0.01	0.01	0.02	0.03
(14) ROA	0.07	0.02	0.03	0.01	-0.03	0.0	-0.0	-0.0	0.0	0.0	-0.0	0.0
(15) Leverage	0.23	0.18	0.19	0.15	0.03	0.18	0.09	0.08	0.08	0.07	0.03	0.07
(16) Growth	-0.07	-0.06	0.06	-0.07	-0.04	-0.03	-0.06	-0.05	-0.05	-0.04	-0.03	-0.04
(17) MB	-0.14	-0.12	-0.13	-0.11	-0.05	-0.1	-0.11	-0.1	-0.11	-0.09	-0.07	-0.07
(18) TQ	-0.29	-0.23	-0.26	-0.2	-0.1	-0.18	-0.23	-0.19	-0.22	-0.17	-0.13	-0.14
(19) Governance Score	0.11	0.09	0.07	0.07	0.03	0.02	-0.0	0.01	0.01	0.01	0.01	0.01
(20) CSR Committee	0.15	0.16	0.11	0.12	0.05	-0.01	-0.02	0.01	0.0	0.01	-0.0	0.01
(21) Filing length (t+1)	0.21	0.26	0.21	0.09	0.09	0.13	0.04	0.08	0.06	0.06	0.08	0.07
(22) Emissions Intensity	0.48	0.42	0.51	0.49	0.19	0.38	0.35	0.33	0.36	0.29	0.16	0.24

Correlation table (continued)

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(13) Size	1									
(14) ROA	0.43	1								
(15) Leverage	0.27	-0.04	1							
(16) Growth	-0.02	0.09	-0.05	1						
(17) MB	0.06	0.03	-0.01	0.12	1					
(18) TQ	-0.05	-0.04	-0.12	0.24	0.48	1				
(19) Governance Score	0.42	0.25	-0.02	-0.11	-0.01	-0.05	1			
(20) CSR Committee	0.61	0.25	0.04	-0.12	0.03	-0.03	0.41	1		
(21) Filing length (t+1)	0.13	-0.15	0.18	0.12	0.01	0.05	-0.2	-0.1	1	
(22) Emissions Intensity	0.03	-0.07	0.11	-0.08	-0.08	-0.18	0.07	0.09	0.01	1

This table presents correlation coefficients. All variables are defined in Appendix C.

Table 5. Analysis of the association between buyer and supplier disclosure

	Supplier Disclosure (t+1)					
Panel A. Disclosure style	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Extent)		*Ln(Commitment)*		*Ln(Specificity)*	
Buyer Disclosure (t)	0.1478***	0.1199***	0.1020***	0.0661**	0.1458***	0.1171***
	(0.0293)	(0.0230)	(0.0237)	(0.0238)	(0.0270)	(0.0226)
Size	0.0801***	0.0789**	0.0517**	0.0492	0.0400**	0.0584**
	(0.0169)	(0.0278)	(0.0164)	(0.0297)	(0.0143)	(0.0225)
ROA	-0.1225	0.1160	-0.2406	0.1848	-0.1969	0.2088
	(0.1985)	(0.1719)	(0.2193)	(0.1872)	(0.2525)	(0.2080)
Leverage	-0.1298	-0.2817	-0.1964	-0.2346	-0.1701	-0.3156*
	(0.1285)	(0.1600)	(0.1234)	(0.1796)	(0.1335)	(0.1613)
Growth	0.0055	-0.0047	-0.0253	0.0018	-0.0281	-0.0327
	(0.0327)	(0.0409)	(0.0250)	(0.0346)	(0.0228)	(0.0246)
MB	-0.0030	-0.0033	-0.0038**	-0.0051*	-0.0024	-0.0043*
	(0.0018)	(0.0023)	(0.0015)	(0.0020)	(0.0021)	(0.0023)
TQ	-0.0295	-0.0368***	-0.0131	-0.0215	-0.0137	-0.0005
	(0.0170)	(0.0149)	(0.0171)	(0.0137)	(0.0242)	(0.0179)
Filing Length	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Emissions Intensity		0.0006***		0.0006***		0.0009***
		(0.0001)		(0.0001)		(0.0001)
Governance Score		-0.0006		0.0004		-0.0006
		(0.0010)		(0.0011)		(0.0010)
CSR Committee Score		-0.0006		0.0015*		0.0005
		(0.0010)		(0.0008)		(0.0007)
Same industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Same state dummy	Yes	Yes	Yes	Yes	Yes	Yes
Materiality dummy	No	Yes	No	Yes	No	Yes
Supplier industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier state FE	Yes	Yes	Yes	Yes	Yes	Yes

Supplier year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,637	43,054	75,637	43,054	75,637	43,054
Adjusted R^2	0.7210	0.6867	0.5797	0.5126	0.6693	0.6332

Panel B. Disclosure content	(7)	(8)	(9)	(10)	(11)	(12)
	DisclReg		*DisclOpp*		*DisclPhys*	
Buyer Disclosure (t)	0.0639***	0.0443**	0.1596***	0.1660**	0.0405**	0.0259**
	(0.0174)	(0.0177)	(0.0450)	(0.0561)	(0.0135)	(0.0100)
Size	0.0214**	0.0143	0.0249	0.0324	0.0010	0.0058*
	(0.0089)	(0.0145)	(0.0147)	(0.0205)	(0.0019)	(0.0032)
ROA	-0.1116	-0.0701	-0.6181*	-0.2488	-0.0008	-0.0048
	(0.0686)	(0.0919)	(0.3220)	(0.2989)	(0.0168)	(0.0389)
Leverage	-0.0466	-0.0776	-0.3117***	-0.2488	0.0282	-0.0122
	(0.0543)	(0.0617)	(0.0944)	(0.2989)	(0.0302)	(0.0232)
Growth	-0.0352	-0.0357	0.0151	0.0358	0.0081	0.0108
	(0.0227)	(0.0428)	(0.0663)	(0.0935)	(0.0096)	(0.0106)
MB	-0.0023	-0.0022	-0.0007	-0.0004	-0.0007**	-0.0006*
	(0.0016)	(0.0014)	(0.0015)	(0.0020)	(0.0003)	(0.0003)
TQ	-0.0118**	-0.0192*	0.0062	0.0032	-0.0024	-0.0018
	(0.0048)	(0.0098)	(0.0150)	(0.0132)	(0.0032)	(0.0029)
Emissions Intensity		0.0006***		0.0005		0.0000
		(0.0001)		(0.0003)		(0.0000)
Governance Score		-0.0009*		-0.0005		-0.0001
		(0.0004)		(0.0013)		(0.0001)
CSR Committee Score		0.0010**		-0.0001		-0.0003**
		(0.0004)		(0.0004)		(0.0001)
Same industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Same state dummy	Yes	Yes	Yes	Yes	Yes	Yes
Materiality dummy	No	Yes	No	Yes	No	Yes
Supplier industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier state FE	Yes	Yes	Yes	Yes	Yes	Yes

Supplier year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,637	43,054	75,637	43,054	75,637	43,054
Adjusted R^2	0.4918	0.5170	0.4464	0.3080	0.4355	0.3783

This table presents results from regressions that estimate the relationship between buyer and supplier disclosure. Panel A, models 1-6, presents results for models with dependent variable each of the three dimensions capturing disclosure style. Panel B, models 7-12, presents results for models with dependent variable each of the three dimensions capturing disclosure content. Our main independent variable of interest is the buyer's disclosure in the current year (*Buyer Disclosure(t)*). For each variable, the first column presents results with controls as in Dai et al. (2021) and Diebel et al. (2024) (except for institutional ownership), while the second column presents results including a set of variables that have been shown to influence a firm's disclosure practices (i.e., a firm's emissions performance and the quality of corporate governance). All variables are defined in Appendix C. We include supplier-industry (4-digit GICS industry classification), supplier-state, and supplier-year fixed effects. We report regression coefficients with standard errors double clustered at the supplier-industry and supplier-year in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests.

Table 6. Imitation

	Supplier Disclosure (t+1)					
Panel A. Impact of customer base	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Extent)	*Ln(Commitment)*	*Ln(Specificity)*	*DisclReg*	*DisclOpp*	*DisclPhys*
Buyer Disclosure (t)	0.1821***	0.1330***	0.1778***	0.0798***	0.1704***	0.0535***
	(0.0304)	(0.0280)	(0.0296)	(0.0223)	(0.0501)	(0.0112)
Buyer Disclosure (t) x Size Customer Base	-0.0005**	-0.0006**	-0.0006***	-0.0004**	-0.0003	-0.0003
	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0002)	(0.0004)
Control variables	Included	Included	Included	Included	Included	Included
Same industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Same state dummy	Yes	Yes	Yes	Yes	Yes	Yes
Supplier industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier state FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,637	75,637	75,637	75,637	75,637	75,637
Adjusted R^2	0.7253	0.5831	0.6719	0.4929	0.4467	0.4364
Panel B. Impact of competition	(7)	(8)	(9)	(10)	(11)	(12)
	Ln(Extent)	*Ln(Commitment)*	*Ln(Specificity)*	*DisclReg*	*DisclOpp*	*DisclPhys*
Buyer Disclosure (t)	0.1774***	0.1182***	0.1602***	0.0624**	0.1650***	0.0514***
	(0.0312)	(0.0271)	(0.0291)	(0.0268)	(0.0516)	(0.0137)
Buyer Disclosure (t) x Nr. of Competitors	-0.0009***	-0.0006**	-0.0006**	0.0001	-0.0002	-0.0005
	(0.0002)	(0.0003)	(0.0002)	(0.0006)	(0.0004)	(0.0005)
Control variables	Included	Included	Included	Included	Included	Included
Same industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Same state dummy	Yes	Yes	Yes	Yes	Yes	Yes
Supplier industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier state FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,637	75,637	75,637	75,637	75,637	75,637
Adjusted R^2	0.7255	0.5822	0.6714	0.4922	0.4468	0.4373

This table presents results from our tests of imitation. Panel A, models 1-6, presents results for models testing the interaction between buyer disclosure (*Buyer Disclosure(t)*) and the size of the supplier's customer base (*Size Customer Base*). Panel B, models 7-12, presents results for models testing the interaction between buyer disclosure (*Buyer Disclosure(t)*) and the level of competition for the supplier (*Nr. of Competitors*). We include the following control variables: *Size*, *ROA*, *Leverage*, *Growth*, *MB*, and *TQ*. In models 1-3 and 7-9, we also control for *Filing Length*. All variables are defined in Appendix C. We include supplier-industry (4-digit GICS industry classification), supplier-state, and supplier-year fixed effects. We report regression coefficients with standard errors double clustered at the supplier-industry and supplier-year in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests.

Table 7. Matching

	Supplier Disclosure (t-1)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Extent)	*Ln(Commitment)*	*Ln(Specificity)*	*DisclReg*	*DisclOpp*	*DisclPhys*
Buyer Disclosure (t-1)	0.1519***	0.1068***	0.1506***	0.0658***	0.1492***	0.0496***
	(0.0295)	(0.0234)	(0.0247)	(0.0132)	(0.0398)	(0.0139)
Size	0.0711***	0.0334**	0.0266	0.0184**	0.0170	0.0006
	(0.0141)	(0.0134)	(0.0149)	(0.0060)	(0.0109)	(0.0022)
ROA	-0.2539	-0.3592	-0.2922	-0.1641**	-0.7992	0.0016
	(0.2279)	(0.2548)	(0.2784)	(0.0702)	(0.4477)	(0.0093)
Leverage	-0.0355	-0.1344	-0.1447	0.0436	-0.2999**	0.0353
	(0.1391)	(0.1208)	(0.1437)	(0.1424)	(0.1164)	(0.0290)
Growth	0.0057	0.0012	-0.1447	0.0323	0.1152*	0.0186
	(0.0393)	(0.0413)	(0.1437)	(0.0317)	(0.0556)	(0.0141)
MB	0.0005	-0.0021	0.0000	-0.0008	-0.0018	-0.0010**
	(0.0023)	(0.0022)	(0.0021)	(0.0010)	(0.0036)	(0.0004)
TQ	-0.0475*	-0.0144	-0.0281	-0.0230**	-0.0044	-0.0020
	(0.0238)	(0.0231)	(0.0290)	(0.0082)	(0.0208)	(0.0039)
Filing Length	0.0000***	0.0000***	0.0000***			
	(0.0000)	(0.0000)	(0.0000)			
Same industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Same state dummy	Yes	Yes	Yes	Yes	Yes	Yes
Supplier industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier state FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,978	18,978	18,978	19,443	19,443	19,443
Adjusted R^2	0.75017	0.6305	0.7108	0.5244	0.4511	0.4456

This table presents results from our tests of matching. To do so, we estimate the relationship between buyer and supplier disclosure in the year before the relationship was first established. All variables are defined in Appendix C. We include supplier-industry (4-digit GICS industry classification), supplier-state, and supplier-year fixed effects. We report regression coefficients with standard errors double clustered at the supplier-

industry and supplier-year in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests.

Table 8. Descriptive statistics misalignment in disclosure

	Mean	Std.	P25	Median	P75	N
Panel A. Disclosure style						
Extent	2.0920	1.1239	1.3860	2.0970	2.8330	39,402
Commitment	1.4995	0.9795	0.6932	1.3863	2.0794	32,358
Specificity	1.6776	1.0831	0.6932	1.3863	2.3026	33,155
Panel B. Disclosure content						
DisclReg	0.5615	0.7559	0.1077	0.2628	0.6877	32,984
DisclOpp	0.6242	1.1722	0.0938	0.2036	0.5820	32,956
DisclPhys	0.1712	0.0155	0.0740	0.1143	0.2132	20,097

This table presents summary statistics for all variables capturing buyer-supplier misalignment in disclosure.

Table 9. Testing the implications of alignment

	Supplier Emissions Intensity (t+1)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Extent	*Commitment*	*Specificity*	*DisclReg*	*DisclOpp*	*DisclPhys*
Disclosure Misalignment (t)	13.3900***	15.7700***	15.9300***	3.7490	6.6700***	-40.7200
	(3.3470)	(4.6230)	(4.6110)	(3.1390)	(1.5400)	(42.0800)
Size	-10.8700**	-9.4240*	-9.7820*	-8.4710**	-8.6510**	-8.6830
	(3.7580)	(4.646)	(4.8820)	(3.6990)	(3.8600)	(5.4190)
ROA	-99.4900***	-112.9000**	-111.7000*	-116.2000**	-96.4100***	-90.9400
	(29.3200)	(36.8900)	(36.4400)	(40.8700)	(29.8500)	(86.1600)
Leverage	65.4700	67.6900	73.5400	64.8700	67.3600	112.6000*
	(42.2900)	(48.6700)	(44.6100)	(42.7100)	(46.0500)	(59.3800)
Growth	0.3490	-0.8547	1.8050	10.5400	3.8310	-15.3800
	(23.3000)	(26.5000)	(23.5600)	(27.2800)	(21.6800)	(29.6000)
MB	-0.3056	-0.2191	-0.3153	-0.4263	-0.2813	0.1758
	(1.0070)	(1.0570)	(1.0270)	(0.8882)	(0.8406)	(1.4310)
TQ	-0.2407	-1.4510	-1.9250	-0.6928	-5.0990	-6.5750
	(5.8960)	(7.0750)	(7.4020)	(5.5890)	(6.6380)	(9.9950)
Governance Score	0.0797	0.0665	0.0580	0.0381	-0.0493	-0.3563
	(0.2796)	(0.3669)	(0.3209)	(0.3683)	(0.3186)	(0.4557)
CSR Committee Score	0.2771	0.0665	0.3677*	0.2143	0.3152	0.4454
	(0.1978)	(0.3669)	(0.1951)	(0.2359)	(0.2238)	(0.2472)
Emissions Score	0.3877	0.3307	0.2794	0.4501*	0.4719*	0.3309
	(0.2173)	(0.2278)	(0.2236)	(0.2160)	(0.2571)	(0.2810)
Supplier Disclosure (t)	44.4800***	40.2700***	48.7700**	80.4900**	35.3400***	171.6000
	(9.4720)	(8.2520)	(11.9000)	(27.3200)	(5.9090)	(138.8000)
Supplier industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier state FE	Yes	Yes	Yes	Yes	Yes	Yes
Supplier year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,627	18,859	19,155	19,467	19,258	11,895
Adjusted R^2	0.3619	0.3580	0.3742	0.3643	0.3570	0.3729

This table presents results from our tests of performance. To do so, we estimate the relationship between misalignment in buyer-supplier disclosure (*Disclosure Misalignment(t)*) as an inverse measure of alignment and a supplier's emissions intensity. All models are fitted on a limited sample including only those buyers who have pledged to manage the environmental performance in their supply chain. All variables are defined in Appendix C. We include supplier-industry (4-digit GICS industry classification), supplier-state, and supplier-year fixed effects. We report regression coefficients with standard errors double clustered at the supplier-industry and supplier-year in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, using two-tailed tests.

CEO Final Year and Tone Management: Does Managerial Ability Matter?

(Running title: Departing CEOs' tone management and managerial ability)

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ABSTRACT. While departing CEOs, motivated by post-departure pecuniary benefits, manipulate earnings to influence outsiders' perceptions about their final year performance, there is no evidence yet on their qualitative disclosure decisions. Addressing this gap and recognizing the importance of managerial ability in this context, our study examines whether high-ability departing CEOs manage disclosure tone differently from their low-ability counterparts. Based on a textual analysis of the 10-K filings of US nonfinancial firms during 1993–2022, we use the abnormal tone of earnings-related disclosures to measure strategic tone — a linguistic tool used by managers to influence the perceptions of capital market participants. We find that high-ability CEOs, unlike low-ability ones, engage in greater upward tone management (or overoptimism) in their final tenure year, even after controlling for the tone management observed in their early years. Furthermore, this overoptimism was found to facilitate investors' understanding of (and thus reaction to) value-relevant information, suggesting that high-ability departing CEOs have greater incentives to be more forthcoming in their disclosures to signal their superior ability. Finally, we document that the success of this disclosure strategy in positively influencing market perceptions (and thus favourably influencing their equity-based compensation) hinges upon the richness of departing CEOs' firm information environment.

Keywords: tone management, qualitative disclosures, CEO tenure, CEO turnover, information environment

JEL Classification: G3, M41, M51

1. INTRODUCTION

Extant literature abounds with studies depicting how CEOs respond to the critical challenge of managing stakeholders' expectations at crucial stages of their tenure (Ali and Zhang, 2015, Bochkay, et al., 2019). In the early years of their tenure, CEOs are pre-occupied with building confidence among all parties by reaching their initial performance targets (Vancil, 1987). On the other hand, in their final year of service, CEOs are interested to favorably influence their post-departure outcomes. More specifically, they may wish to boost their final year's pay, or enhance the prospect of any post-departure career opportunities, such as, corporate and community board positions, entering politics, taking up consulting work, and so on (Ali and Zhang, 2015, Brickley, et al., 1999). It is worth noting that the availability of these opportunities depends heavily on their performance, or the perception of it, during their final year(s) (Brickley, et al., 1999).

In view of the above, prior studies predict that departing CEOs overstate earnings in their final year of tenure; although, extant empirical evidence in this regard is mixed (Ali and Zhang, 2015, Cheng, 2004, Dechow and Sloan, 1991, Kalyta, 2009, Murphy and Zimmerman, 1993, Pourciau, 1993). Moreover, while there is extensive research on the quantitative reporting choices of departing CEOs, no study has yet examined their decisions pertaining to tone they adopt in their qualitative disclosures. This gap is notable because the linguistic tone of firm narrative disclosures[1] has a widely documented role—incremental to quantitative tools, such as accruals—in providing information about firm fundamentals and managing perceptions (Goel, et al., 2024, Huang, et al., 2014). The

[1] Throughout this paper, we use narrative disclosures, qualitative disclosures, and textual disclosures interchangeably.

current paper addresses this gap by examining what tone management strategy departing CEOs adopt to assist them in positively influencing outsiders' perceptions about their final year performance.

In this context, the question of how the characteristics—namely, the "human side"—of departing CEOs contribute to tone management is natural and important, and we focus on it in this paper. Specifically, we examine to what extent managerial ability of departing CEOs is factored into their tone-related disclosure decisions, where managerial ability is defined as the relative efficiency and capability of CEOs in transforming firm resources into revenue (Demerjian, et al., 2012). On the one hand, it can be argued that all departing CEOs, regardless of ability, will adopt an abnormal positive tone since the underlying objective is the same, that is, to favorably manage outsiders' perceptions about their final year performance. On the other hand, we contend that departing CEOs should adopt a tone management strategy in line with their ability. This is because high-ability CEOs, unlike low-ability ones, are more capable of selecting positive net present value (NPV) projects that are likely to result in higher future profitability (Andreou, et al., 2017, Chang, et al., 2010, Demerjian, et al., 2012, Hasan, 2020, John, et al., 2017), thereby allowing them to adopt an abnormal tone that best conveys their private information. This leads to our first research question: *Does managerial ability have implications for departing CEOs' tone management decision?*

We examine this research question via textual analysis of earnings-related[2] narrative disclosures by using a sample of 10-K filings[3] for the period 1993–2022. In line with Huang, et al. (2014), we use abnormal tone—the residual obtained from a regression of tone on its normal determinants—as a measure of tone management. Also, following Dechow and Sloan (1991), Kalyta (2009) and Ali and Zhang (2015), we define CEO Final Year as an indicator variable that is coded one for the year immediately preceding the CEO turnover year, and zero otherwise.

Our empirical results reveal that high-ability departing CEOs engage in greater upward tone management (or overoptimism) in the earnings-related disclosures contained in their firm's 10-K filing, while their low-ability counterparts do not manage tone differently in their final year as compared to the previous years. It is worth noting that this finding is attained after controlling for the different tone management strategy that CEOs adopt in their early years of service, guided by a different set of concerns.[4] This finding corroborates the argument that high-ability CEOs, in their last year of tenure, tend to remind investors about their competence and ability by adopting an overoptimistic disclosure tone.

[2] It should be noted that narrative disclosures incorporate a myriad of information, both related and unrelated to earnings. Prior studies, however, indicate the usefulness of earnings-related narrative disclosures in increasing market participants' ability to forecast future earnings changes (see, e.g., Cazier and Pfeiffer, 2017, Hussainey and Walker, 2009, Mouselli, et al., 2012). We, therefore, exclusively focus on earnings-related disclosures in 10-K filings.

[3] Our focus on 10-K filings is motivated from prior research suggesting that these filings are an important source of information (Brown and Tucker, 2011, Leder, 2003, Lehavy, et al., 2011, Merkley, 2014, Previts, et al., 1994) and that the narrative disclosures in them contain information incremental to that in other firm disclosures (Davis and Tama-Sweet, 2012).

[4] Following Ali and Zhang (2015), we believe that not controlling for tone management in the early years of CEOs' service can give biased or misleading results when testing for tone management in the final year of CEOs' service. This is because of the fact that about 30 percent of CEOs leave office within the first four years of starting the job and so the difference in tone management between their final year and the other years is likely to be small (given their incentive to manage tone in the early years as well).

Disclosure strategies adopted by CEOs—in our context, high-ability departing CEOs' overoptimism—could reveal information in the current period that may change investors' expectations about firms' future earnings (Huang, et al., 2014, Lundholm and Myers, 2002). On the other hand, this tone management may be uninformative about the firm's prospects if these CEOs do not have the intention to inform market participants or that investors fail to grasp the information content of these disclosure strategies (Huang, et al., 2014). A natural question thus arises: *Does the overoptimistic disclosures of high-ability departing CEOs serve to confirm their superior ability by assisting investors in incorporating future earnings news into their decision making?*

Upon regressing current annual stock returns on future earnings (in addition to the lagged and contemporaneous earnings), we find that high-ability departing CEOs' overoptimism increases future earnings response coefficient, that is, it facilitates investors' understanding of (and thus reaction to) value-relevant information. This positions highly able departing CEOs in a favorable light in the eyes of market participants, thus facilitating the achievement of their post-departure benefits. In fact, our additional analysis confirms that this adopted strategy results in higher equity-based compensation in their final tenure year.

Moreover, we hypothesize that the success of this overoptimistic disclosure strategy in positively influencing market perceptions about their performance should hinge upon the richness of their firm's information environment. This assertion follows in view of the widely documented role of firms' information environment in reducing the information asymmetry between them and investors (Bushman and Smith, 2001, Healy and Palepu, 2001, Hu, et al., 2014). This gives rise to our third and final research question:

Are high-ability departing CEOs more likely to adopt their overoptimistic disclosure strategy when their firm's information environment is richer? Consistent with our expectations, we observe that our main results pertaining to high-ability departing CEOs' tone management exclusively hold in the presence of rich firm information environment (characterized by firm size, high analyst coverage, low forecast error, and low bid-ask spread).

It is noteworthy that all our findings are robust to several tests. To address any potential endogeneity issue, we adopt entropy-based balancing approach and obtain qualitatively similar results. Furthermore, we re-examine departing CEOs' tone strategy while imposing the condition that departing CEOs have stayed in office for at least six years, since these CEOs are more likely to possess higher ability (Milbourn, 2003). Our findings do not materially change. Finally, our results are qualitatively similar in specifications where we use an alternate measure of managerial ability, and when we focus on retirement as the most prevalent case of CEOs' departure.

The contribution of our study is threefold. First, we contribute to the streams of literature on narrative disclosures and CEO behavior by being the first study to examine CEOs' narrative disclosures strategy during an important stage of their tenure—namely, the final year. The focus on final year is particularly important because this last year can provide CEOs with credible opportunities, via their disclosure strategies, to influence outsiders' perceptions with a view to enhance their post-departure prospects (Ali and Zhang, 2015, Brickley, et al., 1999, Cheng, 2004, Dechow and Sloan, 1991, Kalyta, 2009, Murphy and Zimmerman, 1993, Pourciau, 1993). Furthermore, prior studies in this context have solely relied on CEOs' quantitative disclosure choices, such as, discretionary

accruals and write-offs, while presenting mixed evidence. For instance, while Kalyta (2009) and Ali and Zhang (2015) provide evidence of greater earnings overstatement by departing CEOs, Pourciau (1993) finds that they instead record income-decreasing accruals and write-offs during their last year of tenure. Given the salience of narrative disclosures in this context and because CEOs' tone management strategy cannot be inferred from their earnings management strategy, it is important to study tone in addition to earnings manipulation to obtain a complete picture of departing CEOs' overall disclosure strategy.

Second, we contribute to the emerging literature on the implications of managerial ability for firms' disclosure style and financial reporting decisions (Baik, et al., 2011, Demerjian, et al., 2013, Hasan, 2020). We do this by being the first study to examine how departing CEOs' strategies pertaining to their 10-K disclosure tone vary along with their managerial ability. Relatedly, our study provides meaningful insights for board members and stakeholders aiming to assess the advantages and potential challenges associated with (re)employing highly able managers after leaving their erstwhile CEO position.

Finally, by bringing the element of information environment richness to the context of departing CEOs' tone strategies, we contribute to a large stream of literature on the relation between information environment richness and firm reporting/disclosure behavior. Although the literature mainly focuses on this relationship in the context of *quantitative* disclosure choices (such as earnings management (Irani and Oesch, 2016, Yu, 2008); income smoothing strategy (Sun, 2011); and accounting conservatism (Sun and Liu, 2011)), the present paper is among the first (besides Goel, et al. (2024)) to study

whether information environment richness has implications for a *qualitative* disclosure choice (*i.e.,* tone), particularly in an important period in CEOs' tenure (*i.e.,* their final year).

The rest of the current paper is organized as follows: First, we present the literature review and development of our key hypotheses. In the subsequent section, we describe our research design, comprising the data and sample, key variable measurements, and model equations. Then, we present our empirical results and robustness checks. Finally, we conclude the paper.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Final year of CEOs' tenure

The final year constitutes as an important stage of a CEO's tenure, as it provides CEOs with opportunities to enhance their immediate post-departure prospects, which often comes at the cost of long-term firm prospects—a well-documented phenomenon referred to as the 'horizon problem' of departing CEOs (Cheng, 2004, Dechow and Sloan, 1991, Smith Jr and Watts, 1982).

Departing CEOs, especially those approaching a known retirement or departure date, may undertake corporate and reporting decisions so as to increase earnings (and, by consequence, their earnings-based compensation) in their final years, at the expense of future earnings (Ali and Zhang, 2015, Murphy and Zimmerman, 1993). However, contrary to expectations, Pourciau (1993) finds that departing executives record income-decreasing accruals. Furthermore, those managers whose pension is determined as a function of firm performance in their final pre-retirement years have strong incentives to increase short-term earnings in order to enhance the value of their respective pensions

(Kalyta, 2009). In the case of poorly performing firms, CEOs may act opportunistically and attempt to influence the probability or timing of their (forced) departure through accounting choices that cover up their firm's deteriorating financial position (Murphy and Zimmerman, 1993, Pourciau, 1993).

Additionally, CEOs care about post-retirement employment opportunities, as many CEOs prefer to remain active in their retirement years serving on corporate boards. Specifically, Brickley, et al. (1999) find that of the CEOs who retire at age 64, 65, or 66 (the most common ages for retirement), nearly 88 per cent hold at least one board seat, 42 per cent hold three or more seats, and just over 28 per cent hold four or more seats. Moreover, the availability of these opportunities depends heavily on the CEOs' performance during their final year(s). For instance, Brickley, et al. (1999) report that retiring CEOs who stay on their own board generate about 10.9 per cent higher annual abnormal stock returns over their final years than CEOs who do not.

Hence, the above arguments suggest that besides employing quantitative tools such as write-offs and accruals management, departing CEOs have strong incentives to adopt narrative disclosure strategies that enable them to influence outsiders' perceptions, with a view to enhance their aforementioned post-departure prospects. One such widely researched measure, which has so far been overlooked in the context of CEO departures, is tone management and thus becomes the focus of the current study.

2.2. Tone management in CEOs' final year

There is emerging evidence in the literature about CEOs employing specific narrative disclosure strategies at key stages of their tenure. For instance, it is now well-documented

that new CEOs use qualitative disclosure choices to influence markets' assessment of their abilities. In this context, the *tone* of narrative disclosures is the most widely researched textual attribute.[5] This is due to two reasons. First, tone has been found to significantly influence the perception of investors and analysts (Henry, 2008, Huang, et al., 2014, Lang and Lundholm, 2000, Loughran and McDonald, 2011). Second, unlike financial statements, narrative disclosures are marked by the absence of any concrete regulation regarding their exact format or content,[6] thereby making them amenable to CEO discretion with regards to both the extent of detail provided as well as the language (or rhetoric) used (Davis and Tama-Sweet, 2012).[7] When CEOs use this discretion to employ a disclosure tone that is unequal to their firms' underlying quantitative fundamentals, it is referred to as *tone management*.[8]

Specifically, CEOs have been found to adopt a relatively more optimistic tone in their early years for disclosures pertaining to conference calls (Bochkay, et al., 2019). On the other hand, the well-documented 'big bath' phenomenon, whereby new CEOs attribute poor firm performance to their predecessors (Murphy and Zimmerman, 1993, Pourciau, 1993), results in a lower optimistic tone (Garcia Osma, et al., 2018). Additionally, Goel, et al. (2024) show that litigation concerns (that is, likelihood of potential

[5] Tone of a disclosure is typically calculated as the difference in the frequency of positive and negative words occurring in that particular (narrative) disclosure.

[6] Narrative disclosures constitute an "unregulated window" because there are minimal explicit rules regarding the content and format of these disclosures, as words are much more elastic than numbers and thereby more difficult to regulate (Henry, 2008, Huang, et al., 2014, Lang and Lundholm, 1996, Merkl-Davies and Brennan, 2007, Rogers, et al., 2011).

[7] It is worth noting that while CFOs are found to be more influential in terms of accounting numbers, it is CEOs who tend to have a greater say in shaping the narrative disclosure of annual reports (Ranasinghe, et al., 2025).

[8] Huang et al. (2014) decompose tone into a normal component to reflect a neutral description of current performance, and an abnormal (or discretionary) component that proxies for the strategic choice of tone either to inform or misinform investors. Tone management refers to this abnormal tone component.

lawsuits) deter new CEOs from using optimistic language and instead drive them towards adopting an overpessimistic tone for their earnings-related 10-K narrative disclosures.

However, there is no current evidence pertaining to the specific tone management strategy adopted by outgoing or departing CEOs. Given the aforementioned objectives related to their desire to secure and/or enhance various post-departure benefits, it is then not unreasonable to posit that departing CEOs, on average, employ an abnormal positive tone in their firms' narrative disclosures as a tool to favourably influence outsiders' perceptions.[9]

The role of managerial ability

The above argument in favor of an overly optimistic disclosure tone by departing CEOs in general is problematic for two reasons. First, the adoption of an abnormal positive tone could potentially damage the professional reputation and image of departing CEOs if the firm subsequently underperforms. Second, it disregards how the characteristics—namely, the "human side"—of departing CEOs impact their choice of tone management strategy, which is implausible since qualitative disclosures in 10-K filings, being largely unstructured and unregulated, provide an even greater opportunity for manager-specific factors to influence their textual attributes (Hasan, 2020). Importantly, this also resonates with the upper-echelons theory from the strategic management literature, which suggests

[9] We assume that CEOs can predict their turnover, and thus have enough time to influence the annual reports. Voluntary retirement and resignations can, of course, be predicted by CEOs. Also, even if CEOs are asked to leave, they are usually given time to prove themselves (Pourciau, 1993). Moreover, while CFOs are found to be more influential in terms of accounting numbers, it is CEOs who tend to have a greater say in shaping the narrative disclosure of annual reports (Ranasinghe, et al., 2025).

that managerial characteristics explain at least part of a firm's strategic choices and outcomes (Hambrick and Mason, 1984).

Therefore, in this paper we explore whether departing CEOs adopt a tone management strategy in line with their managerial ability. Demerjian, et al. (2012) define managerial ability as managers' efficiency in generating revenues. Specifically, they create a total firm efficiency measure and then "purge" it of key firm-specific characteristics that are expected to aid (like firm size, market share etc.) or hinder (like complex multi-segment and international operations) management's efforts. The "unexplained" portion of firm efficiency is then attributed to management and constitutes their measure of managerial ability. There is widespread support in extant literature that managerial ability has a significant impact on firm policy, which then contributes towards explaining the observed differences across firms with regards to their financing, investment, and organizational performance (Andreou, et al., 2017, Bertrand and Schoar, 2003, Demerjian, et al., 2013), as well as on firms' financial reporting and (narrative) disclosure choices (Hasan, 2020).

We posit that it is the high-ability departing CEOs, unlike low-ability ones, who are more likely to adopt an overoptimistic disclosure tone in the final tenure year in line with the pursuit of their financial objectives and/or post-departure career concerns. This is because high-ability CEOs, unlike their less able counterparts, are more capable of obtaining more precise information on investment opportunities and thus selecting positive net present value (NPV) projects that likely result in greater success and higher future profitability (Andreou, et al., 2017, Chang, et al., 2010, Chemmanur, et al., 2009, Demerjian, et al., 2012, Hasan, 2020, John, et al., 2017). In terms of narrative disclosure

choices, Hasan (2020) documents that more able CEOs are less likely to obfuscate their superior performance and thus have incentives to issue more readable (or less complex) disclosures, commensurate with their high ability. Therefore, in our specific context, we argue that highly able departing CEOs have incentives to engage in greater upward tone management (or overoptimism) to signal their superior ability and because they are confident to achieve the projected firm performance. This leads to our first hypothesis:

HYPOTHESIS 1 (H1): *In their final tenure year, high-ability CEOs, as opposed to low-ability ones, engage in greater upward tone management (or overoptimism) in 10-K disclosures.*[10]

Informativeness of high-ability departing CEOs' tone management strategy

CEOs' tone management strategies, as hypothesised above, may or may not be executed with the intention to inform capital market participants about firms' prospects. For instance, Goel, et al. (2024) document that new CEOs' greater downward tone management (or overpessimism) strategy is more driven by litigation risks emanating from optimistic disclosures rather than CEOs' intention to inform investors about firms' future earnings. It is to be noted that in order to be informative, the abnormal tone adopted in 10-K disclosures is expected to convey incremental managerial private information, which cannot be communicated through the accounting numbers reported in financial reports because of GAAP constraints (Huang, et al., 2014).

[10] The present study does not propose any causal relationship. Instead, we focus on the association of managerial ability and the tone departing CEOs adopt in their 10-K disclosures in their final tenure year.

We contend that highly able departing CEOs' overoptimistic tone management strategy seeks to convey their private information about firm prospects to market participants and thus affirms their superior ability. This is because high-ability managers can better and more credibly convey their firms' intrinsic value to outsiders, thereby reducing the prevalent information asymmetry surrounding the firm in the equity market (Chemmanur, et al., 2009). Furthermore, at least with regard to quantitative disclosure choices, more able executives are known to make more frequent and more accurate management forecasts to signal their firm's underlying economic position, and the market also reacts more to the news embodied in these forecasts (Baik, et al., 2011).

Therefore, we would expect high-ability departing CEOs' more informative disclosures to "bring the future forward", that is, these disclosures could reveal information in the current period that may change investors' expectations about firms' future earnings (Huang, et al., 2014, Lundholm and Myers, 2002). Hence, we formulate our *Hypothesis 2* as follows:

HYPOTHESIS 2 (H2): *The overoptimistic disclosures of high-ability departing CEOs assist investors in incorporating future earnings news into their decision-making.*

Richness of firm information environment and tone management strategy

A rich firm information environment facilitates the flow of accounting information from the firm to outsiders (Hu, et al., 2014), thereby resulting in greater availability of high-quality

information that helps investors decipher managerial decisions (Kelly and Ljungqvist, 2012, Kim, et al., 2019). The richness of the information environment, therefore, attenuates the information asymmetry surrounding the firm in the equity market (Bushman and Smith, 2001, Gong, et al., 2013, Healy and Palepu, 2001).

While several studies seek to advance our knowledge about the effect of the information environment on corporate *quantitative* disclosure decisions (Irani and Oesch, 2016, Yu, 2008), the current literature on whether the information environment has implications for discretionary *qualitative* disclosure choices (such as tone) is rather limited. In the case of new CEOs facing high litigation concerns, Goel, et al. (2024) show that these CEOs' overpessimistic tone management strategy, which is found to be uninformative, is weaker in the presence of a rich firm information environment.

In the current context of highly able departing CEOs seeking to positively influence market perceptions about their performance (and thus favorably influencing their post-departure outcomes), the effectiveness of their disclosure strategy should be associated with the richness of the firm's information environment. We contend that the 'facilitating role' of a rich information environment (Hu, et al., 2014) should serve these CEOs in their efforts to share with market participants relevant information that is aligned with their tone strategies (in our case, greater upward tone management), thereby strengthening their tendency to execute their disclosure strategies in order to reaffirm their superior ability. Therefore, we formulate our third and final hypothesis as follows:

HYPOTHESIS 3 (H3): *High-ability departing CEOs are more likely to adopt their overoptimistic disclosure strategy when their firm's information environment is richer.*

3. RESEARCH DESIGN

3.1. Sample and data

We rely on a sample of US listed firms from 1993 to 2022. We obtain our CEO sample and related data from EXECUCOMP. We also obtain data on managerial ability using the database made available by Demerjian, et al. (2012). The accounting and segments data are from COMPUSTAT, while stock return data and analyst data are obtained from I/B/E/S and CRSP, respectively.

To collect our textual data, we use all firms with available Central Index Key (CIK) in the COMPUSTAT universe, excluding the finance, insurance and real estate sectors (SIC codes between 6000 and 6999). Next, using the SEC EDGAR tool, we download all 10-Ks for the 1993-2022 period and, following Loughran and McDonald (2011), we remove those 10-Ks that contain less than 2,000 words and only include one filing per firm per year by removing the filings that were filed within 180 days from a prior filing. In case of multiple 10-Ks filed within a year, we consider only the first filing. The algorithm for parsing the 10-K documents is outlined in Appendix A. After focusing on earnings-related sentences contained in these 10-K files (see the subsection ‘Tone of the 10-K document’ for more discussions) and merging with the CEO data from EXECUCOMP, managerial ability from Demerjian, et al. (2012) database, and other necessary data from CRSP and I/B/E/S, our final sample comprises 16,209 firm-year observations, representing 3,294 unique CEOs and 1711 unique firms.

3.2. Variable measurement

In this section, we briefly introduce the key variables we have used to test our hypotheses, while the definitions of the other variables used in our empirical tests are outlined in Appendix B.

Tone of the 10-K document

Following prior studies (e.g., Goel, et al., 2024), we consider only earnings-related disclosures in the 10-K filings to define our tone variable.[11] Our exclusive focus on earning-related disclosures is motivated by two important reasons. First, extant research (e.g., Cazier and Pfeiffer, 2017, Hussainey and Walker, 2009, Mouselli, et al., 2012) documents the general salience of earnings-related narrative disclosures in helping market participants predict future earnings. Moreover, earnings reported in the last tenure year of departing CEOs, and thus the associated disclosures, play an important role in their post-departure benefits (see, e.g., Ali and Zhang, 2015, Huson, et al., 2012, Kalyta, 2009). Inspired by Bozanic, et al. (2018), we define earnings-related disclosures as a composite of sentences containing earnings-related terms.[12]

We define tone *(TONE_EARN)* as the difference in the number of positive and negative words pertaining to earnings-related disclosures contained in firms' 10-K filings scaled by the total number of words in these disclosures. To calculate the tone measure, we follow Loughran and McDonald (2011) and employ the *bag of words* approach to

[11] It is to be noted that our findings mostly hold using a tone variable pertaining to the entire 10-K.
[12] Sentences are considered earnings-related if they contain one of the following words: Earning, earnings, EPS, income, loss, losses, profit, profits, sales, revenue, revenues, expense, expenses, EBT, EBIT, and EBITDA.

represent the 10-K text numerically. Under this approach, each document is represented by the words it contains, ignoring any punctuation and ordering. Every word is identified and counted by the number of times it appears in the document. Next, Python scripts are used to search for positive and negative words in the entire document for each 10-K filing,[13] using the financial sentiment dictionary developed by Loughran and McDonald (2011). This specialized dictionary, containing 354 positive words and 2,329 negative words, was developed for analyzing financial communications and has become a widely adopted tool among business researchers for evaluating the linguistic tone of documents (amongst others, Bodnaruk, et al., 2015, Huang, et al., 2014, Kearney and Liu, 2014, Law and Mills, 2015). As an additional refinement, we reduce each word to its "stem," allowing different forms of the same word to be treated as a single word (*e.g.*, the positive words *'improve'*, *'improved'*, *'improving'* and *'improvement'* are stemmed to *'improve'*).

In order to compute a realistic *TONE_EARN* measure, we adopt a term-weighting scheme advised by the literature to attenuate the impact of high-frequency words, thereby allowing less frequently used words to have a greater impact (Jurafsky and Martin, 2009, Loughran and McDonald, 2011). Prior studies (such as Loughran and McDonald (2011)) have argued for and empirically shown that a weighted word count–based measure of tone is superior to an unweighted one. The following term-weighting scheme is used:[14]

[13] Some prior studies restrict attention to the tone of only the MD&A section in the 10-K document. However, Loughran and McDonald (2011) empirically show that the MD&A section does not contain richer tonal content. Therefore, we focus on entire 10-K document and not any one specific section. Other studies that examine 10-K disclosure tone include Li (2008), Lehavy, et al. (2011), Bodnaruk, et al. (2015) and Campbell, et al. (2011).

[14] The weighting scheme is modified to additionally adjust for document length (similar to Loughran and McDonald (2011)) and account for the variation in length over time because the 10-K has become significantly lengthier over time and it is more likely for a word appearing in 1993 to have a different impact than a word appearing in 2022 (our sample period is from 1993–2022).

$$w_{i,j,t} = \begin{cases} \frac{(1 + \log(tf_{i,j,t}))}{(1 + \log(a_{j,t}))} * \log\left(\frac{N_t}{df_{i,t}}\right), & \text{if } tf_{i,j} \geq 1 \\ 0, & \text{Otherwise} \end{cases}$$

where $a_{j,t}$ denotes the average word count of documents in year *t*, $tf_{i,j,t}$ is the raw count of the i^{th} word in the j^{th} document in year *t*, $df_{i,t}$ represents the number of documents containing at least one occurrence of the i^{th} word in year *t* and N_t is the total number of 10-K documents in year *t*.

Abnormal tone (the expected tone model)

It is to be noted that the presence of positive (or negative) words in firm narratives has been generally found to correlate positively with firm performance (Henry, 2008). Therefore, the mere occurrence of certain words (or the general tone adopted in narrative disclosures) does not necessarily indicate tone management; only when the tone is incongruent with the underlying quantitative fundamentals can it be considered tone management. This suggests that tone has a normal component (reflecting a neutral tone commensurate with current available information about firm fundamentals) and an abnormal component (discretionary component capturing managers' strategic choice of tone). In research, it is vital to distinguish between these abnormal and normal components of tone to avoid making any erroneous conclusions (Rogers, et al., 2011).

As suggested in Li (2010) and first applied in the tone management context by Huang, et al. (2014), to compute abnormal tone, we first run annual cross-sectional regressions of tone (*TONE_EARN*) on its determinants. The determinants include measures for current firm fundamentals (*EARN*, *RET_ANNUAL* and *SIZE*), growth opportunities (*BTM*), firm's business and operating risk environment (*RET_VOL*) and

EARN_VOL), operating complexity (*BUS_SEG* and *GEOG_SEG*), life cycle stage of the firm (*AGE*), firm earnings performance benchmarks (*LOSS*, $\Delta EARN$ and *AFE*) and expected future firm performance (*AF*). All variable definitions are outlined in Appendix B. The expected tone model (or the tone determination model) is as follows:

$$TONE\_EARN_{j,t} = \alpha_0 + \alpha_1 EARN_{j,t} + \alpha_2 RET\_ANNUAL_{j,t} + \alpha_3 SIZE_{j,t} + \alpha_4 BTM_{j,t} + \alpha_5 RET\_VOL_{j,t} + \alpha_6 EARN\_VOL_{j,t} + \alpha_7 ln\ BUS\_SEG_{j,t} + \alpha_8 ln\ GEOG\_SEG_{j,t} + \alpha_9 AGE_{j,t} + \alpha_{10} LOSS_{j,t} + \alpha_{11} \Delta EARN_{j,t} + \alpha_{12} AFE_{j,t} + \alpha_{13} AF_{j,t} + \varepsilon_{j,t} \quad \textbf{Equation (1)}$$

We compute the residual term from the estimation of Equation (1) to determine the abnormal component of tone (denoted by *ABTONE_EARN*). Following Huang, et al. (2014), we exclude those variables related to managerial discretionary behaviour (such as seasoned equity offering, special items, and mergers and acquisition) from the above model so that the residual term as a measure of abnormal tone can reflect these strategic incentives.

Final year of the CEOs' tenures

To measure the CEOs' last tenure year, we follow Ali and Zhang (2015) and create an indicator variable (denoted by *FINAL*) that is coded as 1 for the year prior to the CEO's turnover year, and 0 otherwise. We identify turnover year using the "LEFTOFC" variable in EXECUCOMP, and we drop the observations where LEFTOFC was missing.[15]

[15] Note that all the observations pertaining to CEOs' departure due to death are excluded from our sample.

Managerial ability measure

It is to be reiterated that we use the managerial ability measure developed by Demerjian, et al. (2012), where they use a DEA-based method to measure managerial ability for each firm. Relatedly, they first solve an optimization problem (using DEA) that maximizes an output variable (sales revenue) based on seven input variables: (1) net property, plant, and equipment (PP&E), (2) cost of goods sold (COGS), (3) selling, general, and administrative costs (SG&A), (4) capitalized operating leases, (5) net research and development (R&D) costs, (6) purchased goodwill, and (7) other intangible assets. Finally, given the estimated efficiency measure includes both manager and firm characteristics, these scholars adjust the efficiency measure for firm-level characteristics that can affect firm efficiency to arrive at our measure of managerial ability (see Demerjian, et al. (2012) for more details).

3.3. Empirical models

To examine the relationship between managerial ability and CEOs' tone management strategies in the final year of their tenures (*i.e.,* testing *H1*), we estimate the following model equation:

$$ABTONE\_EARN_{j,t}$$

$$= \alpha_0 + \alpha_1 FINAL\_YEAR_{j,t} + \alpha_2 FINAL\_YEAR_{j,t} * ABILITY_{j,t}$$

$$+ \alpha_3 ABILITY_{j,t} + \alpha_4 DA_{j,t} + \alpha_5 EARLY\_YEARS_{j,t} + \alpha_6 NOA_{j,t} + \alpha_7 OPTIMISM_{j,t}$$

$$+ \alpha_8 FINAL\_YEAR_{j,t} * OPTIMISM_{j,t} + \alpha_9 PAY - PERF\_SENSIT_{j,t}$$

$$+ \alpha_{10} FINAL\_YEAR_{j,t} * PAY - PERF\_SENSIT_{j,t}$$

$$+ \alpha_{11} WEALTH\_SENSIT_{j,t} + \alpha_{12} FINAL\_YEAR_{j,t} * WEALTH\_SENSIT_{j,t}$$

$$+ \alpha_{13} CEO\_DUALITY_{j,t} + \alpha_{14} FINAL\_YEAR_{j,t} * CEO\_DUALITY_{j,t}$$

$$+ \varepsilon_{j,t} \qquad \textbf{Equation (2)}$$

All variable definitions are outlined in Appendix B. Equation (2) also includes firm and year fixed effects. Standard errors are clustered at the firm level to control for cross-sectional correlations between the residuals. In this equation, we are interested in the sign of the coefficient for the interaction term (*FINAL_YEAR * ABILITY*), and we expect it to be positive. It Is to be noted that to ensure that any positive coefficient for this variable is not driven by CEO-related factor in their last tenure year—*OPTIMISM*, *PAY-PERF_SENSIT*, *WEALTH_SENSIT*, and *CEO_DUALITY*—we also control for the interaction between *FINAL_YEAR* and these variables. This approach assists us to isolate the effect of these corporate governance factors on departing CEOs' narrative disclosure decisions, thus letting the effect of managerial ability stand out.

In order to test the informativeness of the above tone management strategy (*i.e.,* testing *H2*), we rely on the following model from Lundholm and Myers (2002):

$$ANNUAL\_RETURN_{j,t}$$

$$= \alpha_0 + \alpha_1 ANNUAL\_RETURN_{j,t+1} + \alpha_2 EARN_{j,t+1}$$

$$+ \alpha_3 EARN_{j,t} + \alpha_4 EARN_{j,t-1} + \varepsilon_{j,t} \qquad \textbf{Equation (3)}$$

We adapt the above equation to our context in two steps. We first add *FINAL_YEAR*, *ABTONE_EARN*, and *FINAL_YEAR * ABTONE_EARN*. Next, we interact these three variables with all the independent variables mentioned in Equation (3).[16] We also include a host of control variables, including *DA, SIZE, BTM, RET_VOLURN, EARN_VOL*, and *EARLY_YEARS*. All variable definitions are outlined in Appendix B. Equation (3) also includes firm and year fixed effects, while the standard errors are clustered at the firm level. To test our *H2*, we separately estimate this expanded equation in two sub-samples defined based on CEOs' managerial ability—namely, *High ability CEOs* vs. *Low ability CEOs*. To determine the sub-samples, we include firms with *ABILITY* above (below) the yearly median value in the *High ability CEOs* (*Low ability CEOs*) sub-sample. In this equation, we are interested in the sign of the coefficient for *EARN $_{t+1}$ * ABTONE_EARN * FINAL_YEAR*—representing future earnings response coefficient (FERC)—and we expect it to be positive and stronger in the sub-sample of high-ability departing CEOs.

Finally, to test the effect of firms' information environment richness on departing CEOs' tone strategy (*i.e.,* testing *H3*), we separately estimate Equation (2) in four scenarios of rich vs. poor firm information environment, based on analyst coverage (before 10-K filing date), analyst forecast error (before 10-K filing date), firm size, and bid-

[16] To avoid confusion, and for the purpose of brevity, we do not mention the fully expanded version of the equation here.

ask spread (before 10-K filing date). To create the subsamples, we use the yearly median value of the respective variable as cut-off. All variable definitions are outlined in Appendix B. In this test, we are interested in the sign of the coefficient for *FINAL_YEAR * ABILITY*, and we expect it to be positive and stronger in the rich information environment sub-sample.

4. EMPIRICAL RESULTS

4.1. Summary statistics and correlations

The summary statistics and correlation matrix of our sample are shown in Table 1 and Table 2, respectively. As shown in Table 1, *TONE_EARN* and *ABTONE_EARN* have average values of -0.0104 and -0.0016, respectively. This indicates that, on average, the 10-K earnings-related narrative disclosures in our sample reflect a negative sentiment. The average value of *FINAL_YEAR* is 0.1420, suggesting around 14% of CEOs in our sample are in their final tenure year. This is qualitatively very similar to that reported by Ali and Zhang (2015). Finally, the average value of *ANALYST_BEF* is 2.31, suggesting that the firms in our sample are followed prior to their 10-K filing dates by, on average, 10 security analysts, confirming that our sample includes large companies.

INSERT TABLE 1 ABOUT HERE

We present correlation matrix of all independent variables in Table 2. As can be seen from this table, there is no large correlation between any pair of variables. This reduces multicollinearity concerns in our empirical analysis.

INSERT TABLE 2 ABOUT HERE

4.2. Related to H1

Table 3 reports the regression results from estimating Equation (2), which aims at testing *H1*. We observe both in columns (1) and (2) (representing model specifications without and with control variables, respectively) that the coefficient for *FINAL_YEAR* is statistically insignificant, suggesting that, on average, abnormal tone is not significantly different in the final year compared to the earlier years of CEOs' tenures. Column (4) presents the results from estimating our main model, which aims at testing *H1*, where we control for the effect of managerial ability via the interaction of *FINAL_YEAR* and *ABILITY* (*i.e., FINAL_YEAR * ABILITY*). We observe that the coefficient for *FINAL_YEAR* alone does not attain any statistical significance at the ordinary levels, while *FINAL_YEAR * ABILITY* receives a positive coefficient (significant at the 1% level). These findings confirm that high-ability departing CEOs engage in greater upward tone management (or overoptimism) in the earnings-related disclosures contained in their firm's 10-K filing, while their low-ability counterparts do not manage tone differently in their final year as compared to the previous years. This implies that highly able departing CEOs, besides employing accruals management (as extant evidence shows), additionally rely on tone management to positively influence outsiders' perceptions and enhance their post-departure prospects. Overall, these results support *H1*.[17]

[17] It should be noted that using abnormal tone of the entire 10-K (rather than only earnings-related sentences) renders results that are less significant, but despite that our general inferences remain unchanged. It is noteworthy that the earnings-related sentences are more relevant for departing CEOs' disclosure strategy, rather than the overall 10-K, as the latter incorporates a myriad of information—both related and unrelated to earnings. For more, refer to footnote 2.

It should be noted that this finding is attained after controlling for tone management in CEOs' early years (*EARLY_YEARS*), as not controlling for it can give misleading results when testing for tone management in CEOs' final year. This is because many CEOs leave office within the first four years of starting the job and so the difference in tone management between their final year and the other years is likely to be small (given their incentive to manage tone in the early years as well). Moreover, because performance benchmarks, such as loss, analyst earnings forecast errors and change in earnings, have been used in the calculation of abnormal tone (see the subsection 'Abnormal tone (the expected tone model)' for a detailed discussion), this greater upward tone management strategy is beyond a mere reflection of (favourable) firm performance.

INSERT TABLE 3 ABOUT HERE

4.3. Related to H2

Table 4 presents the results of testing the hypothesis related to the informativeness of departing CEOs' tone management strategy (*i.e.,* effect on future earnings response coefficient, FERC), with columns (1) and (2) focusing on the *High-ability CEOs* and *Low-ability CEOs* sub-samples, respectively. As we can observe, $EARN_{t+1}$ * *ABTONE_EARN* * *FINAL_YEAR* receives a significantly positive coefficient (at the 5% level) only in the *High-ability CEOs* sub-sample (column (1)), and the difference between its coefficient in this sub-sample and the one in the *Low-ability CEOs* sub-sample is significant at the 5% level (p-value equal to 0.033). This finding is consistent with our expectation that high-ability departing CEOs' overoptimism increases future earnings response coefficient (supporting *H2*).

INSERT TABLE 4 ABOUT HERE

Overall, the findings presented in Table 4 confirm that the overoptimistic disclosures of high-ability departing CEOs assist investors in incorporating future earnings news into their decision-making. This positions the former in a favorable light in the eyes of the latter, thus bringing these CEOs a step closer to their desired goals by safeguarding any post-departure benefits accrued to them.

4.4. Related to H3

Table 5 presents results from examining the effect of the richness of the firm information environment on highly able departing CEOs' tone management strategies (*i.e.,* testing *H3*). To ensure that our findings related to testing *H3* are not affected by our choice of information environment measures, we use four different measures to proxy information environment. Relatedly, we first use, in columns (1) and (2), analyst coverage before the 10-K filing date (denoted by *ANALYST_BEF*). Next, and inspired by prior studies (Barth, et al., 2001, Lang and Lundholm, 1996, Lehavy, et al., 2011, Upadhyay, 2014), we use analyst forecast error before the 10-K filing date (denoted by *FERROR_BEF*) in columns (3) and (4), firm size (denoted by *SIZE*) in columns (5) and (6), and bid-ask spread (denoted by BA_SPREAD) in columns (7) and (8) as our alternative measures of information environment. Large analyst forecast errors are indicative of information opacity and, thus, a poor information environment. Firm size is arguably an important attribute of the information environment; that is, large firms have a richer information environment (Miller, 2010). Bid-ask spread represents information asymmetry between

managers and outsiders, with high (low) value indicative of poor (rich) information environment.

As seen in columns (1) and (2), *ABILITY * FINAL_YEAR* receives a positive coefficient (significant at the 5% level) in column (1), while its coefficient in column (2) does not attain any statistical significance at the ordinary levels. Moreover, the difference in this coefficient between columns (1) and (2) is significant at the 5% level (p-value equal to 0.028). This finding supports our conjecture that a rich information environment (as characterised by higher analyst coverage prior to the 10-K filing date) makes it more conducive for highly able departing CEOs to adopt their overoptimistic disclosure strategy. We obtain qualitatively similar results when using the other three proxies for information environment richness—namely, lower analyst forecast error prior to the 10-K filing date (column 3), larger firms (column 5), and lower bid-ask spread prior to the 10-K filing date (column 7).

INSERT TABLE 5 ABOUT HERE

Overall, the findings in this section provide evidence supporting the argument that high-ability departing CEOs' greater upward tone management strategy holds exclusively in the presence of a rich firm information environment.

5. ADDITIONAL ANALYSIS

5.1. Effect on CEOs' final year equity-based compensation

To further shed light on high-ability departing CEOs' motivation underlying their overoptimistic disclosure strategy, in this section we focus on the equity-based element—

granted options and stocks—of their final year compensation. We contend it is particularly important to focus on this element as our findings about the positive effect of high-ability departing CEOs' overoptimism on FERC would naturally give rise to the expectation that this strategy should ultimately boost the equity-based compensation of these CEOs in their last tenure year. Following prior studies (e.g., Dai, et al., 2020, Song and Wan, 2019), we calculate the equity-based part of CEOs' salaries (the dependent variable) as the sum of options and stocks granted to CEO, scaled by total salaries (denoted by *EQUITY_COMP*). Results of this test is presented in Table 6, with column (1) ((2)) being relate to High-ability CEOs (Low-ability CEOs) sub-sample. As this table demonstrates, *FINAL_YEAR * ABTONE_EARN* attains a positive coefficient (significant at the 5% level) in column (1), while its coefficient in column (2) does not attain statistical significance at the ordinary levels. Moreover, these coefficients are statistically different from each other (the p-value of the difference equals 0.015). It is to be noted that an increase in *ABTONE_EARN* from the lowest to the highest decile increases high-ability departing CEOs' final year compensation (or *EQUITY_COMP*) by 0.162 (=0.018*9), which is equal to 25% of its standard deviation. Thus, our findings are also economically meaningful.

INSERT TABLE 6 ABOUT HERE

Overall, the findings presented in this table combined with the prior ones suggest that high-ability departing CEOs' greater upward tone management strategy, does not only assist investors in incorporating future earnings-related information into their investment decisions, but it also boost these CEOs' equity-based compensation in their last tenure year.

5.2. Limits to accruals management

Huang, et al. (2014) observe that when managers are constrained in manipulating accruals, they are more likely to resort to (upward) tone management. Thus, we expect our main finding of high-ability departing CEOs' overoptimistic disclosure strategy to hold stronger in the presence of limits to accruals management (*i.e.,* high NOA).

To test the above assertion, following prior studies (Barton and Simko, 2002, Das, et al., 2011, Hirshleifer, et al., 2004), we use asset-scaled net operating assets (NOA) at the beginning of the fiscal year as a proxy for the limits to accruals management. Next, we divide our sample into two sub-samples (*High NOA* vs. *Low NOA*) based on the yearly median of NOA as cut-off (refer to Appendix B for the computation of NOA). Finally, we re-estimate Equation (2) separately for each of these sub-samples. Columns (1) and (2) of Table 7 present the findings of this test. As depicted in the table, the coefficient for *ABILITY * FINAL_YEAR* loads significantly positive (at the 5% level) only in the *High NOA* sub-sample, and the difference between this coefficient and the similar one in column (2) is marginally significant (p-value equal to 0.040). This result confirms the argument that when limits to accruals management are sufficiently restrictive, high-ability departing CEOs are much more inclined to use their discretion related to disclosure tone, intended to aid investors and favourably influence their perceptions towards achieving desired post-departure benefits.

5.3. Profit versus Loss firms

Our findings, so far, provide evidence that highly-able departing CEOs have incentives to engage in greater upward tone management (or overoptimism) to signal their superior

ability because they are confident to achieve the projected firm performance. While we succeed in documenting that these CEOs do adopt an overoptimistic disclosure strategy in their final year of service, it follows that this result should be stronger in the case of profitable firms. Moreover, this assertion is consistent with the findings in Hasan (2020), where they show that high-ability CEOs' 10-K disclosures are more readable particularly when their firms are highly profitable.

To test the above contention, we first divide our sample into two sub-samples (*Loss firms* vs. *Profit firms*) based on the sign of reported income before extraordinary items. Next, we re-estimate Equation (2) separately for each of these sub-samples. Columns (3) and (4) of Table 7 present the findings of this test. As expected, we observe that *ABILITY * FINAL_YEAR* receives a significantly positive coefficient (at the 5% level) only in the *Profit firms* sub-sample and the p-value of the difference between this coefficient and the similar one based on the *Loss firms* sub-sample equals 0.050 (significant at the ordinary levels).

INSERT TABLE 7 ABOUT HERE

5.4. Other textual attributes

In this study, we specifically focus on the aspect of sentiment reflected by the narrative disclosures—tone—due to its potential to influence market participants' perceptions about the firm's prospects (Henry, 2008, Huang, et al., 2014, Lang and Lundholm, 2000, Loughran and McDonald, 2011) and thus assisting the high-ability departing CEOs to

reaffirm their superior ability. To have a more complete picture about how these CEOs implement their narrative disclosures strategy, that is, whether they merely focus on tone or combine it with other textual dimensions, we re-test our *H1* based on two other important textual attributes—namely, disclosure quantity and complexity. Any contradictory findings from this test can cast doubt about the general inferences drawn from our findings.

We calculate quantity as the natural logarithm of the total number of words in the entire 10-K filings (denoted as *LN(10K)*). We estimate disclosure complexity using FOG index pertaining to the entire 10-K filings (denoted as *FOG_10K*). On average, there are 59,208 words (excluding numeric ones) in the entire 10-K filings, with a median of 50,754. Moreover, the average value of FOG index over the entire 10-K equals 22.9, with a median value of 22.8. This suggests that readers need approximately 23 years of formal education to understand the text of these filings on their first reading. These numbers are consistent with those reported in prior studies (e.g., Dyer, et al., 2017).

Table 8 presents findings of these estimations, with Panel A (B) focusing on 10-K FOG (length). Again, *ABILITY * FINAL_YEAR* is our variable of primary interest since its coefficient represents the effect of managerial ability on the departing CEOs' narrative disclosure strategy. In general, we do not have a specific directional expectation regarding departing CEOs' choice of quantity and complexity—regardless of their managerial ability—since higher quantity and complexity can be explained by both obfuscation (Ertugrul, et al., 2017, Li, 2008, Loughran and McDonald, 2014) and signalling (Barth, et al., 2024, Bushee, et al., 2018, Lang and Stice-Lawrence, 2015) arguments. As demonstrated in this table, *FINAL_YEAR* mostly receives a positive

coefficient (significant at the ordinary levels) in both panels, while the coefficient for *ABILITY * FINAL_YEAR* does not attaint any statistical significance in any of the panels. These findings suggest that 10-K disclosures are on average longer and marginally more complex in the final year of CEOs' tenure, but this does not vary with departing CEOs' managerial ability.

Overall, using all key textual attributes, our findings imply that in their efforts to influence their post-departure outcomes high-ability departing CEOs tend to merely use tone and engage in greater upward tone management in 10-K disclosures as compared to their low-ability counterparts.

INSERT TABLE 8 ABOUT HERE
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6. ROBUSTNESS TESTS

6.1. Endogeneity

It is to be noted that when examining high-ability CEOs' tone strategy, the problem of endogeneity might arise due to reverse causality or omitted correlated variable issues, biasing our coefficient and the associated inferences. To reduce these concerns, we conduct an endogeneity test.

To do so, we apply entropy-based balancing technique and adopt a conservative approach by matching the treatment and control firms based on all our control variables in equation (2). For this purpose, we define treatment firms (*TREAT*) based on the yearly median of *ABILITY*, and we assign firms with the value above (below) median to the

treatment (control) group. Then, we re-estimate Equation (2) replacing *ABILITY* with *TREAT*, that is, this time we interact *FINAL_YEAR* with *TREAT*. Results of this robustness test are presented in Table 9. As this table depicts, and consistent with our primary findings, the coefficient for *TREAT * FINAL_YEAR* loads positive (significant at the 1% level), while the coefficient for *FINAL_YEAR* itself does not attain any statistical significance at the ordinary levels.

INSERT TABLE 9 ABOUT HERE

6.2. Retirement only

The most important reason for CEO departure is retirement, as CEO exits for taking a CEO position in another firm are very rare (Brickley, et al., 1999, Gibbons and Murphy, 1992). Therefore, some prior studies (e.g., Brickley, et al., 1999, Kalyta, 2009) mainly focused on retirement as the primary reason for CEOs' departure. Even across our sample, 1,708 out of 3,090 (55.28 per cent) observations for which the reason of CEO departure is non-missing in EXECUCOMP correspond to these retiring CEOs. In view of this, as a robustness test, we re-examine high-ability departing CEOs' tone management strategy and its informativeness only in the case of departure due to retirement. Findings of this robustness test are presented in Table 10. In this table, Panel A (B) focuses on the narrative disclosure strategy of retiring CEOS, that is, testing *H1* (informativeness of this disclosure strategy, that is, testing *H2*), while Panel C presents findings related to the effect of this disclosure strategy on retiring CEOs' equity-based compensation in their last year of tenure.

As shown in column (4) of Panel A—the full model aiming at testing *H1*—consistent with our primary results, *ABILITY * FINAL_YEAR* loads significantly positive (at the 5% level), while the coefficient for *FINAL_YEAR* itself does not attain any statistical significance at the ordinary levels. Moreover, as depicted in Panel B, $EARN_{t+1}$ * *ABTONE_EARN * FINAL_YEAR* receives a significantly positive coefficient (at the 5% level) only in the *High-ability CEOs* sub-sample, and this coefficient is statistically different from the one in the *Low-ability CEOs* sub-sample. This finding confirms that the high-ability retiring CEOs' overoptimism increases future earnings response coefficient only in the case of high-ability CEOs, that is, assisting investors in capturing future earnings-related information content of their tone strategy. Furthermore, as findings in Panel C reveal, *FINAL_YEAR * ABTONE_EARN* receives a positive coefficient (significant at the 1% level) only in the case of high-ability retiring CEOs, and this coefficient is statistically different (at the 5% level) from the similar one in the *Low-ability CEOs* sub-sample. Our finding related to high-ability retiring CEOs' compensation is also economically meaningful given that an increase in *ABTONE_EARN* from the lowest to the highest decile increases *EQUITY_COMP* by 0.1323 (=0.0147*9), which is equal to 20% of its standard deviation.

Overall, these results assuage our concerns about the undue influence of non-retiring cases—accounting for 44.72% of our observations—on our primary findings about high-ability departing CEOs' tone management.

INSERT TABLE 10 ABOUT HERE

6.3. Adjusted measure of CEO final year

To further address the aforementioned concern, following Ali and Zhang (2015), we adjust our *FINAL_YEAR* variable by adding the condition for departing CEOs to have stayed in the office at least six years. We set this additional condition for two reasons. First, CEOs with at least six years of office are more likely to possess high managerial ability (Milbourn, 2003). Second, we contend that any departure after six years of service is more likely to be voluntary as opposed to forced. Our data sample also supports this cut-off of six years since CEOs are found to have a median tenure of 5.69 years.

Findings of this robustness test is reported in Table 11. As we can observe in this table, once again, *ABILITY * FINAL_YEAR* receives a significantly positive coefficient (at the 5% level), which is consistent with our *H1*.

INSERT TABLE 11 ABOUT HERE

6.4. Alternate measure of managerial ability

Finally, following prior studies (*e.g.,* Fee and Hadlock, 2003, Hasan, 2020, Milbourn, 2003, Rajgopal, et al., 2006), we use industry-adjusted value-weighted stock returns as an alternate measure of managerial ability in our model specification to test *H1*. The findings (untabulated) continue to be qualitatively similar, indicating the robustness of our main findings.

7. CONCLUSION

This study contributes by exploring an under-researched area of CEOs' disclosure strategies during the critical final year of their tenure. It highlights the strategic use of narrative disclosures, particularly tone management, as a complementary tool to earnings manipulation, providing a more comprehensive understanding of CEOs' efforts to shape perceptions and enhance their post-tenure opportunities. Additionally, the study advances the literature on managerial ability by examining how it influences CEOs' disclosure tone, offering practical insights for stakeholders and board members when evaluating the implications of retaining or re-employing highly capable departing CEOs.

Our findings have shown that highly able CEOs act differently from their low-ability counterparts when it comes to formulating their narrative disclosure strategy in the year preceding the turnover year. We documented that the tone adopted for the earnings-related qualitative disclosures contained in the 10-K is abnormally positive in the case of these CEOs. Interestingly, we observe that among the three key attributes of textual disclosures—tone, readability, and length—tone appears to be a more prominent tool for these high-ability departing CEOs to execute their strategy aimed at reaffirming their superior ability in pursuit of any post-departure benefits. Our evidence further depicts that this adopted overoptimistic strategy enables firms' current stock returns to better reflect information about their future earnings, thereby assisting investors in their decision-making and enabling departing CEOs to reaffirm their superior ability. Notably, the success of this strategy is assured only in the presence of low information asymmetry (i.e., rich firm information environment).

The present study opens several avenues for further research. For instance, although we tested our hypotheses using a sample of publicly listed US firms, testing these hypotheses in the context of other countries with different business environments, judicial systems and investor mindsets could be another interesting research topic. Furthermore, in the light of the evidence that CFOs are more influential in terms of accounting numbers and CEOs in shaping the narrative disclosures (Ranasinghe, et al., 2025), it might be worth investigating whether these two senior executive work in tandem to achieve their desired goals. This is further important when these executives are at different stages of their tenure.

APPENDIX A: STEPS IN PARSING THE 10-K DOCUMENTS

All 10-K documents filed between the years 1993 and 2022 were downloaded through the SEC EDGAR tool. The .html version of this document was downloaded, which generally contains figures and tables as well. These 10-K documents were parsed and converted to txt using R scripts, in which we followed the following steps:

1) Removal of any graphic/jpg/xls segment.

2) Removal of all tables.

3) Removal of all other HTML tags.

4) The remaining text was cleaned through the following steps:

4.1) Text was split into sentences based on particular punctuation [‘.’,’!’, or ‘?’]

4.2) Removal of sentences that were short (i.e. less than 3 words) and those with a high fraction of numerical content (i.e. where more than 75% of the sentences consists out of numbers.

4.3) Sentences were next categorised as being (non-)forward-looking and earnings-related based following Muslu et al. (2015) and a keyword-approach respectively (see footnote 12).

4.4) The different categorized sentences were then put again together as a whole. That is, for the calculation of the tone of earnings-related disclosure, all earnings-related sentences were put into one large string. In the different larger text strings, numerical information and punctuation was removed, as well as stop words ["a", “the”, “is” “are”, etc.]. Such that only a larger vector of words remains.

4.5) Each word was reduced to its stem form.

4.6) Positive and negative words [identified based on a stemmed version of the financial sentiment dictionary provided by Loughran and McDonald (2011)] were counted. Positive words that were immediately preceded by a stemmed-version of negation words [no, not, none, neither, never or nobody] were counted as negative.

4.7) The weight for each word was calculated using the term-weighting scheme described in the subsection ‘Tone of the 10-K document’.

APPENDIX B: VARIABLE DEFINITIONS AND MEASUREMENT

Variable	Notation	Definition/Measurement
Count of words in 10-K	10K Wordcount	Total number of words in the 10-K document
10-K tone	TONE_EARN	$\frac{(\text{Weighted count of positive words} - \text{Weighted count of negative words})}{\text{Weighted count of all words}}$
Earnings	EARN	Earnings before extraordinary items/lagged total assets
Change in earnings	∆EARN	Change in $EARN_t$ – $EARN_{t-1}$
Annual returns	ANNUAL_RETURN	Buy-and-hold annual returns over 12 months starting from 8 months before the fiscal year end date, ending at 3 months after the fiscal year end date.
Size	SIZE	Log(market capitalization), where market capitalization is defined as common shares outstanding multiplied by annual closing price
Book-to-Market ratio	BTM	Book value of equity divided by the market value of equity at the fiscal year-end
Discretionary accruals	DA	Discretionary accruals calculated using the modified Jones model (Dechow, et al., 1995)
Return volatility	RET_VOL	Standard deviation of monthly returns over the fiscal year
Earnings volatility	EARN_VOL	Standard deviation of EARN over the last five years
Loss	LOSS	A dummy variable equal to 1 if EARN is negative and 0 otherwise
Analyst forecast error at the end of the fiscal year	AFE	I/B/E/S EPSt minus the median of the most recent analysts' forecasts, deflated by stock price per share at the end of the fiscal year.
Analyst consensus earnings	AF	Analyst consensus forecast for one-year-ahead earnings per share scaled by stock price per share at the end of the fiscal year.
Business segments	BUS_SEG	Number of business segments of a firm

Geographical segments	GEOG_SEG	Number of geographical segments of a firm
Firm Age	AGE	Log[1 + (number of years since a firm appears in CRSP monthly file)]
10-K abnormal tone	ABTONE_EARN	Residual term from annual cross-sectional regressions of TONE_EARN on its determinants (see Equation (1))
Managerial ability	ABILITY	Residual-based measure of managerial (CEO) ability from Demerjian, et al. (2012)
CEO's final year of tenure	FINAL_YEAR	A dummy variable equal to 1 for the year prior to the CEO's turnover year, and 0 otherwise (turnover year identified using the "LEFTOFC" variable in *Execucomp*, and observations where LEFTOFC was missing were dropped)
CEO's early years of tenure	EARLY_YEARS	A dummy variable equal to 1 for firm-years corresponding to the first three years of a CEO's tenure, and 0 otherwise
Net operating assets	NOA	(Operating assets (OA) – Operating liabilities (OL))/ lagged total assets, where OA= total assets – cash and short-term investment, and OL = total assets – debt included in current liabilities – long term debt – minority interests – preferred stocks – common equity [using Hirshleifer, et al. (2004)]. Missing values of long-term debt, minority interest, or preferred stock are coded as zero.
Options-based measure of CEO optimism	OPTIMISM	A dummy variable equal to 1 if the CEO holds (vested) stock options that are at least 67% in-the-money* at least twice during the sample period, and 0 otherwise. [CEOs thus identified as optimistic remain so for the rest of the sample period, beginning with the first time they exhibited this behaviour] *Average moneyness of the CEO's option portfolio is calculated as (Campbell, et al., 2011): Average moneyness = stock price/ strike price – 1, where strike price = fiscal year end stock price - average realizable value, and average realizable value (for each CEO-year) = total realizable options value/ number of options held by the CEO.
CEO pay-performance sensitivity	PAY-PERF_SENSIT	Dollar change in wealth associated with a 1% change in the firm's stock price (in $000s), provided by Coles, et al. (2006).
CEO's wealth sensitivity to stock volatility	WEALTH_SENSIT	Dollar change in wealth associated with a 0.01 change in the standard deviation of the firm's returns (in $000s) , provided by Coles, et al. (2006).
CEO duality	CEO_DUALITY	A dummy variable equal to 1 if a CEO also holds position as the chairman of the board of directors in the same company, and 0 otherwise.
Analyst following before the 10-K filing date	ANALYST_BEF	Natural logarithm of the number of analysts following the firm between days 5 and 90 before 10-K filing date.
Analyst forecast error before the 10-K filing date	FERROR_BEF	Average analyst forecast error before the 10-K filing date, between days 5 and 90. Analyst forecast error is calculated as I/B/E/S EPS_t *minus the* median of analyst earnings forecast, deflated by stock price per share at the end of the fiscal year.
Bid-ask spread	BA_SPREAD	Average bid-ask spread in the last 30 trading days before the 10-K filing date, ending at 2 business days before the 10-K filing date.

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TABLE OF RESULTS

Table 1. Summary Statistics

VARIABLES	Mean	SD	P25	Median	P75
TONE_EARN	-0.0104	0.0076	-0.0152	-0.0152	-0.0057
ABTONE_EARN	-0.0016	0.5090	-0.2570	-0.2570	0.2750
FINAL_YEAR	0.1420	0.3490	0	0	0
EARLY_YEARS	0.2590	0.4380	0	0	1
EARN	0.0476	0.119	0.0161	0.0161	0.0986
SIZE	7.7620	1.5830	6.6450	6.6450	8.7430
BTM	1.0080	0.0339	1	1	1
RET_VOL	0.113	0.0683	0.0694	0.0694	0.1360
EARN_VOL	0.0734	0.1320	0.0190	0.0190	0.0812
NOA	0.827	0.1830	0.7540	0.7540	0.9630
RET_ANNUAL	0.124	0.5210	-0.1720	-0.1720	0.3190
DA	0.0605	0.1260	-0.0101	-0.0101	0.1250
OPTIMISM	0.476	0.4990	0	0	1
ABILITY	0.00168	0.1350	-0.0821	-0.0821	0.0453
PAY-PERF_SENSIT	603.3	1,288	87.30	87.30	586.8
WEALTH_SENSIT	145.5	229.0	11.94	11.94	169.2
CEO_DUALITY	0.5650	0.496	0	0	1
EQUITY_COMP	0.6440	0.6510	0.3550	0.3550	0.7250
FERROR_BEF	-0.0040	0.0488	-0.0045	-0.0045	0.0041
ANALYST_BEF	2.3070	0.6310	1.7920	1.7920	2.8330
BA_SPREAD	0.0021	0.0044	0.0004	0.0004	0.0017

All variable definitions in Appendix B.

Table 2: Correlation Matrix

Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) ABTONE_EARN	1.000												
(2) FINAL_YEAR	-0.024**	1											
(3) ABILITY	0.008	-0.054***	1										
(4) DA	0.016	-0.022**	0.009	1									
(5) EARLY_YEARS	-0.032***	-0.088***	-0.005	-0.019*	1								
(6) NOA	0.050***	0.016	-0.223***	-0.017*	0.021**	1							
(7) OPTIMISM	0.048***	-0.011	0.063***	0.027***	-0.209***	0.002	1						
(8) PAY-PEF_SENSIT	-0.008	-0.003	0.151***	0.016	-0.148***	-0.036***	0.161***	1					
(9) WEALTH_SENSIT	-0.004	-0.012	0.188***	0.068***	-0.092***	-0.031***	-0.107***	0.394***	1				
(10) CEO_DUALITY	0.004	0.038***	0.053***	0.053***	-0.132***	0.056***	-0.034***	0.150***	0.199***	1			
(11) EARN	0.031***	-0.069***	0.215***	0.273***	-0.036***	0.085***	0.167***	0.154***	0.138***	0.057***	1		
(12) SIZE	0.013	-0.010	0.271***	0.094***	0.019*	0.050***	0.096***	0.350***	0.580***	0.184***	0.304***	1	
(13) BTM	0.015	0.002	0.004	0.035***	-0.008	0.063***	-0.020**	0.041***	0.096***	0.084***	-0.003	0.084***	1
(14) ANNUAL_RET	-0.017*	-0.028***	0.008	0.061***	0.008	-0.070***	0.037***	0.035***	-0.016	-0.017*	0.115***	0.076***	-0.012
(15) RET_VOL	-0.036***	0.016	-0.052***	-0.081***	0.016	-0.132***	-0.029***	-0.133***	-0.239***	-0.080***	-0.305***	-0.399***	-0.019*
(16) EARN_VOL	-0.036***	-0.007	0.059***	-0.054***	0.000	-0.279***	0.007	-0.025**	-0.094***	-0.077***	-0.227***	-0.193***	-0.051***
(17) EQUITY_COMP	-0.032***	0.015	-0.026***	-0.009	0.004	-0.093***	0.039***	0.039***	-0.090***	-0.011	-0.071***	-0.113***	-0.029***
(18) ANALYST_BEF	-0.022**	-0.005	0.244***	-0.016	-0.012	-0.003	0.073***	0.254***	0.410***	0.140***	0.145***	0.707***	0.056***
(19) FERROR_BEF	-0.015	-0.043***	0.046***	0.039***	-0.019*	-0.050***	0.018	0.041***	0.048***	-0.001	0.097***	0.097***	0.022*
(20) BA_SPREAD	0.003	0.032***	-0.049***	-0.034***	0.036***	0.030***	-0.083***	-0.052***	-0.086***	0.000	-0.200***	-0.285***	0.040***

Variables	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(14) ANNUAL_RET	1						
(15) RET_VOL	0.098***	1					
(16) EARN_VOL	0.074***	0.318***	1				
(17) EQUITY_COMP	-0.038***	0.112***	0.085***	1			
(18) ANALYST_BEF	-0.047***	-0.214***	-0.095***	-0.070***	1		
(19) FERROR_BEF	0.122***	-0.019*	0.003	-0.020*	0.058***	1	
(20) BA_SPREAD	-0.138***	0.247***	0.099***	0.111***	-0.213***	-0.111***	1

All variable definitions in Appendix B.

Table 3. Estimation results of testing the effect of managerial ability on departing CEOs' tone management strategy (*H1*)

DV: ABTONE_EARN	(1)	(2)	(3)	(4)
FINAL_YEAR	-0.0069	-0.0108	-0.0036	-0.0097
	[0.5328]	[0.3562]	[0.7467]	[0.4010]
ABILITY * FINAL_YEAR [a]			**0.1928****	**0.1615*****
			[0.0104]	**[0.0079]**
ABILITY		0.1577***	0.1440***	0.1428***
		[0.0014]	[0.0043]	[0.0047]
DA		-0.0344		-0.0339
		[0.3371]		[0.3218]
EARLY_YEARS		-0.0233**		-0.0234**
		[0.0430]		[0.0450]
NOA		-0.0000		-0.0000
		[0.2946]		[0.3145]
OPTIMISM		0.0176		0.0179
		[0.1446]		[0.1533]
FINAL_YEAR * OPTIMISM		-0.0239		-0.0275
		[0.2763]		[0.1951]
PAY-PERF_SENSIT		-0.0000***		-0.0000***
		[0.0004]		[0.0006]
FINAL_YEAR * PAY-PERF_SENSIT		0.0000***		0.0000***
		[0.0000]		[0.0000]
WEALTH_SENSIT		0.0000		0.0000
		[0.8252]		[0.7375]
FINAL_YEAR * WEALTH_SENSIT		0.0001*		0.0000*
		[0.0704]		[0.0945]
CEO_DUALITY		-0.0066		-0.0063
		[0.6660]		[0.6690]
FINAL_YEAR * CEO_DUALITY		0.0429*		0.0425*
		[0.0676]		[0.0747]
CONSTANT	-0.0012	0.0112	-0.0025	0.0109
	[0.4277]	[0.4772]	[0.1144]	[0.5188]
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	16,209	16,209	16,209	16,209
Adjusted R-squared	0.4184	0.4202	0.4193	0.4203

Robust (two-tailed) p-value in brackets

*** p<0.01, ** p<0.05, * p<0.1

a: One-tailed p-value, in view of having signed hypothesis.

All variable definitions in Appendix B.

Table 4. Estimation results of testing the effect of departing CEOs' overoptimism on future earnings response coefficient (*H2*)

DV: ANNUAL_RETURN	(1)	(2)
	High-ability CEOs	*Low-ability CEOs*
EARN $_{t+1}$	1.5806***	0.9691***
	[0.0000]	[0.0017]
EARN $_{t+1}$ * ABTONE_EARN	-0.0177	0.0272
	[0.7330]	[0.6112]
EARN $_{t+1}$ * ABTONE_EARN * FINAL_YEAR [a]	**0.2922****	**-0.0133**
	[0.0209]	**[0.4407]**
FINAL_YEAR * EARN $_{t+1}$	-2.0272**	-0.2753
	[0.0104]	[0.6523]
EARN $_{t}$	0.8525**	0.7407**
	[0.0348]	[0.0293]
EARN $_{t}$ * ABTONE_EARN	-0.0072	0.0317
	[0.9205]	[0.5831]
EARN $_{t}$ * ABTONE_EARN * FINAL_YEAR	-0.2273	-0.0588
	[0.1282]	[0.5224]
FINAL_YEAR * EARN $_{t}$	1.0840	-0.0714
	[0.2095]	[0.8969]
EARN $_{t-1}$	-1.5760***	-1.3249***
	[0.0000]	[0.0000]
EARN $_{t-1}$ * ABTONE_EARN	-0.0458	-0.0265
	[0.5678]	[0.6087]
EARN $_{t-1}$ * ABTONE_EARN * FINAL_YEAR	0.1598	0.0200
	[0.3097]	[0.8414]
FINAL_YEAR * EARN $_{t-1}$	-0.6173	0.8873
	[0.4773]	[0.1857]
ANNUAL_RETURN $_{t+1}$	-0.1394***	-0.1795***
	[0.0038]	[0.0001]
ANNUAL_RETURN $_{t+1}$ * ABTONE_EARN	0.0024	0.0188***
	[0.7340]	[0.0013]
ANNUAL_RETURN $_{t+1}$ * ABTONE_EARN * FINAL_YEAR	0.0237	-0.0083
	[0.3202]	[0.3985]
FINAL_YEAR * ANNUAL_RETURN $_{t+1}$	-0.0986	0.0139
	[0.4125]	[0.8350]
ABTONE_EARN	-0.0035	-0.0047
	[0.3962]	[0.1601]
FINAL_YEAR * ABTONE_EARN	-0.0072	0.0019
	[0.4600]	[0.7385]
FINAL_YEAR	0.0041	-0.0343
	[0.9424]	[0.3783]
DA	-0.2149*	-0.0932

	[0.0660]	[0.3117]
SIZE	0.2582***	0.3078***
	[0.0000]	[0.0000]
BTM	1.0109**	0.2200
	[0.0283]	[0.4654]
RET_VOLURN	2.4295***	2.4479***
	[0.0011]	[0.0000]
EARN_VOL	0.1569	0.0315
	[0.1966]	[0.8950]
EARLY_YEARS	-0.0117	0.0442**
	[0.4510]	[0.0116]
CONSTANT	-3.1699***	-2.5859***
	[0.0000]	[0.0000]
Firm FE	YES	YES
Year FE	YES	YES
Observations	5,932	6,048
Adjusted R-squared	0.3558	0.3869
*P-value of the difference in coefficient for EARN $_{t+1}$ * ABTONE_EARN * FINAL_YEAR*	*0.033*	

Robust (two-tailed) p-value in brackets
*** p<0.01, ** p<0.05, * p<0.1
a: One-tailed p-value, in view of having signed hypothesis.
All variable definitions in Appendix B.

Table 5. Estimation results of testing the effect of the richness of firm information environment on departing CEOs' overoptimism (*H3*)

DV: ABTONE_EARN	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High analyst following before 10-K filing date	*Low analyst following before 10-K filing date*	*Low analyst forecast error before 10-K filing date*	*High analyst forecast error before 10-K filing date*	*Large firms*	*Small firms*	*Low bid-ask spread before 10-K filing date*	*High bid-ask spread before 10-K filing date*
FINAL_YEAR	-0.0055	0.0024	-0.0027	0.0043	0.0090	-0.0490	0.0206	-0.0113
	[0.7474]	[0.9355]	[0.8729]	[0.8270]	[0.6178]	[0.2169]	[0.2252]	[0.6523]
ABILITY * FINAL_YEAR [a]	**0.2264****	**0.0697**	**0.3703*****	**0.0494**	**0.3043*****	**0.1862**	**0.2552****	**0.2095**
	[0.0458]	**[0.1011]**	**[0.0062]**	**[0.3825]**	**[0.0043]**	**[0.1766]**	**[0.0217]**	**[0.1479]**
ABILITY	-0.0000	-0.0000	0.0000	-0.0000**	-0.0000	0.0000	-0.0000	-0.0000
	[0.2788]	[0.1681]	[0.9237]	[0.0369]	[0.3933]	[0.6732]	[0.5933]	[0.8396]
DA	0.0617	-0.0194	-0.0867	0.0035	-0.0761	-0.0651*	-0.0226	-0.0463
	[0.3219]	[0.6802]	[0.1203]	[0.9487]	[0.2194]	[0.0831]	[0.7046]	[0.3272]
EARLY_YEARS	0.1261*	-0.0055	0.1086	0.2033***	0.1373**	0.0882	0.1671**	0.0732
	[0.0511]	[0.9298]	[0.1158]	[0.0050]	[0.0262]	[0.3463]	[0.0106]	[0.3045]
NOA	0.0041	-0.0411***	-0.0229	-0.0378**	-0.0034	-0.0552***	-0.0018	-0.0612***
	[0.8082]	[0.0042]	[0.1667]	[0.0175]	[0.8395]	[0.0025]	[0.9119]	[0.0000]
OPTIMISM	0.0035	0.0887***	0.0355**	0.0091	0.0184	0.0183	0.0124	0.0279**
	[0.8590]	[0.0000]	[0.0483]	[0.5732]	[0.3400]	[0.2605]	[0.5086]	[0.0393]
FINAL_YEAR * OPTIMISM	-0.0288	-0.0329	-0.0517	0.0040	-0.0302	-0.0542	-0.0666**	-0.0036
	[0.3526]	[0.3872]	[0.1309]	[0.9157]	[0.3421]	[0.1711]	[0.0385]	[0.9146]
PAY-PERF_SENSIT	-0.0000*	0.0000*	-0.0000***	0.0000	-0.0000**	0.0000	-0.0000	-0.0000
	[0.0754]	[0.0579]	[0.0001]	[0.3381]	[0.0320]	[0.5771]	[0.2195]	[0.1475]
FINAL_YEAR * PAY-PERF_SENSIT	0.0000***	0.0000	0.0000***	-0.0000	0.0000***	0.0000	0.0000***	0.0000
	[0.0002]	[0.3394]	[0.0018]	[0.3970]	[0.0009]	[0.6275]	[0.0005]	[0.1457]
WEALTH_SENSIT	0.0000	-0.0001	0.0000	0.0000	0.0000	-0.0002	-0.0000	0.0001*
	[0.7324]	[0.3991]	[0.8695]	[0.7425]	[0.4510]	[0.3790]	[0.8142]	[0.0969]
FINAL_YEAR * WEALTH_SENSIT	0.0001*	0.0004	-0.0001	0.0002**	0.0001	-0.0004	0.0001	-0.0001

	[0.0752]	[0.1032]	[0.3238]	[0.0133]	[0.2257]	[0.1660]	[0.1273]	[0.5790]
CEO_DUALITY	-0.0010	0.0160	0.0061	-0.0295	-0.0182	0.0044	-0.0108	0.0073
	[0.9648]	[0.2389]	[0.7620]	[0.1800]	[0.4252]	[0.8230]	[0.6214]	[0.6532]
FINAL_YEAR * CEO_DUALITY	0.0564	0.0534	-0.0119	0.0784**	0.0881**	-0.0191	0.0534	-0.0055
	[0.1073]	[0.1522]	[0.7335]	[0.0484]	[0.0167]	[0.5292]	[0.1097]	[0.8671]
CONSTANT	-0.0152	-0.0058	-0.0061	0.0300	0.0099	0.0108	0.0040	0.0060
	[0.5730]	[0.6710]	[0.7834]	[0.1292]	[0.7112]	[0.5587]	[0.8791]	[0.7058]
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	7,092	7,237	7,225	7,105	7,530	6,799	7,438	6,821
Adjusted R-squared	0.4538	0.0106	0.4332	0.4495	0.4418	0.4861	0.4541	0.4701
*P-value of the difference in coefficient for ABILITY*FINAL_YEAR*	*0.028*		*0.000*		*0.060*		*0.003*	

Robust (two-tailed) p-value in brackets
*** p<0.01, ** p<0.05, * p<0.1
a: One-tailed p-value, in view of having signed hypothesis.
All variable definitions in Appendix B.

Table 6. Estimation results of testing the effect of high-ability departing CEOs' overoptimism on their final year equity-based compensation

DV: EQUITY_COMP	(1)	(2)
	High-ability CEOs	*Low-ability CEOs*
ABTONE_EARN	-0.0019	-0.0031
	[0.6748]	[0.4436]
FINAL_YEAR * ABTONE_EARN	**0.0180****	**-0.0033**
	[0.0479]	**[0.6845]**
FINAL_YEAR	-0.0270	0.0439
	[0.6403]	[0.4335]
DA	0.1187	0.1295
	[0.3184]	[0.2523]
SIZE	-0.0948**	-0.0864***
	[0.0105]	[0.0016]
BTM	-0.3270	0.0276
	[0.3698]	[0.9417]
RET_VOLURN	0.0636	0.0854
	[0.8162]	[0.7179]
EARN_VOL	0.2757*	-0.2155*
	[0.0618]	[0.0507]
EARN	0.0687	-0.4564**
	[0.6427]	[0.0141]
EARLY_YEARS	-0.0454	0.0209
	[0.1198]	[0.3668]
NOA	0.0000***	0.0000***
	[0.0000]	[0.0001]
OPTIMISM	-0.0207	0.0350
	[0.4255]	[0.1705]
FINAL_YEAR * OPTIMISM	0.0449	-0.0581
	[0.3850]	[0.2071]
PAY-PERF_SENSIT	0.0000	-0.0000
	[0.2297]	[0.9119]
FINAL_YEAR * PAY-PERF_SENSIT	-0.0000***	0.0000
	[0.0023]	[0.2400]
WEALTH_SENSIT	-0.0000	-0.0001
	[0.7681]	[0.3724]
FINAL_YEAR * WEALTH_SENSIT	0.0000	-0.0000
	[0.6238]	[0.9390]
CEO_DUALITY	0.0673*	-0.0044
	[0.0643]	[0.8961]
FINAL_YEAR * CEO_DUALITY	-0.0157	0.0075
	[0.8291]	[0.8826]
CONSTANT	1.6784***	1.2979***
	[0.0006]	[0.0022]
Firm FE	YES	YES

Year FE	YES	YES
Observations	8,067	8,125
Adjusted R-squared	0.5052	0.4259
*P-value of the difference in coefficient for FINAL_YEAR * ABTONE_EARN*	*0.015*	

Robust (two-tailed) p-value in brackets
*** p<0.01, ** p<0.05, * p<0.1
a: One-tailed p-value, in view of having signed hypothesis.
All variable definitions in Appendix B.

Table 7. Additional analysis (H1): High vs. Low NOA firms and Loss vs. Profit firms

DV: ABTONE_EARN	(1)	(2)	(3)	(4)
	High NOA	*Low NOA*	*Loss firms*	*Profit firms*
FINAL_YEAR	-0.0610**	-0.0040	-0.0188	-0.0224
	[0.0182]	[0.8354]	[0.5562]	[0.1105]
ABILITY * FINAL_YEAR [a]	**0.2094****	**0.1435**	**-0.1706**	**0.2230****
	[0.0437]	**[0.1944]**	**[0.2129]**	**[0.0113]**
ABILITY	-0.0999	0.1004	0.1686*	0.1628***
	[0.3667]	[0.1759]	[0.0741]	[0.0063]
DA	0.0988	-0.0233	0.0013	0.0221
	[0.1449]	[0.5918]	[0.9824]	[0.6487]
EARLY_YEARS	-0.0286*	-0.0496***	-0.0301	-0.0235*
	[0.0722]	[0.0028]	[0.1911]	[0.0699]
OPTIMISM			0.0000	-0.0000
			[0.5188]	[0.2170]
FINAL_YEAR * OPTIMISM	0.0367	0.0311**	0.0409	0.0139
	[0.1117]	[0.0488]	[0.1281]	[0.3015]
PAY-PERF_SENSIT	-0.0404	-0.0671**	-0.0610	-0.0131
	[0.2228]	[0.0280]	[0.1777]	[0.6094]
FINAL_YEAR * PAY-PERF_SENSIT	0.0000	0.0000	-0.0000	-0.0000***
	[0.3680]	[0.4971]	[0.9888]	[0.0079]
WEALTH_SENSIT	-0.0000	0.0000	-0.0000	0.0000***
	[0.5989]	[0.1459]	[0.3472]	[0.0000]
FINAL_YEAR * WEALTH_SENSIT	-0.0000	-0.0001	0.0001	-0.0000
	[0.4275]	[0.1141]	[0.6004]	[0.8068]
CEO_DUALITY	0.0000	0.0001	0.0001	0.0001*
	[0.8118]	[0.2539]	[0.5390]	[0.0825]
FINAL_YEAR * CEO_DUALITY	0.0038	0.0020	-0.0233	-0.0037
	[0.8604]	[0.9182]	[0.4637]	[0.8270]
CONSTANT	0.0457	-0.0097	0.0401	0.0546*
	[0.2403]	[0.7565]	[0.3684]	[0.0513]
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	8,062	8,147	2,914	13,295
Adjusted R-squared	0.0012	0.4748	0.4410	0.4313
*P-value of the difference in coefficient for ABILITY*FINAL_YEAR*	*0.040*		*0.050*	

Robust (two-tailed) p-value in brackets

*** p<0.01, ** p<0.05, * p<0.1

a: One-tailed p-value, in view of having signed hypothesis.

All variable definitions in Appendix B.

Table 8. Estimation results of testing the effect of CEOs' final tenure year on other textual attributes (*H1*)
Panel A: 10-K FOG

DV: FOG_10k	(1)	(2)	(3)	(4)
FINAL_YEAR	0.0590*	0.0550	0.0605*	0.0575*
	[0.0795]	[0.1028]	[0.0745]	[0.0900]
ABILITY * FINAL_YEAR			**0.3453**	**0.3468**
			[0.1755]	**[0.1708]**
ABILITY		-0.1364	-0.1787	-0.1684
		[0.2691]	[0.1564]	[0.1815]
DA		-0.1544		-0.1534
		[0.1617]		[0.1646]
EARLY_YEARS		0.0195		0.0195
		[0.5326]		[0.5332]
NOA		0.0000**		0.0000**
		[0.0152]		[0.0156]
OPTIMISM		0.0098		0.0106
		[0.7601]		[0.7425]
FINAL_YEAR * OPTIMISM		-0.0159		-0.0237
		[0.8082]		[0.7177]
PAY-PERF_SENSIT		-0.0000		-0.0000
		[0.6203]		[0.6214]
FINAL_YEAR * PAY-PERF_SENSIT		-0.0000		-0.0000
		[0.9103]		[0.7876]
WEALTH_SENSIT		-0.0000		-0.0000
		[0.8732]		[0.9062]
FINAL_YEAR * WEALTH_SENSIT		-0.0000		-0.0000
		[0.7319]		[0.5923]
CEO_DUALITY		0.0042		0.0048
		[0.9217]		[0.9107]
FINAL_YEAR * CEO_DUALITY		0.0909		0.0898
		[0.1726]		[0.1771]
CONSTANT	22.9125***	22.8626***	22.9142***	22.8620***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	16,209	16,209	16,209	16,209
Adjusted R-squared	0.3457	0.3459	0.3457	0.3459

Robust (two-tailed) p-value in brackets.
*** p<0.01, ** p<0.05, *p<0.1
All variable definitions in Appendix B.

Panel B: 10-K length

DV: LN(10k)	(1)	(2)	(3)	(4)
FINAL_YEAR	0.0222**	0.0226**	0.0208**	0.0223**
	[0.0202]	[0.0227]	[0.0312]	[0.0256]
ABILITY * FINAL_YEAR		**0.0106**		**0.0107**
		[0.5885]		**[0.5844]**
ABILITY		-0.0941***	-0.1044***	-0.0904**
		[0.0082]	[0.0042]	[0.0124]
DA		-0.0734**		-0.0735**
		[0.0215]		[0.0213]
EARLY_YEARS		0.0159*		0.0159*
		[0.0759]		[0.0758]
NOA		0.0000***		0.0000***
		[0.0000]		[0.0000]
OPTIMISM		-0.0150		-0.0151
		[0.1075]		[0.1053]
FINAL_YEAR * OPTIMISM		-0.0125		-0.0116
		[0.4936]		[0.5258]
PAY-PERF_SENSIT		-0.0000***		-0.0000***
		[0.0025]		[0.0026]
FINAL_YEAR * PAY-PERF_SENSIT		-0.0000		0.0000
		[0.9667]		[0.9877]
WEALTH_SENSIT		0.0000		0.0000
		[0.6380]		[0.6501]
FINAL_YEAR * WEALTH_SENSIT		-0.0000		-0.0000
		[0.5336]		[0.5930]
CEO_DUALITY		0.0127		0.0126
		[0.3162]		[0.3189]
FINAL_YEAR * CEO_DUALITY			-0.0349	-0.0403
			[0.6533]	[0.6093]
CONSTANT	10.8307***	10.7886***	10.8317***	10.7887***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	16,209	16,209	16,209	16,209
Adjusted R-squared	0.5256	0.5298	0.5259	0.5298

Robust (two-tailed) p-value in brackets.
*** p<0.01, ** p<0.05, * p<0.1
All variable definitions in Appendix B.

Table 9. Test of endogeneity - Entropy-based balancing

DV: ABTONE_EARN	
FINAL_YEAR	-0.0055
	[0.6703]
TREAT * FINAL_YEAR [a]	**0.2271*** **
	[0.0012]
TREAT	-0.0215
	[0.1063]
DA	-0.0229
	[0.5524]
EARLY_YEARS	-0.0215*
	[0.0717]
NOA	-0.0000
	[0.4259]
OPTIMISM	0.0070
	[0.6253]
FINAL_YEAR * OPTIMISM	-0.0065
	[0.7764]
PAY-PERF_SENSIT	-0.0000
	[0.6300]
FINAL_YEAR * PAY-PERF_SENSIT	0.0000**
	[0.0135]
WEALTH_SENSIT	0.0000
	[0.6493]
FINAL_YEAR * WEALTH_SENSIT	0.0001
	[0.1306]
CEO_DUALITY	-0.0077
	[0.6007]
FINAL_YEAR * CEO_DUALITY	0.0478*
	[0.0531]
CONSTANT	0.0108
	[0.5604]
Firm FE	YES
Year FE	YES
Observations	16,209
Adjusted R-squared	0.4153

Robust (two-tailed) p-value in brackets

*** p<0.01, ** p<0.05, * p<0.1

a: One-tailed p-value, in view of having signed hypothesis.

All variable definitions in Appendix B.

Table 10. Retirement-only case

Panel A: Estimation results of testing the effect of CEOs' final tenure year on their tone management strategy (*H1*)

DV: ABTONE_EARN	(1)	(2)	(3)	(4)
FINAL_YEAR	-0.0012	-0.0048	0.0022	-0.0034
	[0.9136]	[0.6886]	[0.8482]	[0.7768]
ABILITY * FINAL_YEAR [a]			**0.2178*** **	**0.1842** **
			[0.0050]	**[0.0259]**
ABILITY		0.1337***	0.1179**	0.1175**
		[0.0087]	[0.0230]	[0.0226]
DA		-0.0289		-0.0283
		[0.4327]		[0.4416]
EARLY_YEARS		-0.0195		-0.0196
		[0.1078]		[0.1052]
NOA		-0.0000		-0.0000
		[0.3232]		[0.3218]
OPTIMISM		0.0149		0.0152
		[0.2315]		[0.2204]
FINAL_YEAR * OPTIMISM		-0.0337		-0.0378
		[0.1388]		[0.1002]
PAY-PERF_SENSIT		-0.0000***		-0.0000***
		[0.0006]		[0.0005]
FINAL_YEAR * PAY-PERF_SENSIT		0.0000***		0.0000***
		[0.0000]		[0.0000]
WEALTH_SENSIT		0.0000		0.0000
		[0.9898]		[0.9622]
FINAL_YEAR * WEALTH_SENSIT		0.0001*		0.0001
		[0.0615]		[0.1191]
CEO_DUALITY		-0.0045		-0.0042
		[0.7763]		[0.7903]
FINAL_YEAR * CEO_DUALITY		0.0324		0.0317
		[0.1844]		[0.1929]
CONSTANT	0.0024	0.0146	0.0014	0.0143
	[0.1026]	[0.3824]	[0.3785]	[0.3924]
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	14,827	14,827	14,827	14,827
Adjusted R-squared	0.4289	0.4302	0.4296	0.4303

Robust (two-tailed) p-value in brackets

*** p<0.01, ** p<0.05, * p<0.1

a: One-tailed p-value, in view of having signed hypothesis

All variable definitions in Appendix B.

Panel B: Estimation results of testing the effect of retiring CEOs' overoptimism for future earnings response coefficient (*H2*)

DV: ANNUAL_RETURN	(1)	(2)
	High-ability CEOs	*Low-ability CEOs*
EARN $_{t+1}$	1.6811***	0.9548***
	[0.0000]	[0.0017]
EARN $_{t+1}$ * ABTONE_EARN	-0.0223	0.0553
	[0.6864]	[0.3235]
EARN $_{t+1}$ * ABTONE_EARN * FINAL_YEAR [a]	**0.2902****	**-0.0874**
	[0.0346]	**[0.4871]**
FINAL_YEAR * EARN $_{t+1}$	-1.7576*	-0.0175
	[0.0563]	[0.9809]
EARN $_{t}$	0.7903*	0.6636*
	[0.0865]	[0.0836]
EARN $_{t}$ * ABTONE_EARN	-0.0094	0.0291
	[0.9034]	[0.6484]
EARN $_{t}$ * ABTONE_EARN * FINAL_YEAR	-0.2635	-0.0271
	[0.1741]	[0.8071]
FINAL_YEAR * EARN $_{t}$	0.9324	-0.1761
	[0.4672]	[0.7840]
EARN $_{t-1}$	-1.7386***	-1.0611***
	[0.0001]	[0.0008]
EARN $_{t-1}$ * ABTONE_EARN	-0.0406	-0.0856
	[0.6464]	[0.1730]
EARN $_{t-1}$ * ABTONE_EARN * FINAL_YEAR	0.0504	0.0710
	[0.7591]	[0.5815]
FINAL_YEAR * EARN $_{t-1}$	0.4681	0.7447
	[0.6282]	[0.3685]
ANNUAL_RETURN $_{t+1}$	-0.1405***	-0.1782***
	[0.0046]	[0.0000]
ANNUAL_RETURN $_{t+1}$ * ABTONE_EARN	0.0021	0.0174***
	[0.7731]	[0.0032]
ANNUAL_RETURN $_{t+1}$ * ABTONE_EARN * FINAL_YEAR	-0.0187	-0.0170
	[0.4957]	[0.1410]
FINAL_YEAR * ANNUAL_RETURN $_{t+1}$	0.0503	0.0447
	[0.7230]	[0.5341]
ABTONE_EARN	-0.0042	-0.0048
	[0.3684]	[0.1670]
FINAL_YEAR * ABTONE_EARN	-0.0054	-0.0004
	[0.6182]	[0.9415]

FINAL_YEAR	-0.0097	-0.0009
	[0.8764]	[0.9831]
DA	-0.2302*	-0.0757
	[0.0673]	[0.4159]
SIZE	0.2596***	0.2885***
	[0.0000]	[0.0000]
BTM	0.9304**	0.2741
	[0.0450]	[0.3847]
RET_VOLURN	2.3901***	2.1508***
	[0.0057]	[0.0000]
EARN_VOL	0.1520	-0.1859*
	[0.2248]	[0.0882]
EARLY_YEARS	-0.0192	0.0340*
	[0.2213]	[0.0506]
CONSTANT	-3.0828***	-2.4674***
	[0.0000]	[0.0000]
	YES	YES
Firm FE	YES	YES
Year FE		
Observations	5,426	5,509
Adjusted R-squared	0.3599	0.4003
*P-value of the difference in coefficient for EARN $_{t+1}$ * ABTONE_EARN * FINAL_YEAR*	0.055	

Robust (two-tailed) p-value in brackets
*** p<0.01, ** p<0.05, * p<0.1
a: One-tailed p-value, in view of having signed hypothesis.
All variable definitions in Appendix B.

Panel C: Estimation results of testing the effect of high-ability retiring CEOs' overoptimism on their final year equity-based compensation

DV: EQUITY_COMP	(1)	(2)
	High-ability CEOs	*Low-ability CEOs*
ABTONE_EARN	-0.0051	-0.0040
	[0.2651]	[0.3249]
FINAL_YEAR * ABTONE_EARN	**0.0147*** **	**0.0009**
	[0.0089]	**[0.9129]**
FINAL_YEAR	-0.0156	-0.0053
	[0.7403]	[0.9217]
DA	0.1772	0.2067*
	[0.1658]	[0.0631]
SIZE	-0.1106***	-0.0831***

	[0.0015]	[0.0056]
BTM	-0.1993	0.0522
	[0.6494]	[0.8905]
RET_VOLURN	0.0275	-0.0304
	[0.9221]	[0.8984]
EARN_VOL	0.2253	-0.2115*
	[0.2701]	[0.0907]
EARN	-0.0080	-0.5864***
	[0.9681]	[0.0033]
EARLY_YEARS	-0.0196	0.0221
	[0.4104]	[0.3245]
NOA	0.0000***	0.0000***
	[0.0000]	[0.0003]
OPTIMISM	-0.0044	0.0187
	[0.8704]	[0.4616]
FINAL_YEAR * OPTIMISM	0.0367	-0.0223
	[0.3971]	[0.5986]
PAY-PERF_SENSIT	0.0000	-0.0000
	[0.2021]	[0.7657]
FINAL_YEAR * PAY-PERF_SENSIT	-0.0000***	0.0000
	[0.0056]	[0.5655]
WEALTH_SENSIT	-0.0000	0.0000
	[0.7732]	[0.8278]
FINAL_YEAR * WEALTH_SENSIT	0.0001	0.0000
	[0.3626]	[0.9177]
CEO_DUALITY	0.0724*	0.0160
	[0.0540]	[0.6337]
FINAL_YEAR * CEO_DUALITY	-0.0343	0.0133
	[0.6648]	[0.7569]
CONSTANT	1.6562***	1.2262***
	[0.0005]	[0.0047]
Firm FE	YES	YES
Year FE	YES	YES
Observations	7,407	7,410
Adjusted R-squared	0.5162	0.4165
*P-value of the difference in coefficient for FINAL_YEAR * ABTONE_EARN*	*0.020*	

Robust (two-tailed) p-value in brackets
*** p<0.01, ** p<0.05, * p<0.1
a: One-tailed p-value, in view of having signed hypothesis.
All variable definitions in Appendix B.

Table 11. Estimation results of testing the effect of CEOs' final tenure year on their tone management strategy (*H1*), using adjusted FINAL_YEAR measure

DV: ABTONE_EARN	
FINAL_YEAR	-0.0084
	[0.4832]
ABILITY * FINAL_YEAR [a]	0.1919**
	[0.0119]
ABILITY	0.1411***
	[0.0048]
DA	-0.0337
	[0.3469]
EARLY_YEARS	-0.0232**
	[0.0437]
NOA	-0.0000
	[0.2895]
OPTIMISM	0.0180
	[0.1367]
FINAL_YEAR * OPTIMISM	-0.0273
	[0.2150]
PAY-PERF_SENSIT	-0.0000***
	[0.0004]
FINAL_YEAR * PAY-PERF_SENSIT	0.0000***
	[0.0000]
WEALTH_SENSIT	0.0000
	[0.7788]
FINAL_YEAR * WEALTH_SENSIT	0.0000
	[0.1210]
CEO_DUALITY	-0.0063
	[0.6783]
FINAL_YEAR * CEO_DUALITY	0.0422*
	[0.0736]
CONSTANT	0.0106
	[0.4994]
Firm FE	YES

Year FE	YES
Observations	16,209
Adjusted R-squared	0.4203

Robust (two-tailed) p-value in brackets
*** p<0.01, ** p<0.05, * p<0.1
a: One-tailed p-value, in view of having signed hypothesis.
All variable definitions in Appendix B.

Table 12. Estimation results of testing the effect of managerial ability on departing CEOs' tone management strategy (*H1*), using alternative measure of managerial ability

DV: ABTONE_EARN	
FINAL_YEAR	0.0065
	[0.6603]
ABILITY_ALT * FINAL_YEAR [a]	**0.1145****
	[0.0488]
ABILITY_ALT	0.1978
	[0.3445]
DA	-0.0337
	[0.4425]
EARLY_YEARS	-0.0184
	[0.2185]
NOA	-0.0000
	[0.2477]
OPTIMISM	0.0118
	[0.4587]
FINAL_YEAR * OPTIMISM	-0.0216
	[0.4320]
PAY-PERF_SENSIT	-0.0000*
	[0.0616]
FINAL_YEAR * PAY-PERF_SENSIT	0.0000***
	[0.0000]
WEALTH_SENSIT	0.0000
	[0.8982]
FINAL_YEAR * WEALTH_SENSIT	0.0000
	[0.3504]
CEO_DUALITY	0.0008
	[0.9652]
FINAL_YEAR * CEO_DUALITY	0.0502*
	[0.0826]
CONSTANT	-0.1797

	[0.3897]
Firm FE	YES
Year FE	YES
Observations	10,194
Adjusted R-squared	0.4130

Robust (two-tailed) p-value in brackets

*** p<0.01, ** p<0.05, * p<0.1

a: One-tailed p-value, in view of having signed hypothesis

Counting on accountants' skills: Exploring accountants' pedagogical skills in their advisory role.

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Counting on accountants' skills

Exploring accountants' pedagogical skills in their advisory role.

Many SME entrepreneurs struggle to interpret their annual financial statements. Following the preparation of the financial statements, the external accountant meets the SME client annually to review and discuss the reported figures. This qualitative exploratory study, based on interviews with ten external accountants, investigates whether accountants perceive themselves as utilising pedagogical skills during these meetings with clients of small- and medium-sized enterprises (SME) and how they apply these skills. The findings reveal no clear consensus on the extent to which accountants see themselves as responsible for improving client entrepreneurs' understanding of accounting and financial concepts. Although accountants apply basic pedagogical skills, they predominantly place the responsibility for learning on the client entrepreneurs. In addition, the results indicate that the pedagogical content knowledge (PCK) model can be adapted from an educational to an advisory setting, demonstrating that accountants use basic pedagogical skills while also considering the proficiency level of the client and the client's approach to learning. These findings highlight the importance of integrating pedagogical skills into professional learning of accountants and accounting education curricula.

Accountants, advisory role, pedagogical skills.

Introduction

In 2023, the number of bankruptcies in Western Europe increased significantly. There were 169,496 bankruptcies recorded, an increase of nearly 21% compared to the previous year. These figures exceeded the pre-pandemic levels for the first time, and were higher than those in 2016 (Creditreform, 2024). For 2024, a further increase in the number of bankruptcies in Western Europe is expected. Allianz Trade predicts a 14% increase in the region, particularly in sectors such as construction, retail, and services (Allianz Trade, 2024). Frequently, these bankruptcies are due to a lack of understanding among entrepreneurs about their financial figures (Carter & Van Auken, 2006), as many SME entrepreneurs are unable to read or understand this information (Halabi, 2010). Accountants can play a pivotal role in enhancing client entrepreneurs' understanding of accounting and financial concepts (Marriott & Marriott, 2000; Yigitbasioglu et al., 2022). In this study, entrepreneurs (clients) are defined as owner-managers of small- and medium-sized enterprises (SME) and accountants as external accountants. SMEs do not have an internal accountant but depend on external accountants for preparing financial statements and obtaining financial and tax advice. The yearly meeting, when discussing the financial performance of the SME, is essential in detecting financial problems and elaborating on potential actions to take, in order to avoid bankruptcy of the company. In addition, this meeting also provides opportunities for discussing future investments and financing opportunities, influencing the long-term survival of the company. This study focuses on the conversation between the accountant and the client entrepreneur regarding their annual financial statements in the yearly meeting.

The financial literacy of owner managers of SMEs is important, since previous research found that increased financial literacy among entrepreneurs enhances their ability to identify opportunities (Anwar et al., 2020), optimise financial management

(Ismanto et al., 2020), and implement risk management strategies (Kulathunga et al., 2020), all of which improve firm performance.

According to Migliavacca (2019) findings, financial advisors have the potential to progressively and consistently enhance their clients' financial literacy during personal meetings. This approach appears to be even more impactful than traditional educational settings. In addition, Engström and McKelvie (2017) argue that both the entrepreneur's financial literacy and the presence of proximal role models –those who are closely connected and interact meaningfully with the entrepreneur, such as accountants– positively influence firm performance, particularly in terms of profitability and return on assets. Eniola and Entebang (2017) state that the financial literacy of SME entrepreneurs has a positive effect on the performance of their businesses. They emphasise that entrepreneurs' financial knowledge, awareness, and attitude are key dimensions that contribute to improved business outcomes, including profitability, return on assets, and growth.

The importance of explaining the figures and discussing the financial health of the company with owner managers follows the current shift from compliance to advisory work of accountants (Bowles, 2018; Lawson, 2019; Rakow, 2019). This shift has led to a greater focus on the importance of accountants' professional skills (Yigitbasioglu et al., 2022), aligning with the broader trend of the growing importance placed on such skills (Deming, 2017).

The way the accountant's message is conveyed during the meeting with the client is important. The pedagogical skills used are crucial because they encompass not only the ability to communicate clearly but also to explain complex accounting and financial concepts in an understandable way and facilitate the client entrepreneur's learning process (Melnyk & Zaremba, 2020; Shulman, 1986). From a general educational

perspective, these skills include the ability to recognise the differing mindsets of more experienced versus novice clients (Chi et al., 1981), the aptitude to ask well-crafted questions (Boyer et al., 2010), and the skills to provide verbal explanations of advice or figures during business advice (Clark & Paivio, 1991).

To analyse the yearly meeting between client and accountant, the pedagogical content knowledge (PCK) concept (Shulman, 1986) is used. The model, stemming from educational sciences, describes how teachers require not only content knowledge (*what is taught*) but also pedagogical knowledge (*how to teach*), curriculum knowledge (*how content is related to other courses*), and knowledge of the students (*who is the learner*). Crucial to this is the integration of these knowledge domains, which enables teachers to translate complex concepts into comprehensible explanations while considering the needs and prior knowledge of their students. This makes PCK a defining feature of effective subject-specific pedagogy and a potential theoretical framework for adapting to the advisory setting.

Therefore, the aim of the current study is to examine whether pedagogical skills are utilised by accountants during the yearly meeting with the client, that is, when past performance is discussed. This question is important because accountants are considered the main advisors for SME owner-managers (Halabi et al., 2010, Wiegel & Hiebl, 2023), and this meeting usually forms a starting point for more business advice. To answer the research question, a qualitative exploratory study with semi-structured interviews with 10 accountants was conducted. By analysing the interview data through the PCK lens, we will learn how this model can be adapted to the advisory setting.

Contributions

Few studies have focused on the pedagogical skills of accountants. Do accountants possess the pedagogical skills to effectively convey complex accounting and financial information to their client entrepreneurs? This study aims to address this gap in the literature. In addition, adaptation of the PCK concept is done by translating the element of "knowledge of students" into two different elements, applicable to the client-accountant advisory setting, that is, understanding of the client's proficiency (*prior knowledge*) and understanding of the approach to learning of the client.

Second, prior research has highlighted the significance of an accountant's advisory role. This exploratory study goes further by examining how this advisory role is implemented in practice. This study explores whether accountants perceive themselves as applying pedagogical skills during advisory discussions to enhance client entrepreneurs' understanding of accounting and financial concepts.

Third, this study focuses on one important aspect of the business advice of accountants: the explanation during the yearly meeting, when the accountant discusses the financial performance of the company. Entrepreneurs' understanding of their own financial statements provides a starting point for discussing the future of the company. However, there is no clear understanding of how accountants convey this information.

Fourth, given the need to prioritise essential professional skills in accounting education curricula in higher education (Cunha et al., 2022; Tan & Laswad, 2018), this study underscores the importance of pedagogical skills as an essential component of professional skills. Based on the information gathered from professionals, this study formulates recommendations to effectively adjust curricula. Moreover, the insights gained from this study contribute to the continuous professional development of accountants.

Literature review

The literature review is structured as follows. First, the Resource-Based View (RBV) highlights the advisory role of accountants for small business clients, emphasising their support in fostering client entrepreneurs' understanding of accounting and financial concepts. Next, the theory of mutual understanding (Churchman & Schainblatt, 1965) links client understanding to the strength of advisory relationships. Shulman's (1986) concept of pedagogical content knowledge emphasises the necessity of accountants applying pedagogical skills to effectively transfer their knowledge to client entrepreneurs. Finally, several non-exhaustive pedagogical skills relevant to advisory discussions are described.

The Resource-Based View

Small- and medium-sized enterprises (SMEs) are often managed by individual entrepreneurs who do not possess all the necessary knowledge and resources (De Bruyckere et al., 2020). According to the Resource-Based View (RBV) (Barney, 1991), these organisations may not possess the unique, in-house resources and capabilities that larger companies have at their disposal to achieve competitive advantages. Owing to this limited internal capacity, SME entrepreneurs turn to external accountants for statutory services, such as preparing annual financial statements (Blackburn & Jarvis, 2010; De Bruyckere et al., 2020; Marriott & Marriott, 2000). However, when accountants generate (internal) financial statements, many SME entrepreneurs are unable to read or understand this information (Halabi et al., 2010).Without diminishing the responsibility of the client entrepreneur, an accountant, in their role as a business advisor, should support these clients in understanding accounting and financial concepts (Carey and Tanewski, 2016; Marriott & Marriott, 2000; Yigitbasioglu et al., 2022). Client entrepreneurs’

understanding of accounting and financial concepts refers to their subjective understanding of key financial statements, such as their own balance sheet, income statement, and cash flow statement (Alperovych et al., 2023), and their perceived understanding of financial ratios (Faello, 2015).

Building on the idea that accountants enhance client entrepreneurs' understanding, Migliavacca (2019) highlights the crucial role that qualified independent financial advisors play in enhancing the financial literacy of retail and private banking clients. Clients with a long-term relationship with their advisor exhibited an even greater increase in financial literacy, suggesting that the advisory role of financial advisors develops and deepens over time. Independent advisors are not focused on selling products and, therefore, place greater emphasis on the long-term relationship and education of the client (Migliavacca, 2019). As independent advisors to client entrepreneurs, accountants are perfectly positioned to provide insights from annual financial statements to enhance client entrepreneurs' understanding of accounting and financial concepts, ultimately improving their financial literacy. Moreover, the client entrepreneur and accountant typically discuss (internal) annual financial statements on a yearly basis.

Mutual Understanding

The theory of mutual understanding (Churchman & Schainblatt, 1965) is a concept of cognitive similarity in social psychology literature. Effective communication leads to a common goal and prevents misinterpretation and misinformation (Churchman & Schainblatt, 1965; Hantho et al., 2002; Johnson & Lederer, 2010; Tan, 1994).

Applying the mutual understanding theory to the accountant-client entrepreneur advisory relationship, a high level of mutual understanding is defined as a good understanding between both parties and shared expectations (De Bruyckere et al., 2020). Essentially, there is a shared understanding in which both the external accountant and the

SME owner effectively understand each other's information, expectations, and needs. Thus, the accountant understands the client entrepreneur's strategic and operational goals, and the client entrepreneur is able to apply the financial explanations and advice provided by the accountant (De Bruyckere et al., 2020). Considering both important characteristics, mutual understanding is crucial for effectively fulfilling the accountant's advisory role (De Bruyckere et al., 2020).

Empirical research indicates a positive relationship between the level of mutual understanding and the use of advice, which is, in turn, linked to the company's financial health (De Bruyckere et al., 2020). In addition, a client entrepreneur's good understanding of accounting and financial concepts is vital for a high level of mutual understanding (De Bruyckere et al., 2020). A poor level of client's understanding of accounting and financial concepts hinders the achievement of a strong understanding between the two parties, making it difficult for the client entrepreneur to reach a high level of mutual understanding (Ali & Li, 2021; Graña-Álvarez et al., 2022; Tuffour et al., 2022) and consequently obstructing intensive collaboration. By applying pedagogical skills, accountants can convey complex accounting and financial information in an understandable way, thereby enhancing the client entrepreneur's level of understanding and creating conditions for a higher level of mutual understanding, which positively impacts the advisory relationship.

Accountants' pedagogical and communication skills (Stone, 2011) are considered essential during advisory discussions for increasing client entrepreneurs' understanding.

Accountant's Pedagogical Content Knowledge

To highlight the importance of accountants' pedagogical skills, the concept of pedagogical content knowledge (PCK) is introduced (Shulman, 1986). Although it

originates from older studies, the PCK concept remains widely cited in recent educational literature (e.g., Ward & Kim, 2024). While predominantly applied in STEM education, its use is expanding into non-STEM fields, such as language education (Sarkar et al., 2024). The literature emphasises that PCK primarily enhances the effective development of educators (Berry & Van Driel, 2010; Berry et al., 2016).

This concept originates in the field of educational sciences and posits that a cohesive understanding of three categories of knowledge is essential for delivering effective and high-quality education (Shulman, 1986, 1987). The first category of knowledge is "*content knowledge*" of the teacher, which implies a deep understanding of the subject matter. The second category is "*pedagogical knowledge*", which extends beyond mere subject matter, and focuses on the transferability of knowledge to students. Consequently, this knowledge enables teachers to apply specific "*pedagogical skills*" (Berry et al., 2015). The third category encompasses "*curriculum knowledge*", which involves understanding the interconnections between curriculum components.

Shulman (1986) identified a "*missing paradigm*", focusing on the categories of "*content knowledge*" and "*pedagogical knowledge*". He stressed that possessing knowledge of general pedagogical strategies without accompanying knowledge of the specific content being taught is inadequate for effective teaching, and vice versa. This insight has also been emphasised in more recent studies (Brinkley-Etzkorn, 2018; Hattie, 2003; Janssens et al., 2019).

In 1993, Shulman's original concept (1986, 1987) was revised by Cochran et al. (1993), who introduced an additional knowledge category that stimulates effective teaching: teachers' "*knowledge of students*". This component encompasses various

aspects such as students' abilities, learning strategies, age and developmental levels, attitudes, motivations, and pre-existing understanding of the concepts to be taught.

In accounting education, PCK requires a thorough understanding of both the accounting content and effective pedagogical skills, supported by a comprehensive pedagogical knowledge, ultimately enhancing students' learning outcomes. Similarly and aligned with the "*missing paradigm*", professional accountants must frequently convey complex accounting and financial concepts to client entrepreneurs with limited understanding while explaining their annual financial statements (Halabi et al., 2010). Considering the importance of client entrepreneurs' understanding, this task not only requires thorough accounting and financial knowledge from the accountant's perspective but also an effective application of their pedagogical knowledge, referred to as "*pedagogical skills"*.

Just as teachers must have a deep understanding of their students to provide effective education (Cochran, 1993), it can be assumed that accountants also need a sufficient knowledge of their client entrepreneurs during business advice. In this study, this knowledge of the client entrepreneur is divided into two categories. The first category is "*understanding the client's proficiency level*" which reflects understanding the client entrepreneur's level of financial knowledge and ability to grasp the accounting process. This includes aspects of client entrepreneurs' ability to understand the accounting process, developmental levels of their knowledge, and pre-existing understanding of accounting and financial concepts. The second category is "*understanding the client's approach to learning*", which indicates an understanding of client entrepreneurs' interests, attitudes, motivations, and preferred methods for processing accounting and financial information.

Figure 1 provides a simplified overview of pedagogical content knowledge in the educational and advisory settings.

[INSERT FIGURE 1 HERE]

Pedagogical Skills

Accounting students receive substantial technical knowledge in their education (Cunha et al., 2022; Lawson et al., 2014; Tan & Laswad, 2018) but often lack competence in the targeted application of professional skills (Chan et al., 2023). In the accounting education literature, four main types of professional skills are emphasised as inherent to the accounting profession: teamwork, communication, leadership, and critical thinking (Vanhove et al., 2023). Although communication skills are regarded as essential in the advisory context (Stone, 2011) and highly valued in response to professional demands (Carvalho & Almeida, 2022; Elo et al., 2023; Tan & Laswad, 2018), pedagogical skills have been overlooked. These skills are inherently linked to communication skills (Hodge, 1993; Okoli, 2017). Pedagogical skills encompass not only the ability to communicate clearly but also to explain complex concepts in an understandable way and to facilitate the client entrepreneur's learning process (Melnyk & Zaremba, 2020; Shulman, 1986).

Some non-exhaustive, but relevant pedagogical skills in the advisory context are described below.

First, it is essential for accountants, who are considered experts, to recognise the distinct mindsets of either more experienced or novice client entrepreneurs. Expert client entrepreneurs possess a more in-depth understanding of accounting and financial concepts (Chi et al., 1981; Jiang et al., 2023; Kalyuga et al., 1998), compared with novice client entrepreneurs. Therefore, it is crucial for novice or less experienced client

entrepreneurs to relate newly acquired knowledge to information acquired during previous business advice (Ausubel, 1968; Piaget, 1952).

Second, well-crafted questions during advisory discussions can facilitate the emergence of client entrepreneurs' new insights, stimulate meaningful discussions, and encourage thorough exploration of the subject matter, thus strengthening client entrepreneurs' understanding of accounting and financial concepts (Boyer et al., 2010; Olaniran & Akorede, 2018; Yeadon-Lee, 2015). It also serves as a valuable tool for evaluating understanding, fostering critical thinking, and promoting comprehension (Tofade et al., 2013).

Finally, accountants typically provide verbal explanations of advice or figures in professional settings. However, according to the dual coding theory, accountants must be aware that entrepreneurs will retain information better if they are processed both verbally and non-verbally, such as through visuals (Clark & Paivio, 1991; Marriott & McGuigan, 2018). For instance, modelling, especially when accompanied by verbalisation of actions and thought processes, is an effective method for learning something new (Vygotsky, 1978). Hence, it is useful to ascertain whether accountants integrate visual elements into their advisory practice.

The principal research question

Accountants explicitly assume an advisory role by engaging in business advice when discussing the financial statements with their client entrepreneurs. When an accountant applies essential pedagogical skills during such a meeting, they can positively impact the client entrepreneur's understanding of accounting and financial concepts, thereby closing the knowledge gap. In addition, an enhanced understanding of accounting and financial concepts can lead to an increased level of client entrepreneurs' financial literacy and,

ultimately, enhance business performance (*cf. supra)*. Considering these advantages, pedagogical skills might be integrated as an important component. Hence, the main research question is whether accountants use pedagogical skills during yearly meetings when discussing financial statements with their clients. An important addition is that this question will be answered from the point of view of the accountant in this study to determine if they feel responsible for enhancing client entrepreneurs' understanding of accounting and financial concepts.

> **RQ:** Do accountants perceive themselves as applying pedagogical skills, and how do they apply these skills during discussions of annual financial statements with client entrepreneurs?

Methodology

Empirical settings

The use of interviews greatly enhances the depth and breadth of the investigation of the research question by implementing open-ended and follow-up queries (Silverman, 2021). This is particularly crucial when delving into intricate topics such as the use of pedagogical knowledge, where a sophisticated understanding of participants' experiences and viewpoints is essential (Sharma & Sharma, 2021). Additionally, this particular form of qualitative research allows for the resolution of ambiguities that may originate from the participants' responses (Anyan, 2013).

Participants

Ten accountants were selected from diverse branches within the same accounting organisation. The accounting firm reported 475 full-time equivalents for fiscal year 2021. Hence, it can be classified as a mid-sized organisation. The interviews were conducted

with accountants within a single accounting firm which ensured a consistent data collection process without interference from diverse cultural or organisational variables (Rowley, 2012).

The accounting firm serves 24,000 clients, approximately 60% of which are small and medium-sized enterprises (SME). A company is considered an SME if it does not exceed more than one of the following criteria: 50 FTE employees, 11.25 million euros in annual turnover, or 6 million euros in total assets (Article 1:24, §1 to 6 of the Belgian Companies and Associations Code). When referring to client entrepreneurs in this study, this could encompass newly established SMEs or those with established positions.

In the interviews, only SME clients, without internal accounting departments, were considered. The number of interviewees was based on the saturation principle (Guest et al., 2006).

The accountants had, on average, 16.25 years of experience (SD = 12.39 years). Six of the participants were men, and four were women. They all obtained a bachelor's degree in Accounting and Taxation from a University College in Belgium.

[INSERT TABLE 1 HERE]

Data collection

Procedure

To recruit accountants, an internal memo was distributed within the accounting firm to invite employees to participate.

The internal memo succinctly outlined the purpose of the study and invited accountants to share their opinions, expertise, and experiences through a semi-structured interview. Participants were reassured that there were no right or wrong answers, and they were provided with information about the estimated interview duration (approximately

± 20 minutes). The voluntary nature of participation was emphasised. If accountants chose to participate, they notified their branch manager, who, in turn, informed the head quarter's knowledge centre, who forwarded the names of ten randomly selected participants and the location of their office to the researcher. Afterwards, an appointment was scheduled with each accountant to conduct the interview at their office.

Adhering to the saturation principle (Guest et al., 2006), which dictates that data collection should continue until no new information or insights are acquired, ten interviews were deemed sufficient.

The interview guide

At the start of the interviews, the accountants were thanked for their cooperation, and the purpose of the study was outlined. Participants were requested to give their verbal consent for recording the interview, with the assurance that all recordings would be handled and stored anonymously.

The interview commenced by soliciting general identification information including gender, age, and years of experience as an accountant. In addition, the interviews comprised three background enquiries (Appendix A) aimed at obtaining a more comprehensive understanding of a typical business advice. Conversely, the nine specific enquiries (Appendix B) included in the interviews aimed to assess accountants' perceptions of approaches to conveying complex information. The objective of these questions was to acquire a deeper understanding of the interviewees' use of pedagogical skills during advisory discussions.

Background inquiries (Appendix A)

Accountants' perceived insights into the dynamics of the business advice with the client entrepreneur were gathered using questions (one through three in the guide) that focused

on the topics discussed and the temporal progression of the conversation.

Specific inquiries (Appendix B)

Questions one and two aimed to assess the accountant's understanding of the client entrepreneur's proficiency level and approach to learning. Possessing this understanding is considered significant for effective knowledge conveying (Cochran et al., 1993) as part of the overall pedagogical content knowledge (Shulman, 1986).

The third question aimed to gauge accountants' application of pedagogical skills. Specifically, the aim is to determine whether accountants are cognisant of the disparity in expertise between themselves and client entrepreneurs, considering that client entrepreneurs may possess less knowledge in the relevant area (Chi et al., 1981; Jiang et al., 2023). Furthermore, the objective of this question was to investigate whether accountants could successfully incorporate new information about cash flow into the client entrepreneur's existing knowledge (Ausubel, 1968; Piaget, 1952). Although cash flow is an important parameter for a client entrepreneur's financial success (Kroes & Manikas, 2014), it is a complex concept to explain.

The fourth question aimed to investigate the use of instructional aids in explaining the theory of cash flow, with the objective of determining whether the accountant encompasses more than mere verbal communication and demonstrates an awareness of non-verbal processes (Clarck & Paivio, 1991; Vygotsky, 1978).

Questions five and six were designed to evaluate pedagogical skills. Specifically, they focused on the methods employed by an accountant to ascertain whether a client entrepreneur has comprehended the majority of the information provided during a conversation, and whether the accountant actively seeks feedback from client entrepreneurs to gauge their level of comprehension.

Questions seven and eight addressed aspects related to support from the accountant's company in order to provide comprehensive explanations.

The last question provided insights into the accountant's perception of the value that client entrepreneurs place on receiving more detailed explanations.

Data analysis

To familiarise with the interview data, the interviews were transcribed verbatim, and subsequently, the transcripts were read and re-read. Next, first deductive and then the inductive coding processes were initiated to lastly perform a hybrid approach to both coding processes. A hybrid approach was used to combine theory-driven and data-driven codes, obtain detailed theoretical insights from interviews (Fereday & Muir-Cochrane, 2006), and mainly to enhance the validity of the research (Creswell, 2013), thereby enabling the balanced integration of interviewees' perspectives with theoretical concepts.

In the first stage, the deductive method was applied to code all the interviews. Based on the theoretical insights, a codebook relevant to the research question was developed (Fereday & Muir-Cochrane, 2006; Oliveira, 2022) (see Table 2). The defined coding labels concerned: "*Understanding of the client's proficiency level*" (based on the insights of Cochran et al., 1993), "*Understanding client's approach to learning"* (based on the insights of Cochran et al., 1993)*, "Pedagogical skills"* (based on the insights of Boyer et al., 2010 and Chi et al., 1981) and *"Visual aids"* (based on the insights of Clark & Paivio, 1991).

[INSERT TABLE 2 HERE]

During the initial coding round, relevant responses received from the interviewed accountants were carefully assigned a corresponding label based on the criteria mentioned in the codebook. Each quote was allocated to one label. Following the transcription of the interviews, the data were meticulously analysed using NVivo software (version 14.23.2).

A second coder was used to improve the reliability of coding, as in Vanhove et al. (2023). As a sample, an independent coder coded two of the ten interviews again. Based on this, two Cohen's Kappa interrater reliability coefficients and an agreement percentage were generated in NVivo ($K_{unweighted}$= 0.77; $K_{weighted\ by\ source\ size}$ = 0.77; agreement = 95.15%), indicating a substantial to excellent level of agreement regarding the coding process (Fleiss, 1981).

In the second stage, the inductive method, and more specifically, the Gioia Methodology, was applied to code the interviews (Gioia, 2013). This method supports a systematic, iterative approach to translating respondents' meanings and insights into theoretical concepts (Gehman et al., 2018; Gioia, 2013). It provides structure through a data structure (see Table 3), transforming the raw data into first- and second-order codes and dimensions. This methodology maintains scientific rigor while allowing space for unexpected conceptual discoveries that emerge from interviewees' perspectives (Gehman et al., 2018). Iterative data analysis may yield new and valuable perspectives on the pedagogical role of accountants that go beyond the existing theory and consequently provide additional insights from interviews (Gehman et al., 2018).

Based on the Gioia methodology (Gehman et al., 2018; Gioia, 2013), the process began by coding the interviews on the terms used by the respondents themselves. By categorising these codes, we aimed to identify patterns and similarities using labels that closely reflected respondents' statements. This approach helped to stay close to the respondents' interpretations (Gioia, 2013). For example, many interviewees stated that entrepreneurs with larger SME’s often have more accounting and financial expertise, leading to the creation of this first-order concept. Following this, we moved beyond the original terms and meanings used by respondents (first-order concepts) and sought to identify the underlying patterns, structures, and theoretical themes. This marked a

transition from informant-centred to researcher-centred interpretations (Gehman et al., 2018; Gioia, 2013). For example, the aforementioned first-order concept could be grouped into a second-order theme "*Expertise differences among clients*". After identifying second-order themes, they were reanalysed to uncover the broader underlying structures and core ideas that connect these themes. Second-order themes were then abstracted to a higher level of theoretical interpretation, namely aggregate dimensions. Thus, the second-order theme "*Expertise differences among clients*" became part of the broader dimension "*Client-centered advisory practices*". Finally, a complete data structure was created (see Table 3), providing a clear overview of the inductive coding approach.

[INSERT TABLE 3 HERE]

To ensure the validity of the data structure, it was thoroughly double-checked by a second, independent researcher. This was performed to verify whether first-order concepts were sufficiently aligned with the themes and aggregate dimensions. These insights were discussed in detail.

In the third analysis phase, to identify themes and patterns between the deductive and inductive approaches, a hybrid analysis was applied. By combining predetermined theoretical deductive codes with inductive themes that were spontaneously formed from the data, this method allowed for subtle synthesis. Deductive coding, for example, placed strong emphasis on "*pedagogical skills*", while inductive insights emphasised that these skills support the accountants' role as educators. The use of the hybrid method not only increased the validity of the findings, but also provided consistency (Fereday & Muir-Cochrane, 2006; Creswell, 2013).

Results

The research questions

A hybrid analysis was used to answer the research question.

RQ: Do accountants perceive themselves as applying pedagogical skills, and how do they apply these skills during discussions of annual financial statements with client entrepreneurs?

In this qualitative analysis, the number of participants who provided similar responses is denoted as 'n'. The number of responses related to a specific coded label is referred to as 'N'

The findings pertaining to each category were supported by exemplifying quotes. In each instance, a reference was made to the source of statement (A1-A10).

Table 4 presents a comprehensive deductive coding scheme for each accountant.

[INSERT TABLE 4 HERE]

Deductive themes

Understanding of the client's proficiency level

Drawing on Cochran et al.'s (1993) insights and building on Shulman's (1986) original PCK concept, the accountant's understanding of the client's proficiency level (N=56) is deemed critical for effectively conveying knowledge. This parameter encompasses the accountant's assessment of the client entrepreneur's level of financial knowledge and their ability to understand the accounting process.

According to several interview findings (n=3), entrepreneurs from larger SMEs generally demonstrate a greater understanding of accounting and financial concepts, as well as accounting processes.

"*Entrepreneurs of larger companies tend to be more conscientious and demonstrate a better understanding of financial figures.*" (A7)

In addition to company size, other accountants (n=3) also highlighted the differences in the client entrepreneur's knowledge based on the sectoral differences. Client entrepreneurs in more technical professions often possess less accounting and financial knowledge, whereas consultants or IT professionals are generally more informed.

"*I often have IT professionals as clients, and they really understand very well what they're doing.*" (A3)

Disregarding size and sector, several interviewed accountants (n=4) reported sensing difficulties among client entrepreneurs when interpreting accounting and financial concepts, such as cash flow, revenues, costs, and ratios.

"Sometimes, when you start discussing a ratio, it's as if the client is hearing it in a completely foreign language." (A8)

Six accountants (n=6) provided their perceived views of client entrepreneurs' understanding of accounting and financial concepts. According to three interviewed accountants (n=3), client entrepreneurs possess basic understanding.

"In broad terms, they're on board, I think, but when it gets too specific, they mostly pretend to be" (A7).

Two other accountants (n=2) indicated that there are both knowledgeable and unknowledgeable client entrepreneurs, without going into further detail.

Two interviewees (n=2) directly mentioned that they did not expect any understanding of accounting or financial concepts from client entrepreneurs.

Regarding client entrepreneurs' ability to understand the accounting process, three accountants (n=3) noted that when client entrepreneurs were perceived to have a good

understanding, they also engaged proactively with accounting, for example, by maintaining their own records, performing analyses, or even developing action plans.

"I sometimes have clients who come to me with an action plan already prepared and want to discuss it with me." (A9)

The insights from this theme can be related to the research question, because they highlight how accountants assess varying levels of understanding among client entrepreneurs, which is a fundamental aspect of applying pedagogical skills.

Understanding client's approach to learning

This category (N=86) is essential for effectively conveying knowledge. This parameter encompasses the accountant's comprehension of the client entrepreneurs' interests, attitudes, motivations, and preferred methods for processing accounting and financial information.

It can be noted that there is a considerable degree of disparity with regard to the level of interest exhibited by client entrepreneurs regarding the explanation of their financial figures. According to the majority of the interviewed accountants, some client entrepreneurs demonstrate a strong interest in obtaining extensive explanations, while others depend primarily on their accountants' proficiency (n=7).

"*There are customers who are genuinely interested in that [explanation], but there are equally customers who are absolutely not open to it. I think we need to take into account what the customer would like in this case.*" (A8)

In addition, some accountants (n=3) explained that less-interested clients strongly rely on them to make the right decisions on their behalf.

"I even notice that when a client has little interest, there is more reliance on us to make decisions, compared to clients who are very involved with their own figures."

The vast majority of the accountants interviewed (n=7) expressed confidence that their client entrepreneurs would pose their questions orally in the event of a lack of understanding during the advisory discussion.

"*In my opinion, my clients are assertive enough to say, 'I don't quite understand this', or 'Could you explain this to me again?'"* (A10)

While some entrepreneurs proactively ask questions to enhance their own understanding according to the interviewees, others are hesitant to ask for additional explanations because of concerns about the costs (n=3).

"In some cases, a client doesn't appreciate having to pay on top of their fixed price." (A4)

This theme can be linked to accountants' perceptions of their client entrepreneurs' learning preferences. The ability to recognise the level of interest, the use of proactive questioning, or identify clients' hesitance reflects accountants' insights into individual learning needs, a core aspect of effectively applying pedagogical skills.

Pedagogical skills

Quotes were categorised under the label pedagogical skills (N=64) when they referred to the accountant's perceived use of pedagogical techniques or methodologies to effectively convey accounting and financial concepts to the client entrepreneur.

Half of the participants interviewed (n=5) highlighted the importance of presenting explanations in laymen's terms. These accountants emphasised the necessity of conveying information in a clear and easily understandable manner.

"*I always strive to communicate in plain language. I believe that we should not bombard them with fiscal terms or ratios that may confuse them.*" (A10)

Besides highlighting the importance of presenting explanations in layman's terms, several

interviewed accountants (n=5) emphasised the importance of incorporating simple and concrete examples into the process of explaining information, which enables systematic elaboration and understanding of the subject matter.

"*I would approach it in a highly practical manner, utilising examples based on the case file.*" (A4)

Moreover, the majority of experienced accountants (n=3) believed that they asked client entrepreneurs' anticipatory questions.

"'*Are there any planned investments?' 'Will you finance this?' 'Do you intend to hire more employees?' 'Are you looking to expand?' 'Do you plan to retirement?'*"(A9)

Further, it was inferred from various interview data that several accountants (n=3) perceived themselves as employing a step-by-step explanation approach

"*To make it more visual, allowing the client to follow the progression from profit to cash flow step by step.*" (A5)

Only a limited number of accountants (n=2) indicated that they put themselves in the client entrepreneur's position and, therefore, explicitly considered the latter's level of expertise.

"*Explaining the 'why' to a client is primarily my responsibility. I often put myself in the entrepreneur's shoes*." (A2)

Ultimately, a small group of interviewees (n=3) explicitly confirmed that they asked their client entrepreneurs about their comprehension of the information conveyed during the advisory sessions. They typically pose a rather general inquiry, such as: "*Do you understand everything?*"

"I also often ask, 'Is everything clear?' and then they nod anyway." (A3)

The remaining participants (n=7) in the interview indicated that client entrepreneurs' behaviours provided them with sufficient insights into clients' understanding or, alternatively, they simply perceived it.

"*you can see from the body language of clients that they don't understand it well.*" (A2)

This theme provides insights into how accountants assess their use of pedagogical skills to enhance their client entrepreneurs' understanding. These actions reflect the practical application of pedagogical skills and demonstrate accountants' perceptions of how to apply specific strategies to increase the learning effect for their counterparts.

Visual aids

Various quotes from the interviews were categorised under label visual aids (N=18) when references were made to the accountant's use of visual aids during the discussion.

All accountants interviewed indicated that they utilised an additional tool to explain financial figures to client entrepreneurs (n=10). Half of the respondents (n=5) mentioned using visual aids during their explanation process, whereas the other half (n=5) facilitated their explanation by providing printed versions of financial figures.

"*I prefer working with paper, so I can indicate on paper what exactly is included in the cash flow*." (A2)

The majority of interviewees (n=7) indicated that specific balance sheet concepts and terms, such as cash flow, could be better explained through visual representation.

"It would be helpful to illustrate that the client has made an investment of €80,000 or that their stock has increased, resulting in funds being tied up in receivables, which will eventually be released over time. By visualizing it, I think I could make it more comprehensible." (A10)

Despite the consensus and emphasis on the importance of using visual representations among the interviewed accountants, two experienced accountants (n=2) indicated that finding the time to create and implement these visual aids poses a challenge.

"*A cash flow plan like that would be very useful to discuss. However, I do feel that there is a lack of time to focus on it. An A4 sheet can be used to explain the extent to which cash flow is influenced by various elements, and how it can be further managed by moving forward. This doesn't always come easily from a software program, which is why it's quite time-intensive.*" (A7)

This theme provides insights into how accountants perceive their use of visual aids as part of their pedagogical skills to enhance their client entrepreneurs' understanding of financial figures and concepts. These findings further provide insights into the practical strategies that accountants employ to clarify complex financial information such as visual representation. Moreover, the mentioned time constraints in preparing such aids emphasise the efforts and limitations that accountants face in effectively applying these pedagogical skills.

Inductive themes

Through the inductive coding some additional insights were gained (Gehman et al., 2018). This section provides an overview of the specific additional insights.

Educational role of the accountant

Regarding the theme "*educational role of the accountant*", the inductive coding method revealed that the interviewed accountants held varying views concerning their responsibility to strengthen the client entrepreneurs' understanding of accounting and financial concepts. The accountants generally acknowledged some responsibility, although they described it as a need to increase client entrepreneurs' awareness of their

own figures.

"*I have mixed feelings [about acting as an educator]. I don't expect a client to have our expertise. They need us for that and are paying us for it. I do want them to realise that any action they take has an impact on their bank account.*" (A3)

"*I really enjoy getting clients to the point where they actually want to understand more about it. Especially explaining the 'why' to a client. I see that as my responsibility*." (A7)

Insights from this inductive theme illustrate how accountants perceive their educational role in enhancing client entrepreneurs' understanding of accounting and financial concepts.

Explanations

Using the insight derived from the inductive coding method, three insights were identified within the theme "*explanations*".

First, the interviews revealed that less experienced accountants had noticeably less client contact than more experienced accountants.

"*In my current role, I don't have that many conversations with clients yet.*" (A1)

Second, based on the interviews, a difference was noted in the duration of conversations between less and more experienced accountants. Although all the discussions mainly focused on (some) financial figures, less experienced accountants typically held discussions with client entrepreneurs lasting approximately 30 minutes to an hour, whereas for more experienced accountants, these conversations tended to last longer, with a minimum of one hour and sometimes extended up to three hours.

Finally, some interviewees indicated that their client entrepreneurs appreciated the explanations.

"*They appreciate that. I wouldn't say they're exactly thrilled, but when you give that extra explanation about, for example, cash flow, I often hear them say, 'Ah, yes, that's interesting.*'" (A6)

The insights regarding this inductive theme provide a context for how these pedagogical skills are developed and refined over time.

Hybrid approach to deductive and inductive coding

The combination of deductive and inductive coding ensured the validity of the specific findings (Creswell, 2013). Specifically, a substantial strong alignment was observed between the theoretical themes and data-structured themes, with some additional insights gained through the inductive approach (Gehman et al., 2018).

Table 5 provides an overview of the combination of themes between deductive and inductive coding, explaining the connections between the themes.

[INSERT TABLE 5 HERE]

Discussion

This study explored whether accountants perceive themselves as applying pedagogical skills, and how they apply these skills during discussions of annual financial statements with client entrepreneurs. Key insights were captured through ten interviews with external accountants.

The interviews highlighted that the accountant's understanding of *the client entrepreneur's proficiency level* and their *approach to learning* plays a crucial role in the context of an advisory discussion. This finding aligns with the literature that links effective teaching to a solid understanding of both the parameters (Cochran et al., 1993).

First, consistent with the literature (Halabi et al., 2010), entrepreneurs in *smaller SMEs* tend to possess less understanding of the accounting and financial concepts.

However, interviewees nuanced this view by referring to sectoral differences. According to them, client entrepreneurs in technical professions tend to have less understanding compared to, for example, consultants or IT professionals. This discrepancy can be explained by differences in educational background, underscoring the importance of tailored explanations based on a thorough understanding of client entrepreneurs' proficiency levels.

Second, the interviews revealed *varying levels of interest* among client entrepreneurs regarding explanations of their financial figures. Some interviewees also mentioned that lower interest often corresponds to a greater reliance on the accountant. Consequently, these clients rely strongly on accountants to make decisions. While reliance on the accountant is crucial in an advisory relationship (Blackburn et al., 2018), in this context, it could lead to passive behaviour on the part of the client entrepreneur. Even though the advisory relationship is characterised by strong reliance, the accountant must remain alert to prevent this reliance, resulting in a lack of engagement with financial figures. A solid understanding of the figures by the client entrepreneur contributes to improved business performance for their company (Engström & McKelvie, 2017; Eniola & Entebang, 2017).

Finally, according to the accountants interviewed, some client entrepreneurs *hesitate* to request further exploration because they may incur additional costs. Referring to the Resource-Based view (RBV) (Barney, 1991), limitations in financial resource allocation restrict opportunities for deeper discussions of financial statements, which in turn constrains the firm's ability to improve its competitive position.

Although this is not necessarily a conscious decision by accountants, these interviews gathered insights that could suggest that client entrepreneurs of smaller SMEs, particularly those with a lower educational background, limited interest, or heightened

cost awareness, would receive less in-depth business advice. Consequently, there would be less explanation and education during discussions on financial statements, which would limit the enhancement of client entrepreneurs' understanding of accounting and financial concepts. Moreover, these characteristics are often observed among small business owners (Halabi et al., 2010), and it is precisely these businesses that would benefit from a thorough discussion of financial figures that enhance entrepreneurs' understanding (Resmi et al., 2021).

While this suggested reduced level of advisory depth is primarily influenced by the characteristics and preferences of the client entrepreneurs themselves, it is incorrect to assign them full responsibility. Although accountants seem to recognise these characteristics and preferences, it would be beneficial if they would be aware of their role in enhancing client entrepreneurs' understanding of accounting and financial concepts based on their own figures (Marriott & Marriott, 2000; Yigitbasioglu et al., 2022). Despite this, there is no clear consensus among interviewees *regarding their role in enhancing client entrepreneurs' understanding*. Instead, some of them described it as a need to increase clients' awareness of their own figures. However, it is questionable whether such awareness can be achieved without substantial explanation by the accountant.

Furthermore, most interviewees expressed confidence that client entrepreneurs take the initiative to ask questions if they do not understand something. This assumption places a significant responsibility on the client entrepreneur to learn during advisory discussions, potentially overlooking the need for proactive guidance from accountants (as noted in Marriott & Marriott, 2000; Yigitbasioglu et al., 2022).

Regarding the application of *pedagogical skills* during advisory discussions, accountants highlighted the importance of effectively conveying information in a clear and comprehensible manner. This entails presenting explanations and figures in laymen's

terms, incorporating practical examples, and employing a step-by-step explanation to facilitate the client entrepreneurs' understanding. Furthermore, most accountants acknowledged the disparity in knowledge between experts and novices (Chi et al., 1981; Jiang et al., 2023; Kalyuga et al., 1998). In addition, a substantial number of participants explained that they convey specific knowledge through concrete and easily understandable examples that are more readily related to prior knowledge. However, based on the interview findings, this study suggests that the responsibility for learning lies primarily with the client. Thus, when the client entrepreneur is characterised by a lower level of understanding, limited interest, or cost awareness, accountants consider these characteristics and may, as a result, apply fewer pedagogical skills. Consequently, the level of client entrepreneurs' understanding of accounting and financial concepts won't enhance.

The majority of the interviewees inferred the client entrepreneur's understanding exclusively from specific client behaviour or their own perception, while a minority of interviewed accountants raised a generic query regarding the client entrepreneur's understanding of it (typically, "*Do you understand everything?*"). The use of highly specific questions that prompt client entrepreneurs' genuine contemplation of their figures is important when considering the intended learning process during advisory discussions (Boyer et al., 2010; Olaniran & Akorede, 2018; Tofade et al., 2013; Yeadon-Lee, 2015). The interview findings underscore the importance of a good understanding between the accountant and client entrepreneur during advisory discussions (De Bruyckere et al., 2020). The indication that some accountants assess their client entrepreneurs' level of understanding based on specific behaviour or their own perceptions, while others only ask general questions, suggests that there may be a need for standardised approaches to evaluate client entrepreneurs' comprehension. This could

result in inconsistencies in the extent to which client entrepreneurs understand what is being discussed. It could be valuable if accountants use highly specific questions during advisory discussions to prompt client entrepreneurs to actively reflect on and understand financial figures.

In contrast, apart from assessing client entrepreneurs' understanding, the majority of experienced accountants indicated that they ask anticipatory questions.

The interviews suggest that the advisory role develops over time, with more experienced accountants engaging in a more intensive application of their pedagogical skills than less experienced ones do. This is in line with Migliavacca's (2019) findings.

The study uncovered the utilisation of dual-coding techniques by accountants during the explanation process. Visual aids such as demonstration files, representations, or printed versions of figures were used by the interviewed accountants to enhance the transmission of information. The majority of interviewees confirmed that this approach unequivocally represents an effective method for facilitating an entrepreneur's learning process, as proposed by Vygotsky (1978). Nevertheless, some experienced accountants indicated that it is challenging to find time to create and implement these visuals.

The findings of this qualitative exploratory study suggest that there is no clear consensus among interviewed accountants regarding their role in enhancing client entrepreneurs' understanding of accounting and financial concepts based on their own financial statements. External accountants apply basic pedagogical skills based on their own perceptions (RQ). They do this by presenting explanations and figures in laymen's terms, incorporating practical examples, and employing step-by-step explanations. Nevertheless, this study suggests that clients are primarily responsible for their learning during advisory discussions. Consequently, client entrepreneurs with lower levels of understanding, limited interest, or greater cost awareness may receive less in-depth

advice. Finally, the results indicate that the PCK model can be adapted from an educational to an advisory setting, considering that accountants use different basic pedagogical skills while also considering the proficiency level of the client and the client's approach to learning.

Practical implications

The findings of this study provide important insights into accounting practices, curriculum development, and optimisation of learning and development initiatives.

Initially, accountants must be made fully aware of their role in enhancing client entrepreneurs' understanding of accounting and financial concepts. This could lead to a shift in learning responsibility, which currently lies more with the client entrepreneur than with the accountant. The client's complacency, limited knowledge, and ignorance should not obstruct this responsibility, but rather encourage the accountant to provide specific and tailor-made business advice with the ultimate purpose of enhancing client entrepreneurs' understanding. Moreover, client entrepreneurs should be provided with sufficient transparency regarding the cost of discussions on annual financial statements. Additionally, they should be adequately informed about the value of their advice, allowing costs to be justified from their perspective, and mitigating their fear of higher costs.

Based on the findings of this study, the importance of pedagogical skills is justified as professional external accountants already apply them in specific cases. This significance should also be emphasised by colleges and universities that offer accounting programs. Curricula need to be adjusted to effectively focus on pedagogical skills. This could involve modifying courses or modules to train students in the necessary pedagogical skills, allowing them to tailor their explanations to the client entrepreneur's

understanding level through role-playing and case studies. This does not involve any major changes in the curriculum. For example, in a financial analysis course, students could be asked to explain a part of the analysis of financial statements to a hypothetical client entrepreneur with limited understanding of accounting and financial concepts. Additionally, it would be highly beneficial for students to observe discussions on annual financial statements during their internships and to report on the skills applied.

Although accountants have already applied pedagogical skills, there is room for improvement. Professional learning and development initiatives should focus on strengthening the use of effective questioning techniques to evaluate client understanding and stimulate the learning process. For example, by using structured assessment methods, such as follow-up questions, accountants can assess the level of understanding and identify areas where further clarification is required for the client entrepreneur. Moreover, these training programs could also focus on raising greater awareness of different client profiles, and how less financially literate or less interested clients could be encouraged to engage in learning during advisory discussions. In addition to training programs, it could be valuable for accountants to share good practices with one another.

Limitations and future directions

This study has several limitations that must be acknowledged. First, it should be noted that a qualitative approach with a limited sample size of ten accountants from one organisation was employed, which may restrict the generalisability of the findings. However, these small samples are often considered sufficient to gather detailed insights into homogeneous groups, such as accountants form a single organisation (Guest et al., 2006; Mason, 2010; Vasileiou et al., 2018). Moreover, the possibility of self-selection bias needs to be considered as the accountants themselves could determine whether they could participate in the interview. Nevertheless, a random selection of 10 accountants was

made by the accounting firm's headquarters' knowledge centre itself, after some accountants had registered through their branch manager.

Second, although this was not part of the scope of the study, there were no insights into client entrepreneurs' perceptions of the information received. Only the perceptions of the accountant were captured through interviews. It is unclear whether the perception of the client entrepreneur would be in line with these of the accountant. This could provide an interesting avenue for future research.

Hence, Future research could focus on observing advisory discussions. Instead of relying on accountants' self-reporting, observing actual advisory conversations could provide more interesting information on how pedagogical skills are truly applied. Further research could also explore the perceptions of client entrepreneurs: To what extent do they find such discussions comprehensible and useful? Additionally, examining whether and how the application of pedagogical skills varies across sectors could help develop more sector-specific training programmes. Moreover, longitudinal research could offer valuable insights into how accountants' pedagogical skills affect entrepreneurs' understanding and contribute to their business performance in the long term.

Conclusion

This study explored whether accountants perceive themselves as applying pedagogical skills during their yearly meetings, discussing the financial performance of SMEs with client entrepreneurs and how these skills are applied to enhance clients' understanding of accounting and financial concepts. The findings revealed mixed perceptions among accountants regarding their role in improving clients' understanding. While basic pedagogical skills such as simplifying explanations, using practical examples, and applying a step-by-step approach are employed, responsibility for learning is mainly

placed on the client entrepreneur.

These results confirm the relevance of the pedagogical content knowledge (PCK) concept in advisory settings as accountants adapt their approach based on clients' proficiency levels and learning preferences. However, the lack of consensus about accountants' educational responsibilities and limited efforts to actively assess client understanding suggest room for improvement in professional practices.

This study highlights broader implications for the accounting profession: Integrating pedagogical skills into accounting education and training could enhance accountants' advisory roles, ultimately supporting SME entrepreneurs' financial literacy.

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Appendix A: Background questions

1. What is the progression of the yearly meeting on the financial statements with the client?
2. Which topics are discussed during the meeting?
3. What is the duration of these meetings?

Appendix B: Specific questions

1. How do you perceive your clients' expertise in accounting and finance matters?
2. Do clients appreciate the supplementary clarification or elaboration of specific matters related to accounting and finance?
3. Imagine you need to explain the concept of cash flow to a new client. How would you approach this explanation?
4. In your view, what would be required to explain the concept of cash flow to clients?
5. Do you generally perceive that upon the conclusion of a discussion, the client comprehends the yearly financial report of the company?
6. How do you infer whether the client has understood the main conclusions of the discussion?
7. Do you sense that you lack anything to provide explanation?
8. Does your workplace provide latitude to enable you to do so?
9. Do you believe that the client appreciates the explanation of the figures?

Figure 1. Simplified overview of pedagogical content knowledge in the educational and an advisory settings

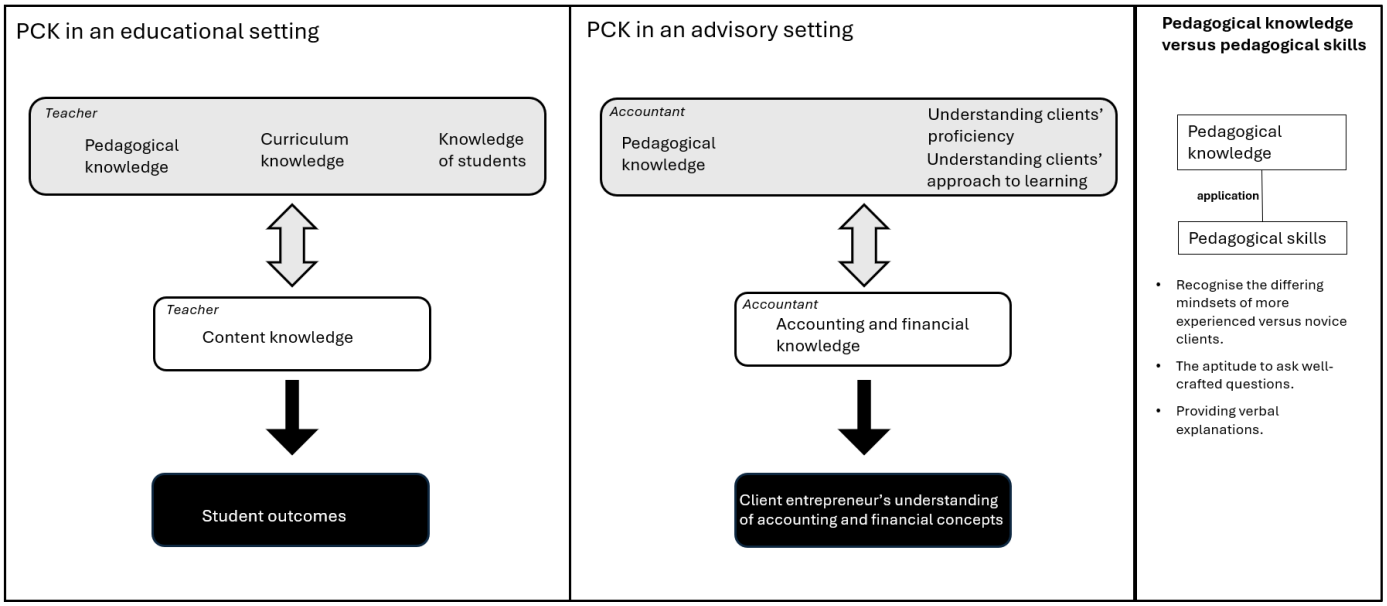


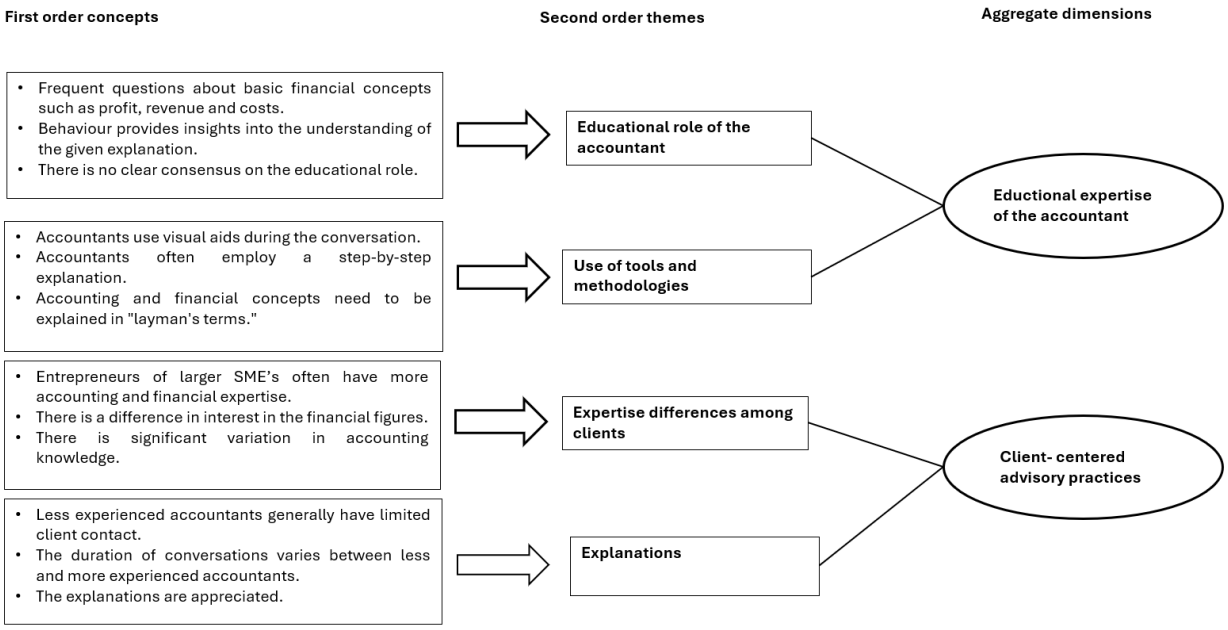
Table 1. Participants characteristics

Participant	Gender	Age (years)	Experience (years)	Interview duration
A1	M	27	1,5	15 min 41s
A2	F	28	7	15 min 03s
A3	F	31	8	15 min 22s
A4	M	22	1	21 min 23s
A5	M	30	8	20 min 21s
A6	M	57	33	21 min 42s
A7	F	45	23	15 min 17s
A8	M	53	32	17 min 29s
A9	F	46	24	23 min 05s
A10	M	48	25	19 min 32s

Table 2. Coding scheme

Code	Label	Definition	Criteria
1.	**Understanding of the client's proficiency level.** (Cochran et al., 1993)	This code includes the accountant's assessment of the client's level of financial knowledge and their ability to understand the accounting process.	• Quotes where the accountant refers to the client's level of accounting and financial knowledge. • Quotes where the accountant refers to the client's understanding of the accounting process.
2.	**Understanding client's approach to learning** (Cochran et al., 1993)	This code refers to the client's overall interest, attitude, motivation, and preferred methods for processing accounting and financial information.	• Quotes indicating the client's interest, attitude and motivation in learning about accounting and finance. • Quotes referring to the client's reliance on the accountant's expertise.
3.	**Pedagogical skills** (Boyer et al., 2010; Chi et al., 1981)	This code refers to the accountant's use of pedagogical techniques or methodologies to effectively convey accounting and financial concepts to the client, with the aim of improving the client's understanding.	• Quotes where the accountant considers the expertise level of the client entrepreneur. • Quotes where the accountant indicates linking new information to the client's existing knowledge. • Quotes where the accountant describes methods used to ensure that the client has understood the information.
4.	**Visual aids** (Clark & Paivio, 1991)	This code refers to the accountant's use of visual aids during their verbal explanations.	• Quotes where the accountant describes the use of visual aids to supplement verbal explanations. • Quotes describing how printed or digital aids are used to clarify accounting information during the advisory discussion.

Table 3. Data structure



50

Table 4. Deductive coding scheme referring to the number of responses related to a specific coded label (N).

	A: Understanding of the client's proficiency level	B: Understanding client's approach to learning	C: Pedagogical skills	D: Dual coding
A1	5	8	3	2
A2	4	4	8	2
A3	3	9	4	2
A4	1	6	3	1
A5	6	9	9	2
A6	5	10	5	2
A7	5	10	6	1
A8	8	9	10	1
A9	8	10	7	2
A10	11	11	9	3
TOT	**56**	**86**	**64**	**18**

Table 5. Structure deductive codes and inductive themes

DEDUCTIVE CODING	Second order themes INDUCTIVE CODING	Connection
Pedagogical skills	Educational role of the accountant	Pedagogical skills help accountants convey complex financial information in an understandable way, contributing to their role as educators.
Visual aids	Use of tools and methodologies	Visual aids are a specific part of the use of tools and methodologies that support the accountant in conveying complex information more clearly.
Pedagogical skills		Accountants' pedagogical skills encompass the effective use of tools and methodologies to convey complex information clearly.
Understanding client's proficiency level	Expertise differences among clients.	By understanding the client's proficiency level and approach to learning, the accountant could take the difference in expertise between clients into account.
Understanding client's approach to learning		
Pedagogical skills	Explanations	Accountants' pedagogical skills are influenced by differences in conversation time, with more experienced accountants engaging in longer interactions, which allows for deeper explanations and a more intensive application of their pedagogical skills.

Management Tax Guidance & Analyst Forecasting Behavior: The Peculiar Role of Tax Forecasting*

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We investigate how financial analysts rely on management-provided, voluntarily-disclosed tax forecasts under increased tax information complexity. Using data on quarterly ETR forecasts disclosed within conference calls from 2001 to 2020, we examine changes in analysts' tax forecasting behavior following the 2017 Tax Cuts and Jobs Act (TCJA), which we utilize as a quasi-exogenous shock to the analysts' information environment. Results indicate that firms with strong reputations for high forecast accuracy experience increased mimicking by analysts, underlining reputation's role in shaping reliance of analysts on management-provided tax forecasts. However, this positive relationship is attenuated when tax information becomes overly complex. These findings suggest that while management-provided tax guidance is valuable, high information complexity can reduce its perceived reliability among analysts, even if a firm's forecasting reputation is ex ante positive. By identifying a scenario where a positive management forecasting reputation – a generally preferred firm characteristic – becomes less relevant to analysts, our study is able to detect limitations to the benefits of voluntary corporate transparency.

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Management Tax Guidance & Analyst Forecasting Behavior: The Peculiar Role of Tax Forecasting

Preliminary draft with tentative results – please do not circulate without permission

Abstract

We investigate how financial analysts rely on management-provided, voluntarily-disclosed tax forecasts under increased tax information complexity. Using data on quarterly ETR forecasts disclosed within conference calls from 2001 to 2020, we examine changes in analysts' tax forecasting behavior following the 2017 Tax Cuts and Jobs Act (TCJA), which we utilize as a quasi-exogenous shock to the analysts' information environment. Results indicate that firms with strong reputations for high forecast accuracy experience increased mimicking by analysts, underlining reputation's role in shaping reliance of analysts on management-provided tax forecasts. However, this positive relationship is attenuated when tax information becomes overly complex. These findings suggest that while management-provided tax guidance is valuable, high information complexity can reduce its perceived reliability among analysts, even if a firm's forecasting reputation is ex ante positive. By identifying a scenario where a positive management forecasting reputation – a generally preferred firm characteristic – becomes less relevant to analysts, our study is able to detect limitations to the benefits of voluntary corporate transparency.

Keywords: analyst forecasts, management guidance, forecast reputation, conference calls, tax information complexity, tax reform, TCJA

1 Introduction

To what extent do financially sophisticated stakeholders rely on voluntarily-provided guidance issued by firms when faced with complex external information? To answer this question, we focus on the voluntary disclosure of tax information by firms to financial analysts. Specifically, our objective is to investigate (1) whether firms can build a reputation among analysts for issuing accurate or inaccurate forecasts of future effective tax rates (ETRs), and (2) how analysts rely on this reputation when faced with increased external tax information complexity, as measured by the implementation of the Tax Cuts and Jobs Act (TCJA) of 2017.

Financial analysts operate within a complex information environment, where their primary objective is to provide accurate earnings forecasts and well-informed investment recommendations to their clients. To achieve this, they draw upon a diverse array of information sources (Brown et al. 2015). One of these information sources is management-provided guidance, which is usually disclosed in conference calls[1]. Firms provide guidance on disaggregated measures, such as tax expense forecasts, to enhance their reputational standing and to appear transparent and informative to analysts and investors (Han and Wild 1991; Hutton, Miller, and Skinner 2003). Disaggregated guidance allows firms to showcase particular line items, which can signal a more nuanced and comprehensive view of future performance. Research indicates that firms issuing disaggregated forecasts are perceived as more credible, and this perceived credibility can boost their reputation among analysts (Mercer 2005; Hirst, Koonce, and Venkataraman 2007). A record of accurate guidance helps firms build a positive forecasting reputation, making analysts more likely to rely on future voluntary disclosures. However, firms face potential drawbacks, as inaccurate or unfavorable disaggregated forecasts can lead to significant negative reactions from investors, who may interpret such disclosures as a signal of heightened risk or poor performance (Chen et al. 2008).

By examining firm-provided forecasts of future ETRs and how analysts utilize this tax information, our study focuses on analysts' tax forecasting behavior. Prior studies highlight both

[1] In this study, we use the terms "management guidance" and "management forecasts" interchangeably.

the difficulties and capabilities of analysts in handling such information. Research shows that legal changes, such as tax reforms, often complicate analysts' tax forecasting accuracy, as seen in studies examining the impact of regulations like the Omnibus Budget Reconciliation Act of 1993 and the 1986 Tax Reform Act, which introduced complexities that impaired forecast precision (Chen and Schoderbek 2000; Plumlee 2003). As tax-related disclosures often fall outside the routine earnings metrics, analysts' ability to accurately interpret tax guidance can vary depending on external information complexity and their understanding of firm-specific, internal tax practices. In this context, one factor that can assist analysts in addressing the challenges of tax forecasting is the voluntary disclosure of tax-relevant information during conference calls. Existing research indicates that such disclosures provide additional informativeness to analysts and enhance the accuracy of their ETR forecasts (Ehinger et al. 2017; Chen, Chi, and Shevlin 2023). Therefore, we predict that voluntary management ETR forecasts may help analysts better assessing the impact of the TCJA on firms' future ETRs.

We use the implementation of the TCJA as a quasi-exogenous shock to the information environment in which firms and analysts operate. The TCJA introduced a range of far-reaching tax provisions that brought a substantial increase in tax information complexity, potentially making tax forecasting more challenging. During such periods, analysts may rely more strongly on management guidance, as the management has deeper insights into the firm's internal information environment, which gives them an informational advantage (Hutton, Lee, and Shu 2012; Maslar, Serfling, and Shaikh 2021). Consistent with this, firms may have access to detailed internal tax information and understand the operational impacts of new tax rules, potentially enabling them to provide informed guidance on how these changes will affect future tax burdens. By offering voluntary ETR guidance, firms can reduce some of the complexity analysts face in a post-TCJA environment, providing a stabilizing influence on tax-related forecasting through management's clearer view of regulatory impacts.

We predict that a positive management tax forecasting reputation is associated with an in-

creased likelihood of analysts mimicking the management-provided tax forecasts. While this prediction may initially seem intuitive, it remains uninvestigated whether the TCJA-induced increase in tax information complexity alters the relationship between managements' tax forecasting reputation and analysts' mimicking behavior. We argue that this setting offers an intriguing area of tension due to an outcome that is difficult to predict. Following the findings of the broader task and information complexity literature (e.g., Payne 1976; Campbell 1988), it can be reasoned that when faced with increased information complexity, analysts tend to simplify their forecasting task by increasingly mimicking management-provided guidance, regardless of whether the respective firm has a positive forecast reputation. On the other hand, prior literature shows that analysts are able to make their own accurate forecasts that can be relatively more accurate than those made by the management, even as tax-related information becomes more complex (Bratten et al. 2017). Therefore, whether and how analyst will alter their forecasting behavior due to the TCJA is ex ante unclear.

Our data is derived from voluntary ETR forecasts extracted from corporate conference call transcripts spanning from 2001 to 2020. Using keyword-based filtering, and both manual and GPT-based classification, sentences related to corporate tax rates were identified, yielding a final sample of over 10,000 quarterly ETR forecasts from over 700 unique firms. These forecasts were paired with analysts' implied ETR forecasts collected from I/B/E/S to assess the extent of how analysts mimic management ETR forecasts. Additional control variables account for firm- and analyst-specific characteristics. The empirical approach involves both regular OLS and difference-in-differences (DiD) regression models to measure the effect of a firm's tax forecasting reputation on analyst behavior, and to compare trends in analysts mimicking management ETR forecasts before and after the TCJA's enactment. This methodological framework enables a comprehensive analysis of whether analysts become more likely to mimic reputable firms' guidance as regulatory complexity increases.

Our study finds that firms with a strong reputation for accurate tax forecasting experience

greater mimicking behavior from analysts, supporting the hypothesis that positive forecasting reputation fosters reliance on management guidance by analysts. Our most comprehensive DiD model demonstrates that the introduction of the TCJA led analysts to rely more heavily on high-reputation tax forecasts provided by firms, suggesting that analysts responded to the increased tax information complexity by more frequently mimicking firm-issued tax forecasts. For low-reputation firms, we identify no TCJA-induced increases in mimicking. Interestingly, when firms are affected by the newly-implemented Base Erosion and Anti-Abuse Tax (BEAT), a particularly complex tax introduced by the TCJA, analysts following these firms are less likely to mimic even highly reputable management forecasts, indicating that extreme tax information complexity may deter reliance on firm guidance altogether. These findings suggest that while management-provided tax guidance is valuable, excessively high information complexity can reduce its perceived reliability among analysts, even if a firm's forecasting reputation is positive. Additional results also indicate that analysts do not rely on the accuracy of prior mandatory GAAP ETRs reported in quarterly filings. This decline in reliance on initially reputable voluntary firm disclosures and mandatory quarterly ETRs highlights a limitation to the benefits of corporate transparency, as analysts appear to rely on other information sources that do not include conference calls or quarterly reports.

By examining the intersection of management forecasting reputation, analyst forecasting behavior, and information complexity within a tax context, our study contributes to multiple strands of literature. Firstly, it extends the understanding of how analysts utilize management-provided tax forecasts (Chen, Chi, and Shevlin 2023; Koutney, Aier, and Tideman 2024). By demonstrating that firms with a high reputation for disclosing accurate tax guidance attract greater analyst response, the study sheds light on the role of voluntary disclosures in complex regulatory environments (Plumlee 2003). Additionally, our work extends information complexity theory by showing how the TCJA – a significant tax reform that increases information complexity – shifts analysts' behavior and reliance on firm-provided guidance. Overall, it highlights how reputational factors influence the effectiveness of voluntary guidance under varying levels of information complexity, providing insights into how corporate transparency affects analysts' decision-making in a complex

information environment.

The remainder of this paper is structured as follows: Section 2 provides an overview of the related literature and our hypotheses. Section 3 describes the sample selection. Section 4 introduces our empirical design. The empirical results of our main analyses are presented in Section 5. In Section 6, we present additional cross-sectional tests. The study ends with a discussion and conclusion in Section 7.

2 Related Literature & Hypotheses Development

Our study is related to several literature strands. First, we connect to research on the consequences of management-provided guidance and forecast disaggregation. Second, since we aim to investigate analyst forecasting behavior in an information environment that changes in complexity, we derive our theoretical foundation from early research about information and task complexity. Third, we aim to examine whether analysts can effectively evaluate complex tax information by accurately integrating it into their tax forecasts. Therefore, we also link to past research on analyst tax forecasting behavior.

Management Forecasting Reputation

To achieve accurate earnings forecasts, analysts use elaborate forecasting models in which they can account for multiple information sources (Bradshaw, Ertimur, and O'Brien 2017), one of which is firm-provided guidance on future earnings (Brown et al. 2015). Because such guidance is issued on a voluntary basis and is not extensively regulated, analysts have to decide whether this information is accurate and should be incorporated into their own forecasts[2]. Hence, whenever

[2] An important policy that led to the regulation of privately disclosed management guidance is the Regulation Fair Disclosure ("Reg FD") of August, 2000. However, the practice of firms providing public guidance on future earnings remains the subject of discussions. However, these discussions are beyond the scope of this paper. For further information, see, for example, Houston, Lev, and Tucker 2010; Green et al. 2014; Wang 2007.

firms provide guidance on future earnings, analysts have to assess the credibility of these management forecasts. In this regard, whether a given management guidance is considered credible may be associated with the previous accuracy of the respective firm's forecast (Williams 1996).

Theoretical literature suggests that firms choose to provide guidance in order to build a reputation for being forthcoming (Beyer and Dye 2012). Accordingly, it can be argued that such a forthcoming reputation may affect analysts' response to subsequent management guidance. In this context, extant research shows that firms are able to build a positive forecasting reputation when they repeatedly provide accurate earnings guidance (Williams 1996; Ng, Tuna, and Verdi 2013; Ota, Kawase, and Lau 2019; Hutton and Stocken 2021). For the management, a positive forecasting reputation could lead to increased responsiveness of analysts, expressed in higher precision of analyst forecast (Lang and Lundholm 1996; Bowen, Davis, and Matsumoto 2002; Chen and Matsumoto 2006), a greater number of analysts following (Graham, Harvey, and Rajgopal 2005), and a more timely release of forecast revisions after the issuance of accurate management guidance (Williams 1996; Baginski, Hassell, and Wieland 2011). Therefore, extant literature shows that firms can establish a positive forecasting reputation by consistently providing accurate guidance[3].

Forecast Disaggregation

Studies on management forecasting reputation mainly focus on the provision of earnings guidance, which are also defined as *aggregated* forecasts (Hirst, Koonce, and Venkataraman 2007; Chen et al. 2008). Besides issuing guidance on future earnings, some firms also publish additional forecasts on single line items, such as expected pre-tax income or revenues. Because the previous literature reveals that these so-called *disaggregated* forecasts and their disclosure can also have an impact on the response behavior of analysts, we argue that there is a link between the provision of disaggregated forecasts and a firm's intention to build a positive forecasting reputation, as both

[3]Research suggests that – apart from firm-level forecasting reputation – individual managers may also be able to build their own forecasting reputation (Bertrand and Schoar 2003; Kala, Shailer, and Wilson 2024). However, due to the underlying data, we focus on firm-level reputation and do not distinguish between the forecasting reputation of firms and individual managers.

streams of literature exhibit complementary findings. In line with this notion, extant research shows that the issuance of disaggregated guidance is associated with an increase in forecasting credibility, as measured in experimental settings via perceived forecasting credibility (Mercer 2005; Hirst, Koonce, and Venkataraman 2007) and quantitatively by increased stock price reactions (Hutton, Miller, and Skinner 2003). This positive relationship appears to be particularly evident for firms where accurate earnings forecasting would otherwise be more difficult (Merkley, Bamber, and Christensen 2013; Boone et al. 2020). Similar to a positive forecasting reputation, firms that provide disaggregated forecasts experience timelier forecasting revisions by analysts (Lansford, Lev, and Wu Tucker 2013) and are perceived as more informative (Han and Wild 1991). Thus, issuing disaggregated forecasts can be seen as a way for firms to enhance their forecasting reputation by voluntarily providing additional information that is valuable to analysts.

However, issuing disaggregated forecasts can also have adverse effects for firms, particularly when the guidance provided does not meet the initial expectations of analysts or investors. In contrast to the results of Hutton, Miller, and Skinner 2003, Chen et al. 2008 find that the stock market reacts similarly to both disaggregated and aggregated good news forecasts, indicating no perceived difference in quality by investors. However, they also find that the stock market reacts more negatively to disaggregated forecasts of bad news compared to aggregated ones, making disaggregated forecasts disadvantageous in scenarios involving bad earnings news. In an experimental setting, Dong, Lui, and Wong-On-Wing 2017 detect that disaggregated management forecasts have an initial positive effect on participants' investment judgment in a company (i.e., they are willing to invest more into the firm), but this reaction seems to change when a forecasted value is missed. In this case, investors react negatively by making downward adjustments to their initial investment decision. Taken together, providing management guidance – aggregated or disaggregated – cannot be regarded as purely beneficial for firms. Such guidance can serve as a commitment, binding the firm to a specific target. If that target is not met, investors may "punish" the firm through downward adjustments.

Combining the literature on management forecasting reputation and forecast disaggregation leads us to state two propositions. First, since firms voluntarily provide additional information on individual figures by issuing disaggregated forecasts, we argue that there is an association between the disaggregation of management forecasts and a firm's intention to build a positive forecasting reputation. However, this reputation-building process can be risky as analysts and investors may punish inaccurate disaggregated forecasts. Second, to our knowledge, there is a paucity of literature examining whether firms are also able to establish a forecasting reputation for accurately forecasting future tax rates. In this vein, we argue that ETR forecasts can be defined as disaggregated forecasts that firms can voluntarily disclose. Based on these two propositions, we formulate our first research hypothesis in alternative form:

H1: An increase in a firm's ETR forecasting reputation is positively associated with analysts mimicking (i.e., adopting) a firm's ETR forecast.

Taxes: A Sealed Book for Analysts?

The question of whether analysts understand taxes has been investigated through several lenses. One lens mainly focuses on how changes in tax laws and accounting regulations affect the precision of analyst forecasts[4]. For example, Shaw 1990 investigates how safe harbor leasing provisions affected analysts' earnings forecast accuracy and finds that analysts did not accurately account for leasing income effects within their forecasts. Investigating the effect of the Omnibus Budget Reconciliation Act of 1993 on analysts' forecast accuracy, Chen and Schoderbek 2000 and Chen, Danielson, and Schoderbek 2003 find that after the introduction of the tax law change, analysts had difficulties accounting for firms' deferred tax adjustments, which resulted in a decrease of the precision of analysts' earnings forecasts. Exploiting the different changes in the law within Reagan's 1986 Tax Reform Act, Plumlee 2003 discovers that analysts have difficulties incorporating

[4]Other lenses through which this question is examined include firm-internal tax accounting issues (e.g., Donelson, Koutney, and Mills 2017; Francis, Neuman, and Newton 2019; He, Ren, and Taffler 2020) and the design of analysts' information environments (e.g., Ehinger 2020; Kim, Schmidt, and Wentland 2020).

the effect of more complex changes in the tax law into their own tax expense forecasts. More recently, Hoopes 2018 discovers an increase in analysts' forecast errors during the expiration of the temporary R&D tax credit. Consistent with this, Brushwood et al. 2019 provides evidence of increased analyst ETR forecast errors after the implementation of ASU 2016-09, which was intended to simplify the accounting for discrete tax events. Thus, studies investigating tax-related legal and regulatory changes reveal that analysts appear to have difficulties assessing the impact that these changes can have on their forecast precision.

One factor that can help analysts mitigate the challenges of tax forecasting is the voluntary disclosure of tax-relevant information. Existing research identifies conference calls as one source for such voluntary tax disclosures. For example, in their study on corporate transparency, Balakrishnan, Blouin, and Guay 2019 find evidence that tax-aggressive firms disclose more tax-related information in their conference calls, potentially to assist analysts in evaluating complex tax-related matters. Additionally, Ehinger et al. 2017 examines the information acquisition by analysts during conference calls and show that analysts' ETR forecasts become more accurate when taxes have been a subject matter within these conference calls. Lastly, Chen, Chi, and Shevlin 2023 provide evidence suggesting that voluntary ETR forecasts offer incremental informativeness to analysts. Analysts rely on such voluntarily provided firm guidance, as firms generally hold an informational advantage regarding firm-internal matters (Hutton, Lee, and Shu 2012; Maslar, Serfling, and Shaikh 2021). Therefore, we predict that voluntary management tax forecasts can help analysts in better assessing the impact of the TCJA on firms' ETRs.

Information Complexity & Analyst Forecasting Behavior

Our analysis focuses on whether analysts choose to follow voluntary tax forecasts issued by the management, arguing that their decision depends on the perceived reliability of the information. Additionally, we aim to explore how analysts' tax forecasting behavior evolves as tax information complexity increases. Consequently, we investigate analyst forecasting behavior within an

information complexity framework (Payne 1976; Campbell 1988). Since analysts use diverse information sources (Brown et al. 2015), we argue that analysts face varying degrees of information complexity, which affects their task complexity and ultimately their forecast performance. In this context, earlier literature identifies a close relationship between information and task complexity, and subsequent task performance. Based on findings from choice experiments, Payne 1976 argues that information processing is influenced by the complexity of the underlying task. He finds that, when faced with greater information complexity – such as an increased number of available options – individuals tend to eliminate certain alternatives to simplify their information set[5]. While this strategy reduces task complexity, it may also impair performance. According to Campbell 1988, information complexity is an important aspect of task complexity. Based on past research, he states that task complexity increases with information load, diversity, uncertainty and interrelations. Bonner 1994, focusing on auditors' judgment, demonstrates how a rise in information complexity can increase task complexity, which in turn reduces auditors' judgment performance.

In analyst research, the concept of increasing information complexity is used to explain why analysts have difficulties assessing the impact of more complicated changes in tax laws (Plumlee 2003), why intangible assets are positively associated with increasing forecast errors (Gu and Wang 2005), and why less readable 10-K filings are associated with lower earnings forecast accuracy (Lehavy, Li, and Merkley 2011). Bozanic and Thevenot 2015 build on this research and show that firm-provided qualitative disclosures with higher within-document diversity and over-quarter similarity can help reduce information uncertainty for analysts. However, it remains unexamined whether increased tax-related information complexity affects the relationship between management forecast reputation and analyst forecasting behavior, specifically in terms of analysts mimicking management ETR forecasts. We argue that this gap offers an interesting research opportunity as the outcome is difficult to predict. Following the concept of information complexity, it can be argued that when faced with increased information complexity, analysts tend to simplify their task

[5]This is also in line with the "satisficing" concept, whereby economic agents seek solutions that are "good enough" rather than optimal, in order to manage the complexity of their decision-making processes.

by increasingly mimicking management-provided guidance, regardless of whether the respective firm has a positive forecast reputation. On the other hand, prior literature shows that analysts are able to make their own accurate forecasts that can be relatively more accurate than those made by the management, even as tax-related information becomes more complex (Bratten et al. 2017). We visualize the tension invoked by an increase in tax information complexity in Figure 1. As illustrated in the figure, the information complexity framework predicts an ambiguous response from analysts when faced with increased tax information complexity.

[Figure 1 about here.]

As we largely base our theoretical foundation on the concept of information complexity and the resulting task simplification by analysts, we formulate our second hypothesis in alternative form:

H2: An increase in tax information complexity amplifies analysts mimicking (i.e., adopting) a firm's ETR forecast.

3 Sample Selection

Extracting & Merging Management ETR Forecasts

To identify voluntary ETR forecasts provided by management, we use conference call transcripts sourced from LSEG (formerly Refinitiv) Eikon[6]. Our original dataset consists of 333,529 transcripts spanning the years 2001 to 2020. Within these transcripts, we conducted targeted keyword searches to capture a broad range of relevant tax sentences. The keywords we used to extract relevant sentences were: *tax*rate(s)*, *ETR* and *effective tax*. To ensure high precision, we further

[6]In addition to voluntary ETR forecasts, Bratten et al. 2017 highlight that ASC 740-270 requires managers to disclose a de facto annual ETR forecast, which can be considered a mandatory ETR forecast. However, Chen, Chi, and Shevlin 2023 provide evidence that voluntary ETR forecasts tend to be more accurate and, consequently, incrementally more informative than mandatory ETR forecasts. Therefore, our primary focus lies on the firms' voluntary ETR forecasts.

refined our selection by retaining only those sentences that included percentage indicators, specifically the % symbol, or the words *per*cent* or *percentage*. In doing so, we identified a total of 64,079 sentences containing voluntary ETR forecasts. Appendix A 1 provides examples for the extracted sentences.

After extracting the relevant sentences, we conducted a manual review of hundreds of these sentences to gain a deeper understanding of how managers provide voluntary guidance on future ETRs[7]. This manual examination contributed to the creation of a data frame designed for the granular capture of the disclosed ETRs' characteristics. Leveraging this data frame and our insights from manual classification, we employed a large language model (LLM), specifically ChatGPT's 4o model, to classify all extracted sentences[8]. The outcome of this process is a novel dataset containing voluntarily-provided management ETR forecasts expressed as percentages. Appendix A 2 details the prompt used for the LLM, while Appendix A 3 displays the classification tree that summarizes the individual classification steps of the manual classification[9]. Lastly, Appendix A 4 provides descriptions of all the data fields included in our newly created management ETR forecasts dataset. In order to maintain a cohesive time window, we focus on management ETR forecasts relating to future fiscal quarters. After filtering for management forecasts with an explicit quarterly reference, we retained 10,976 management ETR forecasts from 1,963 distinct firms[10][11].

[7]For the manual review process, we developed an application using the "Shiny" package in R. This app allows users to manually classify randomly selected sentences containing ETRs by responding to a series of pre-defined questions. As users answer these questions, the app automatically populates a data frame, which can then be utilized as a dataset for further analysis. We thank Sebastian Geschonke for his excellent support in co-developing and hosting the app. The code for this classification app is available on GitHub upon request.

[8]We used OpenAI's API to process all sentences. We used the version gpt-4o-2024-08-06, which has training data up to October 2023.

[9]It should be noted that the final GPT classification prompt has more answer options for some classification steps when compared to the manual classification tree. These additional categories were identified during our manual classification process and were subsequently added to the GPT classification prompt.

[10]"Explicit" in this context means that both an ETR in percent and a clear, forward-looking quarterly time reference must be mentioned within the extracted sentence.

[11]We gathered more data from these conference call transcripts than we used in this study (e.g., ETR guidance that refers to the past, whether an ETR forecast is disclosed within the presentation or Q&A section of the conference call, and ETR forecasts that were issued while the disclosing person uses ambiguous

We merge our quarterly management ETR forecasts with analysts' implied ETR forecasts as provided by I/B/E/S Detail History. In order to cover a broad spectrum of analyst forecasts, we include both newly-announced and revised forecasts[12]. We follow Koutney, Aier, and Tideman 2024 and include all analyst forecasts published within a time window of 14 days from day d of a conference call. Thus, we create a dataset on the analyst level, where an analyst a publishes their forecast for firm i on day d, with the respective forecast pertaining to fiscal quarter-end q[13]. This approach provides us with a dataset consisting of 11,953 forecasts provided by 2,261 analysts who cover 846 firms. For these observations, we include quarterly and annual controls for firm-level characteristics, management-provided earnings guidance, analyst characteristics and institutional ownership, which were extracted from Compustat, I/B/E/S Guidance, I/B/E/S Detail History and Thomson-Reuters 13-F, respectively. After merging all datasets and creating lagged variables, we have a final dataset containing 10,491 implied ETR forecasts issued by 2,051 analysts covering 705 firms. An overview of the sample selection process is listed in Table 1.

[Table 1 about here.]

Measuring Management Tax Forecasting Reputation

We use two proxies to measure management tax forecasting reputation: One that captures intertemporal accuracy and another that assesses the accuracy of a single ETR forecast. The first measure, *Absolute Forecast Accuracy* ($AFA_{i,d,q}$), focuses on the accuracy of a single management ETR forecast and is based on the methodology used by Bratten et al. 2017. It is defined as follows:

$$AFA_{i,d,q} = -1 \; x \; (\mid ETR\_Actual_{i,q-1} - Mgmt\_ETR\_Forecast_{i,d-1,q-1} \mid). \tag{1}$$

words). We will exploit this additional heterogeneity in future cross-sectional studies.

[12]Newly-announced forecasts are forecasts that received a new entry within the I/B/E/S database while revised forecasts are already-existing forecasts that were revised by the analyst. We account for potential duplicates due to analysts announcing and revising their forecasts on the same day by taking the most recently-issued forecast on that day.

[13]Likewise, the corresponding management ETR forecast by firm i disclosed during the conference call on day d also refers to the same fiscal quarter-end q.

where $ETR\_Actual_{i,q-1}$ is the actual implied ETR of firm i for the previous fiscal quarter end *q-1* as reported in I/B/E/S. The variable $Mgmt\_ETR\_Forecast_{i,d-1,q-1}$ represents the ETR forecast disclosed by firm i during the previous conference call on day *d-1*, pertaining to the same fiscal quarter end *q-1*[14]. Thus, $AFA_{i,d,q}$ is calculated as the absolute difference between the actual ETR and the management ETR forecast issued by firm i during the prior conference call on day d, both relating to the end of the previous fiscal quarter *q-1*. In line with Bratten et al. 2017, we take the absolute difference and multiply it by -1, so that higher values of $AFA_{i,d,q}$ indicate greater accuracy of the given ETR forecast. Therefore, $AFA_{i,d,q}$ assesses the accuracy of management's most recent ETR forecast for which an actual value is available to the analyst.

Since reputation is typically established over multiple periods and through consistent behavior, we additionally utilize an *Average Absolute Forecast Accuracy* ($AAFA_{i,d,q}$) as our second proxy. $AAFA_{i,d,q}$ is modeled after the approach used by Chen, Francis, and Jiang 2005 and Hutton and Stocken 2021, which we specifically adapt to a tax context:

$$AAFA_{i,d,q} = -1\ x\ (\frac{1}{n}\ \sum_{k=1}^{n}\ (|\ ETR\_Actual_{i,q-k} - Mgmt\_ETR\_Forecast_{i,d-k,q-k}\ |)). \qquad (2)$$

ETR_Actual and $Mgmt\_ETR\_Forecast$ are as defined for equation (1). For $AAFA_{i,d,q}$, the absolute difference between $ETR\_Actual_{i,q-k}$ and $Mgmt\_ETR\_Forecast_{i,d-k,q-k}$ is cumulated over time and scaled by the number n of firm-issued management ETR forecasts up to the ETR forecast disclosed within the pevious conference call *d-k*. Thus, a higher value of $AAFA_{i,d,q}$ indicates a greater accuracy of the provided ETR forecast over a firm's entire observation period. By considering both cumulative and individual forecast accuracy, our study offers a comprehensive assessment of management's forecasting reputation in the context of tax-related disclosures.

[14] If a management ETR forecast is disclosed as a range value (e.g., from 21% to 23%), we take the mean value of the range.

Measuring Analysts' Reaction

For analysts' tax forecasting behavior, we rely on data from I/B/E/S Detail History. Since I/B/E/S does not provide explicit ETR forecasts, we follow the approach outlined by Bratten et al. 2017 and compute the *implied* ETR forecasts using the following calculations:

$$Tax\_Expense\_Forecast_{a,i,d,q} = PRE_{a,i,d,q} - NET_{a,i,d,q}, \tag{3}$$

where $PRE_{a,i,d,q}$ are the *Pre-Tax Profits* forecasts, while $NET_{a,i,d,q}$ are the *Net Income* forecasts issued by analyst a for firm i on day d, pertaining to fiscal quarter end q as reported in I/B/E/S. Subsequently, we measure an analyst's implied ETR forecast:

$$Analyst\_Implied\_ETR_{a,i,d,q} = Tax\_Expense\_Forecast_{a,i,d,q}/PRE_{a,i,d,q}. \tag{4}$$

To measure whether analysts follow the ETR forecast provided voluntarily by managers, we assume that analyst a mimics the ETR guidance of firm i if the absolute difference between the management's and the analyst's ETR forecasts is less than one-half percentage point (Bratten et al. 2017):

$$Mimic_{a,i,d,q} = \begin{cases} 1 & \text{if } \left| Mgmt\_ETR\_Forecast_{i,d,q} - Analyst\_Implied\_ETR_{a,i,d,q} \right| < 0.005 \\ 0 & \text{otherwise} \end{cases}$$

To provide a clearer understanding of the timing of our analysis, Figure 2 visualizes the conceptual timeline of the analysts' mimicking decision. It shows that analysts consider both the past $AFA_{i,d,q}$ and $AAFA_{i,d,q}$ to evaluate the reliability of the ETR disclosed in the current conference call.

[Figure 2 about here.]

4 Research Design

In order to measure the overall association between management tax forecasting reputation and analysts' tax forecasting reaction, we employ the following baseline regression:

$$\begin{aligned} Mimic\_Var = \beta_0 + \beta_1(Forecast\_Reputation_{i,d,q}) + \beta_2(TCJA_{i,q,t}) + \\ \beta_3(Forecast\_Reputation_{i,d,q}\ x\ TCJA_{i,q,t}) + \\ \beta_4(Firm\_Characteristics_{i,q-1}) + \beta_5(Tax\_Characteristics_{i,q-4\ to\ q-1}) + \\ \beta_6(Analyst\_Characteristics_{a,i,q}) + \mu_a + \tau_i + \phi_q + \varepsilon_{a,i,d,q,t}, \end{aligned} \tag{5}$$

where *Mimic_Var* is a placeholder for either $Mimic_{a,i,d,q}$ or $Mimic\_Frac_{i,d,q}$. $Mimic_{a,i,d,q}$ is a dummy variable equal to one if the absolute difference between the analyst's and the management's ETR forecasts is less than one-half percentage point. $Mimic\_Frac_{i,d,q}$ denotes the fraction of mimicking analysts that cover firm i with an ETR forecast issued on d, all referring to same fiscal quarter q. We estimate the coefficients for $Mimic_{a,i,d,q}$ using a linear probability model, while the effects on $Mimic\_Frac_{i,d,q}$ are estimated using an OLS model[15].

$Forecast\_Reputation_{i,d,q}$ indicates our management tax forecasting reputation proxies, which are either $AFA_{i,d,q}$ or $AAFA_{i,d,q}$, both defined in the previous section. We use the enactment of the TCJA as a quasi-exogenous shock to the degree of tax information complexity. Hence, $TCJA_{i,q,t}$ is a dummy variable equal to one for all management ETR forecasts that refer to a quarter within the fiscal year 2018 or later (i.e., the fiscal years in which the new regulations of the TCJA are binding), and zero otherwise. $Firm\_Characteristics_{i,q-1}$ is a vector of controls containing the firm-related characteristics $Size_{i,q-1}$, $BTM_{i,q-1}$, $Coverage_{i,q-1}$, $Instown_{i,q-1}$, $ROA_{i,q-1}$, $Leverage_{i,q-1}$, $MVAL_{i,q-1}$, $Earn\_Guide_{i,q-1}$, and $Litrisk_{\ i,q-1}$. Additionally, $Tax\_Characteristics_{i,q-4\ to\ q-1}$ in-

[15] In untabulated tests, we re-estimate all linear probability models with $Mimic_{a,i,d,q}$ as the dependent variable by using logit models instead. The results remain consistent, including the strong and highly significant effects of the interaction terms within the difference-in-differences regression model (6). All logit models are estimated with firm and fiscal quarter-year fixed effects, and standard errors clustered at the firm and fiscal quarter levels.

cludes the firm-specific, tax-related variables $GAAP\ \_ETR_{i,q-1}$ and $\sigma\_ETR_{i,q-4}$. To mitigate simultaneity concerns, both $Firm\_Characteristics_{i,q-1}$ and $Tax\_\ Characteristics_{i,q-4\ to\ q-1}$ are lagged by at least one fiscal quarter. Lastly, $Analyst\_Characteristics_{a,i,q}$ contains current-quarter controls accounting for the analysts' forecasting behavior. Specifically, these are $BSIZE_{a,i,q}$, $Forecast\_Horizon_{a,i,q}$, $Companies_{a,i,q}$, and $For\_Frequency_{a,i,q}$[16]. μ_a, τ_i and ϕ_q denote analyst, firm and fiscal quarter-year fixed effects, respectively. For all regressions, we cluster our standard errors at firm and fiscal quarter level. We winsorize all continuous variables at the 1% and 99% levels. An overview of all variable definitions is provided in Appendix A 5. The descriptive statistics of all included variables are presented in Table 2.

[Table 2 about here.]

5 Results

One Quarter, Several ETRs

Before presenting our regression results, we provide additional descriptive analyses of the intertemporal development of the ETRs within our sample. Figure 3 presents the mean values of the four quarterly ETRs that are included in our empirical analyses. The *actual* mean quarterly *GAAP ETR* exhibits considerable volatility, marked by pronounced fluctuations between peaks and troughs. This pattern aligns with the fact that quarterly GAAP ETRs are frequently skewed by discrete items, including significant one-time tax benefits or settlement payments to the IRS, which are required to be fully reported within the quarter in which they occur (Bratten et al. 2017). In contrast, the actual mean *I/B/E/S ETR*, calculated as the difference between the actual *PRE* and *NET* values reported in I/B/E/S, tends to exhibit lower volatility, though some fluctuation remains evident. Conversely, the mean ETR forecasts by managements and analysts are notably smoother. It appears that both managers and analysts prefer to forecast a "clean" ETR that is free of dis-

[16]The control variables within $Analyst\_Characteristics_{a,i,q}$ refer to the *calendar* quarter in which the analyst publishes or revises their forecast, and not the fiscal quarter the published forecast refers to.

crete items that otherwise may distort earnings forecasting. Moreover, the strong convergence between both ETR forecasts may suggest a significant level of mimicking behavior by the analysts, which also corroborates the findings of Chen, Chi, and Shevlin 2023, who conclude that voluntary management tax forecasts provide incremental information to analysts, prompting timely reactions from them[17]. In summary, the substantial discrepancy between regular GAAP ETRs and voluntary ETR forecasts by managements and analysts highlights the distinct nature of voluntary tax forecasting and underscores the value of its analysis.

[Figure 3 about here.]

General Results

We begin by presenting the results of our baseline regression ((5)). Table 3 displays the estimated coefficients for our two forecasting reputation proxies, $AFA_{i,d,q}$ and $AAFA_{i,d,q}$. The results indicate that an increase in both *AFA* and *AAFA* is associated with a higher likelihood and proportion of analysts mimicking management's ETR forecast, with the coefficients for *AAFA* showing a larger magnitude. It appears that a long-term positive forecasting reputation (i.e., *AAFA*) has a more profound effect on analysts mimicking management-provided voluntary tax forecasts. Quantitatively, a one-unit increase in the *AFA* (*AAFA*) measure raises the probability of an analyst mimicking a management ETR forecast by approximately 35 (61) percentage points, while the fraction of mimicking analysts increases by 34.7% (60%). This confirms our first hypothesis H1 that an increase in managements' tax forecasting reputation is associated with an increase in analysts mimicking these tax forecasts. Thus, firms can establish a positive forecasting reputation with analysts within a tax-specific context[18]. Our analysis reveals no substantial evidence of either a detrimental or enhancing

[17] In addition, it appears that the investigated ETRs have generally declined over our observation period. This would be consistent with the findings of Dyreng et al. 2017, who identify long-term decreasing trends in annual ETRs for both multinational and domestic US firms.

[18] In untabulated tests, we also took the raw forecasting error measures that were not multiplied by -1. The results of these tests indicate that analysts tend to not mimic those firms that do have high forecasting errors, which is consistent with our main findings.

effect of the TCJA on analysts' mimicking behavior, even when interacting both reputational proxies with the *TCJA* dummy. It appears that the regulatory change itself did not substantially alter analysts' tax forecasting behavior. Therefore, the results of this test do not allow us to confirm our second hypothesis H2.

[Table 3 about here.]

The Effect of High Tax Information Complexity

The analysis in the previous subsection assumes that the TCJA led to a uniform increase in tax information complexity for all firms included in our sample. However, the TCJA comprises several elements that vary in complexity. For example, the implementation of a flat 21% federal statutory corporate tax rate is a less complex element of the TCJA, making it easier for firms and stakeholders to assess its effects on affected firms[19]. However, one of the more complex elements of the TCJA was the implementation of the Base Erosion and Anti-Abuse Tax (BEAT), which is specifically designed to target large US firms that make significant tax-deductible payments to foreign related parties, for example towards tax havens. BEAT requires firms with average annual gross receipts of at least $500 million over their three preceding tax years to calculate a separate BEAT tax liability that takes base erosion payments into account. Ultimately, firms required to report under BEAT must calculate their tax liabilities both under the regular US tax system and the BEAT system, ultimately paying the higher amount at year-end. Besides its complex calculation, BEAT also includes loopholes that firms can potentially exploit to avoid being subject to base erosion taxation[20]. For example, Kelley et al. 2024 provide evidence for firms reclassifying payments to

[19] Before the enactment of the TCJA, the federal corporate tax rate ranged from 15% to 35%. Hence, one may argue that the introduction of the flat tax brought a decrease in tax information complexity.

[20] Another reason why we argue that the introduction of BEAT caused an increase in tax information complexity is the absence of initial guidance provided by regulators. While BEAT was implemented for any taxable year beginning after December 31st, 2017, comprehensive guidance by the IRS was provided almost one year later, on December 21st, 2018 (see IRS Proposed Rule REG-104259-18), which was subsequently finalized on December 6th, 2019 as Treasury Decision (TD) 9885. Therefore, there was a substantial time gap between the implementation of BEAT and the provision of comprehensive guidance, which likely contributed to an increase in tax information complexity.

related parties as cost of goods sold, thus avoiding the BEAT[21]. Given this level of discretion, we argue that the introduction of BEAT significantly increased tax information complexity for external stakeholders, such as analysts. Consequently, we predict that BEAT will have ambiguous effects on analysts' tax forecasting behavior. To investigate this, we extend our baseline regression (5) to a DiD design:

$$\begin{aligned} Mimic\_Var = {} & \beta_0 + \beta_1(Forecast\_Reputation_{i,d,q}) + \beta_2(TCJA_{i,q,t}) + \beta_3(BEAT_{i,t}) \\ & + \beta_4(BEAT_{i,t}\ x\ TCJA_{i,q,t}) + \beta_5(BEAT_{i,t}\ x\ Forecast\_Reputation_{i,d,q}) + \\ & \beta_6(TCJA_{i,t}\ x\ Forecast\_Reputation_{i,d,q}) + \\ & \beta_7(BEAT_{i,t}\ x\ TCJA_{i,t}\ x\ Forecast\_Reputation_{i,d,q}) + \\ & \beta_8(Firm\_Characteristics_{i,q-1}) + \beta_9(Tax\_Characteristics_{i,q-4\ to\ q-1}) + \\ & \beta_{10}(Analyst\_Characteristics_{a,i,q}) + \\ & \mu_a + \rho_j + \phi_q + \varepsilon_{a,i,j,d,q,t}, \end{aligned} \tag{6}$$

where the newly added variable $BEAT_{i,t}$ is a dummy variable equal to one if firm i has three-year average operating revenues (i.e., *sales*) greater than $500 million in fiscal year 2015 or later, and zero otherwise[22]. The triple interaction coefficient, β_7, captures the combined effect of the TCJA (i.e., our *post* variable), BEAT (i.e., our *treatment* variable) and *AFA* or *AAFA* on analyst mimicking behavior. Due to collinearity issues, we employ industry fixed effects based on two-digit *SIC* industry codes, denoted as ρ_j, instead of firm fixed effects. To ensure robust comparability between treated and untreated observations, we apply entropy balancing on the matching variables $Size_{i,q-1}$, $Coverage_{i,q-1}$, $Leverage_{i,q-1}$, $GAAP\_ETR_{i,q-1}$, and two-digit *SIC* industry codes prior to conducting the regression analysis.

[21] In addition to BEAT, the TCJA also introduced the Global Intangible Low-Taxed Income (GILTI) provision. GILTI is designed to tax certain income types earned by Controlled Foreign Corporations (CFCs), especially income from intangible assets that is generated outside the US. Since it is difficult to quantitatively identify CFCs of US firms, we choose to focus on BEAT instead.

[22] This approach is identical to the methodology employed by Kelley et al. 2024.

[Table 4 about here.]

Table 4 presents the results of our DiD regression. The positive and highly significant coefficients on *AFA* and *AAFA* are consistent with the baseline regression of the previous subsection, and further corroborate our first hypothesis H1. However, in contrast to our previous findings, the interaction terms *TCJA x AFA* and *TCJA x AAFA* are highly significant and positive, suggesting that following the implementation of the TCJA, a strong short- or long-term forecasting reputation increases the likelihood of analysts mimicking management-provided forecasts. Notably, the effect is more pronounced for long-term forecasting reputation, as reflected in the larger coefficient magnitude. This suggests that, during periods of increased tax information complexity, analysts may rely more heavily on management-provided guidance when generating their own tax forecasts. Interestingly, the coefficient on *BEAT x TCJA x AAFA* is negative and highly significant. This result implies that, among BEAT firms during the TCJA period, higher average forecast accuracy reduces the likelihood of analysts mimicking management's ETR forecasts. This interaction highlights a unique dynamic in which a regulatory change that heightens tax information complexity interacts with forecast reputation to diminish mimicking behavior. It appears that in increasingly complex tax contexts, a strong tax forecasting reputation is insufficient to prompt analysts to simply follow management-provided guidance. This result contradicts our second hypothesis H2, which posits that analysts would increase their mimicking behavior in situations of heightened tax information complexity. Instead, analysts appear to favor diverging from management's ETR forecasts, opting to issue independent forecasts. Thus, we find no evidence to confirm H2.

6 Additional Analyses

The Effects of Low Forecasting Reputation

Next, we conduct additional cross-sectional analyses. One of our initial predictions was that an increase in management forecasting reputation would result in more analysts mimicking

management-provided forecasts, whereas a negative reputation would discourage analysts from doing so. While our main analysis addresses and confirms the former prediction, the tests conducted in this subsection focus on the latter. Specifically, we aim to investigate how the mimicking effect manifests in low-reputation firms. To accomplish this, we expand on our baseline regression equation (5) by introducing the indicator variables $Lowrep\_AFA_{i,d,q}$ and $Lowrep\_AAFA_{i,d,q}$, which are equal to one if the given value for *AFA* or *AAFA* falls within the bottom 10th percentile of its distribution, and zero otherwise. We further interact both variables with our primary reputation proxies (*AFA* and *AAFA*) as well as with the *TCJA* dummy. The results are presented in Table 5.

[Table 5 about here.]

The results reinforce our primary finding that a positive management forecasting reputation amplifies analyst mimicking behavior. Additionally, the results demonstrate the deteriorating effects of a negative forecasting reputation. A low *AFA* or *AAFA* is associated with a significant and negative change in analysts following a voluntary ETR forecast. The effect is particularly pronounced for our short-term reputation proxy, *AFA*, suggesting that a positive forecasting reputation may be compromised by a single inaccurate forecast. Regarding the effects of the TCJA, we find that its implementation does not alter analyst mimicking behavior. Overall, these findings support the general notion that analysts are more likely to mimic firms with a strong forecasting reputation, whereas firms with a negative forecasting reputation experience less mimicking by analysts. This relationship remains stable despite the increased tax information complexity introduced by the TCJA.

Mimicking vs. Non-mimicking Analysts: Who Is More Accurate?

In this subsection, we aim to investigate whether mimicking firm-provided ETR forecasts is advantageous for analysts. For this purpose, we calculate the *AFA* from the analysts' perspective, which we label $AFA\_Analys_{a,i,d,q}$, to examine how *Mimic* correlates with analysts' ETR forecasting

accuracy. The regression model is structured as follows:

$$\begin{aligned} AFA\_Analys_{a,i,d,q} = \beta_0 + \beta_1(Mimic_{a,i,d,q}) + \beta_2(TCJA_{i,q,t}) + \beta_3(Mimic_{a,i,d,q}\ x\ TCJA_{i,q,t}) \\ + \beta_4(Firm\_Characteristics_{i,q-1}) + \beta_5(Tax\_Characteristics_{i,q-4\ to\ q-1}) + \\ \beta_6(Analyst\_Characteristics_{a,i,q}) + \mu_a + \tau_i + \phi_q + \varepsilon_{a,i,d,q,t}. \end{aligned} \tag{7}$$

Table 6 presents the findings with and without additional controls. Both columns indicate that mimicking analysts tend to issue more accurate ETR forecasts, supporting our conclusion that analysts prefer to mimic firms with a history of accurate tax forecasts, thereby improving the accuracy of their own forecasts. This pattern persists following the TCJA, as evidenced by the non-significant interaction between *Mimic* and *TCJA*. Overall, analysts who mimic firms tend to issue more accurate ETR forecasts, likely due to their pre-selection of firms that consistently provide reliable tax forecasts. These results emphasize that this tendency is unaffected by changes in tax information complexity.

[Table 6 about here.]

Which ETR Do Analysts Rely On?

Our DiD design reveals evidence that the implementation of highly complex tax regulations, such as the BEAT, leads analysts to not mimic voluntary management ETR forecasts, even if the management's long-term forecasting reputation is generally positive. This raises the question of whether analysts rely on alternative information sources to estimate firms' future ETRs. In addition to voluntarily provided ETRs, firms are required to report quarterly GAAP ETRs by using their year-to-date pre-tax income and applying an estimated annual ETR to calculate year-to-date tax expenses. Consequently, the existing literature refers to these reported quarterly GAAP ETRs as *mandatory* ETR forecasts (Bratten et al. 2017; Chen, Chi, and Shevlin 2023)[23]. These manda-

[23] Both studies provide detailed explanations for how these mandatory ETR forecasts are calculated under the integral approach.

tory ETR forecasts may serve as an alternative information source for analysts when voluntary ETR forecasts lose their informativeness. Hence, we expand on our DiD regression equation (6) by introducing the $AFA\_GAAP_{i,q}$ proxy that assesses the absolute forecast accuracy of a given quarterly-reported GAAP ETR. In line with previous studies (Bratten et al. 2017; Chen, Chi, and Shevlin 2023), this measure is defined as the absolute value of the difference between the year-to-date GAAP ETR for firm *i* in quarter *q* and the I/B/E/S actual implied ETR for the same quarter q, multiplied by -1. Table 7 presents the results.

[Table 7 about here.]

The interaction terms involving *AFA_GAAP* are generally insignificant, with the exception of the interaction between *AFA_GAAP* and *TCJA*, which is largely negative and significant. This suggests that, in periods of heightened tax information complexity, analysts tend to not mimic mandatory ETR forecasts and may even actively disregard them. These results confirm the findings of both Bratten et al. 2017 and Chen, Chi, and Shevlin 2023 that analysts tend to not mimic mandatory ETR forecasts under increased tax complexity. While our study confirms an increased reliance on voluntary management ETR forecasts by analysts, this relationship weakens as tax information complexity increases, as seen with the introduction of BEAT. The alternative information sources analysts may use in place of mandatory and voluntary ETR forecasts in such situations remain unclear.

7 Discussion & Conclusion

This study explores the influence of management's tax forecasting reputation on analyst forecasting behavior, particularly in the context of tax-related regulatory complexity. Focusing on the effect of the TCJA, we investigate whether analysts are more likely to mimic firms' ETR forecasts when the firm has a positive forecasting reputation and how this association changes when tax information complexity rises. The main findings confirm that analysts are more inclined to mimic firms with a high reputation for accurate tax forecasts, especially post-TCJA, indicating that

regulatory complexity generally increases analysts' reliance on reputable firms' guidance.

Additionally, this study reveals that while high tax information complexity generally increases mimicking behavior, extreme complexity – such as that introduced by the BEAT – reduces analysts' reliance on management-provided guidance, even among high-reputation firms. These results emphasize that a strong management forecasting reputation amplifies reliance among analysts, but only to a point; excessive complexity can erode this effect. Further cross-sectional analyses show that firms with a low forecasting reputation experience minimal mimicking, underlining the critical role of reputation-building in volatile and complex information environments.

Our analysis further demonstrates that mimicking analysts who align their forecasts with management-provided guidance tend to produce more accurate ETR forecasts. This higher accuracy suggests that analysts selectively mimic firms with established forecasting credibility, which improves their own forecast precision. However, in situations of extreme complexity, such as under the BEAT provisions of the TCJA, analysts deviate from both the mandatory GAAP and voluntary ETR forecasts provided by firms. This divergence highlights a threshold of complexity beyond which regular ETR metrics appear to lose their informativeness.

To our knowledge, this study is among the first to bridge the fields of management forecast reputation and analyst forecast behavior while considering the role of tax information complexity. Our findings contribute to empirical accounting research in two key ways. First, we address whether analysts can accurately forecast taxes, adding to mixed evidence in the literature. While some studies indicate analysts can navigate tax complexity (e.g., Bratten et al. 2017), others show challenges (e.g., Francis, Neuman, and Newton 2019; Kim, Schmidt, and Wentland 2020). Our study reconciles these strands of literature by demonstrating that analysts can rely on firm-provided guidance, even under increased tax information complexity, to issue more accurate tax forecasts. However, this reliance is effective only to certain extent: Overly complex tax regulations, such as the BEAT, potentially causes dissent between firms and analysts, which could lead to analysts not mimicking management ETR forecasts, even when they exhibit an accurate forecasting history.

Second, we extend the research on management forecasting reputation by examining its effect within a tax context. We find that firms can build a reputation for disclosing accurate tax forecasts, and a positive forecasting reputation amplifies analysts mimicking behavior. This behavior suggests analysts generally view managements as having superior insights into tax implications, which enhances forecast reliability (Hutton, Lee, and Shu 2012; Maslar, Serfling, and Shaikh 2021). Thus, our research underscores the interplay between forecasting reputation, voluntary tax disclosures, and regulatory pressures in shaping analyst behavior.

Our study is subject to some limitations. First, we focus on quarterly ETR forecasts. Quarterly mandatory GAAP ETRs are typically highly volatile due to discrete items that distort its purpose of being an estimated annual ETR (Bratten et al. 2017; Chen, Chi, and Shevlin 2023). Given this volatility, it is plausible that analysts prefer to mainly rely on voluntary ETR guidance, which is free from these discrete items, thereby leading to a self-selection bias toward voluntary management ETR forecasts. Second, the GPT-based classification of ETR forecasts extracted from conference calls may be prone to errors. To mitigate this, we randomly selected sentences from our sample and manually corrected them when necessary[24]. Lastly, our study cannot account for alternative tax information channels beyond conference call transcripts and quarterly reports. Any additional sources of tax information accessed by analysts, such as private meetings or direct calls with managers, remain outside the scope of our study. Identifying these alternative information channels may provide a valuable avenue for future research.

[24]It is important to acknowledge that manual classification is also prone to potential classification errors.

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Tables

Table 1
Sample selection.

	No. of observations	No. of management ETR forecasts	No. of analysts	No. of firms
All sentences extracted from LSEG Eikon conference calls transcripts from 2001 to 2020 containing the keywords *tax*rate(s)*, *ETR* or *effective tax*, and including either a percentage sign (%), or the word *per*cent* or *percentage*.	64,079	64,079	.	3,049
Retained only quarterly voluntary management ETR forecast explicitly relating to future fiscal quarters.	10,925	10,925	.	1,961
Merged with analysts' implied ETR forecasts (i.e., the difference between pre-tax profits and net income forecasts, divided by the pre-tax profits), extracted from I/B/E/S Detail History.	15,211	5,653	2,261	845
Merged with control variables from Compustat, I/B/E/S Guidance, I/B/E/S Detail History, Thomsom-Reuters 13-F, and taking lagged variables.	10,491	4,749	2,051	705

Table 2

Descriptive statistics.

Variable	N	Mean	Std. Dev.	25th	50th	75th
Mimic	10,491	0.493	0.500	0.000	0.000	1.000
Mimic_Frac	10,491	0.493	0.419	0.000	0.500	1.000
AFA	10,491	-0.077	0.142	-0.070	-0.023	-0.006
AAFA	10,491	-0.036	0.088	-0.027	-0.006	-0.002
AFA_Analys	10,491	-0.076	0.146	-0.064	-0.022	-0.006
AFA_GAAP	10,491	-0.155	0.397	-0.097	-0.011	-0.000
Lowrep_AAFA	10,491	0.100	0.301	0.000	0.000	0.000
Lowrep_AFA	10,491	0.100	0.300	0.000	0.000	0.000
Mgmt_ETR_Forecast	10,491	0.276	0.095	0.215	0.290	0.350
Actual_ETR	10,491	0.255	0.178	0.185	0.276	0.347
Analyst_Implied_ETR	10,491	0.273	0.127	0.215	0.295	0.355
Size	10,491	8.289	1.717	6.999	8.106	9.530
BTM	10,491	0.449	0.299	0.242	0.379	0.577
MVAL	10,491	20.967	45.560	1.600	4.181	15.325
ROA	10,491	0.018	0.021	0.008	0.017	0.029
Leverage	10,491	0.150	0.166	0.001	0.108	0.231
Coverage	10,491	12.214	5.950	7.833	11.100	15.633
Instown	10,491	0.459	0.412	0.000	0.619	0.852
EPS_Guidance	10,491	0.162	0.369	0.000	0.000	0.000
Litrisk	10,491	0.132	0.339	0.000	0.000	0.000
Loss	10,491	0.085	0.278	0.000	0.000	0.000
σ_ETR	10,491	7.820	18.429	1.072	2.343	7.086
GAAP_ETR	10,491	0.255	0.362	0.181	0.282	0.354
BSIZE	10,491	32.922	20.078	17.000	30.000	47.000
Forecast_Horizon	10,491	14.571	12.889	5.000	11.000	21.000
Companies	10,491	15.196	5.766	11.000	15.000	19.000
For_Frequency	10,491	14.321	9.824	8.000	12.000	18.000
BEAT	10,491	0.570	0.495	0.000	1.000	1.000
TCJA	10,491	0.117	0.322	0.000	0.000	0.000

All continuous variables are winsorized at the 1% and 99% levels.

Table 3

Results of the baseline regression.

	(1) Mimic	(2) Mimic_Frac	(3) Mimic	(4) Mimic_Frac
AFA	0.349***	0.347***		
	(0.078)	(0.079)		
AAFA			0.608***	0.593***
			(0.139)	(0.137)
TCJA	0.119	0.194	0.123	0.198
	(0.132)	(0.139)	(0.132)	(0.139)
AFA x TCJA	0.067	0.080		
	(0.211)	(0.206)		
AAFA x TCJA			-0.332	-0.318
			(0.701)	(0.674)
Size	0.002	-0.003	0.003	-0.002
	(0.040)	(0.040)	(0.039)	(0.039)
BTM	-0.080	-0.064	-0.063	-0.047
	(0.061)	(0.058)	(0.063)	(0.060)
MVAL	-0.000	-0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
ROA	0.638	0.697	0.629	0.688
	(0.786)	(0.725)	(0.793)	(0.741)
Leverage	0.134	0.139	0.133	0.137
	(0.156)	(0.148)	(0.154)	(0.145)
Instown	0.325	0.351*	0.262	0.291
	(0.237)	(0.210)	(0.226)	(0.202)
EPS_Guidance	0.085	0.084	0.099	0.098
	(0.091)	(0.093)	(0.088)	(0.091)
Litrisk	-0.006	-0.019	-0.010	-0.022
	(0.033)	(0.032)	(0.034)	(0.033)
Loss	-0.038	-0.033	-0.042	-0.037
	(0.042)	(0.041)	(0.045)	(0.044)
σ_ETR	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
GAAP_ETR	0.025	0.016	0.025	0.016
	(0.021)	(0.021)	(0.022)	(0.021)

	(1) Mimic	(2) Mimic_Frac	(3) Mimic	(4) Mimic_Frac
BSIZE	0.001	0.000	0.001	0.000
	(0.001)	(0.000)	(0.001)	(0.000)
Coverage	0.009	0.009*	0.008	0.009
	(0.006)	(0.005)	(0.006)	(0.005)
Forecast_Horizon	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Companies	0.001	-0.000	0.001	-0.000
	(0.002)	(0.001)	(0.002)	(0.001)
For_Frequency	-0.000	-0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Obs.	10,491	10,491	10,491	10,491
Firm FE	X	X	X	X
Analyst FE	X	X	X	X
Quarter-Year FE	X	X	X	X
Clustered	Firm, Quarter	Firm, Quarter	Firm, Quarter	Firm, Quarter
Adj. R^2	0.276	0.386	0.274	0.383

Table 3 shows the regression coefficients for regression equation (5). Columns (1) and (2) display the changes in analyst mimicking for our forecast reputation proxy *AFA*, while columns (3) and (4) display the changes in analyst mimicking for our forecast reputation proxy *AAFA*. Standard errors are presented in parentheses. *, **, and *** indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. The coefficients are estimated using firm, analyst, and fiscal-quarter fixed effects, and standard errors clustered at the firm and fiscal-quarter level. All variables are defined in Appendix A 5.

Table 4

Results of the DiD regression.

	(1) Mimic	(2) Mimic_Frac	(3) Mimic	(4) Mimic_Frac
AFA	0.484***	0.500***		
	(0.104)	(0.089)		
AAFA			0.772***	0.776***
			(0.173)	(0.151)
TCJA	0.150	0.168	0.169	0.187
	(0.130)	(0.126)	(0.128)	(0.124)
BEAT	-0.022	-0.019	-0.030	-0.025
	(0.030)	(0.029)	(0.030)	(0.029)
BEAT x TCJA	-0.133	-0.091	-0.148	-0.106
	(0.092)	(0.094)	(0.092)	(0.094)
BEAT x AFA	-0.079	-0.081		
	(0.128)	(0.111)		
BEAT x AAFA			-0.214	-0.163
			(0.228)	(0.214)
TCJA x AFA	0.699**	0.542*		
	(0.346)	(0.295)		
TCJA x AAFA			2.176**	1.828**
			(0.952)	(0.791)
BEAT x TCJA x AFA	-0.509	-0.310		
	(0.442)	(0.390)		
BEAT x TCJA x AAFA			-2.195**	-1.812*
			(1.085)	(0.969)
Size	-0.038**	-0.037**	-0.044***	-0.042***
	(0.015)	(0.015)	(0.015)	(0.015)
BTM	-0.025	-0.008	-0.030	-0.014
	(0.049)	(0.046)	(0.049)	(0.046)
MVAL	0.001**	0.001**	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
ROA	0.393	0.195	0.365	0.177
	(0.653)	(0.665)	(0.657)	(0.664)
Leverage	-0.029	-0.073	-0.045	-0.089
	(0.088)	(0.085)	(0.086)	(0.083)

	(1) Mimic	(2) Mimic_Frac	(3) Mimic	(4) Mimic_Frac
Instown	0.023	0.023	0.027	0.026
	(0.041)	(0.040)	(0.040)	(0.040)
EPS_Guidance	0.005	0.008	0.006	0.010
	(0.045)	(0.043)	(0.045)	(0.043)
Litrisk	0.029	0.025	0.027	0.023
	(0.032)	(0.032)	(0.033)	(0.032)
Loss	-0.063**	-0.059*	-0.077**	-0.073*
	(0.031)	(0.033)	(0.034)	(0.037)
σ_ETR	-0.001	-0.001	-0.001*	-0.001*
	(0.000)	(0.000)	(0.000)	(0.001)
GAAP_ETR	0.030	0.018	0.034	0.022
	(0.021)	(0.021)	(0.022)	(0.022)
BSIZE	0.001	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Coverage	0.010***	0.009***	0.010***	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)
Forecast_Horizon	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Companies	0.002	0.001	0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
For_Frequency	0.001	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Obs.	10,491	10,491	10,491	10,491
Industry FE	X	X	X	X
Analyst FE	X	X	X	X
Quarter-Year FE	X	X	X	X
Clustered	Firm, Quarter	Firm, Quarter	Firm, Quarter	Firm, Quarter
Adj. R^2	0.256	0.316	0.253	0.311

Table 4 shows the regression coefficients for regression equation (6). Columns (1) and (2) display the changes in analyst mimicking for our forecast reputation proxy *AFA*, while columns (3) and (4) display the changes in analyst mimicking for our forecast reputation proxy *AAFA*. Standard errors are presented in parentheses. *, **, and *** indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. The coefficients are estimated using industry, analyst, and fiscal-quarter fixed effects, and standard errors clustered at the firm and fiscal-quarter level. All variables are defined in Appendix A 5.

Table 5
The effect of low management tax forecasting reputation on analyst mimicking behavior.

	(1) Mimic	(2) Mimic_Frac	(3) Mimic	(4) Mimic_Frac
AFA	1.284***	1.281***		
	(0.230)	(0.212)		
AAFA			0.411**	0.379**
			(0.178)	(0.173)
Lowrep_AFA	-0.128*	-0.120*		
	(0.069)	(0.065)		
Lowrep_AAFA			-0.197***	-0.184***
			(0.069)	(0.067)
AFA x Lowrep_AFA	-1.158***	-1.145***		
	(0.251)	(0.227)		
AAFA x Lowrep_AAFA			-0.264	-0.224
			(0.164)	(0.155)
TCJA	0.096	0.171	0.122	0.197
	(0.138)	(0.145)	(0.134)	(0.140)
AFA x TCJA	-0.303	-0.319		
	(0.358)	(0.363)		
AAFA x TCJA			-0.754	-0.649
			(0.973)	(1.010)
TCJA x Lowrep_AFA	-0.154	-0.169		
	(0.124)	(0.120)		
TCJA x Lowrep_AAFA			-0.189	-0.150
			(0.216)	(0.232)
Size	-0.001	-0.006	0.006	0.001
	(0.039)	(0.039)	(0.039)	(0.039)
BTM	-0.058	-0.042	-0.057	-0.043
	(0.060)	(0.057)	(0.063)	(0.060)
MVAL	-0.000	-0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
ROA	0.634	0.693	0.635	0.698
	(0.767)	(0.707)	(0.789)	(0.734)
Leverage	0.126	0.131	0.112	0.118
	(0.155)	(0.145)	(0.153)	(0.144)

	(1) Mimic	(2) Mimic_Frac	(3) Mimic	(4) Mimic_Frac
Instown	0.315	0.342	0.289	0.317
	(0.236)	(0.210)	(0.220)	(0.197)
EPS_Guidance	0.088	0.087	0.102	0.101
	(0.087)	(0.089)	(0.088)	(0.091)
Litrisk	-0.008	-0.020	-0.010	-0.022
	(0.031)	(0.030)	(0.034)	(0.033)
Loss	-0.026	-0.021	-0.037	-0.033
	(0.044)	(0.042)	(0.044)	(0.044)
σ_ETR	-0.000	-0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
GAAP_ETR	0.031	0.022	0.024	0.015
	(0.019)	(0.019)	(0.021)	(0.020)
BSIZE	0.000	0.000	0.001	0.000
	(0.001)	(0.000)	(0.001)	(0.000)
Coverage	0.009*	0.010*	0.008	0.009
	(0.005)	(0.005)	(0.006)	(0.005)
Forecast_Horizon	0.000	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Companies	0.001	-0.000	0.000	-0.000
	(0.002)	(0.001)	(0.002)	(0.001)
For_Frequency	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Obs.	10,491	10,491	10,491	10,491
Firm FE	X	X	X	X
Analyst FE	X	X	X	X
Quarter-Year FE	X	X	X	X
Clustered	Firm, Quarter	Firm, Quarter	Firm, Quarter	Firm, Quarter
Adj. R^2	0.280	0.393	0.276	0.386

	(1) Mimic	(2) Mimic_Frac	(3) Mimic	(4) Mimic_Frac

Table 5 shows the regression coefficients for regression equation (5), accounting for the effect of low ETR forecasting reputation on analyst mimicking behavior. *Lowrep_AFA* (*Lowrep_AAFA*) is an indicator variable equal to one if the given value of *AFA* (*AAFA*) falls within the bottom 10th percentile of its distribution, and zero otherwise. Columns (1) and (2) display the changes in analyst mimicking for our forecast reputation proxy *AFA*, while columns (3) and (4) display the changes in analyst mimicking for our forecast reputation proxy *AAFA*. Standard errors are presented in parentheses. *, **, and *** indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. The coefficients are estimated using firm, analyst, and fiscal-quarter fixed effects, and standard errors clustered at the firm and fiscal-quarter level. All variables are defined in Appendix A 5.

Table 6
The effect of analyst mimicking behavior on analyst ETR forecasting accuracy.

	(1) AFA_Analys	(2) AFA_Analys
TCJA	-0.022	-0.026
	(0.014)	(0.035)
Mimic	0.031***	0.029***
	(0.004)	(0.004)
Mimic x TCJA	0.007	0.009
	(0.011)	(0.010)
Size		-0.002
		(0.018)
BTM		0.005
		(0.028)
MVAL		0.001**
		(0.000)
ROA		-0.035
		(0.350)
Leverage		-0.039
		(0.035)
Instown		-0.099**
		(0.047)
EPS_Guidance		0.089**
		(0.042)
Litrisk		-0.028*
		(0.015)
Loss		-0.032
		(0.023)
σ_ETR		0.000*
		(0.000)
GAAP_ETR		-0.042**
		(0.016)
BSIZE		-0.000
		(0.000)
Coverage		0.002*
		(0.001)

	(1) AFA_Analys	(2) AFA_Analys
Forecast_Horizon		-0.001***
		(0.000)
Companies		-0.000
		(0.000)
For_Frequency		0.000
		(0.000)
Obs.	10,491	10,491
Firm FE	X	X
Analyst FE	X	X
Quarter-Year FE	X	X
Clustered	Firm, Quarter	Firm, Quarter
Adj. R^2	0.383	0.389

Table 6 shows the regression coefficients for regression equation (7), measuring the effect of mimicking behavior (*Mimic*) and the TCJA (*TCJA*) on analyst forecast accuracy (*AFA_Analys*). *AFA_Analys* is the absolute forecast accuracy of an analyst's implied ETR forecast. Columns (1) displays the association without control variables while column (2) includes all controls. Standard errors are presented in parentheses. *, **, and *** indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. The coefficients are estimated using firm, analyst, and fiscal-quarter fixed effects, and standard errors clustered at the firm and fiscal-quarter level. All variables are defined in Appendix A 5.

Table 7

Results of the DiD regression including mandatory ETR forecasting accuracy.

	(1) Mimic	(2) Mimic_Frac	(3) Mimic	(4) Mimic_Frac
AFA	0.491***	0.517***		
	(0.106)	(0.094)		
AAFA			0.765***	0.777***
			(0.174)	(0.156)
TCJA	0.087	0.112	0.099	0.124
	(0.129)	(0.130)	(0.129)	(0.130)
BEAT	-0.024	-0.020	-0.033	-0.026
	(0.029)	(0.028)	(0.030)	(0.029)
BEAT x TCJA	-0.116	-0.078	-0.128	-0.090
	(0.084)	(0.090)	(0.085)	(0.092)
BEAT x AFA	-0.030	-0.055		
	(0.126)	(0.113)		
BEAT x AAFA			-0.182	-0.153
			(0.238)	(0.226)
BEAT x AFA_GAAP	-0.036	-0.014	-0.023	-0.005
	(0.047)	(0.044)	(0.043)	(0.041)
TCJA x AFA	0.676**	0.509*		
	(0.317)	(0.270)		
TCJA x AAFA			2.151**	1.799**
			(0.935)	(0.779)
TCJA x AFA_GAAP	-0.152*	-0.120	-0.180**	-0.152*
	(0.077)	(0.084)	(0.078)	(0.083)
BEAT x TCJA x AFA	-0.448	-0.235		
	(0.395)	(0.350)		
BEAT x TCJA x AAFA			-2.063*	-1.678*
			(1.043)	(0.930)
BEAT x TCJA x AFA_GAAP	0.083	0.051	0.094	0.068
	(0.113)	(0.111)	(0.110)	(0.107)
Controls	Yes	Yes	Yes	Yes
Obs.	10,491	10,491	10,491	10,491
Industry FE	X	X	X	X
Analyst FE	X	X	X	X
Quarter-Year FE	X	X	X	X

Clustered	Firm, Quarter	Firm, Quarter	Firm, Quarter	Firm, Quarter
Adj. R^2	0.256	0.316	0.253	0.311

Table 7 shows the regression coefficients for regression equation (6), extended by including the variable $AFA\_GAAP_{i,q}$, which accounts for the accuracy of mandatory management ETR forecasts. Columns (1) and (2) display the changes in analyst mimicking for our forecast reputation proxy *AFA*, while columns (3) and (4) display the changes in analyst mimicking for our forecast reputation proxy *AAFA*. Standard errors are presented in parentheses. *, **, and *** indicate significance at the two-tailed 10%, 5%, and 1% levels, respectively. The coefficients are estimated using industry, analyst, and fiscal-quarter fixed effects, and standard errors clustered at the firm and fiscal-quarter level. All variables are defined in Appendix A 5.

Figures

Figure 1
Analyst behavior conditional on degree of tax information complexity.

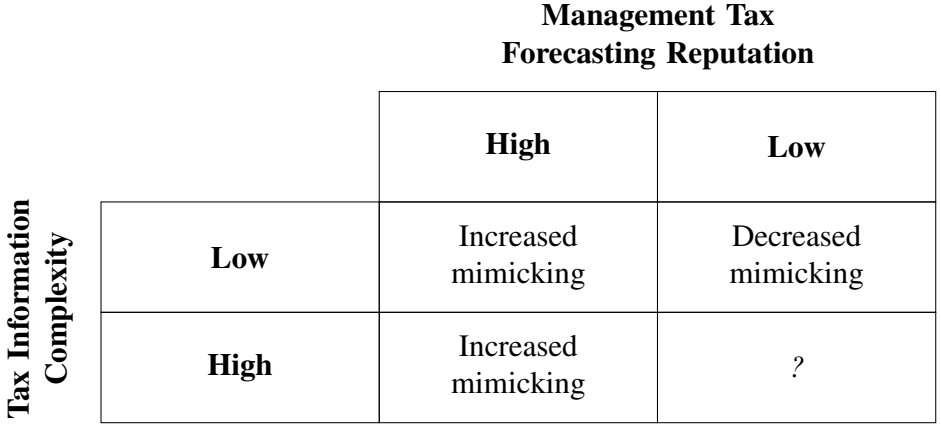


Figure 2

Conceptual timeline of the quarterly mimicking decision by the analysts.

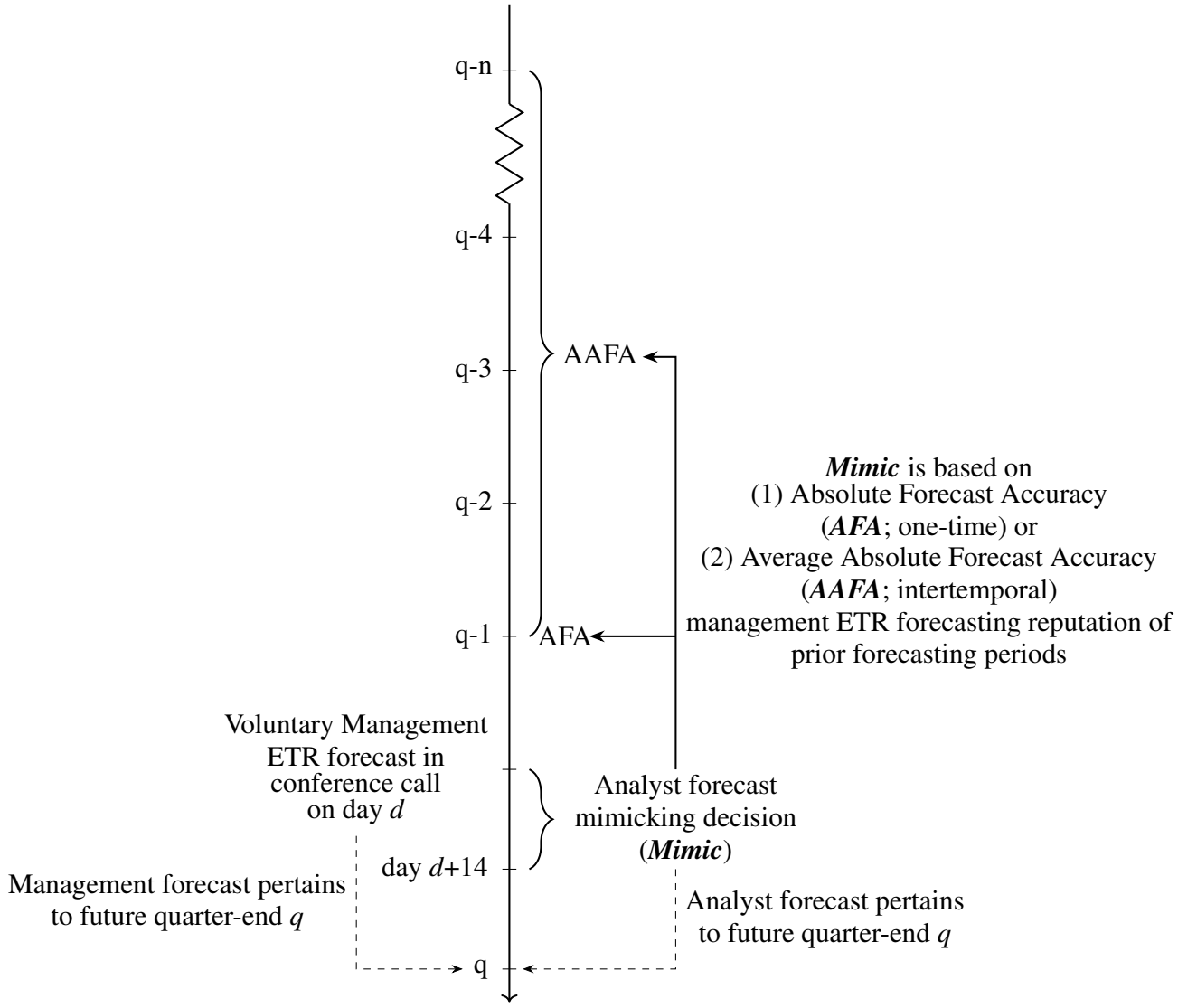
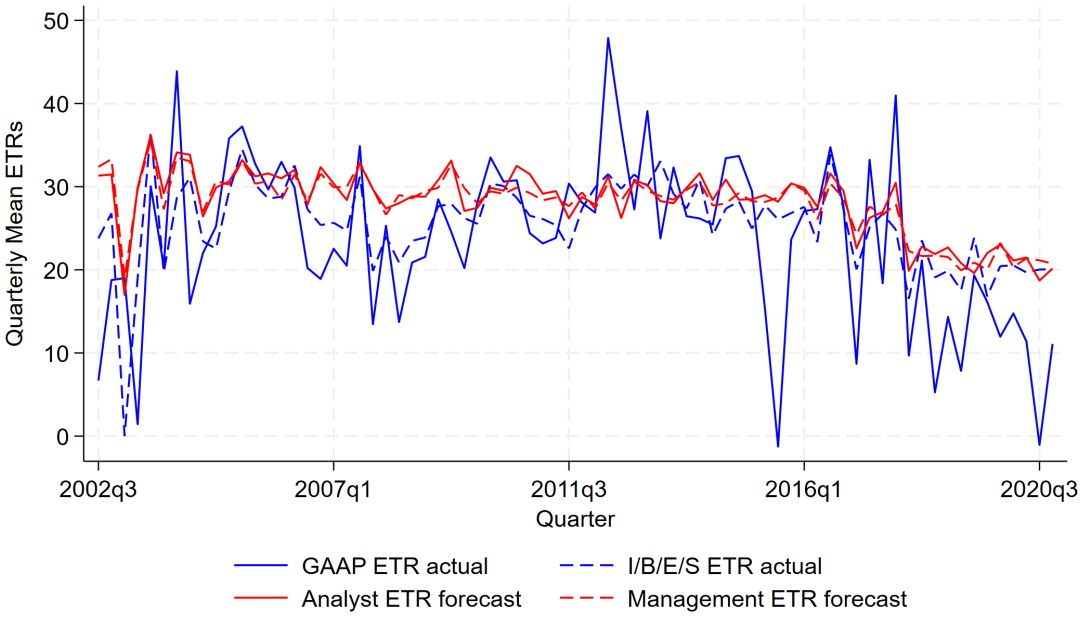


Figure 3

Mean quarterly effective tax rates over investigation period.



Appendix

A 1

Example sentences containing management ETR forecasts extracted from conference calls transcripts.

"We expect our income tax rate in the third quarter to approximate 41%,
which reflects the outsized impact of the French business tax effect that I discussed last quarter."
- Manpower Inc., July 20th, 2020

"We expect the tax rate to remain 26% in the fourth quarter."
- Timken Co., October 29th, 2020

"The company expects the first quarter tax rate to be approximately 26%."
- IPG Photonics Corp., February 13th, 2020

"For the fiscal fourth quarter, we estimate an effective tax rate of 13% to 15%,
while we expect a non GAAP effective tax rate of 12% to 14% for the full year."
- Plexus Corp., July 23rd, 2020

"In the fourth quarter of fiscal 2020, we expect our tax rate to be approximately 28.5%."
- MLC Holdings Inc., February 5th, 2020

"And for the second quarter, non GAAP EPS is expected to be in the $0.28 to $0.30 range based on
a 22% non GAAP tax rate and 119 million weighted average shares outstanding."
- Teradata Corp., February 07th, 2019

"Therefore, the effective tax rate should be about 21% in the first quarter, 22% in the second and third,
and 23% in the fourth quarter of 2018."
- Intercontinental Rubber Co., January 23rd, 2018

"We expect our effective tax rate of approximately 22% in the first quarter."
- WESCO International Inc., February 1st, 2018

"The effective tax rate is expected at 27.6% in Q3 19."
- Dycom Industries, Inc., August 29th, 2018

"Lastly, we expect our effective tax rate for the second half of the year to be in the range of 26.5% to 28.5%,
which includes an estimate of $0.02 for the potential tax benefit related to stock based compensation
accounting method."
- AptarGroup, Inc., July 28th, 2017

A 2

ChatGPT prompt used for classifying sentences containing management ETR forecasts extracted from conference calls transcripts.

"Classify the following tax-related sentences that were extracted from corporate conference calls using the given criteria:

1. Sentence: "{text}"
2. Conference Call Date: "{date}"
3. Next Fiscal Year-End: "{datadate}"
4. Previous Fiscal Year-End: "{datadate_prev}"
5. Current Fiscal Year: "{fyear}"
6. Sentence ID: "{sent_id}"

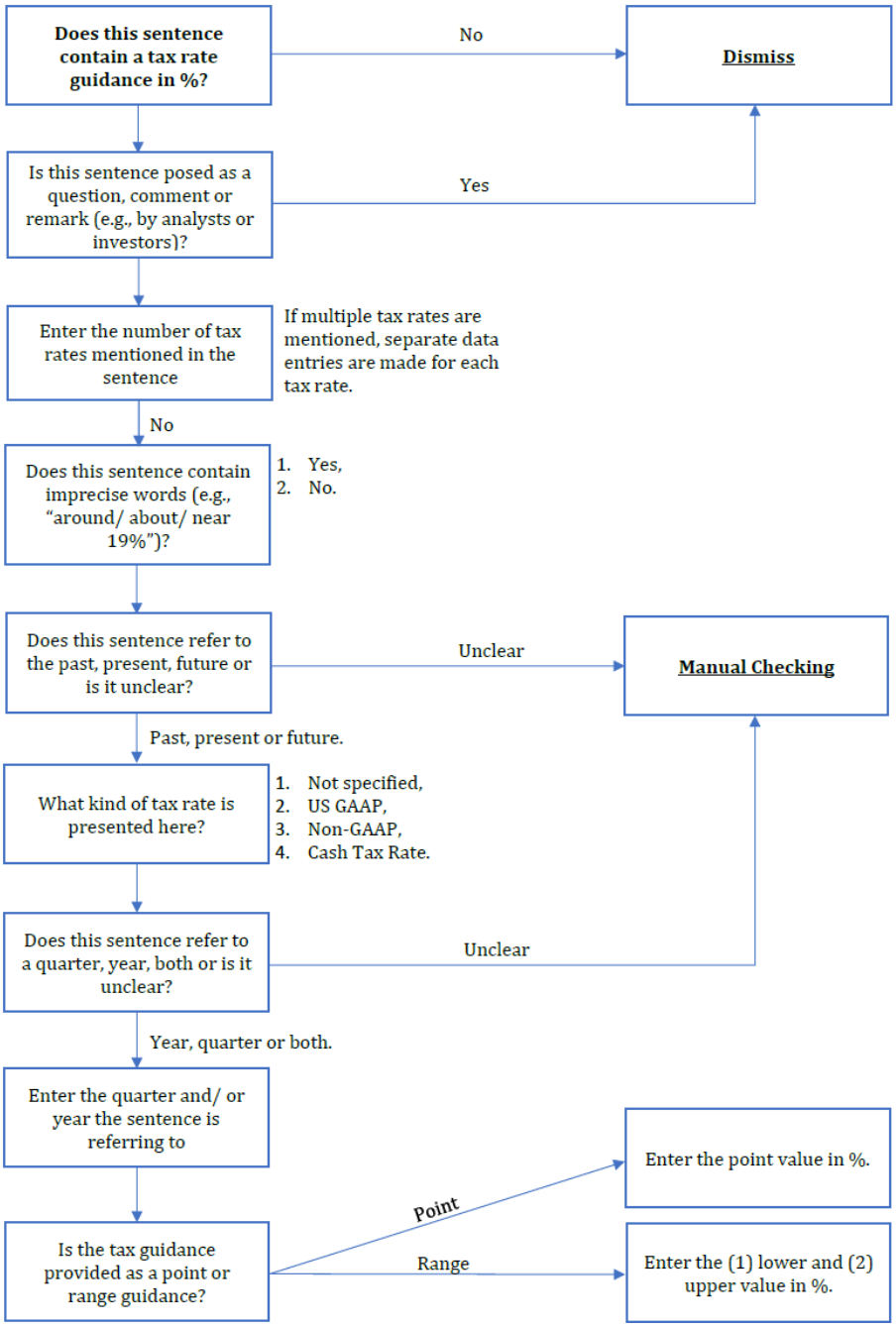
Classification Criteria:
1. Contains tax guidance in percent: If the sentence contains tax guidance in percent (presence of "%"), enter "Yes". Otherwise, enter "No" and replace all following entries with "NULL".
2. Is question: If the sentence is formulated as a question (presence of "?"), enter "Yes". Otherwise, enter "No".
3. Number of distinct tax guidance percentage values: Count the number of distinct tax guidance percentage values mentioned in the sentence that refer either to different periods or different tax types. A guidance provided as range type "Range Value" is not to be classified as 2 distinct tax guidance percentage values, but instead as 1.
4. For each distinct tax guidance percentage value, make distinct classifications as follows:
- Sentence: "{text}"
- Conference Call Date: "{date}"
- Next Fiscal Year-End: "{datadate}"
- Previous Fiscal Year-End: "{datadate_prev}"
- Current Fiscal Year: "{fyear}"
- Sentence ID: "{sent_id}"
- Contains tax: "Yes"
- Is question: "Yes" or "No"
- Number of distinct tax guidance percentage values: [Number]
- Contains imprecise words: Check for the presence of imprecise words (e.g., about, around, near, approximately, mid, lower, upper) and enter "Yes" or "No".
- Time reference: Determine the time reference (Past, Present, Future, Unclear). If unclear, estimate using "datadate_prev", "datadate", "fyear", and "date".
- Tax type: Identify the tax type (U.S. GAAP, Non-GAAP, Cash, Not specified).
- Period: Determine the period the guidance is referring to (Quarter, Year, Annual, Both, Half Year, Six Months, Semi Annual, Nine Months, Unclear).
- Year: Extract the year if mentioned.
- Quarter: Extract the quarter if mentioned. If the forecast has the "Period" classification "Half Year", "Semi Annual" or "Six Months", enter Q2 in the "Quarter" variable. If the forecast has the "Period" classification "Nine Months", enter Q3 in the "Quarter" variable.
- Range type: Determine the range type of the mentioned tax guidance ("Range Value" for ranges like 25% to 27%, otherwise "Point Value"). If a guidance is given as a range value, make a single data entry with the low and high values.
- Point value: Extract point values in percent without the percentage sign (e.g., for 25%, enter 25).
- Range value low: Extract the lower range value in percent without the percentage sign.
- Range value high: Extract the higher range value in percent without the percentage sign.

Additional Instructions:
- The output should only contain the pre-defined output format and no additional text or signs, such as additional explanations or "—".
- If the tax guidance contains words like "mid", "lower", and/or "upper", classify the values as "Range Value" with 1 distinct tax guidance percentage value, and use the following ranges:
For "mid to upper" or "mid to higher" range, enter 24 to 29 for "Range value low" and "Range value high", respectively.
For "lower to mid" range, enter 20 to 26 for "Range value low" and "Range value high", respectively.
For "lower" range, enter 20 to 23 for "Range value low" and "Range value high", respectively.
For "mid" range, enter 24 to 26 for "Range value low" and "Range value high", respectively.
For "upper" or "high" range, enter 27 to 29 for "Range value low" and "Range value high", respectively.

Output format for each distinct tax guidance percentage value:
1. Sentence: "{text}"
2. Conference Call Date: "{date}"
3. Next Fiscal Year-End: "{datadate}"
4. Previous Fiscal Year-End: "{datadate_prev}"
5. Current Fiscal Year: "{fyear}"
6. Sentence ID: "{sent_id}"
7. Contains tax: "Yes"
8. Is question: "Yes" or "No"
9. Number of distinct tax guidance percentage values: [Number]
10. Contains imprecise words: "Yes" or "No"
11. Time reference: [Past, Present, Future, Unclear]
12. Tax type: [U.S. GAAP, Non-GAAP, Cash, Not specified]
13. Period: [Quarter, Year, Both, Half Year, Nine Months, Unclear]
14. Year: [Extracted Year or "NULL"]
15. Quarter: [Extracted Quarter or "NULL"]
16. Range type: "Range Value" or "Point Value"
17. Point value: [Extracted Point Value or "NULL"]
18. Range value low: [Extracted Lower Range Value or "NULL"]
19. Range value high: [Extracted Higher Range Value or "NULL"]"

A 3

Classification tree used for manual classification of sentences containing management ETR forecasts extracted from conference calls transcripts.



A 4

Data fields for sentences containing management ETR forecasts.

Variable	Definition
text	Extracted sentence from the conference call transcript
date	Date of the conference call
datadate	Date of the next fiscal year-end
datadate_prev	Date of the previous fiscal year-end
fyear	Current fiscal year
sent_id	Unique sentence ID
contains_tax	Does the record contain an ETR in percentages? (Yes/No)
is_question	Is the sentence formulated as a question? (Yes/No)
no_tax_statements	How many ETR percentages are mentioned?
imprecise_words	Does the sentence contain imprecise words (e.g., about, circa, approximately)?
time_reference	What time reference does the sentence have? (past, present, future, unclear)
tax_type	Which ETR is being forecast? (GAAP, non-GAAP, Cash, unclear)
period	What time period does the ETR refer to? (quarter, year, both, unclear)
year	The year to which the forecast ETR relates
quarter	The quarter to which the forecast ETR relates
range_type	Does the forecast include point or range values?
point_value	Point value
range_low	Lower range value
range_high	Upper range value

A 5

Variable definitions.

Variable	Definition
	Mimic_Var
$Mimic_{a,i,d,q}$	A dummy variable that equals 1 when analyst *a's* implied ETR forecast pertaining to quarter q and firm *i's* voluntarily-provided ETR forecast differ by less than 0.5 percentage points, and 0 otherwise. Source: I/B/E/S Detail History.
$Mimic\_Frac_{i,d,q}$	The fraction of mimicking analysts that cover firm i with an ETR forecast issued on day d, all referring to same fiscal quarter q. Source: I/B/E/S Detail History.
	$Forecast\_Error_{i,d,q}$
$AFA_{i,d,q}$	Absolute Forecast Accuracy of the management ETR forecast issued by firm i on day d, pertaining to fiscal quarter q. For the specific calculation, see equation (1). Sources: LSEG Eikon, I/B/E/S Detail History.
$AAFE_{i,d,q}$	Average Absolute Forecast Accuracy of the management ETR forecast issued by firm i on day d, pertaining to fiscal quarter q. For the specific calculation, see equation (1). Sources: LSEG Eikon, I/B/E/S Detail History.
$AFA\_Analys_{a,i,d,q}$	Absolute Forecast Accuracy of the analyst ETR forecast issued by analyst a covering firm i on day d, pertaining to fiscal quarter q. Calculation identical to equation (1), but substituting $Mgmt\_ETR\_Forecast_{i,d-1,q-1}$ with $Analyst\_Implied\_ETR_{a,i,d,q}$. Source: I/B/E/S Detail History.

$AFA\_GAAP_{i,d,q}$	Absolute Forecast Accuracy of the last mandatory ETR forecast available for firm i on day d, pertaining to fiscal quarter q. Calculation identical to equation (1), but substituting $Mgmt\_ETR\_Forecast_{i,d-1,q-1}$ with $GAAP\_ETR_{a,i,d-1,q-1}$. Sources: Compustat Fundamentals Quarterly, I/B/E/S Detail History.
	Treatment_Variables
$TCJA_{i,q,t}$	A dummy variable that equals 1 if an ETR forecast by firm i pertains to a fiscal quarter q within a fiscal year t that is 2018 or later, and 0 otherwise.
$BEAT_{i,t}$	A dummy variable that equals 1 when firm i has three-year average operating revenues (*sale*) greater than $500 million in fiscal year 2015 or later, and zero otherwise. Similar to Kelley et al. 2024. Source: Compustat Fundamentals Annual.
$Lowrep\_AFA_{i,d,q}$	A dummy variable that equals 1 when the given value of *AFA* for firm i falls within the bottom 10th percentile of its sample distribution, and zero otherwise.
$Lowrep\_AAFA_{i,d,q}$	A dummy variable that equals 1 when the given value of *AAFA* for firm i falls within the bottom 10th percentile of its sample distribution, and zero otherwise.
	$Firm\_Characteristics_{i,q-1}$
$Size_{i,q-1}$	Natural logarithm of firm *i's* quarterly total assets at the end of the previous quarter *q-1* (*ln(atq+1)*). Missing values replaced by zeroes. Source: Compustat Fundamentals Quarterly.
$BTM_{i,q-1}$	Book-to-market ratio of firm i, calculated as quarterly common equity scaled by the product of quarterly common shares outstanding and the quarterly price close, both at the end of the previous fiscal quarter *q-1* (*ceqq/(prccq*cshoq)*). Missing values replaced by zeroes. Source: Compustat Fundamentals Quarterly.

$Coverage_{i,q-1}$	The mean number of EPS estimates (*NUMEST)* published by analysts for firm *i* during the previous fiscal quarter *q-1*. Missing values replaced by zeroes. Source: I/B/E/S Summary History.
$Instown_{i,q-1}$	The percentage of firm *i's* common stock held by institutional investors in the previous previous fiscal quarter *q-1*. Missing values replaced by zeroes. Source: Thomson-Reuters 13-F.
$ROA_{i,q-1}$	Return on assets of firm *i*, calculated as the quarterly net income divided by the quarterly total assets, both at the end of the previous fiscal quarter *q-1* (*niq/atq*). Missing values replaced by zeroes. Source: Compustat Fundamentals Quarterly.
$Leverage_{i,q-1}$	Leverage of firm *i*, calculated as the quarterly long-term debt divided by the quarterly total assets, both at the end of the previous fiscal quarter *q-1* (*dlttq/atq*). Missing values replaced by zeroes. Source: Compustat Fundamentals Quarterly.
$MVAL_{i,q-1}$	Market value of equity of firm *i*, calculated as the product of quarterly common shares outstanding and the quarterly price close, both at the end of the previous fiscal quarter *q-1* (*prccq*cshoq*). Scaled to millions of USD. Missing values replaced by zeroes. Source: Compustat Fundamentals Quarterly.
$Earn\_Guide_{i,q-1}$	A dummy variable that equals 1 if firm *i* provided quarterly or annual earnings guidance during the previous fiscal quarter *q-1*, and zero if otherwise. Source: I/B/E/S Guidance.
$Litrisk_{i,q-1}$	A dummy variable that equals 1 if firm *i* is in a high-litigation industry: SIC Codes 2833–2836 (biotechnology), 3570–3577 and 7370–7374 (computers), 3670–3674 (electronics), 5200–5961 (retailing), and 8731–8734 (R&D service), and suffered a 20 percent or greater decrease in earnings during the previous fiscal quarter *q-1*, and 0 if otherwise. Variable based on Kala, Shailer, and Wilson 2024. Source: Compustat Fundamentals Quarterly.
$Tax\_Characteristics_{i,q-4\ to\ q-1}$	

$GAAP\_ETR_{i,q-1}$	GAAP effective tax rate of firm i, calculated as the quotient of quarterly income taxes over quarterly pre-tax income, both at the end of the previous fiscal quarter *q-1* (*txtq/piq*). Missing values replaced by zeroes. Source: Compustat Fundamentals Quarterly.
$\sigma\_ETR_{i,q-4}$	Standard deviation of the GAAP effective tax rate of firm i over the previous four quarters *q-4*. Missing values replaced by zeroes. Source: Compustat Fundamentals Quarterly.
	Analyst_Characteristics$_{a,i,q}$
$BSIZE_{a,i,q}$	The number of analysts appearing in I/B/E/S during calendar quarter q for analyst *a's* brokerage house, minus the minimum number of analysts employed by brokerage houses following firm i in quarter q, with this difference scaled by the range of *BSIZE* for all analysts following firm i in quarter q. Measure based on Clement and Tse 2005 and Bratten et al. 2017. Only includes analysts that issue pre-tax or net income forecasts. Missing values replaced by zeroes. Source: I/B/E/S Detail History.
$Forecast\_Horizon_{a,i,q}$	The first quarter in which analyst a issued a pre-tax or net income forecast covering firm i minus the current calendar quarter q. Source: I/B/E/S Detail History.
$Companies_{a,i,q}$	The total number of firms analyst a issues pre-tax or net income forecast for in calendar quarter q. Source: I/B/E/S Detail History.
$For\_Frequency_{a,i,q}$	The number of pre-tax and net income forecasts analyst a issued for firm i in calendar quarter q. Source: I/B/E/S Detail History.
	Auxiliary Variables
$ETR\_Actual_{i,q}$	The actual quarterly implied ETR for firm i for fiscal quarter q, calculated by subtracting the actual net income from the actual pre-tax income as reported in I/B/E/S ($PRE_{i,q} - NET_{i,q}$). Source: I/B/E/S Detail History.

$Mgmt\_ETR\_Forecast_{i,d,q}$	The ETR forecast disclosed by firm i within the conference call on day d, referring to the fiscal quarter q. Source: LSEG Eikon.
$Tax\_Expense\_Forecast_{a,i,d,q}$	The analyst's a implied tax expense forecast for firm i issued within 14 days of the conference call on day d in which a management ETR forecast was issued and relating to the same fiscal quarter q as the management ETR forecast. Calculated as the difference between pre-tax and net income forecast ($PRE_{a,i,d,q} - NET_{a,i,d,q}$). Source: I/B/E/S Detail History.
$Analyst\_Implied\_ETR_{a,i,d,q}$	The analyst's a implied ETR forecast for firm i issued within 14 days of the conference call on day d in which a management ETR forecast was issued and relating to the same fiscal quarter q as the management ETR forecast. Calculated as the quotient of $Tax\_Expense\_Forecast_{a,i,d,q}$ and the analyst's pre-tax income forecast $PRE_{a,i,d,q}$ ($Tax\_Expense\_Forecast_{a,i,d,q}/PRE_{a,i,d,q}$). Source: I/B/E/S Detail History.

All continuous variables are winsorized at the 1% and 99% levels.

The role of boutique advisers in fairness opinions: Evidence from tender offers

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The role of boutique advisers in fairness opinions: Evidence from tender offers

Abstract

In this study, we investigate the role of boutique advisers in the provision of fairness opinions (FOs) in tender offers. First, we examine whether boutique advisers provide more precise FOs than non-boutique advisers. Second, we investigate the association between the precision of a target-sought FO and the timeliness of completing the tender offer. Our findings show that boutique advisers provide more precise FOs than their non-boutique counterparts. In addition, we find that more precise FOs are associated with timelier completion of tender offers, suggesting that target shareholders prefer more precise FO disclosures. We also provide evidence of a possible channel, as FOs of boutique advisers are less likely to receive an SEC comment letter. Our findings hence show that the recent popularity of boutique advisers has been warranted as their FOs are more precise and result in more timely completions of tender offers.

Keywords: Fairness opinions, Tender offers, Boutique advisers, Timeliness of completion

JEL Codes: G24, G34, J24, K41

The role of boutique advisers in fairness opinions: Evidence from tender offers

1. Introduction

Over the last decade, the popularity of boutique advisers has been on the rise. Boutique advisers primarily provide their services to firms in mergers and acquisitions (M&As) and are generally viewed as being independent (Song et al., 2013; Chessell, 2015). These small but specialized investment banks are stealing M&A market share from the larger well-established banks at a notable rate (Song et al., 2013). In 2016, boutique advisers accounted for 34% of the total M&A advisory fees, that is an increase of 20% compared to 2007 (Oran, 2016, December 14).[1] Yet, despite their growing popularity, evidence of the benefits of hiring boutique advisers versus larger ones is still scarce. Therefore, we investigate the role of boutique advisers in fairness opinions.

In M&As and going-private transactions, the board of the acquiring or target firm obtains a fairness opinion (FO) to help determine the appropriateness or "fairness" of the tender offer. An FO typically consists of different valuations that help the adviser evaluate whether the price received or paid is fair – from a financial point of view – to the shareholders of the client firm (Liu, 2020). These valuations are at the heart of an FO and serve as an important basis for decision-making by the board of directors and shareholders. In particular, the valuations in an FO can be used to evaluate the attractiveness of the offer price as they depict the ranges within which the offer price can fall. However, anecdotal evidence suggests that the heterogeneity in the valuations is large; and the wideness of the ranges has

[1] Retrieved from: https://www.reuters.com/article/us-banks-boutiques-strategy-idUSKBN1432WH/

received substantial criticism from the media, regulators, and courts.[2] Duff and Phelps (2017), for instance, finds that FOs are often criticized for producing valuation ranges that are too broad to provide meaningful information.

Hence, given this debate and the recent rise in boutique advisers, we investigate whether (1) boutique advisers are associated with the precision of the FO (measured by a narrower valuation range) and (2) the precision of the FO is associated with the timeliness of completing tender offers. We focus on FO precision for two reasons. First, precision is one of the most important properties over which financial advisers and target board members have discretion in an FO. Second, prior studies on management earnings forecasts show that a significant portion of the information that range forecasts provide is through the forecasted ranges and that they should not be condensed to the midpoint of the range (Baginski et al., 1993; Clement et al., 2003; Baginski et al., 2011; Jensen and Plumlee, 2020). In addition, studies have provided evidence that the precision of these range forecasts is associated with market reactions and analyst forecast revisions (Kim and Verrecchia, 1991; Baginski et al., 1993; Subramanyam, 1996; Cheng et al., 2013).

To investigate our research questions, we focus on a setting in which FOs and their properties are likely to be very important: tender offers. The completion and success of tender offers is highly dependent on target shareholders' tendering decisions. Tender offers often have so-called minimum conditions that indicate the percentage of target shareholders' shares needed within a specified time frame to complete the offer. Hence, shareholders need to

[2] For instance, one judge presiding over shareholder litigation concluded that the valuation ranges presented in an FO were so wide that "even a Texan would feel at home on them. Per-share prices ranged from $159–$247 for 1991, $230–$332 for 1992, to $208–$402 for 1993. See Paramount Communications v. Time, Inc. (CivilActionNo.10866, Del.Ch.LEXIS77; Ohta and Yee, 2008).

receive an accurate and timely assessment of the value of their shares, and FO valuations can help them make an informed decision.[3]

We hand-collect all US tender offers and target FO valuations between 2010 and 2019. The results show that 33% of the target firms in tender offers hire a boutique adviser, which supports the popularity of and demand for boutique advisers. Descriptive statistics show that there are significant differences in terms of the FO properties that boutique and non-boutique advisers provide. First, non-boutique advisers use on average more valuation methods than boutique advisers on the FOs. Second, while non-boutique advisers report more valuation methods, the proportion of these methods containing specific ranges is lower than for boutique banks. Lastly, boutique advisers provide significantly more information to describe and explain their valuations than non-boutique advisers measured by the number of pages per valuation method.

To reduce potential endogeneity in the choice of a boutique adviser, we implement an IV approach, in which we use the choice of a boutique adviser by the acquirer as an instrument for the choice of a boutique adviser by the target. The decision to hire a boutique adviser is endogenously determined, as firms self-select their advisers and the choice of a boutique adviser is likely correlated with characteristics of the merging firms and the transaction (Song et al., 2013). This endogeneity could bias our estimation of the relation between boutique advisers and merger outcomes. Hence, to control for endogeneity in the choice of financial adviser, we use an instrumental variable (IV) approach. Using a two-stage model, we find that boutique advisers provide more precise FOs than larger investment banks. The results further show that almost 37% of boutique advisers hired by the target have prior ties with the acquirer. Our results show that boutique advisers with prior ties with the

[3] Notably, in our sample of tender offers the FO is disclosed on average 20 days after the announcement of the offer, while in a matched merger sample, the FO is disclosed on average 63 days after the announcement. In addition, after the disclosure of the FO, tender offers are on average completed after 40 days, while it takes on average 57 days in the merger sample. This illustrates the importance of FOs in shareholders' tendering decisions.

acquirer provide less precise FOs. Given that boutique advisers depend heavily on the revenues from their services, they may want to cater to the acquirer to increase the likelihood of being hired again in the future.

Regarding our second research question, we find that the timely completion of the tender offer, measured by its extensions as well as the number of days between disclosure of the FO and the completion date, is positively associated with the precision of an FO, in line with target shareholders' preference for more precise FO disclosures. We also find that target shareholders tender their shares faster if the target hires a boutique adviser than a non-boutique adviser. Overall, our results show that target firms benefit from hiring boutique advisers since they provide more precise FOs that in turn facilitates a timelier completion of the offer.

We also investigate a potential channel through which more precise FOs and the presence of a boutique adviser could lead to faster completion times. Specifically, we investigate whether they are associated with the likelihood of receiving a merger-related SEC comment letter. We find that more precise FOs and boutique advisers have a lower probability of receiving SEC comment letters, which results in faster completion times.

This study contributes to the fairness opinion and financial adviser literatures in several ways. First, it contributes by investigating how the type of financial adviser is associated with the properties observed in an FO. Boutique advisers and FOs both represent unexplored phenomena despite their prevalence in the M&A arena. Most studies have mainly focused on the decision to obtain an FO and deal and shareholder wealth implications (Kisgen at al., 2009; Frye and Wang, 2010; Liu, 2018; Liu, 2020).

Especially the role of boutique advisers in providing FOs has been largely unexplored. To our knowledge, only a few studies have examined the role of boutique advisers and deal outcomes. Song et al. (2013) examines the choice and role of boutique

advisers for deal outcomes in a US setting, while Loyeung (2019) investigates the performance of boutique advisers in the Australian market. These studies show that both acquiring and target firms benefit from hiring a boutique adviser. More recently, Alexandridis et al. (2023) shows that acquiring firms represented by boutique advisers generate significantly higher abnormal returns than those advised by non-boutique advisers in difficult-to-value transactions with greater information asymmetry. Our study differs from these studies in at least two respects. First, we examine the role of boutique advisers in providing FOs. Other studies have focused on either the initial stage, that is, the choice of a boutique adviser; or the final step, namely deal outcomes. While the adviser is an important determinant of deal outcomes, we argue that the intermediate step in the M&A chain, the provision of an FO, is equally relevant. In both M&As and tender offers the target shareholders rely on FOs for either M&A approval and voting, or tendering decisions. Therefore, rather than investigating the type of adviser and deal outcomes directly, we first focus on the type of adviser and FO properties, and in a second step how these properties relate to deal outcomes.

Second, this is the first study to investigate how FO properties interact with the timeliness of completing the tender offer. Extensions of a tender offer delay its completion and reduce the comparative advantage of faster completion times of tender offers over mergers. Our findings show that the precision of an FO is associated with a timelier completion as measured by the extensions as well as the number of days between disclosure of the FO and the completion date. We are also the first to provide evidence of a possible channel through which FO precision and boutique advisers are associated with faster completion times as we show that FO precision and boutique advisers are associated with fewer merger-related SEC comment letters.

2. Background and the Development of Hypotheses

Institutional Background

FOs have their origin in the Smith vs. Van Gorkom (1985) legal case and in Delaware that institutionalized an "outside" opinion for M&As in the US. In this case, the Delaware Supreme Court declared the board of Trans Union Corporation guilty of approving an acquisition without obtaining anything more than a "rough" and "unquestioned" estimate of a possible value from its CFO (Davidoff, 2006). According to the court, a target board, as part of its greater duty of care in a corporate control transaction, is obliged to thoroughly inform itself about its corporation's value by means of a well-prepared financial analysis (Davidoff, 2006). Even though FOs are not required by law, over the period from 1996 to 2013, over 90% of the M&A transactions had one (Liu, 2020).

Although voluntary, governments have regulated the information content of FOs, albeit to a limited extent. In 2007, the SEC approved the rules proposed by the National Association of Securities Dealers Inc. (NASD) to increase disclosure requirements for FOs. As of 2007, firms requesting an FO have to disclose (1) whether the adviser will receive compensation contingent on the successful completion of the transaction, (2) whether the adviser has had a material relationship with the company in the last two years, and (3) what information was provided to the adviser by the board of directors to derive the opinion (Liu, 2018). The SEC monitors the quality of FO disclosures. Liu et al. (2024) examines SEC comment letters for M&As and finds that the most frequent ones relate to FOs and their valuations, general compliance, and transaction background. Despite this increased regulatory scrutiny, boards of directors and financial advisers are still left to their own devices regarding the information content of FOs.

Role of Financial Advisers in Issuing an FO

The target board of directors is responsible for evaluating and acting on a tender offer. After receiving the offer, the target board needs to assess the inherent value of its firm to evaluate the fairness and attractiveness of the offer price. FOs are a useful second opinion from a financial adviser, who provides an independent valuation of the target firm. The board of directors first selects and hires a financial adviser and provides all relevant firm-specific information and internal forecasts. The financial adviser then delivers an FO valuation, verifies the fairness of the offer price, and bundles all the relevant information into a single document for target shareholders to help them to make an informed decision regarding the tender offer.

Prior research has focused mainly on two aspects of the advisory relationship: the fee structure and contract terms and the adviser's reputation and deal outcomes (Kisgen et al., 2009; Cain and Denis, 2013; Song et al., 2013). Kisgen et al. (2009) examines the relation between the fee structure and reputation of an adviser and the quality of FOs. The authors show that the reputation of acquirers' FO advisers matters for deal outcomes. Top-tier FO advisers reduce the deal premium, while lower-tier advisers are associated with a higher probability of deal completion, higher premiums paid, and lower announcement returns. Cain and Denis (2010) analyzes the valuations of target firms that FOs by both acquiring and target firms' financial advisers disclose in negotiated mergers. Their findings show that investment banks of the acquirer systematically overvalue, while the advisers for targets undervalue the firm. In addition, the authors find that the reputation of financial advisers is positively related to the accuracy of their valuations as top-tier advisers produce more accurate valuations than their lower-tier counterparts.

Boutique Advisers

The firms engaged in the investment banking industry are commonly classified based on size, types of services provided, and the associated diversification of their revenue streams. Bulge bracket investment banks represent the traditional large full-service brokerage firms that offer a wide range of services such as underwriting, trading, sales, asset management services to research and lending (Song et al., 2013). Recognizable names in this category include Goldman Sachs or J.P. Morgan Chase. Full-service advisers have more resources and are diversified, yet they have been criticized as they are prone to potential conflicts of interest (Allen et al., 2004; Ertugrul and Krishnan, 2014; Loyeung, 2019).[4]

Since the financial crisis, the demand for boutique advisers has been on the rise. Boutique advisers differ from their full-service counterparts in at least two important respects. First, unlike full-service investment banks, boutique advisers are not traditional brokerage houses and are not associated with commercial banks (Loyeung, 2019). These differences mean that they operate more independently and focus mainly on providing advisory services to their clients rather than trying to cross-sell other products (Loyeung, 2019). For instance, in 2019, 82% of Evercore's (a boutique bank) total net revenues came from advisory services,[5] while J.P. Morgan's advisory fees accounted for 2% of their total net revenues.[6] The second distinction is that boutique advisers are often industry specialists. For example, Torreya Partners mainly serves the life science industry, while Endeavor Financial specializes in the natural resource industry (Song et al., 2013; Loyeung, 2019). Industry specialization allows advisers to have deeper knowledge and understanding of a particular industry within which their clients operate.

[4] The main concern regarding full-service advisers is the conflicts of interest they face when providing advice to clients to whom they have sold a wide range of financial products ((Loyeung, 2019).
[5] Retrieved from: https://investors.evercore.com/static-files/70463eac-3adb-4f50-92ad-f8f0c4e90419
[6] Retrieved from: https://www.jpmorganchase.com/content/dam/jpmc/jpmorgan-chase-and-co/investor-relations/documents/annualreport-2019.pdf

To the best of our knowledge, only a few studies have investigated the consequences of hiring a boutique adviser. In a US setting, Song et al. (2013) examines the choice of a boutique adviser, while Alexandridis et al. (2023) investigates whether boutique advisers create value for their buyside clients. Loyeung (2019) investigates the performance of boutique advisers in the Australian market. Specifically, Song et al. (2013) investigates firms' decision to hire boutique advisers and the impact of this decision on deal outcomes. The authors find that firms are more likely to hire boutique advisers when deals are complex, suggesting that boutique advisers are selected because of their expertise and competence. They also show that deal premiums are lower when acquirers hire boutique advisers and that these advisers lengthen the duration of a deal because they are likely to spend more time on due diligence and negotiation. In line with these findings, Alexandridis et al. (2023) shows that boutique advisers generate significantly higher abnormal returns than non-boutique ones in difficult-to-value transactions with greater information asymmetry. Loyeung (2019) finds that boutique advisers help acquiring firms achieve positive post-merger outcomes, while target firms enjoy positive cumulative abnormal returns when they hire boutique advisers.

Boutique Advisers and the Precision of Fairness Opinions

Given that boutique advisers are regarded as being more independent and specialized in certain industries, they might be able to provide more precise FOs than non-boutique advisers. However, boutique advisers' revenues also depend more on fees for advisory services as this is their core business (Loyeung, 2019). This dependency may provide them with an incentive to complete deals that might not necessarily benefit their clients and clients' shareholders (Song et al., 2013). Rau (2000) shows that valuations of deals are of secondary importance because the contingent fee structure provides investment banks with strong incentives to complete them. This suggests that financial advisers are often primarily concerned with completing deals to receive compensation rather than identifying and

completing only deals that create value for their clients (Loyeung, 2019). Since this pressure is likely higher for boutique advisers than for non-boutique ones, boutique advisers may have greater incentives to issue less precise FOs to ensure that the tender offer is completed, and their compensation is secured. Based on these opposing arguments, we formulate the following null hypothesis:

H1: There is no difference in the precision of an FO provided by a boutique adviser or a non-boutique adviser.

In addition, we examine whether the existence of prior ties with the acquirer affects the association between boutique advisers and the precision of their FOs. Cain and Denis (2013) shows that banks with a prior relationship with target firms provide more accurate target valuations in FOs. Yet little is known about the role of target advisers' prior ties with the acquirer. In general, hiring a counterparty's ex-adviser entails two considerations, namely the benefits of information transmission and the costs of a potential conflict of interests. The decision to hire an adviser with prior ties with the acquirer reduces information asymmetry for the target firm, provides it with greater access to information, and strengthens the bargaining position of the target firm (Agrawal et al., 2013; Chang et al., 2016). The potential conflict of interest stems from target advisers' desire to be hired by the acquirer in the future. While targets normally delist after a successful takeover, acquiring firms continue to survive and thus represent a lure of future business to target advisers (Chang et al., 2016). Consequently, a target's adviser might focus on maximizing the acquirer's wealth at the expense of the target shareholders to increase its chances of being hired by the acquiring firm in the future (Bhattacharya et al., 2019). In addition, Francis et al. (2014) shows that acquirers' past relationships with their advisers significantly influences their current choice of M&A advisers. Given boutique advisers' dependence on fees for advisory services, those with prior ties with the acquirer might issue less precise FOs to facilitate shareholders'

tendering and to ensure the success of the acquirer's takeover attempt in the hope of being hired by the acquirer in the future.

On the other hand, Bhattacharya et al. (2019) finds that target advisers are more likely to be hired if they deliver excellent service to the target and if they represent a reputable investment bank. Their findings show that the "service excellence" demonstrated by advisers positively affects future engagements. Thus, boutique advisers with prior ties with the acquirer might issue more precise FOs to increase their chances of a potential rehiring by the acquirer in the future. Given these two opposite predictions, we formulate the following null hypothesis:

H2: There is no difference in the precision of an FO provided by a boutique adviser with or without a prior relationship with the acquirer.

Timeliness of Completing Tender Offers

Our underlying premise is that target shareholders use FOs to decide whether to tender their shares. If an FO delivers useful information to target shareholders, they might need less time to evaluate the offer, implying that they may tender their shares relatively fast. This speed increases the probability that the minimum condition is satisfied within the specified period. If an FO provides less useful information, target shareholders are likely to need more time to decide whether to tender their shares. Consequently, the minimum condition is unlikely to be satisfied within the specified period and the acquirer may need to extend the offer.

Prior studies on earnings forecasts and precision find that investors in general prefer more precise information, which means narrower ranges, due to its informative advantage over less precise disclosures (Du et al., 2011). Hirst et al. (1999) find that investors perceive precise forecasts also to be more credible.

In the case of tender offers, the precision of FOs is very important as target shareholders only have a defined short period of time to decide whether to tender their shares.

Less precise FOs make it more difficult for target shareholders to assess the attractiveness of the offer and whether the board made the right decision in accepting it. Consequently, we predict that more precise FOs will be more useful for target shareholders to assess the tender offer's attractiveness. Hence, we formulate the following hypothesis:

H3: The precision of an FO is positively related to the timeliness of completion of a tender offer.

3. Research Design

Sample Selection

We gather data on all tender offers identified in the Thomson Reuters Securities Data Corporation (SDC) database involving deals of publicly traded US firms for the period from 2010 to 2019. We exclude offers with values below $1 million and those with a pending or intended status. Both target and acquirer must be listed on either the NYSE, AMEX or NASDAQ (Kisgen et al., 2009; Cain and Denis, 2013). We also exclude buybacks and recapitalizations. Our initial sample has 221 tender offers. Next, we exclude tender offers that were withdrawn, had FOs without valuations or had multiple target FOs (i.e., 34 offers). We exclude one tender offer where almost all members of the target board were also members of the acquiring firm's board. We also remove tender offers with multiple advisers who provided one joint FO (i.e., 7 offers); the final sample contains 180 offers.

For this final sample, we manually collect FO data from Schedule 14D-9 filings on the SEC EDGAR website. These filings include the target's board recommendation on how shareholders should respond to the tender offer. In addition, they include fairness verdicts, valuation methods and their corresponding valuation ranges, fees paid to the adviser as well as information about a prior relationship with the client firm.

To classify an adviser as a boutique adviser, we follow the classification of Song and Wei (2010) and focus on the following aspects.[7] First, we manually inspect the scope of services provided by advisers on their websites. Second, we analyze the financial reports of advisers to determine the business line that generates the largest revenue stream. In addition, we examine whether there is evidence of financing or lending activities on the balance sheets of advisers. We also examine the news and the histories of transactions of boutique advisers to ensure that these banks serve primarily in advisory roles.

We obtain board of directors' characteristics from the Schedule 14D-9 filings. In case the information is missing, we either use the proxy statement that is referenced in the filling or the most recent proxy statement available prior to the disclosure of Schedule 14D-9. Institutional ownership data come from Thomson Reuters Institutional Holdings (13f). Target and deal characteristics come from either the SDC database or the Schedule 14D-9 fillings. Data on tender offer extensions and comment letters issued by the SEC are collected from the target's SEC filings on EDGAR. The information on the extensions is filed either under amended FOs (SC 14D9/A) or amended tender offer statements (SC TO-T/A). Financial information, such as R&D expenditures, net income, and market capitalization of the acquirer and target come from either Compustat or FactSet.

Panel A of Table 1 presents the distribution of the sample and boutique advisers over time, while Panel B presents the distribution by industry (based on Fama French 12-industry classifications). In general, the distribution of tender offers over time and industries is comparable to those in other studies (Lukas et al., 2023). Prior studies have shown the highly cyclical nature of M&A transactions and their tendency to occur in waves (Hillier et al., 2020; Liu, 2020; Lukas et al., 2023). Approximately two-thirds of the transactions in the sample occurred over the period from 2011 to 2016, which is in line with the 2011 merger

[7] We want to thank Weihong Song and Diana Wei for sharing their list of advisers classified as boutique. Compared to their sample period ending in 2006, there have been changes in the market of boutique advisers. Our updated list of advisers and their classifications is available on request.

wave identified in the literature (Hillier et al., 2020). Consequently, most FOs were also issued over this period, and especially in 2015. Looking at the engagement of boutique advisers over time, we find that most boutique advisers were engaged in 2018 (50%). We see an increase in the engagement of boutique advisers over time, although the increase is less drastic than documented by prior studies (Loyeung, 2019). In the first half of our sample (until 2014), boutique advisers were hired in 31% of the deals. In the later period (from 2015 onwards), this percentage increased to 36%.

Panel B shows that there is wide variation in the use of FOs across industries. Approximately 40% of the FOs are issued in the computers, software and electronic equipment industry, followed by healthcare, medical equipment, and drugs industry (29%). Firms operating in the utilities, chemicals, and consumer durables sectors use FOs the least. We find that firms operating in the consumer (non-)durables and finance industries engage most boutique advisers as a percentage of the FOs. All target firms operating in the consumer durables industry engaged a boutique adviser, and 56% of target firms operating in the finance sector hired one.

(Insert Table 1 about here)

Table 2 presents the frequency distribution of FOs by financial adviser. Consistent with prior research, we find that the M&A arena is still dominated by large and well-established investment banks such as Morgan Stanley and Goldman Sachs (Kisgen et al., 2009; Cain and Denis, 2013). However, two boutique investment banks, namely Centerview Partners and Qatalyst Partners, also provide a large percentage of FOs in the sample. These two boutique advisers have a combined market share of 11%. This illustrates the growing popularity of these specialized investment banks. The top five financial advisers in our sample are Goldman Sachs & Co (21 offers), JP Morgan (17 offers), Morgan Stanley (16 offers),

Centerview Partners (12 offers), and Qatalyst Partners (8 offers). These top five advisers account for 41% of the tender offers.

(Insert Table 2 about here)

Empirical Models

When examining the association between boutique advisers, the precision of an FO, and the timeliness of offer completion, we acknowledge that the decision to hire a boutique adviser is endogenously determined, as firms self-select their advisers (Song et al., 2013). Prior research shows that the choice of a boutique adviser is correlated with characteristics of the merging firms and the transaction (Song et al., 2013). This endogeneity could bias our estimation of the relation between boutique advisers and merger outcomes. Hence, to control for endogeneity in the choice of financial adviser, we use an instrumental variable (IV) approach.[8]

Both the setting and the small sample size make it challenging to use common approaches to select instrumental variables, such as using industry averages in the year prior to the event. Consequently, we use an indicator variable that captures whether the acquiring firm hires a boutique adviser (*ACQ_BOUTIQUE*) as our IV. This choice is likely to be correlated with the choice of an adviser by the target side, which means that the relevance condition is likely to be satisfied. At the same time, the acquiring firm's choice of an adviser should not affect the target firms' FOs and their properties. Hence, the exclusion condition is also likely to be satisfied.

We first estimate a selection model in which we estimate the probability that a boutique adviser is hired by the target firm. *BOUTIQUE* is an indicator variable that equals one if the target board hires a boutique adviser, and zero otherwise. Our instrument,

[8] Kisgen et al. (2009), Song et al. (2013) and Loyeung (2019) use a two-step treatment procedure to control for endogeneity in either the use of FOs or the use of boutique advisers in M&As. Note that in our setting of tender offers, all offers are accompanied by an FO. This rules out endogeneity in the use of FOs.

ACQ_BOUTIQUE, is included in the model to examine whether it is a good instrument. The control variables are motivated by prior research (Song et al., 2013; Loyeung, 2019). The model is as follows:

$$BOUTIQUE = \alpha + \beta_1 ACQ\_BOUTIQUE + Controls + Industry\ fixed\ effects + time\ trend + \varepsilon \quad (1)$$

First, we include measures of deal and target complexity since firms are more likely to choose a boutique adviser when the deal and target are complex (Servaes and Zenner, 1996; Song et al., 2013; Loyeung, 2019). We include deal premium (*DEAL_PREM*) as it increases with valuation complexity of the target (Carlin et al., 2013; García-Feijóo et al., 2015). When shares are used as the payment method (*PAY_EQUITY*), there is more uncertainty regarding the offer price and this might require the superior skills and expertise of boutique advisers. When the target firm receives multiple bids (*COMP_BIDDER*), the demand for a boutique adviser is likely lower as the target has more bargaining power. Large targets have more resources to resist a takeover bid and are more difficult to value as they may consist of more business units (*RELATIVE_SIZE, SIZE*). Similarly, volatile firms (*VOLAT*) and target firms with high R&D expenditures (*R&D*) are more likely to hire boutique advisers as they have a better understanding of the industry in which their clients operate. Following prior literature, we include an indicator variable to capture targets operating in a litigious industry (*LITIG_IND)* using the high litigation risk industry classification by Cheng et al. (2013). The demand for a boutique adviser is lower when the target operates in the same industry as the acquirer (*SAME_IND*). In these deals, information asymmetry is lower, which decreases the need to hire a boutique adviser. Target firms that operate in difficult-to-value industries are more likely to hire boutique advisers (*DIFF_IND*) as these targets are inherently more complex.

Second, we include measures for target firms' knowledge and expertise. Frye and Wang (2010) find that a board's knowledge is an important determinant of the use of an FO. We argue that firm-specific knowledge of the board is related not only to the decision to obtain an FO, but also to the choice of adviser. We control for the board's firm-specific knowledge, measured by the tenure of the directors (*BOARD_TENURE*) and their independence (*IND*). In addition, we control for target board members' financial (*FIN_EXP*) and investment banking expertise (*INV_BANK_EXP*). We control for the presence of a special committee (*SPECIAL_COM*), which is formed by independent board members to evaluate the offer. Finally, we include an indicator variable, *SEC_LETTER_PRIOR,* that is equal to one if the target firm received at least one SEC comment letter in the past, to control for the financial reporting quality of the target. Targets with lower financial reporting quality could be more likely to select a boutique adviser.

In a next step, we examine the effect of boutique advisers on the precision of the FO and the influence of a prior relationship with the acquirer (H1 and 2). To measure FO precision, we create two alternative measures. First, we use the mean scaled wideness. To construct this variable, we first calculate the mean scaled wideness of each method and then calculate the average wideness across all methods in the FO. Next, we calculate the yearly median FO wideness to account for a potential time trend in the wideness of the FO valuation ranges. Given that FOs are mostly criticized for producing wide valuation ranges, we focus on wide versus narrow FOs rather than the average FO wideness. Thus, our first measure of precision, *PRECISE_FO,* equals one if an FO's average wideness is below the yearly sample median wideness, and zero otherwise. For the second measure (*PRECISE_FO_OFFER_PR*), we scale the wideness of the ranges by the actual offer price, instead of the corresponding means. Similarly, the yearly median FO wideness in the second step is also based on the actual offer price in the denominator.

The model is as follows:

$$PRECISE = \alpha + \beta_1 BOUTIQUE\_IV + \beta_2 PRIOR\_ACQ + \beta_3 BOUTIQUE\_PRIOR + Controls + Industry\ fixed\ effects + time\ trend + \varepsilon \quad (2)$$

For ease of exposition and as some control variables are measured at either the target or offer level, the subscripts are suppressed. *PRECISE* is measured by either *PRECISE_FO* or *PRECISE_FO_OFFER_PR*. *BOUTIQUE_IV* are the fitted values of *ACQ_BOUTIQUE* from the first-stage regression. The existence of a prior relationship with the acquirer is captured by an indicator variable *PRIOR_ACQ*. If the boutique adviser has provided services to the acquirer during the past 12 months, *PRIOR_ACQ* is equal to one, and zero otherwise. To investigate whether the existence of prior ties between the acquirer and boutique adviser affects FO precision, we add an interaction term, *BOUTIQUE_PRIOR*. We add industry fixed effects based on the Fama French 12-industry classifications and a year trend variable to control for time trends.

To investigate H3, namely whether more precise FOs are associated with more timely deal completion, we use the following model:

$$TIMELINESS = \alpha + \beta_1 PRECISE + \beta_2 BOUTIQUE\_IV + Controls + industry\ fixed\ effects + time\ trend + \varepsilon \quad (3)$$

We use different measures for *TIMELINESS*. First, we measure whether a tender offer is extended. This is captured by the variable *EXTEND* that is equal to one if there is an extension, and zero otherwise. Next, we measure the number of times the tender offer is extended *(N_EXTEND)*. Then, we use a measure for the time to completion, which is often analyzed in M&A studies (Offenberg and Pirinsky, 2015) but adjust it to our setting of tender offers. The traditional time-to-completion variable is measured from the day the deal is announced to the day it is effective (Offenberg and Pirinsky, 2015). However, this measure is less appropriate in our setting. As opposed to the entire time span of the deal, we are

interested in the period after the disclosure of the FO. FOs are not disclosed at the same time the tender offer is announced. In addition, we are interested in the extent to which FOs and their properties facilitate target shareholders' tendering decisions. Therefore, we measure *DAYS_TO_COMPLETE* as the number of days between the disclosure of the FO and the completion of the offer. The continuous measures of the timeliness of offer completion, namely *N_EXTEND* and *DAYS_TO_COMPLETE,* are winsorized at 5 and 95%.

We also add several common control variables to models (2) and (3). First, we control for the level of R&D expenditures (*R&D*) of the target and the use of the acquirer's stock in the payment (*PAY_EQUITY*). Complexity is greater when the target invests more in R&D and when the payment includes the acquirer's stocks. Stock offers also have different tax implications for target shareholders than cash offers that can potentially affect the timeliness of the tender offer (Offenberg and Pirinsky, 2015; Liu et al., 2024). This valuation complexity and uncertainty is expected to have implications for both the precision of an FO and the completion time. Second, in line with Liu et al. (2024), we control for the financial reporting quality of the target. We add an indicator variable, *SEC_LETTER_PRIOR,* that is equal to one if the target firm received a SEC comment letter in the past. The financial reporting quality of the target is expected to be related to the precision of the FO and is also shown to be related to deal outcomes such as deal duration and the likelihood of receiving comment letters (Johnston and Petacchi, 2017; Liu et al., 2024). Third, given that a CEO who also serves as the chairman of the board has more power and influence over the board, we control for the incentives of the CEO. We add an indicator variable, *CEO_CHAIR_REMAIN*, that is equal to one when the CEO is the chairman of the board and remains employed at the merged firm. Lastly, we control for the presence of a competing bidder (*COMP_BIDDER).*

Along with the common set of control variables, we add model-specific controls. In Model (2) we control for the board's firm-specific knowledge captured by the tenure of the

directors (*BOARD_TENURE*) and their independence (*IND*). On the one hand, independent board members are often associated with stricter monitoring. On the other hand, independent board members may lack firm-specific knowledge. This lack of knowledge could have a negative effect on FO precision. We also control for target board members' financial (*FIN_EXP*) and investment banking expertise (*INV_BANK_EXP*). Karamanou and Vafeas (2005) find that firms with financial experts serving on their boards make less precise management forecasts. We control for the presence of a special committee (*SPECIAL_COM*) of independent board members who evaluate the offer. Duff and Phelps (2009) show that 64% of senior executives and board members in the US use FOs to protect themselves from potential lawsuits by shareholders. Thus, the precision of an FO might reflect the desire of the target board to shield itself from liability and from those lawsuits. The more precise a forecast is, the lower the accuracy, and the higher the disclosure risk (Choi et al., 2010; Cheng et al., 2013). Hence, litigation risk is an important determinant of forecast precision (Rogers, 2008; Cheng et al., 2013). Following prior literature, we add an indicator variable to capture targets operating in a litigious industry (*LITIG_IND)* using the high litigation risk industry classification by Cheng et al. (2013). We also control for the existence of prior ties between the target firm and the financial adviser with the indicator variable *PRIOR_TAR.* If the target adviser provided services to the target during the past 12 months, *PRIOR_TAR* is equal to one, and zero otherwise. Additionally, we control for the investor base of the target as measured by the percentage of institutional owners (*INST_OWN*), and we measure target firm profitability (*ROA*). Forecast precision tends to be higher when the demand for information is higher, which is captured by institutional ownership. Target firm uncertainty (reflected in negative earnings and weak performance), on the other hand, is negatively associated with forecast precision (Cheng et al., 2013). Lastly, we add an indicator variable to capture the offers whose price was increased prior to the disclosure of the FO (*SWEET_TERMS*).

In Model (3) we control for the absolute and relative sizes of the target as they may affect the timeliness of offer completion. We add the size of the target firm as measured by the log of total assets (*SIZE*), as well as its relative size as measured by the target's market capitalization divided by the acquirer's market capitalization (*RELATIVE_SIZE*). We also control for whether the acquirer and target operate in the same industry (*SAME_IND*). Acquisitions of larger targets and cross-industry acquisitions are more complex, which is expected to result in longer completion times (Grinstein and Hribar, 2004; Bhagwat et al., 2016). FO amendments represent additional relevant information for target shareholders, and hence another reason why a tender offer might be extended. We add an indicator variable that is equal to one if the FO is amended after its disclosure, and zero otherwise (*FO_AMEND*). We also control for the equity held by the target board (*BOARD_EQUITY*) since the more equity the board owns, the sooner the minimum condition can be satisfied, resulting in a timelier completion of the offer (Liu et al., 2024). We also control for the deal premium (*DEAL_PREM*) since its attractiveness is likely related to the target shareholders' tendering decisions. Additionally, we control for initiations of merger-related lawsuits (*LAWSUIT*) and the number of SEC comment letters received by the target firm during the tender offer (*N_SEC_LETTER*) as these may delay the completion of the deal (Liu et al., 2024). We also control for the number of valuation methods reported in the FO (*N_METHODS*) and the extent of information that advisers specifically dedicate to valuations. The variable *N_METHODS_PAGE* captures the average amount of pages that advisers use to present, describe and explain a valuation method. Lastly, we control for the decision of the target board to grant a top-up option to the acquiring firm (*TOPUP*). A top-up option enables the acquiring firm to bypass target shareholder consent and allows for relatively fast execution of

the tender offer (Devos et al., 2014).[9] Appendix A provides more detailed descriptions of the variables.

4. Results

Descriptive Statistics

We first present some detailed descriptive statistics on the FOs and the valuation methods used in FOs. Panel A of Table 3 presents the valuation methods used by all financial advisers in our sample of FOs. It shows that the primary valuation methods used are the discounted cash flow (DCF) model, selected public companies analysis (SPCA), and the precedent M&A transactions analysis (PMTA). These three core methods account for 65% of the valuations in FOs. Panel B presents the most used valuation methods by boutique and non-boutique advisers separately. This table shows that boutique advisers make more use of the core valuation methods (DCF, SPCA, and PMTA) than non-boutique advisers. These core methods account for a total of 75% of the methods used by boutique advisers as opposed to 61% of those used by non-boutique advisers. Furthermore, the analysis of the present value of future share price analysis is rarely used by boutique advisers.

(Insert Table 3 about here)

Panel A of Table 4 presents summary statistics for all variables. The table shows that 33% of the target firms hire a boutique adviser. Almost 40% (42%) of target advisers have prior ties with the acquirer (target). Moreover, 59% of FOs are amended and 28% of the deals have at least one extension. These findings indicate that the minimum condition is not satisfied within the originally specified period in almost one-third of the tender offers. Untransformed statistics show that the number of extensions ranges from zero to 17. A similar dispersion is observed for the time-to-completion measure as the untransformed number of days to completion ranges from zero to 290 days. In addition, while 33% of target firms decides to

[9] A top-up option gives a bidder the right, after completion of the tender offer that reaches the minimum condition, to purchase newly issued shares of the target to increase the buyer's common stock ownership interest to 90% required to effect a "short form" merger (Devos et al., 2014).

engage a boutique adviser, this proportion is much smaller for the acquiring firms at about 11%. Around 79% of target firms received at least one SEC comment letter in the three years prior to the tender offer and 32% of target firms formed a special committee of independent board members to assess the offer. When looking at comment letters received during the tender offer, we find that, on average, 29% of target firms receive at least one comment letter from the SEC. The number of comment letters ranges from zero to ten.

In terms of FO properties, we find that financial advisers, on average, use 4.2 valuation methods in their FOs (*N_METHODS*), with the number of methods ranging from one to ten. On average, 82% of disclosed FO valuation methods provide a specific price range (*N_METHODS_RANGE*).

Panel B presents the mean and median differences for our key variables of interest between boutique and non-boutique advisers. We find no significant differences regarding the precision of the FO, whether the tender offer is extended, and the number of extensions; although there is some evidence that boutique advisers are associated with faster completion times. Panel B also shows that there are statistically significant differences between the two types of advisers and the existence of a prior relationship with the acquirer and target. Of the non-boutique advisers, 48% have prior ties with the acquirer, while only 14% of the boutique advisers were engaged by the acquirer in the past. Similarly, 51% of the non-boutique advisers have prior ties with the target, while only 22% of boutique advisers were engaged by the target in the past.

There are also significant differences in terms of the FO properties that the two types of advisers provide. First, non-boutique advisers use more valuation methods than boutique advisers. Non-boutique advisers use on average 4.4 valuation methods, while boutique banks use on average 3.8 valuation methods. Second, while non-boutique advisers report more valuation methods, the proportion of these methods containing specific ranges is lower than

for boutique banks. In the FOs prepared by non-boutique advisers on average 78% of the valuation methods have a specific price range. In the FOs provided by boutique advisers, 89% of the valuation methods provide price range estimates. Lastly, we also find that there is a significant difference in the extent of information that advisers disclose to accompany their valuations. Panel B indicates that boutique advisers provide more information to describe and explain their valuations than non-boutique advisers.

(Insert Table 4 about here)

Selection of Boutique Advisers

Turning to the factors that affect the target boards' decision to hire a boutique adviser, our results in Table 5 provide several interesting observations. First, we find that our instrumental variable (*ACQ_BOUTIQUE)* is strongly correlated with our endogenous variable, which is the choice of a boutique adviser by the target firm. Target firms are more likely to hire a boutique adviser when the acquiring firm employs a large bulge bracket investment bank. The coefficient for *ACQ_BOUTIQUE* is negative and significant at the 1% level, and an untabulated Z-test on *ACQ_BOUTIQUE* shows a Chi-square of 28.14. This provides preliminary evidence that our instrumental variable is a good instrument.

Consistent with prior research, we find that target firms are more likely to hire boutique advisers when the deal or target firm are more complex, which illustrates that boutique advisers are often chosen for their skill and expertise (Song et al., 2013; Loyeung, 2019). Specifically, we find that the probability of hiring a boutique adviser increases with the target firm's R&D intensity and the deal premium. Contrary to our expectations, we find that boutique advisers are more likely to be hired when cash is used as the payment method. However, this finding could be attributed to a low number of purely stock-financed deals in

our sample.[10] In addition, we find that there is a positive and marginally significant association between the probability of hiring a boutique adviser and the relative size of the target, which captures the negotiation power of the target. Larger targets have more resources to resist a takeover bid or to engage in negotiations with the acquirer to improve the terms of the offer. Hence, the target requires the expertise and skills of a boutique adviser on how to deal with the tender offer and how to negotiate a higher price (Loyeung, 2019). Our results also show that when the bargaining power of the target is already high, that is, when there are competing bids, the demand for a boutique adviser decreases. These findings also provide insight into the endogenous choice of a financial adviser: more complex targets are more likely to select a boutique adviser but are also more likely to have less precise FOs and longer completion times.

Interestingly, our findings indicate that the target board's independence is the strongest predictor of the decision to hire a boutique adviser, with independent boards being less likely to use a boutique adviser. Target firms might choose a boutique adviser for different reasons. Some firms might hire boutique advisers for their expertise and skills, while others choose boutique advisers to mitigate litigation risk, which arises because of the threat of a perceived conflict of interest (Song et al., 2013). Prior research has shown that the perceived conflict of interest is greater in management buyouts, going-private transactions, and when the target's board lacks independence (Imperatore et al., 2024). Hence, in line with prior literature (Malm and Mobbs, 2016; Shi et al., 2016), our findings show that insider-dominated target boards are more likely to opt for a boutique adviser to mitigate litigation risk.

(Insert Table 5 about here)

[10] In our sample, there are only two tender offers that are purely stock-financed, 15 that use a hybrid payment method with both cash and equity, and 163 that are purely cash-financed.

FO Precision

Table 6 presents the results of the two-stage probit regression analyses. Column (1) shows the first-stage probit results with *BOUTIQUE* as the dependent variable. In line with the results reported in Table 5, this column shows that the coefficient for *ACQ_BOUTIQUE* is negative and significant. The Kleibergen–Paap LM Wald *F*-statistic obtained in the first stage is 18.66.[11] Based on the *F*-statistic cut-off value for a weak instrument that Stock and Yogo (2005) suggest, we reject the null hypothesis that the instrument is weak. Hence, the first-stage estimation indicates that the acquiring firms' decision to hire a boutique adviser serves as a valid instrument.

Columns (2) and (3) of Table 6 present the second-stage probit results from estimating the effect of the fitted values of *BOUTIQUE* and *BOUTIQUE_PRIOR* on *PRECISE_FO* and *PRECISE_FO_OFFER_PR*, respectively. Our results show that boutique advisers, on average, provide more precise FOs than non-boutique advisers. At first, this finding suggests that boutique advisers' superior M&A expertise outweighs their potential incentives to complete the tender offer. However, we also find that boutique advisers with prior ties with the acquirer provide less precise FOs as this may increase the likelihood of their rehire by the acquirer in the future. Taken together, our results show that boutique advisers provide more precise FOs than non-boutique advisers, unless they have prior ties with the acquiring firm. Boutique advisers with such prior ties may use FOs strategically to facilitate shareholders' tendering and to ensure the success of the acquirer's offer in the hope of being hired by the acquirer in the future.

Additionally, we find that the expertise and firm-specific knowledge of the target board plays a significant role when it comes to the precision of an FO. Interestingly, we find that financial expertise of the board is positively related to the precision of an FO, while the

[11] Additionally, Montiel-Pflueger's robust weak instrument test shows an effective *F*-statistic of 20.41.

opposite is true for investment banking expertise of the board. This difference might hinge on the potential conflict of interest arising from directors' affiliation with investment banks in the past. Prior research has shown that directors with prior affiliations in the investment banking industry pursue the interests of those affiliated institutions rather than maximizing shareholder value (Güner et al., 2008). Our findings align with this idea.

Our results offer some additional interesting findings. First, we find that R&D intensive target firms are likely to have less precise FOs, which reflects the valuation uncertainty for these firms (Cheng et al., 2013). Second, we find that FOs are more precise if the acquirer has already increased the offer price prior the FO disclosure. In that case, further negotiations with the acquirer are rather unlikely, and target firms prefer disclosing more precise FOs to make the offer price more appealing and attractive to target shareholders.

(Insert Table 6 about here)

Timeliness of Completing the Tender Offer

For the sake of brevity, Table 7 shows only the results of the second-stage regression analyses that examine the determinants of the timeliness of deal completion. With exception of column (6), the findings in Table 7 indicate that both the precision of an FO and the presence of a boutique adviser facilitate a timely completion. Our results show that the probability of a tender offer extension increases if a less precise FO is issued. Similarly, less precise FOs are positively associated with the number of tender offer extensions. It also takes more days before the deal is completed if imprecise FOs are disclosed. Collectively, we find that imprecise FOs delay the completion of the deal, providing support for *H3*.[12] We also find

[12] In untabulated additional analyses, we re-run our completion analyses controlling for the level of the valuation in relation to the offer price. Our findings are unaffected, and, more importantly, we find that the level of FO valuation is not related to the timeliness of deal completion. This aligns with prior literature and provides some evidence for our main argument that it is the ranges that matter to shareholders, and not the level of the valuation.

that the FOs provided by boutique advisers are perceived as credible. Target shareholders tender their shares faster if FOs are issued by boutique advisers than non-boutique advisers.

(Insert Table 7 about here)

In addition, we find that tender offers are completed faster if target advisers have prior ties with the acquirer. The decision to hire an adviser with prior ties with the acquirer reduces information asymmetry for the target firm, provides it with greater access to information, and strengthens the bargaining position of the target firm (Agrawal et al., 2013; Chang et al., 2016). This informational advantage and reduced information asymmetry can eliminate delays that might result from prolonged negotiations between the two parties and their advisers, thereby facilitating faster deal completion (Agrawal et al., 2013). In line with our expectations, we find that the timeliness of completion is negatively affected by the complexity of the deal and target firm. Tender offers that involve the acquisition of large targets take longer to complete because they are associated with greater valuation and regulatory complexity. Further, our findings indicate that the equity holdings of the target board facilitate the timely completion of the tender offer. Our results also show that tender offers are completed slower if the target firm received SEC comment letters in the three years prior to the tender offer. Lastly, we find that the number of valuation methods disclosed in an FO is positively correlated with the timeliness of completion.

In terms of tender offer extensions, we find that when the CEO is the chairman of the board and remains employed at the merged company, the probability of an extension and the number of extensions is lower. This highlights the CEO's incentives to complete the deal in a timely manner. Further, when looking at tender offer extensions, we find that the use of the acquirer's stock as the payment method is negatively related to both the probability of an extension and the number of extensions. This is in line with prior research that has highlighted the role of the differential tax implications associated with the nature of the

consideration to be received (Offenberg and Pirinsky, 2015). When target shareholders receive cash in exchange for their shares, they could owe taxes on capital gains. However, when the same shareholders receive stock for their shares, there are no taxes due (Huang and Walkling, 1987; Offenberg and Pirinsky, 2015). Hence, target shareholders tender their shares faster when stock payments are used by acquirers. Lastly, we find that SEC comment letters are associated with delays in deal completion time and a greater number of extensions, in line with prior research (Liu et al., 2024).

Taken together, our results show that boutique advisers provide more precise FOs, and that both precise FOs and the engagement of a boutique adviser facilitate the timely completion of the tender offer. One channel through which this timely completion might be facilitated is the decrease in the likelihood of receiving a merger-related SEC comment letter. Prior literature has provided evidence that SEC comment letters delay completion times (Liu et al., 2022); our findings show that SEC comment letters are associated with delays in completion time and a greater number of extensions. In our sample, on average, 29% of target firms receive at least one comment letter from the SEC during the tender offer, with the number of letters ranging from zero to ten. Hence, if boutique advisers and precise FOs reduce the likelihood of receiving a merger-related SEC comment letter, then the completion time should be shorter. Therefore, we run a two-stage probit regression analysis to investigate whether boutique advisers and precise FOs can indeed help target firms reduce the likelihood of receiving a comment letter. This reduced probability is one channel through which a timelier and faster completions can then be achieved. The dependent variable, *COMMENT_LETTER*, equals one if the target firm receives at least one SEC comment letter between offer's announcement and completion, and zero otherwise. Our main variables of interest are the engagement of a boutique bank (*BOUTIQUE*) and the disclosure of a precise

FO (*PRECISE_FO* or *PRECISE_FO_OFFER_PR)*. We use the same instrument as in Tables 6 and 7. The results are presented in Table 8.[13]

The results in column (1) show that boutique advisers and precise FOs indeed reduce the likelihood that the target firm will receive a comment letter from the SEC during the tender offer, although we only find an effect of boutique advisers in column (2). Hence, through issuing more precise FOs, boutique advisers facilitate a timelier deal execution. An additional insight is worth mentioning. Our results show that the likelihood of receiving a comment letter is higher for insider-dominated target boards. This reconciles with prior evidence on insider-dominated target boards being subject to greater scrutiny (Malm and Mobbs, 2016; Shi et al., 2016).

5. Conclusion

In this study, we investigate the role of boutique advisers in providing FOs for tender offers. FOs have been criticized for having very wide ranges that fail to provide useful information to shareholders. Over the last decade, the use of boutique advisers in M&A transactions has been on the rise. Boutique advisers are believed to be more independent and to deliver higher quality services, although empirical evidence on the benefits of using one are still scarce. We first investigate whether boutique advisers provide more precise FOs than non-boutique advisers. Our findings show that this is indeed the case. Yet, we also find that boutique advisers with prior ties with the acquirer provide less precise FOs than boutique advisers without such ties.

Next, we provide evidence that FO precision and the choice of a boutique adviser matters for the timeliness of completing the offer. We show that imprecise FOs delay the completion of the tender offer, since target shareholders prefer precise FOs. We also find that

[13] For the sake of brevity, Table 8 reports only the results of the second-stage regression analyses. The Kleibergen–Paap LM Wald *F*-statistic obtained in the first stage is 13.65 and the Montiel-Pflueger's robust weak instrument test shows an effective *F*-statistic of 15.08, which both suggest that our instrument is a valid instrument.

target shareholders tender their shares faster if the target hires a boutique adviser. One channel through which boutique advisers and precise FOs can facilitate a timely completion is the issuance of comment letters. Our findings show that both precise FOs and the engagement of a boutique adviser are negatively related to the probability that the target firm receives a merger-related comment letter from the SEC. This, in turn, has positive implications for the completion time of the tender offer.

This study contributes to the fairness opinion and financial adviser literature in several ways. First, this is the first paper to investigate how the type of financial adviser is associated with the properties observed in an FO, especially the role and superiority of boutique advisers. FOs and boutique advisers both still represent unexplored phenomena despite their prevalence in the M&A arena. Second, this is the first study to analyze how FO properties interact with the timeliness of deal completion. Given that acquirers often choose to conduct a tender offer because of its substantially faster completion times, it is important to understand which properties impair the usefulness of an FO, thereby diminishing the comparative advantage of tender offers.

The findings of the study are subject to several limitations. First, in addition to the examined characteristics of the FO provider, future research can incorporate some additional factors such as industry specialization of the investment bank. Second, future research can examine the different incentives and conflicts of interest of financial advisers in more detail. Lastly, while we expect FOs to matter more in the case of tender offers as opposed to friendly M&A deals, this, nevertheless, results in a relatively small sample size and makes our findings less generalizable to other settings.

Appendix A. Definitions of Variables

Dependent Variables	Description	Data Source
PRECISE_FO	We first calculate the mean scaled wideness of each method, $wide_1$ to $wide_n$ as *wide* = [Upper bound range$_1$ – Lower bound range$_1$] / ((Upper bound range$_1$ + Lower bound range$_1$)/2). Then we calculate the average wideness across all methods in an FO, as *AV_WIDE* = ($wide_1$+$wide_2$+…$wide_n$)/*N*, where *N* is the total number of methods with a range in the FO. We then calculate the median average FO wideness on a yearly basis. *PRECISE_FO* is equal to one if *AV_WIDE* of the FO is lower than the yearly sample median *AV_WIDE*, and zero otherwise.	Schedule 14D-9
PRECISE_FO_OFFER_PR	Similar to *PRECISE_FO*, we first calculate the wideness of each method scaled by the *actual offer price*, as wide$_1$ to wide$_n$ as, for instance, wide$_1$ = (Upper bound range$_1$ – Lower bound range$_1$) / actual offer price. Then we calculate the average wideness across all the methods in an FO, as *AV_WIDE* = (wide$_1$+wide$_2$+…wide$_n$)/N, where N is the total number of methods with a range in an FO. We then calculate the median average FO wideness on a yearly basis. *PRECISE_FO* is equal to one if *AV_WIDE* of an FO is lower than the yearly sample median *AV_WIDE*, and zero otherwise.	Schedule 14D-9
EXTEND	Indicator variable that is equal to one if there is at least one tender offer extension, and zero otherwise.	Target SEC filings
N_EXTEND	Total number of extensions. Winsorized at 5 and 95%.	Target SEC filings
DAYS_TO_COMPLETE	Total number of days between the disclosure of the FO and completion of the tender offer. Winsorized at 5 and 95%.	SDC
COMMENT_LETTER	Indicator variable that is equal to one if the target firm receives at least one SEC comment letter between the announcement and completion of the tender offer, and zero otherwise.	Target SEC filings
Main Explanatory Variables		
BOUTIQUE	Indicator variable that is equal to one if the target adviser is classified as a boutique adviser, and zero otherwise.	Websites/ SEC filings of investment banks
PRIOR_ACQ	Indicator variable that is equal to one if the	Schedule 14D-9/

	target adviser has provided services to the acquirer during the past 12 months, and zero otherwise.	Target SEC filings
Instrument		
ACQ_BOUTIQUE	Indicator variable that is equal to one if the acquiring firm hires a boutique adviser, and zero otherwise.	SDC/Schedule 14D-9
Target Characteristics		
SIZE	Logarithm of total assets of the target.	SDC
R&D	Three-year moving average of R&D expenditures divided by total assets of the target.	Compustat
VOLAT	Standard deviation of net income of the target measured on a rolling basis over a three-year period. Winsorized at 5 and 95%.	Compustat
ROA	EBIT divided by total assets of the target.	SDC
INST_OWN	Total number of shares owned by institutional investors divided by the total number of shares outstanding of the target.	Thomson Reuters Institutional Holdings (13f)
LITIG_IND	Indicator variable that is equal to one if the target operates in a litigious industry (SIC codes 2833-2836, 3570-3577, 3600-3674, 5200-5961,7370), and zero otherwise.	SDC
DIFF_IND	Indicator variable that is equal to one if the target belongs to a more complex and opaque industry (SIC codes 28, 36, 38, 73), and zero otherwise.	SDC
SEC_LETTER_PRIOR	Indicator variable that is equal to one if the target firm received at least one SEC comment letter in the three years prior to the tender offer, and zero otherwise.	Target SEC filings
Offer Characteristics		
DEAL_PREM	Measured as offer price – target share price four weeks prior to the tender offer announcement divided by the target's share price four weeks prior to the tender offer announcement.	SDC
DEAL_SIZE	Transaction value reported by SDC. Winsorized at 5 and 95%.	SDC
PAY_EQUITY	Indicator variable that is equal to one if the payment method includes the use of the acquiring firm's stock, and zero otherwise.	Schedule 14D-9
SAME_IND	Indicator variable that is equal to one if the	SDC

	acquirer and target operate in the same industry (based on the Fama French 12-industry classifications), and zero otherwise.	
RELATIVE_SIZE	Market capitalization of the target firm divided by the market capitalization of the acquiring firm.	FactSet
COMP_BIDDER	Indicator variable that is equal to one if there are multiple bidders for the target, and zero otherwise.	FactSet
SWEET_TERMS	Indicator variable that is equal to one if the offer price was increased prior to the disclosure of an FO, and zero otherwise.	Target SEC filings
LAWSUIT	Indicator variable that is equal to one if there is at least one lawsuit initiated after the disclosure of an FO, and zero otherwise.	Target SEC filings
FO_AMEND	Indicator variable that is equal to one if there are FO amendments after the disclosure of the FO, and zero otherwise.	Target SEC filings
N_SEC_LETTER	Total number of SEC comment letters received by the target firm between the announcement and completion of the tender offer.	Target SEC filings
PRIOR_TAR	Indicator variable that is equal to one if the target adviser provided services to the target in the past 12 months, and zero otherwise.	Schedule 14D-9/ Target SEC filings
N_METHODS	Total number of valuations in the FO.	Schedule 14D-9
N_METHODS_RANGE	Total number of FO valuations with a price range divided by total number of valuations in the FO.	Schedule 14D-9
N_METHODS_PAGE	Total number of pages in the FO divided by the total number of valuations.	Schedule 14D-9
STD_FO_ESTIMATE	Standard deviation of the mean valuation estimates across all valuations in the FO. We first calculate the mean valuation of each method, $mean_1$ to $mean_n$ as, for instance, $mean_1$ = [Upper bound $range_1$ – Lower bound $range_1$] / 2. We then calculate the standard deviation of the mean estimates of all the methods with a range. Winsorized at 5 and 95%.	Schedule 14D-9

Board Characteristics

IND	Number of independent board members divided by total number of board members.	Schedule 14D-9/ DEF 14A
INV_BANK_EXP	Number of board members with investment banking experience divided by total number of board members.	Schedule 14D-9/ DEF 14A
FIN_EXP	Number of board members with finance experience divided by total number of board members.	Schedule 14D-9/ DEF 14A
BOARD_EQUITY	Logarithm of total equity-related payments of target directors. This total includes payments for the common stock held by the board and the accelerated equity vesting.	Schedule 14D-9
CEO_CHAIR_REMAIN	Is equal to one if the CEO is the chairman of the board and also if they remain employed at the merged company, and zero otherwise.	Schedule 14D-9/ DEF 14A
BOARD_TENURE	Logarithm of the total number of years of service of all board members / total number of board members.	Schedule 14D-9/ DEF 14A
SPECIAL_COM	Is equal to one if the target board of directors formed a committee of independent directors to review the terms of the transaction and to ensure that any subsequent recommendation of the transaction is unbiased, and zero otherwise.	FactSet
TOPUP	Is equal to one if a top-up option is granted to the acquirer by the target board of directors, and zero otherwise.	SDC

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Table 1. Distribution of Fairness Opinions

Panel A. Sample distribution by year

Year	Tender Offers	Number boutique advisers	Percentage of boutique advisers
2010	28	9	32%
2011	10	2	20%
2012	14	5	36%
2013	16	3	19%
2014	19	9	47%
2015	31	9	29%
2016	23	6	26%
2017	19	7	37%
2018	10	5	50%
2019	10	4	40%
Total	**180**	**59**	

Panel B. Sample distribution by industry

Industry	Tender Offers	Number boutique advisers	Percentage boutique advisers
1 - Consumer Non-Durables	4	2	50%
2 - Consumer Durables	3	3	100%
3 - Manufacturing	11	3	27%
4 - Energy: Oil, Gas, and Coal Extraction and Products	3	0	0
5 - Chemicals and Allied Products	1	0	0
6 - Computers, Software and Electronic Equipment	68	20	29%
7 - Telecommunication: Telephone and Television Transmission	3	1	33%
8 - Utilities	0	0	0
9 - Wholesale & Retail	13	2	15%
10 - Healthcare, Medical Equipment, and Drugs	52	19	37%
11 - Finance	9	5	56%
12 - Other	13	4	31%
Total	**180**	**59**	

This table presents the distribution of tender offers in the sample. Panel A presents the distribution of the tender offers and boutique advisers by year from 2010 to 2019. Panel B presents the distribution of tender offers and boutique advisers by industry based on the Fama French 12-industry classifications.

Table 2. Overview of Fairness Opinions by Financial Adviser

Adviser	Boutique Adviser	Frequency	Percentage
Goldman Sachs & Co	NO	21	11.67
JP Morgan	NO	17	9.44
Morgan Stanley	NO	16	8.89
Centerview Partners LLC	YES	12	6.67
Qatalyst Partners	YES	8	4.44
Citigroup Global Markets Inc	NO	7	3.89
Jefferies	NO	7	3.89
Deutsche Bank Securities Inc	NO	6	3.33
Lazard	YES	6	3.33
Bank of America Merrill Lynch	NO	5	2.78
Barclays	NO	4	2.22
Credit Suisse	NO	4	2.22
Houlihan Lokey	YES	4	2.22
MTS Securities LLC	YES	4	2.22
Perella Weinberg Partners LP	YES	4	2.22
Stifel Nicolaus & Co Inc	NO	4	2.22
William Blair & Co	NO	4	2.22
Duff & Phelps LLC	YES	3	1.67
Evercore Group LLC	YES	3	1.67
Raymond James & Associates Inc	NO	3	1.67
Cowen & Co LLC	NO	2	1.11
Greenhill & Co LLC	YES	2	1.11
Guggenheim Securities LLC	NO	2	1.11
Moelis & Co	YES	2	1.11
Needham & Co LLC	NO	2	1.11
Robert W Baird & Co Inc	NO	2	1.11
Rothschild Inc	NO	2	1.11
Stone Key Partners	YES	2	1.11
UBS Securities LLC	NO	2	1.11
Other (one deal each)		20	11.13
Total		**180**	**100%**

This table presents the frequency distribution of fairness opinions by financial adviser.

Table 3. Valuation Methods Used in Fairness Opinions

Panel A. Valuation methods used in FOs

Valuation method	**Frequency**	**Percentage**
Discounted Cash Flow Analysis (DCF)	169	22.30
Selected Public Companies Analysis (SPCA)	168	22.16
Precedent M&A Transactions Analysis (PMTA)	158	20.84
Precedent M&A Transaction Premiums Paid Analysis	62	8.18
Analysis of Implied Premiums and Multiples	54	7.12
Present Value of Future Share Price Analysis	38	5.01
Historical Stock Trading Analysis	27	3.56
Research Analysts Price Target Analysis	26	3.43
Leveraged Buyout Analysis	15	1.98
Sum-of-the-Parts Discounted Cash Flow Analysis	8	1.06
Analysis of Multiples at Offer Price	6	0.79
Sum-of-the-Parts Analysis	5	0.66
Proforma Discounted Cash Flow Analysis	2	0.26
Dividend Discount Analysis	2	0.26
Forward Discounted Multiple Analysis	2	0.26
Proforma Transaction Analysis	2	0.26
Other	14	1.87
Total	**758**	**100%**

Panel B. Valuation methods by boutique and non-boutique advisers

Adviser	*Discounted Cash Flow Analysis*	*Selected Public Companies Analysis*	*Precedent M&A Transactions Analysis*	*Precedent M&A Transaction Premiums Paid Analysis*	*Analysis of Implied Premiums and Multiples*	*Present Value of Future Share Price Analysis*	*Top 6 valuation methods*	*Total Number of Valuation methods*
Boutique	56	59	54	18	7	3	197	225
Non-boutique	113	109	104	44	47	35	452	533
Total	**169**	**168**	**158**	**62**	**54**	**38**	**649**	**758**

This table presents valuation methods used in the sample of 180 fairness opinions between 2010 and 2019. Panel A shows the valuation methods by financial advisers, while Panel B presents the valuation methods for boutique versus non-boutique advisers.

Table 4. Descriptive Statistics

Panel A. Descriptive statistics for the full sample

	N	Mean	Min	Q1	Median	Q3	Max	Std. Dev.
PRECISE_FO	180	0.50	0.00	0.00	0.50	1.00	1.00	0.50
PRECISE_FO_OFFER_PR	180	0.48	0.00	0.00	0.00	1.00	1.00	0.50
BOUTIQUE	180	0.33	0.00	0.00	0.00	1.00	1.00	0.47
EXTEND	180	0.28	0.00	0.00	0.00	1.00	1.00	0.45
N_EXTEND	180	0.48	0.00	0.00	0.00	1.00	3.00	0.89
DAYS_TO_COMPLETE	180	38.39	28.00	29.00	30.50	38.50	88.00	17.12
COMMENT_LETTER	180	0.29	0.00	0.00	0.00	1.00	1.00	0.45
PRIOR_ACQ	180	0.37	0.00	0.00	0.00	1.00	1.00	0.48
ACQ_BOUTIQUE	180	0.11	0.00	0.00	0.00	0.00	1.00	0.32
SIZE	178	2.39	0.85	2.01	2.35	2.77	4.21	0.57
R&D	178	0.13	0.00	0.00	0.07	0.17	1.11	0.18
VOLAT	173	25.37	1.47	5.25	13.00	30.46	108.89	29.65
ROA	178	-0.06	-1.49	-0.14	0.01	0.09	1.55	0.30
INST_OWN	175	0.59	0.00	0.40	0.66	0.83	1.24	0.32
LITIG_IND	180	0.39	0.00	0.00	0.00	1.00	1.00	0.49
DIFF_IND	180	0.70	0.00	0.00	1.00	1.00	1.00	0.46
SEC_LETTER_PRIOR	180	0.79	0.00	1.00	1.00	1.00	1.00	0.41
DEAL_PREM	180	0.62	-0.87	0.28	0.44	0.70	3.47	0.63
DEAL_SIZE	180	6.46	4.25	5.54	6.44	7.37	8.82	1.25
PAY_EQUITY	180	0.09	0.00	0.00	0.00	0.00	1.00	0.29
SAME_IND	180	0.76	0.00	1.00	1.00	1.00	1.00	0.43
RELATIVE_SIZE	149	0.12	0.00	0.02	0.05	0.14	1.13	0.18
COMP_BIDDER	180	0.07	0.00	0.00	0.00	0.00	1.00	0.26
SWEET_TERMS	180	0.09	0.00	0.00	0.00	0.00	1.00	0.29
LAWSUIT	180	0.67	0.00	0.00	1.00	1.00	1.00	0.47
FO_AMEND	180	0.59	0.00	0.00	1.00	1.00	1.00	0.49
N_SEC_LETTER	180	0.87	0.00	0.00	0.00	2.00	10.00	1.42
PRIOR_TAR	180	0.42	0.00	0.00	0.00	1.00	1.00	0.49
N_METHODS	180	4.19	1.00	3.00	4.00	5.00	10.00	1.41
N_METHODS_RANGE	180	0.82	0.00	0.71	1.00	1.00	1.00	0.24
N_METHODS_PAGE	180	1.25	0.50	1.00	1.20	1.50	2.67	0.38
IND	180	0.80	0.43	0.72	0.83	0.86	1.00	0.10
INV_BANK_EXP	180	0.10	0.00	0.00	0.00	0.17	0.67	0.13

FIN_EXP	180	0.36	0.00	0.22	0.33	0.50	1.00	0.21
CEO_CHAIR_REMAIN	180	0.05	0.00	0.00	0.00	0.00	1.00	0.22
BOARD_EQUITY	177	7.70	5.80	7.26	7.71	8.15	9.49	0.67
BOARD_TENURE	180	0.79	0.11	0.69	0.80	0.92	1.33	0.24
SPECIAL_COM	180	0.32	0.00	0.00	0.00	1.00	1.00	0.47
TOPUP	180	0.39	0.00	0.00	0.00	1.00	1.00	0.49

Panel B: Key descriptive statistics for boutique versus non-boutique advisers

Adviser	***PRECISE__FO***	***PRECISE_FO_OFFER_PR***	***EXTEND***	***N_EXTEND***	***DAYS_TO_COMPLETE***	***PRIOR_ACQ***	***PRIOR_TAR***	***N_METHODS***	***N_METHODS_RANGE***	***N_METHODS_PAGE***
Boutique (N=59)	0.49 (0.00)	0.53 (1.00)	0.20 (0.00)	0.37 (0.00)	35.42 (29.00)	0.14 (0.00)	0.22 (0.00)	3.80 (3.00)	0.89 (1.00)	1.14 (1.00)
Non-boutique (N=121)	0.50 (1.00)	0.45 (0.00)	0.31 (0.00)	0.53 (0.00)	39.83 (31.00)	0.48 (0.00)	0.51 (1.00)	4.39 (4.00)	0.78 (0.00)	1.30 (1.20)
Mean differences:										
t-stat	0.15	-0.89	1.56	1.11	1.63	4.74***	3.86***	2.68***	-2.72***	2.73***
p-value	0.875	0.374	0.121	0.269	0.105	0.000	0.000	0.008	0.007	0.007
Median differences:										
z-stat	0.16	-0.89	1.55	1.43	1.85*	4.48***	3.72***	3.01***	-2.86***	2.55**
p-value	0.874	0.463	0.121	0.152	0.064	0.000	0.000	0.002	0.00	0.011

This table presents the summary statistics of all variables used in the empirical models. Panel A presents the summary statistics for the full sample, while Panel B presents mean and median differences for the key variables among boutique and non-boutique advisers. In Panel B, the differences between the advisers are tested using a *t*-test for mean differences and a Wilcoxon rank-sum test for median differences. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Appendix A.

Table 5. Choice of a Boutique Adviser

	BOUTIQUE
ACQ_BOUTIQUE	-0.203***
	(0.000)
DEAL_PREM	0.222***
	(0.000)
PAY_EQUITY	-0.226**
	(0.048)
COMP_BIDDER	-0.163***
	(0.000)
RELATIVE_SIZE	0.316*
	(0.060)
SIZE	-0.081
	(0.495)
VOLAT	0.000
	(0.945)
R&D	0.003***
	(0.003)
LITIG_IND	-0.127
	(0.198)
SAME_IND	-0.035
	(0.780)
DIFF_IND	0.047
	(0.822)
BOARD_TENURE	-0.110
	(0.557)
IND	-0.866*
	(0.085)
FIN_EXP	-0.057
	(0.688)
INV_BANK_EXP	-0.114
	(0.757)
SPECIAL_COM	0.013
	(0.885)
SEC_LETTER_PRIOR	-0.035
	(0.705)
Industry FE	YES
Year trend	YES
Observations	137
Pseudo R^2	16.82%

This table presents the marginal effects of the probit regression on the choice of a boutique adviser. *BOUTIQUE* is an indicator variable that equals one if the target firm hires a boutique adviser, and zero otherwise. All variables are defined in Appendix A. P-values are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at the industry level, using Fama French 12-industry classifications.

Table 6. FO Precision

	(1) *First stage* ***BOUTIQUE***	***(2)*** *Second stage* ***PRECISE_FO***	***(3)*** *Second stage* ***PRECISE_FO_OFFER_PR***
ACQ_BOUTIQUE	-0.204*		
	(0.075)		
BOUTIQUE_IV		1.668***	2.198***
		(0.000)	(0.000)
PRIOR_ACQ	-0.379***	1.098***	1.276***
	(0.000)	(0.000)	(0.000)
BOUTIQUE_PRIOR		-5.152***	-4.457***
		(0.000)	(0.000)
R&D	-0.022	-0.650**	-0.703***
	(0.925)	(0.019)	(0.005)
PAY_EQUITY	-0.260*	0.004	-0.028
	(0.059)	(0.992)	(0.932)
SEC_LETTER_PRIOR	-0.053	0.100	0.140
	(0.584)	(0.611)	(0.404)
CEO_CHAIR_REMAIN	0.108	-0.185	-0.309***
	(0.498)	(0.406)	(0.002)
COMP_BIDDER	-0.125	0.011	0.111
	(0.425)	(0.965)	(0.482)
BOARD_TENURE	-0.168	-0.111	0.237
	(0.350)	(0.728)	(0.596)
IND	-0.811**	-1.329*	-0.411
	(0.036)	(0.066)	(0.570)
FIN_EXP	0.101	1.386**	1.202**
	(0.613)	(0.011)	(0.022)
INV_BANK_EXP	0.147	-2.270**	-1.771**
	(0.659)	(0.011)	(0.016)
SPECIAL_COM	0.003	0.036	0.004
	(0.968)	(0.854)	(0.978)
LITIG_IND	0.026	-0.078	-0.033
	(0.768)	(0.746)	(0.896)
PRIOR_TAR	-0.146*	0.054	0.189
	(0.057)	(0.700)	(0.133)
INST_OWN	0.085	0.107	-0.145
	(0.474)	(0.867)	(0.764)
ROA	-0.123	1.294*	0.797
	(0.393)	(0.062)	(0.201)
SWEET_TERMS	-0.070	0.986***	0.997***
	(0.584)	(0.000)	(0.000)
Year trend	YES	YES	YES
Industry FE	YES	YES	YES
Observations	162	162	165
Kleibergen–Paap LM Wald *F*-statistic	18.662		
R^2	26.95%	-143.47%	-245.36%

This table presents the results of the two-stage probit model. The instrumental variable (*BOUTIQUE*) captures whether the acquiring firm hires a boutique adviser. In the first-stage probit regression, the predicted values of the endogenous variable are generated. These predicted values are then used as the

instrument in the second-stage probit regressions (*BOUTIQUE_IV*). Columns (2) and (3) show the second-stage probit results, where the dependent variable is either *PRECISE_FO* or *PRECISE_FO_OFFER_PR*, respectively. Definitions of all variables are provided in Appendix A. *P*-values are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered at the industry level, using Fama French 12-industry classifications.

Table 7. Timeliness of Deal Completion

	(1) ***EXTEND***	*(2)* ***EXTEND***	*(3)* ***N_ EXTEND***	*(4)* ***N_ EXTEND***	*(5)* ***DAYS_ TO_COMPLETE***	*(6)* ***DAYS_TO_ COMPLETE***
PRECISE_FO	-0.658***		-0.334***		-4.945*	
	(0.000)		(0.018)		(0.076)	
PRECISE_FO_OFFER_PR		-0.519**		-0.326***		-4.354
		(0.043)		(0.003)		(0.148)
BOUTIQUE_IV	-2.248***	-2.182***	-0.963**	-0.832**	-30.090*	-28.921
	(0.000)	(0.001)	(0.030)	(0.022)	(0.055)	(0.123)
PRIOR_ACQ	-0.891**	-0.864**	-0.417**	-0.357*	-13.552**	-12.934*
	(0.011)	(0.025)	(0.021)	(0.052)	(0.038)	(0.082)
R&D	1.250	1.455	0.528	0.583	8.242	8.864
	(0.163)	(0.149)	(0.343)	(0.192)	(0.331)	(0.253)
PAY_EQUITY	-0.823**	-0.938**	-0.434***	-0.454***	-7.432	-7.802
	(0.041)	(0.032)	(0.000)	(0.000)	(0.308)	(0.317)
SEC_LETTER_PRIOR	0.753*	0.794*	0.336**	0.346**	4.945***	5.124***
	(0.065)	(0.070)	(0.015)	(0.016)	(0.004)	(0.001)
CEO_CHAIR_REMAIN	-1.045*	-1.130*	-0.491***	-0.526***	-0.912	-1.312
	(0.061)	(0.057)	(0.000)	(0.000)	(0.654)	(0.574)
COMP_BIDDER	-0.499	-0.362	-0.153	-0.066	-5.212	-4.112
	(0.497)	(0.555)	(0.514)	(0.788)	(0.584)	(0.706)
SIZE	1.417***	1.422***	0.755***	0.733***	11.378***	11.099***
	(0.001)	(0.010)	(0.000)	(0.000)	(0.001)	(0.000)
RELATIVE_SIZE	1.963***	1.854***	1.726***	1.601***	21.351**	19.900**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.016)	(0.039)
SAME_IND	-0.886***	-0.871**	-0.153	-0.143	-2.346	-2.179
	(0.009)	(0.031)	(0.243)	(0.241)	(0.351)	(0.330)
FO_AMEND	-0.127	-0.039	-0.073	-0.041	0.148	0.650
	(0.628)	(0.896)	(0.631)	(0.806)	(0.972)	(0.885)
BOARD_EQUITY	-0.378*	-0.338*	-0.253***	-0.217***	-5.260***	-4.787***
	(0.051)	(0.077)	(0.005)	(0.005)	(0.000)	(0.000)
DEAL_PREM	-0.169	-0.146	-0.050	-0.054	0.876	1.014
	(0.508)	(0.628)	(0.358)	(0.377)	(0.837)	(0.844)
LAWSUIT	0.095	-0.043	-0.101	-0.168	0.900	-0.059
	(0.617)	(0.873)	(0.374)	(0.255)	(0.780)	(0.987)
N_ SEC_LETTER	0.051	0.033	0.085**	0.086**	2.883***	2.875***
	(0.480)	(0.687)	(0.027)	(0.021)	(0.000)	(0.001)
N_METHODS	-0.222*	-0.227*	-0.137***	-0.132***	-3.388***	-3.365***
	(0.100)	(0.100)	(0.001)	(0.000)	(0.002)	(0.001)
N_METHODS_PAGE	0.099	0.083	-0.036	-0.019	-5.796**	-5.643**
	(0.713)	(0.750)	(0.854)	(0.916)	(0.017)	(0.026)
TOPUP	0.143	0.213	0.158	0.220	-4.595	-3.777
	(0.844)	(0.773)	(0.689)	(0.556)	(0.316)	(0.412)
Year trend	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	142	142	146	146	146	146
R^2	31.49%	31.94%	29.67%	33.00%	8.10%	10.43%

This table presents the results of the second-stage regression analyses that examine the determinants of the timeliness of offer completion. *EXTEND* is an indicator variable that is equal to one if there is a tender offer extension, and zero otherwise. *N_EXTEND* captures the total number of extensions. *DAYS_TO_COMPLETE* is the number of days between the disclosure of an FO and the closure of the offer (date effective). Columns (1),

(3) and (5) show the results using the precision measure *PRECISE_FO*, while in columns (2), (4) and (6) the variable *PRECISE_FO_OFFER_PR* is used. Definitions of all variables are provided in Appendix A. P-values are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1 % levels, respectively. Standard errors are clustered at the industry level, using Fama French 12-industry classifications.

Table 8. Probability of Receiving a SEC Comment Letter

	(1) *COMMENT_LETTER*	*(2)* *COMMENT_LETTER*
PRECISE_FO	-0.132*	
	(0.097)	
PRECISE_FO_OFFER_PR		-0.056
		(0.509)
BOUTIQUE_IV	-2.414***	-2.401***
	(0.000)	(0.000)
INV_BANK_EXP	0.486	0.530
	(0.164)	(0.141)
FIN_EXP	0.087	0.059
	(0.838)	(0.887)
BOARD_TENURE	0.218	0.227
	(0.533)	(0.504)
IND	-1.894*	-1.822*
	(0.075)	(0.090)
SPECIAL_COM	0.103	0.105
	(0.442)	(0.418)
BOARD_EQUITY	-0.129	-0.113
	(0.386)	(0.473)
CEO_CHAIR_REMAIN	0.170	0.160
	(0.412)	(0.479)
R&D	-0.721	-0.670
	(0.121)	(0.141)
DEAL_SIZE	0.141	0.134
	(0.311)	(0.326)
SAME_IND	-0.088	-0.075
	(0.798)	(0.822)
LITIG_IND	0.072	0.058
	(0.713)	(0.780)
DIFF_IND	0.242	0.230
	(0.499)	(0.533)
DEAL_PREM	0.432**	0.445**
	(0.022)	(0.021)
SEC_LETTER_PRIOR	-0.137	-0.141
	(0.442)	(0.420)
PRIOR_TAR	-0.336	-0.322
	(0.129)	(0.152)
STD_FO_ESTIMATE	-0.013	-0.013
	(0.687)	(0.678)
N_METHODS_PAGE	-0.390**	-0.391**
	(0.024)	(0.023)
N_METHODS_RANGE	0.831*	0.822*
	(0.100)	(0.096)
Year trend	YES	YES
Industry FE	YES	YES
R^2	-120.93%	-114.40%
Observations	162	162

This table presents the results of the second-stage regressions that examine the determinants of receiving a merger-related SEC comment letter. *COMMENT_LETTER* is an indicator variable that is equal to one if the target firm receives at least one SEC comment letter between the announcement and the completion of the tender offer, and zero otherwise. Column (1) reports the results using *PRECISE_FO*, while in column (2) *PRECISE_FO_OFFER_PR* is used. Definitions of all variables are provided in

Appendix A. P-values are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1 %levels, respectively. Standard errors are clustered at the industry level, using Fama French 12-industry classifications.

"Navigating External Shocks: The Role IFRS Compliance in Ukrainian Companies During War"

Abstract

This study examines the profitability and resilience of Ukrainian companies using International Financial Reporting Standards (IFRS) during the war. Using baseline and triple interaction regression models, the research examines how governance practices, in particular audit quality, and operational resilience affect firm performance under external uncertainty. The baseline model shows that external uncertainties, such as operating in war-affected regions or geopolitical shocks, do not uniformly affect firm profitability, highlighting heterogeneity across firms. In contrast, the triple interaction model highlights the dual role of corporate governance. While high audit quality promotes transparency and long-term credibility, it also amplifies short-term financial challenges in conflict-affected regions by exposing vulnerabilities through rigorous reporting standards. Business continuity emerges as a critical factor, with firms that maintain operations during disruptions achieving higher profitability. These findings underscore the need for balanced governance and resilience strategies and provide actionable insights for policymakers and practitioners to enhance financial stability in conflict-affected economies. Future research should explore additional dimensions, such as innovation capacity and the regulatory environment, to deepen the understanding of firms' adaptation strategies during crises.

Keywords: IFRS compliance, Governance practices, Audit quality, Operational resilience, Ukrainian-Russian war, External uncertainties, Firm profitability, Conflict-affected regions

I. Introduction

The war between Russia and Ukraine has disrupted global economic systems, destabilising energy markets, trade routes and geopolitical stability. Coming on the heels of the COVID-19 pandemic, the conflict exacerbates pre-existing economic vulnerabilities and increases uncertainty in international markets. Its consequences are far-reaching: rising energy prices, disrupted food supplies, and sanctions that ripple through financial markets and international trade (Liu & Pan, 2024; Shahid, 2024). Beyond these economic impacts, the war is heightening geopolitical tensions, undermining global peace and stability, and exposing businesses to unprecedented external shocks (Yahaya, 2023).

In this volatile environment, compliance with International Financial Reporting Standards (IFRS) takes on added importance. IFRS compliance increases financial transparency, enabling investors and stakeholders to access reliable and comparable financial information. This transparency is particularly important in conflict-affected regions such as Ukraine, where economic stability is fragile. By reducing information asymmetry, IFRS compliance improves the comparability of financial statements and provides decision-makers with the tools to assess risks and opportunities in highly uncertain environments (Chouaibi & Mutar, 2024; Mohammed et al., 2024). Despite these benefits, the implementation of IFRS in conflict zones presents challenges, including incomplete disclosures and underdeveloped non-financial reporting mechanisms (Iefymenko et al., 2022).

Existing literature demonstrates the potential of IFRS to enhance corporate transparency and value relevance (Albu, N., Albu, C. N., & Filip, A. (2017), Novak, A., & Valentinčič, A. (2017), especially in times of crisis. For example, research on Iraqi banks shows that IFRS compliance significantly improves the usefulness of financial statements for investors (Chouaibi & Mutar, 2024). Similar evidence from North African countries highlights the reinforcing effect of firm-level transparency on the comparability of financial statements (Mohammed et al., 2024). However, the practical application of these standards

in conflict zones is uneven, with gaps in sector-wide disclosure and operational challenges undermining their effectiveness (Iefymenko et al., 2022). This study builds on this foundation to examine how IFRS adoption and governance practices shape firms' resilience and adaptability during the Ukrainian-Russian war.

This research addresses critical gaps in our understanding of how governance practices affect firm performance in conflict settings. While previous studies highlight the general benefits of IFRS compliance, few examine its interaction with external shocks such as war. Furthermore, limited attention has been paid to the role of audit quality in mediating these effects. To fill these gaps, this study examines the factors that determine the profitability and stability of Ukrainian companies using IFRS and their adaptation strategies during the war. Specifically, we test whether governance practices, such as audit quality, enhance or mitigate the effects of external uncertainty. The rest of the paper is structured as follows. Section II reviews related literature and develops our hypothesis. Section III describes our variables and data. Section IV discusses our models and reports the empirical results. Additional analyses and Discussion are presented in Section V. We conclude with a summary of our main findings and suggestions for further research in Section VI.

II. Literature review and Hypotheses development

Theoretical background. Research on the application of International Financial Reporting Standards (IFRS) in wartime draws on theories of governance and resilience.

In the context of agency theory, effective governance mechanisms reduce information asymmetries and agency costs and support IFRS compliance (Leung & Ilsever, 2013; Clacher et al., 2010). War exacerbates these challenges, making sound governance essential to ensure transparency and accurate reporting (Leung & Ilsever, 2013).

Stakeholders' theory expands governance to include the interests of employees, creditors and the community. This approach builds trust and ensures transparency, which is critical for IFRS compliance in volatile environments (Bellavitis et al., 2023). During war,

responding to stakeholder needs helps companies maintain trust and cope with disruption, thereby improving their IFRS compliance (Bellavitis et al., 2023).

Institutional theory examines how external factors such as rules and cultural norms influence governance. Coercive, imitative and normative pressures drive IFRS adoption, particularly in conflict-affected regions. For example, international pressure influenced IFRS adoption in Iraq after the regime change (Hassan et al., 2014). In Ukraine, similar forces shape compliance despite the weakening of compliance mechanisms during the war (Hassan et al., 2014).

An ethical culture and internal controls are critical to reducing the risk of non-compliance and ensuring consistency in financial reporting, even in conflict zones (Nalukenge et al., 2018). Robust governance systems enable companies to maintain accountability and stakeholder trust in the face of external shocks.

Resilience theory explains how systems adapt to maintain functionality during extreme events. In the context of IFRS compliance, operational resilience, systemic stability and adaptability are emphasised to ensure that companies can maintain reporting practices despite disruptions (Teichmann et al., 2023; Nikishina et al., 2022).

Governance and resilience theories therefore provide a framework for understanding how firms maintain transparency, accountability, and adaptability in volatile environments. These perspectives emphasise the interplay between governance mechanisms, external pressures and operational resilience in maintaining financial reporting standards in conflict-affected regions.

Impact of the war on the Ukrainian economy. The war in Ukraine has severely disrupted the economy, resulting in significant losses of human resources due to migration, displacement and military recruitment. The relocation of businesses and reduced utilisation of production facilities have added to the economic challenges. According to the Rapid Assessment of Damage and Recovery Needs (RDNA3, 2023), the cost of reconstruction and recovery over the next decade is estimated at $486 billion, requiring substantial public

and private funding. Despite these challenges, Ukraine has maintained macro-financial stability, supported by international assistance, which is crucial for post-war recovery. Economic impacts include a 29.2% contraction in GDP in 2022, loss of income, reduced purchasing power, and labour shortages affecting recovery (Lb.ua, 2023; World Bank, 2024). The National Bank of Ukraine forecasts modest growth of 3.7% in 2024, accelerating to 4-5% by 2026, driven by international aid, export expansion and budget support. However, challenges remain, including power shortages, low harvests and supply chain disruptions. Export data reflects resilience, with grain and oilseed exports up 29% year-on-year (Center for Economic Strategy, 2024).

However, Ukrainian businesses have shown adaptability in the midst of conflict. Studies show that businesses prioritise economic resilience, with many adjusting operations, relocating or diversifying to maintain functionality (Kazak & Sulyma, 2023). Manufacturing operations have adapted to martial law conditions, emphasising continuity in reporting under IFRS, which is critical to maintaining stakeholder confidence (Smachylo, 2024).

Crucially, the absence of a defined endpoint for the conflict poses unique challenges for risk assessment and the application of IFRS. Crisis management studies emphasise the need for flexible, dynamic frameworks to support decision-making under prolonged uncertainty (Opatska et al., 2024). These findings underscore the importance of the continuity principle in financial reporting and its implications for IFRS compliance.

IFRS reporting in conflict contexts. In Ukraine, IFRS are mandatory for public interest entities and certain industries. All other companies may voluntarily apply IFRS. However, voluntary adoption of IFRS remains limited, with only 1.27% of companies opting for IFRS in 2015 (Zasadny, 2018). The war has complicated IFRS compliance, with reporting deadlines postpointed due to martial law, while maintaining the need for accurate accounting. Key sectors such as energy, metallurgy and agriculture face particular challenges. Regular attacks on the power grid disrupt industrial operations, especially for high-energy consumers. For example, steel production in 2024 fell to its lowest level in eight

months, reflecting the strain on critical industries. These disruptions raise questions about the feasibility and reliability of IFRS compliance in such volatile contexts (Center for Economic Strategy, 2024).

The war has global implications for IFRS reporting companies. International companies withdrawing from the Russian market demonstrate the intersection of corporate social responsibility (CSR) and geopolitical dynamics, positively influencing brand perceptions (Ayoub & Qadan, 2023; Lim et al., 2022 such as EY and KPMG have issued guidance on the application of IFRS in wartime conditions, emphasising considerations such as going concern, impairment and fair value measurement (KPMG, 2022). The uncertainty of war affects IFRS reporting through increased risks, including measurement uncertainty, impairment, exchange rate volatility and tax changes (Umut, 2023). These challenges emphasise the need for robust disclosures to assess the financial impact on companies' positions and performance. In addition, geopolitical conflicts such as the war in Ukraine create regulatory divergences that affect global accounting standards and equity market participants reporting under IFRS (Noy & Dabamona, 2024).

While the existing literature explores the broader implications of IFRS compliance during geopolitical conflicts, the specific impact of IFRS on the performance and resilience of Ukrainian companies remains under-researched. This study addresses this gap by investigating how governance practices and IFRS compliance influence firm stability and profitability in the context of the Ukrainian-Russian war.

Hypotheses development. Various research has examined the relationship between governance practices and firm profitability in conflict situations, providing insights into how governance structures can improve firm performance under uncertainty. For example, Mardnly et al. (2018) analysed firms in Syria and showed that ownership structure, especially foreign ownership, significantly affects profitability during conflict. Using multiple linear regression, the study found that governance arrangements improve performance measures such as earnings per share (EPS) and return on assets (ROA). Similarly, Heenetigala and

Armstrong (2012) studied firms in Sri Lanka during the civil war and found a positive relationship between governance practices such as board composition and profitability. These findings suggest that strong governance practices, including effective board oversight, contribute to a firm's ability to maintain profitability under unfavourable conditions.

In terms of governance practices such as audit quality, it has been identified as a key factor in ensuring financial reliability in wartime, influencing corporate profitability through increased transparency. High quality audits reduce earnings management and promote the credibility of financial statements, a critical asset in unstable environments (Yasin, 2023). The association between Big 4 audit firms and higher profitability, as shown by Chen et al. (2023), underscores the importance of audit quality in enhancing stakeholder confidence. Furthermore, Megeid (2022) emphasises that independent audit committees indirectly increase profitability by ensuring reliable financial reporting, especially in highly competitive markets.

Operational resilience has also been a focus of research and has been shown to enable firms to withstand disruptions and maintain profitability during crises. Quantitative studies have shown that firms exposed to higher operational risks experience lower profitability, as demonstrated by Sroka and Wieczorek-Kosmala (2024) in their study of manufacturing firms in V4 countries. However, resilience strategies, such as the integration of dynamic capabilities and scenario testing, have been associated with higher profit growth rates, providing competitive advantages during crises (Bughin, 2023; Englund, 2022).

Despite significant advances in understanding the impact of governance practices, operational resilience and external uncertainties on firm profitability, there is a noticeable gap in research on their combined impact on firms operating in conflict-affected environments, particularly in the context of IFRS compliance.

Addressing these gaps, this study uses a quantitative approach to investigate how governance practices, operational resilience influences the profitability of Ukrainian companies using IFRS during the ongoing conflict.

This study investigates a critical question**: What factors determine the profitability and stability of Ukrainian companies using IFRS, and how do they adapt to external uncertainties such as the Ukrainian-Russian war?** The war presents a unique challenge to firms operating in a volatile and uncertain environment, necessitating an exploration of how governance practices, particularly those mandated by IFRS, influence firms' ability to adapt and maintain stability during crises.

The study posits that governance mechanisms, such as audit quality, play a pivotal role in shaping firms' resilience to external shocks. **Hypothesis 1 (H1) suggests that governance practices significantly affect the adaptability of Ukrainian companies using IFRS to uncertainties like the war.** Enhanced audit quality is expected to heighten firms' transparency and stakeholder confidence, but it may also amplify exposure to risks due to increased visibility of vulnerabilities in volatile markets.

Two sub-hypotheses (H1A and H1B) explore this relationship in more detail:

H1A: Ukrainian companies using IFRS with higher audit quality are more likely to be impacted by external uncertainties, such as the Ukrainian-Russian war.

H1B: Ukrainian companies using IFRS with lower audit quality are less likely to be exposed to external uncertainties.

By exploring these hypotheses, the research provides insights into the dual role of governance as both a stabilizing mechanism and a potential amplifier of risks during crises. It also aims to identify key factors that enable Ukrainian firms to navigate economic instability and external shocks effectively.

III. Research design

The methodology includes two complementary regression models, the first (baseline regression) examining the general effects of external uncertainties on profitability, and the second incorporating governance characteristics to explore conditional effects (regression with the triple interaction). The analysis uses a **difference-in-differences (DiD)** framework to assess the interaction between treatment (war-affected regions), time (pre- and post-war periods) and audit quality.

As a dependent variable, we used the profitability of the companies, in particular the **return on assets (ROA).** The dependent variable measures the financial performance and stability of companies, providing an indicator of their ability to adapt to external uncertainties.

As an independent variable, we consider **audit quality**. This is a proxy for governance quality and reflects the degree of transparency, accountability and compliance with IFRS standards. It is used to assess the role of governance in determining profitability and stability.

In this study, audit quality is operationalised by distinguishing between audits performed by Big 4 audit firms (such as EY, KPMG and PwC) and those performed by Ukrainian audit firms. Big 4 firms are associated with higher audit quality due to their rigorous standards, global expertise and established reputation. In contrast, Ukrainian audit firms are associated with lower audit quality, as they are often constrained by limited resources, less global integration and less rigorous audit standards.

To measure **operational resilience**, we used a binary variable (Binary Continuity Variable) indicating whether firms maintain operational continuity during periods of external shocks, highlighting the importance of resilience in sustaining performance.

To reflect regional impact, a variable (Firms in war affected regions) capturing whether **a firm is located in a conflict-affected region**, such as those affected by the Ukrainian-Russian war, to control for geographical exposure to geopolitical risks.

As a control variable, we used **firm age** (in full years): reflects the number of years a firm has been in operation and is included to account for lifecycle effects and potential differences in structural efficiency; **firm size** (total assets) **macroeconomic variables** (GDP growth, inflation), which represent broader economic conditions that may influence firm profitability and provide context for the external environment during the study period.

Robust standard errors were used to account for potential heteroskedasticity. The overall significance of the model was tested using the F-statistic and individual coefficients were tested for statistical significance.

Data collection and sources

The study focuses on a dataset of Ukrainian IFRS reporting companies, with an emphasis on those operating in industries directly or indirectly affected by the Ukrainian-Russian war. Firms were selected based on the availability of consistent financial data for both the pre-war and war periods, ensuring that the analysis captures changes in financial performance under external uncertainty.

Data Sources. This study uses a multi-faceted dataset to analyse the relationship between governance practices, operational resilience and profitability of Ukrainian companies under the influence of external uncertainties, such as the Ukrainian-Russian war.

Firm-level financial data were obtained from ORBIS, a comprehensive database that provides standardised financial statements in line with IFRS requirements. The data includes key information on profitability, business continuity and governance practices, as well as firm-specific attributes such as industry classification, geographical location and business history.

Macroeconomic indicators, such as GDP growth and inflation rates, have been sourced from trusted international sources, including the World Bank database and the International Monetary Fund (IMF). These indicators contextualise firm-level performance within broader economic trends, providing a nuanced understanding of external economic shocks during the period under review.

To capture the regional impact of the Ukrainian-Russian conflict, conflict exposure data were compiled from reports by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) and local government authorities. This information was used to classify companies into war-affected and non-war-affected regions, providing critical insights into the heterogeneity of war impacts.

Additional contextual data on corporate governance practices, in particular audit quality, was collected from company disclosures, regulatory filings and publicly available reports. These data sources ensured consistency with the operational definitions of governance quality used in the analysis.

Timeframe and scope. The study spans four years, covering periods of relative stability (pre-war: 2020-2021) and geopolitical uncertainty (during war: 2022-2023). This temporal scope allows for a longitudinal analysis of how companies have adapted to external shocks, facilitating comparisons of financial performance and governance practices across different economic conditions.

IV. Empirical results

Table 1 presents summary statistics comparing two regression models used to analyse the impact of governance practices, operational resilience and external uncertainty on firm profitability. Baseline Model, the baseline model, shows limited explanatory power with an R-squared value of 0.0087 and lacks statistical significance (Prob > F = 0.1844). This suggests that treatment and time effects alone are not sufficient to explain variations in firm performance during periods of external uncertainty.

In contrast, model with the triple interaction, which includes a triple interaction term, shows a significant improvement in explanatory power with an R-squared value of 0.1283 and high statistical significance (Prob > F = 0.0000). This improved model highlights the critical role of audit quality and operational continuity in mitigating the adverse effects of external uncertainty. These results emphasize the importance of governance structures and resilience

mechanisms in influencing firm outcomes, particularly in volatile and conflict-affected environments.

Table 1. Descriptive Statistics of Regression Models Analyzing Governance, Resilience, and External Uncertainties on Firm Profitability

Metric	Model 1 (Baseline regression)	Model 2 (Regression with the triple interaction)
Model Significance	Not statistically significant (Prob > F = 0.1844)	Statistically significant (Prob > F = 0.0000)
Explained Variance	R-squared = 0.0087 (low explanatory power)	R-squared = 0.1283 (higher explanatory power)
Key Factors	Treatment and time effects not significant	Audit quality and operational continuity significant
Interpretation	External uncertainties do not uniformly affect firms	Governance and resilience conditionally affect outcomes

Model Specification

The objective of the models is to examine how governance practices, operational resilience and regional factors influence the financial performance of companies using IFRS, particularly in the context of external uncertainties such as the Ukrainian-Russian war. Control variables are included to account for firm-specific and macroeconomic influences to ensure a robust analysis.

Model 1: Baseline regression (***Overall impact of external uncertainty)***

The first regression examines the overall effect of external uncertainties on profitability, measured as return on assets (ROA), without considering governance practices. The model is specified as follows:

$$ROA_{it} = \beta_0 + \beta_1\, treatment_{it} + \beta_2\, post_{it} + \beta_3(treatmentit \times post)_{it} + \varepsilon_{itROA_{it}}$$

Where:

ROA = (earnings before interest and tax)/total assets;

Treatment = being in a war-affected region (1 if a firm is in a war-affected region, 0 otherwise);

Post = Coefficient for **post** (1 for post-war period, 0 for pre-war period);

Treatment × post = the combined effect of being in a war-affected region during the post-war period;

The results of Baseline Model suggest that external uncertainties, such as the Ukrainian-Russian war, do not uniformly impact firm profitability across the sample. None of the independent variables, including treatment, post, or their interaction, show a statistically significant relationship with ROA ($p>0.05$). This indicates that, on average, the war's effects on profitability are negligible without considering firm-specific characteristics or governance practices.

Model 2: Regression with the triple interaction (Conditional effect on high audit quality firms)

The second regression includes governance characteristics and focuses on firms in high-risk zones (regions close to the Russian border). This model extends the specification to include audit quality and interaction terms:

$$ROA_{it} = \beta_0 + \beta_1\, treatment_{it} + \beta_2\ post_{it} + \beta_3(treatmentit \times post)_{it} + \beta_4\ \text{Auditquality}_{it} + \beta_5\ (treatment \times \text{Auditquality})_{it} + \beta_6\ (post \times \text{Auditquality})_{it} + \beta_7(treatment \times post \times \text{Auditquality})._{it} + \sum \beta_i Year + \sum \beta_j\ Industry + \sum \beta_k\, BinaryContinuityVariable + \beta_l \log(Age) + \beta_m log\ (TotalAssets) + \varepsilon_{\ itROA_{it}}$$

Where:

ROA = (earnings before interest and tax)/total assets;

Treatment = being in a war-affected region (1 if a firm is in a war-affected region, 0 otherwise);

Post = Coefficient for **post** (1 for post-war period, 0 for pre-war period);

Treatment × post = the combined effect of being in a war-affected region during the post-war period;

Auditquality = Firms with higher audit quality *(audits performed by Big-4 audit firms);*

Treatment×Auditquality = War-affected firms with higher audit quality;

post×Auditquality = Higher audit quality in the post-war period;

treatment×post×Auditquality = War-affected firms with higher audit quality in the post-war period;

BinaryContinuityVariable = Firms maintaining operational continuity during the war;

Firm Age = natural logarithm of the firm's age;

Firm Size = natural logarithm of total assets.

Table 2 shows that in contrast with Model 1, Model 2 reveals nuanced insights into the role of governance. Audit quality alone positively influences profitability (β=7.06, p=0.069), suggesting that firms with higher governance standards are more resilient under

general conditions. However, the interaction [term treatment×post×Auditquality treatment×post× Auditquality] is statistically significant (β=−17.10, p=0.046), ***indicating that high audit quality firms experience amplified negative impacts during the post-war period in war-affected regions.*** This result underscores the dual role of governance: while it enhances resilience, it also exposes firms to the full extent of external shocks by transparently reflecting these effects in financial reporting.

Results: The results of the two regression models presented in Table 2 provide a detailed understanding of the factors influencing the profitability of Ukrainian IFRS companies during the Ukrainian-Russian war. By examining the general impact of external uncertainty and the conditional effects of governance quality, the analysis highlights the complex interplay between geopolitical shocks, governance practices and firm-specific characteristics.

The baseline regression model examines the general relationship between external uncertainty, such as operating in war-torn regions, and firm profitability, measured as return on assets (ROA). This model does not include governance characteristics such as audit quality.

Among the main findings: operating in war-affected regions does not seem to be associated with higher profitability. Firms exposed to conflict zones do not show differential performance compared to firms outside such regions.

The post-war period also does not significantly affect profitability across the sample, and the interaction term capturing the differential impact of war exposure in the post-war period is also insignificant.

Thus, the results suggest that external uncertainties, such as the Ukrainian-Russian war, do not uniformly affect the profitability of Ukrainian companies. These findings highlight the need to consider firm-specific factors, such as governance and operational

resilience, in order to fully understand the determinants of financial performance under geopolitical shocks.

Table 2. Comparative regression analysis of baseline and interaction models on governance and external uncertainties affecting firm profitability

	Model 1: Baseline regression		Model 2: Regression with the triple interaction	
VARIABLES	ROA		ROA	
	Coeff.	T-stat.	Coeff.	T-stat.
The combined effect of being in a war-affected region during the post-war period	-0.663	(-0.162)	3.684	(0.791)
War-affected firms with higher audit quality in the post-war period			-17.10**	(-2.004)
Being in a war-affected region	-2.260	(-0.752)	-1.968	(-0.550)
War period	-3.121	(-1.111)	-2.011	(-0.561)
Firms with higher audit quality			7.058*	(1.823)
War-affected firms with higher audit quality			4.946	(0.799)
Higher audit quality in the post-war period			6.267	(1.151)
Firms maintaining operational continuity during the war			7.161**	(2.433)
Firm's age			-15.31***	(-3.225)
Firm's Size			0.473	(1.015)
Industry fixed effect	No	No	Yes	Yes
Year fixed effects	No	No	Yes	Yes
Constant	3.432*	(1.738)	38.35**	(2.447)
N (Observations)	490		490	
Adjusted R-squared	0.009		0.128	
P- value model	0.1844		0.0000	

The regression with the triple interaction incorporates governance characteristics and focuses on the role of audit quality and its interaction with war exposure and the post-treatment period. This model examines how firms with high audit quality respond to external uncertainties in regions affected by war activities (e.g. close to the Russian border).

We find that the model is statistically significant and that audit quality has a positive impact on profitability. The result underlines the role of corporate governance in improving financial performance in general.

In addition, the three-way interaction term is statistically significant and negative (-17.10), indicating that firms with high audit quality experience amplified negative effects on profitability in war-affected regions during the post-war period. This finding suggests that transparent reporting under IFRS highlights the full financial impact of external shocks, potentially exposing firms to greater financial scrutiny.

In turn, operational continuity significantly improves profitability, highlighting the importance of resilience strategies in mitigating the negative effects of geopolitical uncertainty.

In addition, older firms face a significant negative impact on profitability, probably due to structural inefficiencies or reduced adaptability.

We can also consider industry effects: firms in certain industries show significant differences in profitability, suggesting sectoral differences in responses to geopolitical shocks.

This model thus highlights the critical role of governance and resilience in shaping firm performance under geopolitical uncertainty. High audit quality enhances the transparency and integrity of financial reporting, but also increases the visibility of financial losses during crises. Operational continuity emerges as a key driver of profitability, highlighting the importance of resilience strategies for firms in conflict-affected regions.

V. Analysis and Discussion

The results of the second regression show a paradoxical result: firms with higher audit quality are significantly affected by the Ukrainian-Russian war, especially in war-affected regions in the post-treatment period.

Let us discuss possible reasons for this amplified impact on firms with higher audit quality.

Firms with higher audit quality **adhere to stricter governance and financial reporting standards, as required by IFRS.** While these practices enhance credibility and stakeholder confidence, they also require firms to fully disclose the financial impact of geopolitical shocks. This transparency can increase the visibility of financial distress, making firms appear more adversely affected than those with lower governance standards, which may obscure or delay the reporting of losses. For example, a company with robust audit practices is more likely to report impairments, write-downs and increased costs related to disrupted operations or supply chains, while a company with lower audit quality may underreport these impacts.

Firms with higher audit quality often **have stronger links to international markets and investors** due to their adherence to global standards such as IFRS. During the Ukrainian-Russian war, these firms may face increased scrutiny from international stakeholders, increased risk aversion from foreign investors, and disruptions in global trade or financing.

Higher audit quality indicates **reliability and international compliance, attracting foreign investment prior to the crisis**. However, during a geopolitical conflict, these companies may experience capital outflows or increased financing costs as international investors reassess risk.

High audit quality is often **associated with larger, more complex companies** that require detailed governance mechanisms. Such companies may operate across multiple geographies, supply chains or industries, making them more vulnerable to the systemic

effects of war. As a result, there are disruptions in supply chains that cross conflict zones or rely on logistics hubs affected by war.

Companies with high audit standards are more likely to **reflect war-related losses** in their financial statements, including write-downs of inventory or investments rendered obsolete or inaccessible due to geopolitical disruptions; increased costs associated with relocating operations or securing alternative supply chains.

These practices ensure accurate financial reporting, but may exacerbate the apparent financial impact of the war compared to companies with lower audit quality.

Companies with higher audit quality are often **more dependent on equity or debt markets for financing.** During geopolitical crises, these markets typically exhibit increased volatility, leading to higher costs of capital or reduced access to funding. This dependency can amplify the negative financial impact of war on high audit quality companies. For example, during the Ukrainian-Russian war, international and domestic capital markets may penalise companies in conflict-affected regions, even those with strong governance, due to heightened geopolitical risks.

Higher audit quality often reflects **stronger governance**, which includes greater accountability to stakeholders such as investors, regulators and creditors. During a crisis, these stakeholders may put additional pressure on companies to adopt costly resilience strategies, such as Maintaining operations despite disruptions (e.g. paying higher logistics costs); Committing to employee retention or community support initiatives in conflict zones.

While these measures improve long-term sustainability, they impose short-term financial burdens that can drastically affect profitability during a crisis.

We can conclude that while IFRS compliance ensures transparency and comparability, it can exacerbate the financial impact of crises due to strict valuation and reporting rules. As we have said, IFRS requires companies to reassess the fair value of assets on a regular basis. During a war, asset values can fall significantly, and firms with high audit quality are

more likely to report these falls. In addition, IFRS requires detailed provisions for expected losses. Firms with robust governance are more likely to allocate resources to these provisions, reflecting higher short-term losses.

The amplified negative impact on firms with higher audit quality can be attributed to a combination of transparency, market exposure, operational complexity and IFRS compliance. While these practices enhance long-term sustainability and stakeholder confidence, they also make the financial consequences of war more visible, leading to a drastic short-term impact on profitability. These findings underscore the dual role of governance: it provides resilience and credibility, but also exposes companies to the full visibility of external shocks.

Future strategies for high audit quality firms should focus on balancing transparency with resilience measures, such as diversifying operations, securing alternative financing options and communicating effectively with stakeholders in times of crisis. Further research could explore the long-term benefits of corporate governance in mitigating the financial impact of geopolitical shocks.

Discussion. The combined results of the two regressions offer complementary insights into the factors influencing the financial performance of Ukrainian companies during the Ukrainian-Russian war. Baseline regression highlights those external uncertainties, such as operating in war-affected regions or the timing of the conflict, do not uniformly impact profitability across the sample. This finding suggests that a broader analysis of firm-level differences is necessary to understand the nuanced effects of geopolitical shocks. In contrast, the regression with the triple interaction demonstrates the significant role of governance practices and firm-specific characteristics, particularly audit quality and operational continuity, in shaping financial outcomes. These findings reveal that the financial impact of geopolitical crises is contingent on both external factors and the internal strategies employed by firms.

The role of governance emerges as particularly complex. Firms with high audit quality benefit from enhanced transparency and credibility, which contribute positively to profitability under normal conditions. However, this same adherence to governance standards, particularly under IFRS, amplifies the financial visibility of losses during crises. Transparent reporting and compliance with stringent valuation and provisioning requirements can make the financial repercussions of war more apparent, thus exposing these firms to greater scrutiny and short-term financial volatility. This dual role of governance underscores its importance as both a stabilizing factor and a mechanism for transparency, emphasizing the need for firms to balance their governance practices with strategic measures to mitigate the heightened visibility of financial risks during geopolitical crises.

Resilience, particularly operational continuity, also plays a pivotal role in mitigating the adverse effects of geopolitical uncertainty. Firms that manage to maintain operations despite disruptions exhibit significantly higher profitability, highlighting the critical importance of adaptive strategies. This finding supports the notion that firm-specific responses, such as diversifying supply chains, leveraging technology, and implementing robust contingency plans, are vital for financial stability in the face of external shocks. The capacity to sustain operations in conflict-affected regions is a defining characteristic of resilient firms, enabling them to withstand and recover from the challenges posed by war.

These results underscore the complexity of financial performance during geopolitical crises, with governance and resilience emerging as key determinants. However, they also reveal gaps in understanding that warrant further exploration. Future research should investigate additional dimensions of firm performance, including leadership quality, innovation capacity, and market competition, to provide a more comprehensive view of the factors influencing resilience and profitability. Examining the long-term effects of governance and resilience strategies could also offer valuable insights into the sustainability of these practices in post-conflict recovery. Expanding the scope of analysis to include other

conflict zones or varying regulatory environments would further enhance the generalizability of these findings and deepen our understanding of the interplay between governance, resilience, and external uncertainties.

By integrating governance and resilience into the analysis of firm performance during geopolitical crises, this study contributes to a growing body of literature on organizational adaptation. It highlights the need for a nuanced approach to understanding how firms navigate complex environments, balancing transparency and accountability with strategic flexibility. These findings provide a foundation for both theoretical advancements and practical recommendations, underscoring the importance of continued research into the multifaceted impacts of geopolitical shocks on firms.

Research limitations

While this study provides valuable insights into the determinants of profitability and resilience of Ukrainian companies using IFRS during the war, several limitations must be acknowledged.

One of the main limitations of this research is the quality and availability of data. The study relies on financial information during a period of significant geopolitical disruption, where data collection is inherently challenging.

The relatively low R-squared value in both regression models indicates that a significant proportion of the variability in profitability remains unexplained, highlighting the inherent complexity of firm performance, which is likely to be influenced by many unobserved factors.

The analysis uses binary indicators such as treatment (war-affected regions) and post-treatment (post-war period) to capture the impact of external uncertainties. While these proxies are appropriate for difference-in-difference analysis, they may oversimplify the complex and multifaceted effects of the Ukrainian-Russian war.

The study focuses exclusively on companies using IFRS, which provides valuable insights into the role of corporate governance and financial transparency. However, this limitation prevents a comparative analysis of how non-IFRS companies respond to external uncertainties.

The study primarily examines the immediate and short-term effects of the Ukrainian-Russian war, focusing on the period during and immediately after the conflict. While this approach provides timely insights into how firms cope with geopolitical shocks, it does not capture the longer-term impact of governance and resilience strategies on recovery and sustainable financial stability.

Robustness check

In order to ensure the validity and reliability of the results of the regression with the triple interaction, a robustness check was carried out by replacing the previously used performance measure ROA (return on assets) with Profit Margin as the dependent variable.

The robustness check supports the main findings of the regression with the triple interaction, emphasising that high audit quality is associated with significantly better profitability overall.

War-affected firms with higher audit quality experience a reduction in profit margins (-9.43, $p = 0.242$). This finding mirrors the results from the regression with the triple interaction, where high audit quality exposed financial vulnerabilities in war-affected firms, likely through more accurate reporting of losses or inefficiencies.

This underscores the value of corporate governance and transparency in maintaining financial stability, even during geopolitical crises. This analysis confirms the critical importance of audit quality and operational resilience in managing complex crises, and provides a solid foundation for future research on firms' adaptation strategies during periods of geopolitical uncertainty.

VI. Conclusion

This study provides insights into the profitability and resilience of Ukrainian companies using IFRS during the Ukrainian-Russian war, highlighting the interplay between external uncertainties, governance practices and firm-specific characteristics. The baseline regression shows that external uncertainties, such as operating in war-affected regions or geopolitical shocks, do not uniformly affect firm profitability, underscoring the heterogeneity among firms and the importance of firm-specific strategies.

In contrast, the regression with the triple interaction underlines the central role of governance, as measured by audit quality, in shaping firm performance. Firms with high audit quality show resilience and profitability under normal conditions due to governance and transparency. However, in war-affected regions during the post-war period, these firms face heightened financial challenges. This paradox arises because robust governance enhances credibility, but also increases the visibility of financial losses through transparent reporting and IFRS compliance, exposing firms to heightened short-term scrutiny.

Operational resilience emerges as a critical factor in mitigating geopolitical uncertainty. Companies that maintain operations in the face of disruption achieve higher profitability, highlighting the value of adaptive strategies such as supply chain diversification, contingency planning and innovation.

The findings have important implications for both theory and practice. For policymakers, they highlight the need to promote robust governance frameworks and IFRS adoption to enhance financial resilience and transparency in conflict-affected economies. Strengthening institutional support can help firms withstand shocks while maintaining stakeholder confidence. For companies, investing in audit quality and operational continuity is essential to manage uncertainty effectively. Balancing transparency with strategic flexibility is critical to mitigate short-term impacts while ensuring long-term stability.

Future research should explore the interplay between governance, resilience and external shocks by incorporating variables such as innovation capacity, leadership and

market competition. Comparative studies across conflict zones and regulatory environments could further enrich the understanding of governance practices and their impact on financial performance during crises.

By integrating general and conditional analyses, this study provides a nuanced understanding of governance and resilience in determining firm performance during geopolitical crises. It fills gaps in the existing literature and provides actionable insights for policymakers and practitioners to enhance financial stability in conflict-affected regions.

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The Influence of Time Horizon and Narrative Framing in Environmental Disclosures on Investor Decisions

ABSTRACT: This study investigates the impact of time horizon and narrative framing in environmental disclosures on investor decisions. Environmental disclosures often vary in their time horizon, ranging from short-term initiatives to long-term projects. Moreover, these disclosures can emphasize the practical aspects (feasibility) of environmental projects or focus on their aspirational goals (desirability). Through the lens of construal level theory (CLT), this study investigates whether this distinction in time horizon, alongside the narrative framing of environmental initiatives, plays a role in shaping investor responses and preferences. Contrary to conventional CLT predictions, findings from an initial experiment suggest that short-term environmental goals evoke more abstract thinking among investors than long-term goals. A subsequent study further investigates how the congruence between the time horizon of environmental goals and narrative framing affects investors' perceived credibility of the firm and their willingness to invest. Results reveal that environmental goals with a short time horizon paired with desirability framing significantly enhanced investors' perceived credibility of the firm and their willingness to invest. These findings challenge and extend the application of CLT in environmental communication, suggesting that a strategic match between the time horizon and narrative framing can enhance a firm's attractiveness to investors.

Keywords: environmental disclosures, time horizon, narrative framing, goal setting, investor judgment and decisions

INTRODUCTION

In recent years, corporate reports increasingly feature environmental disclosures, highlighting their growing significance to both organizations' financial performance and their broader societal and environmental impacts (KPMG, 2020; Rouen, Sachdeva, & Yoon, 2022). While the literature underscores the value of such sustainability activities (Amel-Zadeh & Serafeim, 2018; Edmans, 2023; Friede, Busch, & Bassen, 2015), communicating these initiatives poses a challenge due to their varying time horizons—from immediate projects to visionary strategies. This paper explores how the interplay of these time horizons with narrative framing—be it practical feasibility or aspirational desirability—affects investor decisions, offering fresh insights into environmental communication's role in investor behaviour.

More specifically, this paper investigates the time horizon of firms' environmental goals. Many of these goals inherently possess long-term orientations, often entailing multi-year projects and investments that may not immediately translate into quantifiable financial returns (Christensen, Hail, & Leuz, 2021). Given this temporal landscape, firms are faced with a strategic choice in their communication: they can highlight the ultimate, long-term environmental achievements they aim to reach, or they can focus on the nearer-term, interim milestones that mark progress toward these broader goals. This strategic choice could significantly impact investor decisions: construal level theory (CLT) posits that individuals construe events in the distant future in more abstract terms, while near-future events are construed more concretely (Trope & Liberman, 2003).

Given that investors' construal levels might be shaped differently based on the time horizon of an environmental goal, the role of narrative framing becomes particularly salient. Narrative framing can be oriented towards feasibility, focusing on the practical, 'how' aspects of environmental goals, or towards desirability, emphasizing aspirational goals or the 'why'. Therefore, I expect it to be most effective to match the narrative framing to fit these construal

levels. In this way, distant environmental goals would be most effectively conveyed in terms of desirability or the 'why', and temporally closer environmental goals in terms of feasibility or the 'how'. Conversely, communicating long-term goals in terms of feasibility could also prove effective, as this could make these distant goals more concrete and bring them psychologically closer. This potential interaction between time horizon and narrative framing remains a salient gap in the literature, necessitating empirical exploration.

In a first experiment, I investigated the hypothesis that long-term environmental goals would lead to more abstract thinking compared to short-term goals. Surprisingly, the findings challenge conventional CLT predictions: investors exposed to short-term horizons adopted more abstract construals than those considering long-term horizons. This outcome hints at the complex interplay between temporal framing and environmental engagement, suggesting that immediate, actionable goals may invoke broader, value-driven considerations among investors, potentially due to a perceived direct impact on environmental sustainability.

A subsequent study was conducted to delve deeper into these findings. This main experiment aimed to understand how the time horizon of environmental goals and their narrative framing together influence investors' willingness to invest. The follow-up study hypothesized that the congruence between the time horizon of environmental goals and the type of narrative framing (desirability for short-term, feasibility for long-term) affects investors' perceived credibility of the firm's efforts and, consequently, their willingness to invest. It also proposed that processing fluency would mediate this relationship. However, the results are mixed: while narrative framing did moderate the relationship between time horizon and perceived credibility, influencing investment willingness as predicted for short-term goals with desirability framing, the hypothesized mediation effect of processing fluency was not supported.

These findings partly validate the initial experiment's surprising results, underscoring the nuanced interplay between time horizon, narrative framing, and investor responses within the environmental sustainability context. Specifically, they highlight that short-term goals framed in terms of their broader, value-driven implications can enhance a firm's perceived credibility and, by extension, its attractiveness to investors. This research contributes to the body of knowledge by challenging and extending the application of CLT in environmental communication, suggesting that immediate action towards sustainability, when communicated with an emphasis on desirability, may indeed foster a stronger investor commitment.

The current research thus presents a compelling contrast to the findings of Puspitasari, Ko, Phang, and Prasad (2024). They discovered that short-term investors are more inclined to invest when disclosures are framed in terms of feasibility, not desirability. Both studies, grounded in CLT, suggest intriguingly divergent strategies for engaging short-term perspectives, whether related to the goals themselves or the investors' horizons. These contrasting insights enrich our understanding of CLT's application in environmental sustainability communication, underscoring its role in shaping investor perceptions.

This paper also contributes to the broader discourse on environmental, social, and governance (ESG) communications as highlighted by recent studies, such as the work by Garavaglia, Van Landuyt, White, and Irwin (2023). They unveiled the "ESG stopping effect," revealing that while investors react similarly to the initiation of both ESG-related and non-ESG-related initiatives, their reactions turn significantly more negative when firms terminate ESG initiatives compared to general business initiatives, suggesting that investors attribute a unique sense of ethical responsibility to ESG efforts. Young's (2023) discussion of this research emphasizes the nuanced investor expectations surrounding ESG commitments and the critical role of goal attributes and communication in managing these expectations. Against this backdrop, the present study delves into two such attributes—the time horizon and narrative

framing of environmental goals. By examining their influence on investor perceptions, this research responds to the call for deeper understanding of effective ESG communication strategies.

BACKGROUND

In the last decade, Environmental, Social, and Governance (ESG) considerations have steadily ascended the corporate and investment agenda. Key international agreements, such as the Paris Agreement on climate change and the United Nations' Sustainable Development Goals (SDGs), have underscored the urgency and centrality of sustainable practices. Concurrently, a growing cohort of investors and stakeholders are actively prioritizing ESG performance, evidenced by the surging inflow of capital into ESG-themed funds and investment vehicles (Hartzmark & Sussman, 2019).

Given this increasing attention, there have been concerted efforts to establish comprehensive and coherent standards for ESG reporting. Recently, the European Commission (EC) together with the European Financial Reporting Advisory Group (EFRAG) and the International Financial Reporting Standards (IFRS) Foundation, have been at the forefront of this endeavour (Giner & Luque-Vílchez, 2022). Importantly, recognizing the diverse temporal scales at which ESG initiatives operate, the European Sustainability Reporting Standards (ESRS) explicitly categorize disclosures into short, medium, and long-term frameworks (Delegated Regulation 2023/2772; Wagenhofer, 2023). This move towards nuanced temporal categorization represents a significant departure from the traditional focus on short-term financial reporting, highlighting an evolving understanding of the importance of sustainability in the long-term corporate strategy.

Time Horizon

Prior research indicates a link between investors' investment horizons and their preferences for ESG initiatives. For instance, the presence of long-term institutional investors promotes ESG

engagement (Meng & Wang, 2019) and long-term nonprofessional investors are more willing to invest in sustainable firms than their short-term counterparts (Puspitasari et al., 2024). This preference for ESG strategies among long-term investors accentuates a notable challenge in current reporting practices. Financial reporting and management are often geared towards short-term outcomes, emphasizing immediate financial performance and quarterly earnings (Geng, Zhang, & Zhou, 2023; Hahn, Pinkse, Preuss, & Figge, 2014).

Such short-term focus can obscure the long-term benefits and impacts of ESG initiatives, making it challenging for companies to effectively communicate these aspects. The disparity between the time horizon of ESG initiatives and the short-term orientation of traditional financial reporting underscores the importance of understanding how stakeholders perceive and process information about ESG initiatives, a perception potentially influenced by psychological distance, a key concept in construal level theory.

Construal Level Theory

Construal level theory (CLT) is a psychological theory that explores how different dimensions of psychological distance—temporal, spatial, social, and hypothetical—affect people's mental representation of events, objects, and actions (Trope & Liberman, 2010). According to CLT, as the psychological distance from an event increases, people tend to think about the event in more abstract terms (high-level construals). Conversely, when an event feels psychologically closer, individuals are more likely to construe it in concrete terms (low-level construals). This theory articulates that psychological distance impacts how abstractly or concretely people think about the world around them, influencing not only how they perceive events but also how they make decisions and act in various contexts.

In marketing, CLT has been used to tailor advertising messages that align with the psychological distance of products, effectively influencing consumer decisions (Florence, Fleischman, Mulcahy, & Wynder, 2022). Environmental communication studies have applied

CLT in a different vein, often attempting to use more concrete messaging to make abstract, long-term environmental issues more relatable and actionable to the public (Maiella et al., 2020). CLT has also been applied in accounting (for a discussion, see Weisner, 2015). For instance, Elliott, Grant, and Rennekamp (2017) focused on the interplay between the strategy frame (whether CSR efforts are community-focused or global) and the presentation style (pictorial vs. textual) in CSR reports. They found that congruence in the construals induced by these aspects enhanced investors' willingness to invest. Similarly, congruence between framing features of a corporate climate change strategy disclosure and investment horizon have been shown to enhance willingness to invest as well (Puspitasari et al., 2024).

Narrative Framing

In communicating ESG goals over different time horizons, managers can vary the content and framing of their narratives. For example, investors respond favourably to green investments when managers highlight societal benefits rather than costs (Martin & Moser, 2016). In addition, investors assign higher valuations to firms that implement operational changes to reduce greenhouse gas emissions, as opposed to those that rely on offset strategies (Johnson, Theis, Vitalis, & Young, 2020). Such findings suggest that narratives can significantly influence investor reactions. Building on this, this study focuses on two types of narrative framing: feasibility-focused narratives that present practical or the 'how' aspects of ESG targets, and desirability-focused narratives that emphasize aspirational goals or the 'why'.

More generally, goal-setting theory posits that the specificity of a goal can significantly influence an individual's motivation and performance towards achieving that goal (Hochli, Brugger, & Messner, 2018). As Young (2023) notes, it follows that such goal attributes could also significantly influence stakeholders. Within the framework of goal-setting, goals are often categorized into superordinate (aspirational, broad outcomes) and subordinate (practical, immediate tasks) goals. Superordinate goals align with desirability-focused narratives by

emphasizing the 'why'—the broader, aspirational outcomes of ESG initiatives, such as contributing to a sustainable future or enhancing societal well-being. These goals tap into abstract thinking and are akin to the high-level construals described in CLT, where the focus is on the overarching purpose and long-term vision of ESG efforts. On the other hand, subordinate goals are more aligned with feasibility-focused narratives, concentrating on the 'how'—the specific, actionable steps required to achieve ESG targets. These narratives resonate with concrete thinking and low-level construals, emphasizing the practical aspects and immediate tasks at hand. By drawing on goal-setting theory, this study delineates a theoretical basis for distinguishing between feasibility and desirability in ESG narratives.

Processing Fluency and Credibility

Drawing from the insights of CLT and guided by prior accounting literature, I expect that congruence between the construals induced by both time horizon and narrative frames can increase investors' processing fluency. Processing fluency, or the ease with which information is processed (Alter & Oppenheimer, 2009), has been shown to significantly influence investor judgments and decision-making in a number of different contexts (e.g., Asay, Elliott, & Rennekamp, 2017; Elliott et al., 2017; Rennekamp, 2012; Tan, Wang, & Zhou, 2015; Tan, Wang, & Zhou, 2014). In this context specifically, narratives that align with the mental construal associated with their time horizon are likely to be processed more fluently, thereby enhancing investors' willingness to invest.

Specifically, I anticipate an increase in processing fluency to strengthen investors' perceptions of a firms' credibility. In a corporate context, credibility is often assessed as a combination of a firms' expertise and trustworthiness (Newell & Goldsmith, 2001). I expect that enhanced fluency will lead investors to perceive the firm's expertise as high, reflecting a competence in delivering accurate and insightful information on ESG matters. Similarly, improved fluency is expected to bolster the perceived trustworthiness of the firm, showcasing

its commitment to ethical integrity and honesty. As a result, these heightened perceptions of expertise and trustworthiness should increase investor trust and reliance on the firm's ESG disclosures, and consequently their willingness to invest.

Furthermore, the time horizon and narrative framing of ESG disclosures could also directly influence investors' perceived credibility. As outlined by Mercer (2004), disclosure characteristics such as the precision, horizon, plausibility, and the extent of supporting information of disclosures significantly shape credibility assessments. Shorter time horizons might be perceived as more credible due to their immediacy and the perceived urgency of action they convey rather than distant promises. Additionally, when narratives are framed to emphasize feasibility—focusing on practical steps and realistic assessments rather than overly aspirational goals—they provide a clearer sense of how ESG goals will be achieved. This can enhance the plausibility of the disclosure, leading to a stronger perception of the firm's competence and sincerity.

Building on these theoretical insights, the following sections present the rationale and formulate hypotheses for two empirical studies designed to test these dynamics.

STUDY 1: TIME HORIZON AND INVESTORS' LEVEL OF CONSTRUAL

Rationale and Hypothesis

In this initial study, my focus was on whether time horizon affects investors' level of construal in the context of environmental reporting. This focus, despite the broader ESG context discussed previously, was specifically chosen due to the typically long-time horizons associated with environmental outcomes, making this an especially pertinent topic.

CLT posits that individuals' psychological distance from an event influences their mental representation of that event—shifting between more abstract or concrete thinking based on perceived temporal distance. Specifically, events or objectives perceived as temporally distant are construed at a higher, more abstract level, while those seen as imminent are interpreted

more concretely. The manipulation of time horizon in this study aims to operationalize these theoretical constructs within environmental reporting, leading to the following hypothesis:

H1: Investors reading environmental reports with short-term (long-term) goals show a preference for concrete (abstract) descriptions of sustainability initiatives.

Accordingly, this investigation acts as a pilot study to ensure that the manipulation effectively influences the construct it is designed to affect—a step identified as best practice in experimental research for ensuring construct validity, or the degree to which experimental manipulations accurately represent the theoretical constructs they intend to operationalize (Chester & Lasko, 2021; Ejelöv & Luke, 2020; Hauser, Ellsworth, & Gonzalez, 2018). In the context of construal level theory (CLT), the importance of this step has been particularly emphasized (Benschop et al., 2020; Trautmann, 2019).

Method[1]

Participants

This study recruited 202 nonprofessional investors from the United States through Prolific. Participants were selected based on three criteria: a history of making investments in company stocks or shares, experience with evaluating a company's financial statements, and a minimum approval rate of 95% on Prolific to ensure reliable responses. Submissions from two participants were excluded because they provided nonsense responses to the open questions, leaving a final sample of 200 participants. Participants spent an average (median) of 22 (18) minutes on the survey and they were compensated at a rate of £9.00 an hour based on the median completion time. The sample was predominantly male (65%) with an average age of 41 years. One participant identified as agender.

[1] This study was pre-registered on the Open Science Framework (OSF). Ethical approval for the experiment was granted by the institution where the online experiment was administered.

Procedure

Upon recruitment, participants were randomly assigned to one of two experimental conditions in a between-subjects design: they were exposed to an environmental report from a fictitious company, XYZ Clothing, which either emphasized a short-term horizon (by 2026) or a long-term horizon (by 2040) for achieving its environmental goals.

The study commenced with participants engaging with the dynamic Behavior Identification Form (BIF), a tool designed to measure construal levels (Nguyen, Grinfeld, Liberman, & Wakslak, 2023).[2] In this initial stage, participants were presented with ten predefined environmental initiatives. They were instructed to describe each initiative in terms of "how" the initiative is performed (aligning with a concrete, low-level construal) and "why" the initiative is taken (aligning with an abstract, high-level construal).

Following this, participants were presented with the environmental report from XYZ Clothing which detailed the company's environmental goals with a specified time horizon. After reading the report, participants revisited the ten environmental initiatives. In this subsequent stage, utilizing their initial descriptions, they rated their preference for describing the ten sustainability initiatives in concrete vs. abstract terms on a 5-point scale.

Additionally, the study incorporated measures of participants' perceptions of the environmental report's time horizon, the future distance of the company's environmental goals, and their evaluations of XYZ Clothing's ambition, achievability, and commitment to improving its environmental impact. These were rated on a 100-point scale for time horizon

[2] The dynamic BIF improves upon the original version by Vallacher and Wegner (1989) in several ways. It asks participants to give their own descriptions of actions in concrete and abstract terms, which better captures individual differences in perception. This approach also removes the need for preliminary pilot studies to establish normative responses, making the tool adaptable to various research contexts, including this study. Specifically, this adaptability allowed for the creation of new items focused on environmental sustainability, directly aligning with the context of the study. Additionally, the transition from a binary choice to a 5-point scale reflects the understanding that abstraction exists on a continuum, potentially enhancing the measure's sensitivity.

and future distance, and a 7-point scale for the ambition, achievability, and commitment assessments. Lastly, participants answered demographic questions.

Results

Attention checks

Building upon the qualitative examination of open responses, where only two submissions were removed due to clearly demonstrated low effort (see Participants), this study further implemented two attention checks to ensure participant engagement. The first attention check queried participants on the primary issue discussed in XYZ Clothing's environmental report, with 67.5% responding correctly. The second attention check involved identifying the target year by which XYZ Clothing aims to achieve its environmental goals, which 88.5% of participants answered accurately. These measures collectively affirm a high level of engagement with the material. Furthermore, the statistical inferences presented below, based on the complete sample, remain unchanged when excluding participants who failed these checks.

Manipulation checks

The data indicate a statistically significant difference in the perceived time horizon of XYZ Clothing's environmental goals between the two conditions. Participants exposed to the short-term horizon condition rated the time horizon of the company's environmental goals as shorter-term ($M = 40.690$, $SD = 27.559$) compared to participants in the long-term horizon condition, who rated them as longer-term ($M = 71.210$, $SD = 21.641$), $t(198) = -8.710$, $p < .001$. Similarly, when asked how distant in the future they perceive the company's environmental goals to be, participants in the short-term condition perceived them as nearer ($M = 31.870$, $SD = 21.406$) than participants in the long-term condition ($M = 63.790$, $SD = 23.101$), $t(198) = -10.135$, $p < .001$. These results suggest that the manipulation of temporal distance was effective, with the

long-term condition being associated with a greater psychological distance from the company's environmental goals.

Level of construal

Construal levels were assessed by averaging participant' responses to the ten initiatives on the dynamic BIF ($\alpha = 0.746$). Participants in the short-term horizon condition demonstrated a higher mean construal level ($M = 3.384$, $SD = 0.829$) compared to those in the long-term condition ($M = 3.158$, $SD = 0.855$). This result is contrary to the original hypothesis, which suggested that a short-term horizon would be associated with a more concrete level of construal, while a long-term horizon would be associated with a more abstract level of construal. The t-test revealed an effect in the opposite direction of the hypothesis, $t(198) = 1.90$, p (one-tailed) = .030, which when adjusted for the hypothesized direction results in a p-value of .970, indicating non-significance.

Ambition, achievability, and commitment

In assessing participants' views on XYZ Clothing's environmental ambitions, those in the short-term condition rated the company's target as moderately ambitious ($M = 5.300$, $SD = 1.141$), whereas participants in the long-term condition found the goals slightly less ambitious ($M = 4.780$, $SD = 1.236$), $t(198) = 3.091$, $p = 0.002$. As for the achievability of these goals, participants' ratings were higher in the long-term condition ($M = 5.080$, $SD = 1.089$) compared to the short-term condition ($M = 4.650$, $SD = 1.258$), indicating they found the long-term goals more achievable, $t(198) = -2.584$, $p = 0.010$. Commitment ratings showed participants in the short-term condition perceived XYZ Clothing as more committed ($M = 5.420$, $SD = 1.174$) compared to those in the long-term condition ($M = 4.950$, $SD = 1.329$), $t(198) = 2.65$, $p = .009$.

Discussion

The current study sought to explore how temporal distance influences construal levels among investors reading about a company's environmental initiatives. The findings yielded an

intriguing, if counterintuitive, result: investors exposed to a short-term horizon demonstrated higher levels of abstract construal compared to those presented with a long-term horizon. This outcome deviates from traditional CLT expectations, which typically posit that longer temporal distances are associated with more abstract construals.

One potential explanation for this unexpected pattern may relate to the specific context of environmental sustainability and how individuals mentally engage with such content. Prior research has highlighted the challenges in measuring construal levels in environmental contexts, particularly when the Behavior Identification Form (BIF) could equate "abstract" construals with environmental attributions (Wang, Hurlstone, Leviston, Walker, & Lawrence, 2019). In this study, the dynamic BIF's adaptation to sustainability initiatives may have similarly aligned participants' environmental attributions with their construal level, as evidenced in how initiatives such as "Engaging in reforestation efforts" could be construed abstractly due to their environmental purpose rather than the more typical abstract reasoning of focusing on the "why" of an action.

Moreover, the findings may not solely be a methodological artifact but also reflective of a broader phenomenon. Research by Reczek, Trudel, and White (2018) indicates that individuals inclined towards abstract thinking are more likely to favour eco-friendly products, suggesting that abstract construal levels and environmental attributions might be intrinsically linked within this context.

This link could explain why a short-term focus, which presumably aligns with immediate action and concrete details, paradoxically elicited a more abstract level of construal. Participants might perceive short-term goals as more directly addressing environmental issues, thereby engaging in more abstract, value-driven thinking about the actions' broader implications. This interpretation is supported by the higher perception of commitment observed in the short-term condition, suggesting that participants may associate immediate action with a

stronger dedication to environmental responsibility. Consequently, they may construe such actions at a higher level of abstraction as being more meaningful and impactful. Conversely, long-term goals, while inherently abstract in nature, might prompt investors to be sceptical and delve into a more detailed consideration of the steps required to achieve these outcomes, leading to a lower-level, more concrete construal. Thus, in the context of sustainability initiatives, the typical temporal framing associated with CLT may be overridden by the immediacy of action and perceived commitment.

STUDY 2: TIME HORIZON, NARRATIVE FRAMING, AND INVESTORS' WILLINGNESS TO INVEST

Rationale and Hypotheses

Building on the exploration of time horizon and investors' construal levels, this second study delves deeper into the dynamics between time horizon, narrative framing, and their collective influence on investors' willingness to invest.

The findings from the initial study challenge traditional CLT expectations, revealing that short-term environmental goals elicited more abstract construals, likely due to the perceived commitment to environmental responsibility. This unexpected outcome underscores the complexity of applying CLT in the sustainability context, where perceived company commitment and the credibility of the information could significantly influence investor perceptions as well. Given the heightened abstraction and perceived commitment associated with short-term sustainability goals, it is conceivable that such immediacy could bolster a firm's credibility in the eyes of investors, potentially enhancing their willingness to invest.

This study seeks to further investigate this premise, particularly examining how narrative framing may moderate this relationship. Building on the insights gained, I posit that short time horizons, which lead to higher-level construals, would be most effectively complemented by desirability framing that underscores the broader, value-driven implications of the

sustainability efforts. Conversely, long time horizons may be better suited to feasibility framing, emphasizing the practical steps and tangible outcomes of the sustainability initiatives. These congruent matches between the time horizon and narrative framing are hypothesized to increase processing fluency, enhancing the perceived credibility of the firm's efforts and, ultimately, leading to a higher investment willingness.

Given these considerations, this study is designed to systematically examine the effects of narrative framing as a moderator in the relationship between time horizon and investors' willingness to invest, with a particular focus on the mediating roles of processing fluency and credibility. A conceptual model illustrating these proposed relationships is depicted in Figure 1. Based on this model, I articulate the following hypotheses to explore the dynamics among the key variables:

H1: The time horizon of environmental goals influences investors' perceived credibility of the firm's efforts, with short-term goals being perceived as more credible than long-term goals and leading to a higher willingness to invest.

Following the unexpected findings from the initial study, this hypothesis aims to further explore the link between time horizon and perceived credibility. Despite CLT suggesting nearer events are processed more concretely, results showed short-term goals led to more abstract construals, possibly due to perceived immediate commitment to sustainability. H1 seeks to validate and extend these findings, examining if short-term goals indeed increase credibility and contribute to a higher willingness to invest.

H2: Narrative framing (desirability vs. feasibility) moderates the relationship between the time horizon of environmental goals (short-term vs. long-term) and investors' perceived credibility of the firm's efforts, subsequently affecting their willingness to invest. Specifically, desirability framing enhances the perceived credibility and investment willingness for short-term goals, and feasibility framing does the same for long-term goals.

This hypothesis adapts CLT to this study's specific context, focusing on the strategic match of construal levels with narrative framing to optimize communication effectiveness. It posits that matching the level of construal induced by time horizon with the appropriate level of construal in narrative framing can enhance message effectiveness.

H3: Processing fluency mediates the moderated relationship between time horizon, narrative framing, and perceived credibility, ultimately affecting investors' willingness to invest. A congruent match between time horizon and narrative framing (desirability with short-term, feasibility with long-term) facilitates processing fluency, thereby increasing the credibility of the firm's sustainability efforts and leading to a higher willingness to invest.

Lastly, this hypothesis explores the cognitive mechanism that may underlie the relationships posited in H2, integrating CLT with additional psychological insights to provide a comprehensive model of how strategic communication influences investor behaviour.

Method[3]

Participants

This study drew from the same population as the first, recruiting 522 nonprofessional investors from the United States through Prolific. Participants were selected based on three criteria: a history of making investments in company stocks or shares, experience with evaluating a company's financial statements, and a minimum approval rate of 95% on Prolific to ensure reliable responses. After excluding 13 participants for failing both attention checks, the final sample consisted of 509 participants. Participants spent an average (median) of 10 (7) minutes on the survey and they were compensated at a rate of £9.00 an hour based on the median completion time. The demographic composition of this sample was similar to that of the first

[3] This study was pre-registered on the Open Science Framework (OSF). Ethical approval for the experiment was granted by the institution where the online experiment was administered.

study, predominantly male (64.4%), with females representing 34.2% and those identifying as other genders comprising 1.4%. The average age was 43 years.

Procedure

The procedure for this experiment closely followed the methodology of the first study with adjustments to explore new variables and hypotheses. Upon recruitment, participants were randomly assigned to one of four experimental conditions, reflecting a 2x2 between-subjects design based on time horizon (short-term vs. long-term) and narrative framing (desirability vs. feasibility) of the environmental goals set forth by a fictitious company, XYZ Clothing.

Participants began by familiarizing themselves with XYZ Clothing, provided through a background briefing that outlines the company's industry position, financial health, and market presence. This foundational knowledge ensured that all participants had a uniform starting point for evaluating the environmental disclosure.

Following this introduction, participants were presented with an environmental disclosure tailored to their assigned condition. The environmental disclosures were crafted to vary both in the time horizon of the sustainability goals (either by 2026 for short-term or by 2040 for long-term) and in the narrative framing employed (emphasizing either the desirability of the sustainability outcomes or the feasibility of achieving these outcomes). Details of these manipulations are provided in the Appendix.

After reviewing the environmental disclosure, participants engaged with a series of measures (see Table 1 for the details). Drawing from Asay, Hales, Hinds, and Rupar (2023), the primary dependent variable assessed investors' holistic perceptions of XYZ Clothing through a set of three questions evaluating their willingness to invest, overall feelings toward the investment, and general perceptions of the company's stock, measured on a 7-point scale ranging from 'Very unwilling' or 'Significantly negative' to 'Very willing' or 'Significantly positive'.

Processing fluency was captured through a single-item measure asking participants to rate the ease of reading the environmental disclosure, on a scale from 'Difficult' (1) to 'Easy' (101), adapted from Graf, Mayer, Landwehr, Kirmani, and Peck (2018). This measure aims to quantify the cognitive ease or difficulty experienced by participants, reflecting the hypothesized impact of narrative framing and time horizon congruence on information processing.

Following the assessment of processing fluency, participants' perceptions of XYZ Clothing's corporate credibility were measured using an 8-item scale focusing on two dimensions of credibility: expertise and trustworthiness. This validated scale includes items assessing the company's experience, skill, expertise, trustworthiness, and honesty, alongside participants' trust and belief in the company's claims (Newell & Goldsmith, 2001).

To control for potential confounding factors and ensure the robustness of our findings, the study also measured participants' environmental concerns using the Schultz (2001) Environmental Concern Scale, alongside collecting demographic information.

Results

Manipulation and attention checks

This study replicated the manipulation checks of the first study to ascertain the effectiveness of the temporal distance manipulation concerning XYZ Clothing's environmental goals. Consistent with the initial findings, participants differentiated significantly between short-term and long-term horizons, indicating a successful replication of the manipulation. Detailed results from these manipulation checks are documented in Study 1.

Additionally, this second study introduced a manipulation check to test the narrative framing (feasibility vs. desirability) manipulation. Participants were asked to evaluate the extent to which XYZ Clothing's environmental report focused on the specific actions they plan to take. Results indicated a statistically significant difference between the feasibility framing

(M = 4.819, SD = 1.255) and desirability framing (M = 4.120, SD = 1.540), t(507) = -5.619, p < .001. This difference corroborates the effectiveness of the narrative framing manipulation, thus affirming that participants perceived the environmental report to be more action-specific under the feasibility condition as opposed to the desirability condition.

To further ensure the reliability of the data, two attention checks were incorporated into the study design. The first attention check asked participants, "Which of the following best describes the primary issue discussed in XYZ Clothing's environmental report?" A total of 75.4% of participants answered this question correctly, demonstrating a high level of engagement with the material. The second attention check queried, "By which year does XYZ Clothing aim to achieve its environmental goal?" with 80.4% of participants providing the correct answer. These results suggest that a substantial majority of the study participants paid careful attention to the details presented in XYZ Clothing's environmental report, thereby supporting the integrity of the responses collected. To uphold pre-registration commitments, this study reports findings based on the entire sample. Furthermore, to ensure the robustness of the findings, sensitivity analyses were also conducted to examine the impact of excluding participants who failed the attention checks. Where these sensitivity analyses revealed differences in the findings, such deviations are explicitly noted.

Effect of time horizon and narrative framing on willingness to invest

This study set out to explore how the time horizon of environmental goals and narrative framing affect investors' perceptions of a firm's credibility and their willingness to invest. I proposed two hypotheses: H1 suggested that short-term goals would be seen as more credible than long-term goals, thus increasing willingness to invest. H2 posited that the effect of time horizon on perceived credibility and investment willingness would be moderated by narrative framing, predicting that desirability framing would enhance short-term goals' appeal, while feasibility

framing would do the same for long-term goals. In this first section, I investigate the effects of time horizon and narrative framing on investors' willingness to invest.

Panel A of Table 2 presents the mean willingness to invest under the various conditions and Figure 2 depicts this graphically. Most notably, for short-term goals, desirability framing (M = 5.528, SD = 0.898) showed a clear advantage over feasibility framing (M = 5.059, SD = 1.315), suggesting that narrative framing's impact is most significant when goals are short-term.

A two-way ANOVA (Panel B of Table 2) examined the main and interaction effects of time horizon and narrative framing on willingness to invest. The analysis showed no significant main effect for time horizon, $F(1, 505) = .098$, $p = .623$, indicating that H1, which predicted a differential impact of short- vs. long-term goals on investment willingness, was not supported. Conversely, a significant main effect of narrative framing was observed, $F(1, 505) = 5.176$, $p = .023$, supporting part of H2 by demonstrating that narrative framing significantly influences investors' willingness to invest. The interaction between time horizon and narrative framing was also significant, $F(1, 505) = 5.185$, $p = .012$, further supporting H2 by suggesting that the effectiveness of narrative framing on investment willingness is contingent upon the goal's time horizon.

Simple effects tests (Panel C of Table 2) revealed that the impact of narrative framing was significant within short-term goals, $F(1, 505) = 10.340$, $p = <.001$, supporting H2 that desirability framing increases investment willingness compared to feasibility framing for short-term objectives. However, for long-term goals, narrative framing did not significantly affect investment willingness, $F(1, 505) = <.000$, $p = .500$, suggesting that the persuasive power of narrative framing diminishes over longer time horizons.

Moreover, the influence of the time horizon within the feasibility framing context was not significant, $F(1, 505) = 1.289$, $p = .162$. This indicates that for feasibility-focused narratives, the length of the goal's time horizon does not sway investors' willingness to invest. In contrast,

within desirability framing, short-term goals were marginally significantly more effective in garnering investor support than long-term goals, $F(1, 505) = 3.297$, $p = .070$, reinforcing the claim of H2 regarding the strategic match between narrative framing and time horizon.

Mediating role of corporate credibility and processing fluency

This section examines corporate credibility and processing fluency as mechanisms potentially underlying the impact of time horizon and narrative framing on an investor's willingness to invest. Credibility, identified in H1 and H2, is considered a mediator that may sway investors' perceptions. Additionally, processing fluency, the ease with which information is understood and introduced in H3, is assessed for its role in this relationship.

Table 3 details the descriptive statistics for these proposed mediators. For corporate credibility (Panel A), a pattern parallel to that of investment willingness manifests. For short-term goals, desirability framing results in a higher mean credibility score ($M = 5.482$, $SD = 0.813$) compared to feasibility framing ($M = 5.199$, $SD = 0.980$). This trend is less pronounced for long-term goals, where the means are 5.346 ($SD = 0.894$) for feasibility and 5.281 ($SD = 0.940$) for desirability. These findings suggest that the congruence between the time horizon of environmental goals and the type of narrative framing may be influential for the perceived credibility of the firm's efforts.

Conversely, the descriptive statistics for processing fluency (Panel B) do not demonstrate large differences between conditions, with all groups reporting similarly high levels of fluency. This lack of variance implies that the narrative framing and time horizon do not substantially affect the ease with which investors process the firm's environmental reports. An ANOVA supports this conclusion, showing no statistically significant effects ($F(3, 505) = 0.020$, $p = 0.996$, untabulated). Consequently, processing fluency was not considered further as a potential mediator in the study.

To further investigate the mediating role of corporate credibility, a moderated mediation analysis, utilizing Model 7 from Hayes' (2017) PROCESS macro, was conducted. As depicted in Figure 3, Panel A, the analysis revealed a significant moderation effect of narrative framing on the impact of time horizon on credibility ($F(1, 505) = 4.674$, $p = 0.016$, untabulated), indicating that the type of narrative framing used significantly alters how the time horizon of environmental goals affects perceived corporate credibility. Specifically, desirability framing in conjunction with a short-term goal significantly enhanced credibility ($\beta = 0.201$, $p = 0.041$), whereas feasibility framing did not produce a significant effect ($\beta = -0.148$, $p = 0.096$).

The analysis further demonstrated the influential role of corporate credibility in the investment decision-making process. Credibility emerged as a strong predictor of investment willingness ($\beta = 0.785$, $p < 0.001$), signifying its central importance as a mediator in the model. Furthermore, the indirect effect of a short time horizon on investment willingness was significantly positive in the desirability condition, with the 90% confidence interval excluding zero [0.014, 0.306]. In line with H2, this finding suggests that the combined effect of a short time horizon and desirability framing significantly bolsters corporate credibility, which in turn positively affects investors' willingness to invest.

Conversely, the indirect effect under the feasibility condition did not reach statistical significance, with a 90% confidence interval that spans zero [-2.274, 0.031]. Furthermore, the index of moderated moderation indicates a significant difference between these two indirect effects, with the 90% confidence interval excluding zero [-0.493, -0.065]. This contrast underscores the specificity of the conditions under which time horizon influences the perceived corporate credibility and, consequently, investment willingness.

Panel B in Figure 3 extends the analysis to a reduced sample, excluding participants who failed one or more attention checks (see Manipulation and attention checks), to assess the robustness of the findings. While the direction of the effects observed in this reduced sample

remains consistent with those from the full sample, their failure to reach statistical significance underscores the inherent trade-off encountered when improving data quality by excluding inattentive responses: a reduction in noise comes at the cost of decreased statistical power (Abbey & Meloy, 2017). This outcome suggests that, although the effects are directionally consistent, they are relatively small in magnitude.

Environmental concern

To enhance the robustness of the main findings, I explored the role of investors' environmental concern. Recognizing that investors' environmental attitudes could influence their reactions to environmental communications, this addition seeks to explore how such attitudes might interact with the main variables of interest: time horizon and narrative framing. Utilizing a model comparison approach as outlined by Piercey (2023), I assess both the direct and interactive effects of environmental concern on investment willingness.

First, environmental concern was introduced as a covariate in an analysis of covariance (ANCOVA), alongside time horizon and narrative framing, with investment willingness as the dependent variable. This inclusion revealed environmental concern as a significant predictor ($F(1, 504) = 52.929$, $p < .001$, untabulated), affirming its importance in investment decision-making. Crucially, accounting for environmental concern did not change the results for the other variables from the original ANOVA, preserving the integrity of those inferences.

Next, I investigated whether environmental concern interacts with any of the variables of interest. To this end, I compared the model including these interactions to the model previously discussed. Results from a semiomnibus F-test reveal the interactions in this expanded model are not statistically significant ($F(3, 501) = 1.161$, $p = 0.324$, untabulated). Therefore, the primary findings regarding the effects of time horizon and narrative framing on investment willingness remain robust and unaffected by the level of environmental concern.

Discussion

Contrary to conventional CLT expectations, which typically associate nearer events with lower-level, more concrete construals, the initial study found that short-term environmental goals elicited more abstract construals. This suggested that investors may interpret short-term goals as a marker of immediate commitment to sustainability, enhancing the perceived dedication of a firm to environmental responsibility. The present study was designed to dissect these dynamics further, and especially to examine the moderating role of narrative framing on the relationship between time horizon and investment willingness.

The results yielded no support for H1, which posited that short-term environmental goals would be inherently perceived as more credible than long-term goals, thus increasing investment willingness. However, there was partial support for H2, suggesting that narrative framing does indeed moderate the relationship between the time horizon of environmental goals and investors' perceived credibility, subsequently affecting their willingness to invest. Specifically, desirability framing appeared to enhance the perceived credibility and investment willingness for short-term goals. Conversely, H3, which proposed processing fluency as a mediator in the moderated relationship, did not find empirical support in the data.

The empirical evidence obtained thus partially corroborates the proposed theory: short time horizons coupled with desirability framing significantly improve the perceived credibility of the firm, which in turn positively sways investors' willingness to invest. In doing so, this study not only replicates the initial investigation's insights into investors' preferences for higher-level construals in short-term sustainability initiatives but also significantly extend them by establishing a direct link between these construal preferences and investment willingness.

GENERAL DISCUSSION AND CONCLUSION

This research explored how the time horizon of environmental goals and narrative framing interact to influence investors' perceptions and their subsequent willingness to invest. Through

two carefully designed studies, I delved into the nuanced application of CLT within the context of environmental sustainability reporting. The findings present a nuanced picture, challenging traditional expectations derived from CLT and contributing novel insights into the dynamics of investor engagement with environmental communications.

The first study revealed that short-term environmental goals elicit more abstract construals among investors than long-term goals, a counterintuitive finding that contradicts conventional CLT predictions. This suggests that immediate, actionable sustainability efforts might resonate more deeply with investors, possibly due to a perception of direct impact and commitment to environmental stewardship. The subsequent experiment built on these insights, examining the combined effect of narrative framing and time horizon on perceived firm credibility and investment willingness. While the anticipated mediating role of processing fluency was not supported, the study found partial support for the moderating role of narrative framing, underscoring the importance of matching the narrative to the time horizon of environmental goals.

This research contributes to a growing body of literature on environmental communication strategies, highlighting the critical role of narrative framing and time horizon in shaping investor responses. By demonstrating that short-term goals framed in terms of their desirability can significantly enhance a firm's perceived credibility and attractiveness to investors, this study offers practical guidance for firms looking to communicate their environmental commitments more effectively. These findings also suggest a need for firms to carefully consider how they present their environmental initiatives, potentially requiring a strategic re-evaluation of communication practices to better align with investor expectations and psychological predispositions.

Moreover, this study enriches the theoretical discourse on CLT, suggesting that the theory's application may have unique considerations within the realm of environmental communication.

The observed divergence in how short-term versus long-term environmental goals are construed by investors calls for a deeper investigation into the psychological underpinnings of sustainability-related decision-making.

Given the complex interplay between narrative framing, time horizon, and investor perceptions identified in this study, future research could further explore how these factors interact across different contexts and types of environmental, social, and governance (ESG) initiatives. Additionally, the role of processing fluency and its influence on investor decision-making warrants further exploration, particularly in relation to other potential mediators and moderators of investment behaviour. Investigating these dynamics across diverse investor demographics and varying levels of ESG commitment could provide richer insights into how to tailor ESG communication strategies effectively.

In conclusion, this research sheds light on the intricate dynamics that shape investor engagement with environmental sustainability initiatives, challenging conventional wisdom and opening new avenues for exploration. By highlighting the significance of narrative framing and time horizon in environmental communication, this study not only contributes to academic discourse but also offers valuable practical implications for firms seeking to enhance their sustainability reporting practices. As the demand for transparency and accountability in corporate ESG efforts continues to grow, understanding the nuances of investor psychology and communication strategies becomes increasingly vital. This research represents a step forward in meeting this challenge, providing a foundation for future inquiries into the effective communication of sustainability initiatives within the corporate sphere.

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APPENDIX

Environmental report

Climate change poses a critical challenge across the global clothing industry, presenting both risks and opportunities for companies striving for sustainability. XYZ Company recognizes the substantial impact of these environmental changes on its operations and stakeholders. In response, the company has set a strategic objective to enhance its carbon emissions efficiency.

[Short time horizon]

Our 2026 target

We aim to elevate our current 5th place industry ranking to 1st in carbon emissions efficiency by our **target year 2026**. We've chosen industry ranking as our benchmark for its adaptability, ensuring our targets remain both challenging and directly comparable to industry advances. This approach, coupled with our proven history of meeting ambitious sustainability goals, underscores our confidence in the achievability of our new target.

[Long time horizon]

Our 2040 target

We aim to elevate our current 5th place industry ranking to 1st in carbon emissions efficiency by our **target year 2040**. We've chosen industry ranking as our benchmark for its adaptability, ensuring our targets remain both challenging and directly comparable to industry advances. This approach, coupled with our proven history of meeting ambitious sustainability goals, underscores our confidence in the achievability of our new target.

[Feasibility narrative framing]

How are we striving towards our target?

Our strategy is built on **concrete, actionable steps** that ensure our climb to the top of the industry rankings for carbon emissions efficiency:

- **Investing in advanced renewable technologies:** Incorporating the latest in solar and wind energy solutions to power our operations.
- **Enhancing energy efficiency:** Streamlining our processes to minimize energy consumption and reduce waste.
- **Forming strategic sustainability partnerships:** Collaborating with leading environmental organizations to implement best practices in sustainability.

[Desirability narrative framing]

Why are we striving towards our target?

Our strategy is driven by our **vision and values** that guide our climb to the top of the industry rankings for carbon emissions efficiency:

- **Promoting environmental stewardship:** Demonstrating our role as a leader in the fight against climate change.
- **Contributing to a sustainable future:** Ensuring that our operations support long-term ecological balance.
- **Upholding our corporate responsibility:** Reflecting our dedication to ethical business practices and reducing our environmental footprint.

TABLE 1
Variable Definitions

Variable	Source	Items and calculation
Willingness to Invest	Asay et al. (2023)	Average of responses to: • How willing are you to invest in XYZ Clothing's stock? (1 = Very unwilling, 7 = Very willing) • Are your feelings towards XYZ Clothing's stock as a potential investment generally more positive or more negative? (1 = Significantly negative, 7 = Significantly positive) • What are your general perceptions of XYZ Clothing's stock as a potential investment? (1 = Significantly negative, 7 = Significantly positive)
Corporate Credibility	Newell and Goldsmith (2001)	Average of responses to: • XYZ Clothing has a great amount of experience. • XYZ Clothing is skilled in what they do. • XYZ Clothing has great expertise. • XYZ Clothing does *not* have much experience. • I trust XYZ Clothing. • XYZ Clothing makes truthful claims. • XYZ Clothing is honest. • I do *not* believe what XYZ Clothing tells me. (1 = Strongly disagree, 7 = Strongly agree)
Processing Fluency	Graf et al. (2018)	Response to: • The process of reading XYZ Clothing's environmental report was... (1 = Difficult, 101 = Easy)
Environmental Concern	Schultz (2001)	Average of responses to: • I am concerned about environmental problems because of the consequences for o Plants o Marine life o Bird o Animals o Me o My lifestyle o My health o My future o People in my country o All people o Children o My children (1 = Not important, 7 = Supreme importance)

This table presents the variables and scales used in Study 2. For each variable, the source of the scale used is indicated as well as the individual items and the calculation of the variable.

TABLE 2
Descriptive Statistics and Analysis of Variance: How Time Horizon and Narrative Framing Affect Willingness to Invest – Tests of H1 and H2

Panel A: Descriptive Statistics, Mean (Standard Deviation), n = 509			
	Narrative Framing		
Time Horizon	*Feasibility*	*Desirability*	*Overall*
Short	5.059 (1.315) n = 129	5.528 (.898) n = 125	5.261 (1.190) n = 255
Long	5.262 (1.206) n = 130	5.261 (1.177) n = 125	5.290 (1.151) n = 254
Overall	5.161 (1.263) n = 259	5.395 (1.053) n = 250	5.276 (1.169) n = 509

Panel B: Two-Way ANOVA					
Source of Variation	**SS**	**df**	**MS**	**F-statistic**	**p-value**
Time Horizon	.133	1	.133	.098	.623[a]
Narrative Framing	6.976	1	6.976	5.176	.023
Time Horizon x Narrative Framing	6.989	1	6.989	5.185	.012 [a]
Error	680.712	505	1.348		

Panel C: Simple Effects Tests			
Comparisons	**df**	**F-statistic**	**p-value**
Effect of *Narrative Framing* given *Short Time Horizon*	1	10.340	<.001[a]
Effect of *Narrative Framing* given *Long Time Horizon*	1	<.001	.500[a]
Effect of *Time Horizon* given *Feasibility*	1	1.289	.162
Effect of *Time Horizon* given *Desirability*	1	3.297	.070

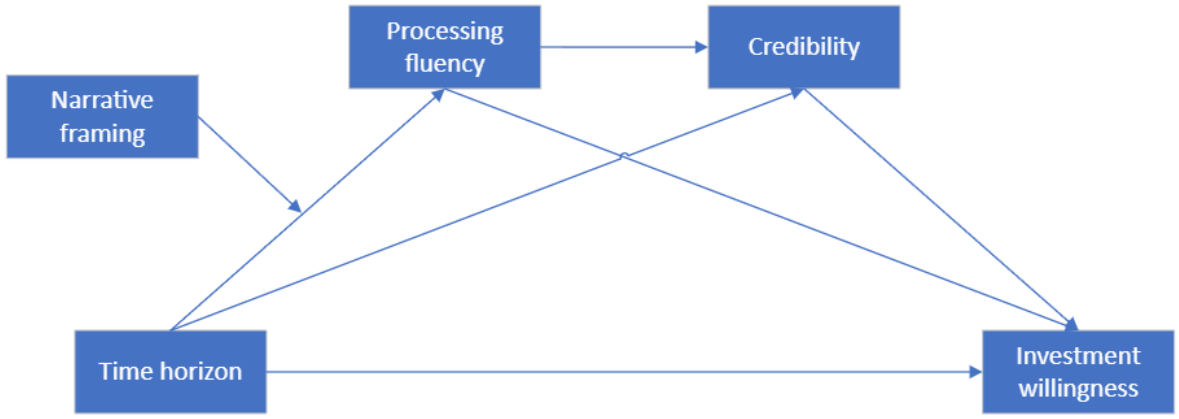
Panel A presents the mean investment willingness by condition. Panel B presents the results of a two-way between-subjects ANOVA with Time Horizon (Short and Long) and Narrative Framing (Feasibility and Desirability) as factors and investment willingness as the dependent variable. Panel C presents the results of simple effects tests following a significant interaction. [a] One-tailed equivalent p-values for directional predictions, all other p-values are two-tailed.

TABLE 3
Descriptive Statistics for Mediating Variables

Panel A: Descriptive Statistics for *Corporate Credibility*, Mean (Standard Deviation)			
	Narrative Framing		
Time Horizon	*Feasibility*	*Desirability*	*Overall*
Short	5.199 (.980) n = 129	5.482 (.813) n = 125	5.338 (1.190) n = 255
Long	5.346 (.894) n = 130	5.281 (.940) n = 125	5.314 (.911) n = 254
Overall	5.273 (.939) n = 259	5.382 (.882) n = 250	5.326 (.912) n = 509
Panel B: Descriptive Statistics for *Processing Fluency*, Mean (Standard Deviation)			
	Narrative Framing		
Time Horizon	*Feasibility*	*Desirability*	*Overall*
Short	77.194 (21.176) n = 129	76.736 (21.218) n = 125	76.969 (21.156) n = 255
Long	77.285 (24.425) n = 130	76.824 (19.895) n = 125	77.059 (22.277) n = 254
Overall	77.239 (22.821) n = 259	76.780 (20.526) n = 250	77.014 (21.704) n = 509

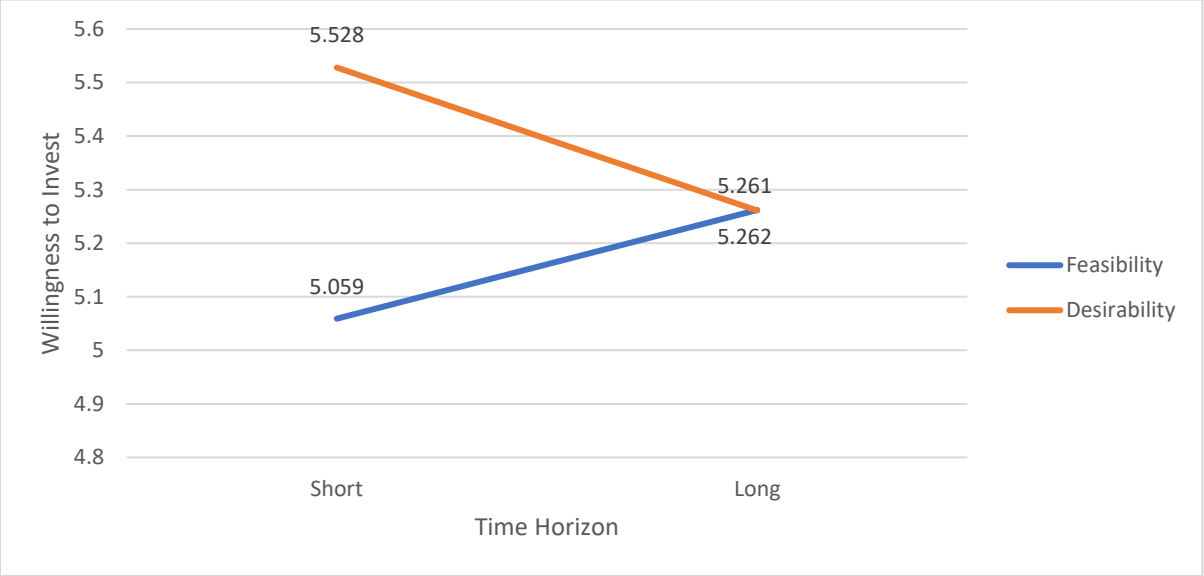
Panel A presents the mean corporate credibility by condition and Panel B presents the mean processing fluency by condition.

FIGURE 1
Conceptual Model



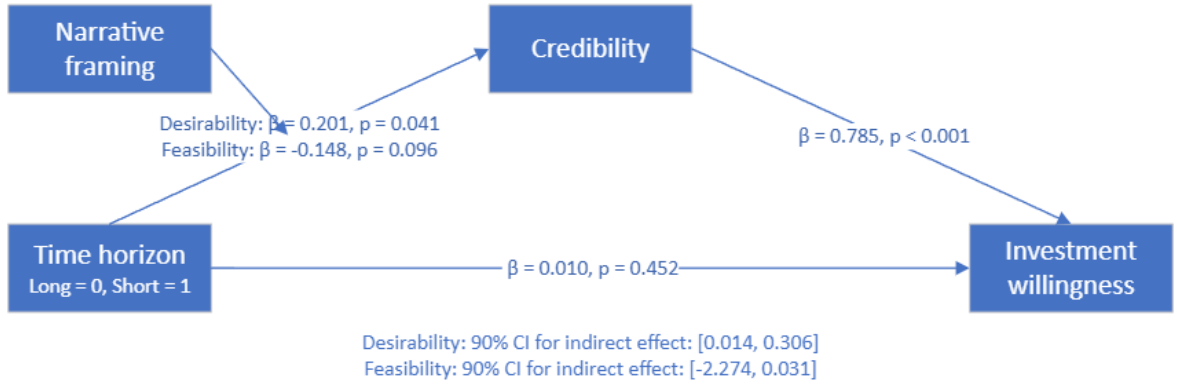
This figure presents the conceptual depiction of the proposed model.

FIGURE 2
Plot of Participants' Willingness to Invest

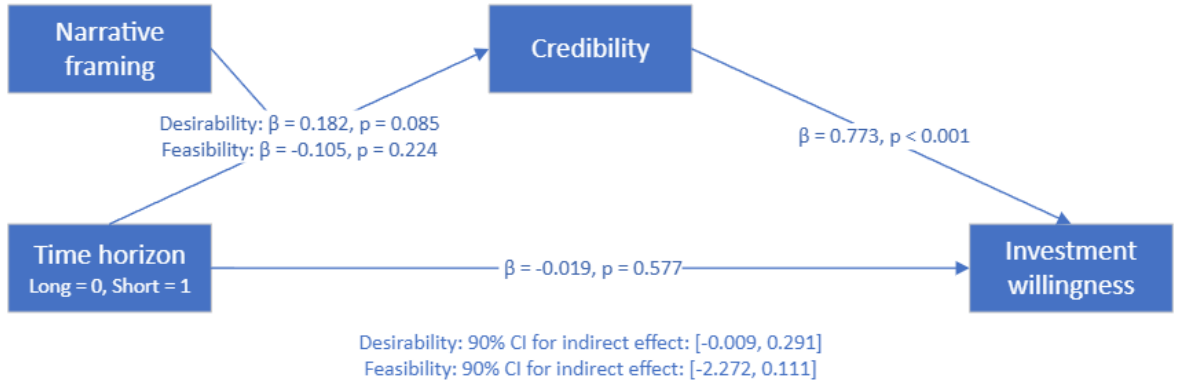


This figure illustrates participants' mean willingness to invest by condition.

FIGURE 3
Panel A: Results from Process Model (full sample)



Panel B: Results from Process Model (reduced sample)



Panel A presents the results from a process analysis utilizing Model 7 from Hayes' (2017) PROCESS macro utilizing the full sample (N = 509). This analysis tested for conditional indirect effects using a bootstrapping procedure for each Narrative framing condition and significant indirect effects are indicated by a 90% confidence interval that does not include zero. Panel B present the results for the same analysis using a reduced sample (N = 337). For this sample, participants who failed one of the attention checks (see Manipulation and attention checks) were removed. All p-values are one-tailed for directional predictions.

Board interlocks and corporate risk disclosures

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Abstract

This study explores how board interlocks influence the content and quality of corporate risk disclosures. Using a dataset of 10-K filings from non-financial U.S. public firms spanning 2006 to 2023, we compare the description of individual risk factors disclosed in *Item 1A* sections using Top2Vec topic modeling technique and find that interlocked firms simultaneously disclose more risk factors with the same topic, particularly when the shared director is an executive director. However, firms that share a director serving on the risk or audit committee are less likely to disclose similar risk factors. We further find that the shared risk factors between interlocked firms are often less specific, shorter, and harder to read, indicating reduced disclosure quality. These findings suggest that rather than resulting in informative knowledge spillovers, board interlocks lead to more boilerplate risk information through copying behavior.

Keywords: Risk disclosure - Board interlock - Textual analysis - Topic modeling - Textual quality

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1 Introduction

Firms are expected to disclose useful information about material risks they face to help investors and other stakeholders better assess the value and risk profile of the reporting firms (Mokhtar & Mellett, 2013; Solomon, Solomon, Norton, & Joseph, 2000). Ideally, risk reporting originates from a firm's risk management procedures, which begins with identifying and evaluating potential risk factors and ends with the decision on which risk factors are material and should be reported (Crovini, Schaper, & Simoni, 2022). Recognizing material risk factor depends on managers' risk awareness as well as their perception of and approach to different risks (Abdelrehim, Linsley, & Verma, 2017; Bravo, 2018). Board of directors can reinforce a risk aware culture within the firm (Braumann, Grabner, & Posch, 2020), influence the recognition and disclosure of material risks and facilitate disclosing useful risk information through their advisory and monitoring roles (Adams, Hermalin, & Weisbach, 2010; Allini, Manes Rossi, & Hussainey, 2016; Moumen, Ben Othman, & Hussainey, 2016). However, the characteristics of boards can significantly influence their role in a firm's risk disclosure practices (Bravo, 2018; Smaili, Radu, & Khalili, 2023).

In this study, we investigate the role of board interlocks, i.e. having common directors on the board [1], between firms in shaping both the content and quality of risk information disclosed by firms. Directors with multi-board membership are a common phenomenon in firms. Such interlocks result in a network of connected firms through which corporate information can be transferred from one firm to another (Davis, 1996). Firms that share directors are likely to exchange information through these directors (Cai, Dhaliwal, Kim, & Pan, 2014), which may increase their awareness of a broader range of risks. However, whether this exchange of information leads to better recognition of material risks and more informative disclosures remains uncertain.

Reporting material risk factors-which, by definition, can adversely impact firm performance (Ibrahim & Hussainey, 2019)-can enhance transparency and decrease information asymmetry between management and investors. However, such disclosures may negatively affect the firm's competitive position and, since they concern mostly downside risk, may harm firm reputation, considerations which may outweigh disclosure benefits (Abraham & Shrives, 2014; Farvaque, Refait-Alexandre, & Saïdane, 2011; Kothari, Li, & Short, 2009). This makes risk disclosure fundamentally different from other types of corporate disclosures, and a strategic decision by

[1] This concept is also referred to as board interlinks or interlocking directorates in the literature. For example, see Mizruchi (1996)

managers (Dobler, 2008). Moreover, a specific risk may be recognized as material and disclosed by one firm but considered immaterial—and therefore omitted—by another. In the context of board interlocks, a director serving on the boards of the two firms may influence the risk disclosure by sharing the information about material risks recognized by one firm with the other, potentially as a means of enhancing legitimacy (Crovini et al., 2022).

Previous research has found that risk reports often contain a mix of informative and "boilerplate", i.e. generic and non-informative, content (Bao & Datta, 2014; Campbell et al., 2014; Kravet & Muslu, 2013). Such boilerplate information, often primarily disclosed for legitimacy or litigation concerns, may lack informativeness and usefulness for stakeholders. This distinction raises important questions about the source of risk information and the reason for disclosure. Our study examines one such source by examining how board interlocks influence the content and quality of risk disclosures in the annual reports (10-K filings) of non-financial US public firms from 2006 to 2023. We collect a sample of $45,281$ *Item 1A: Risk Factors* sections and extract the disclosed individual risk factors from each *Item 1A* section. We use the Top2Vec clustering-based topic modeling technique (Angelov, 2020) to identify the subject or topic of each individual risk factor based on the content of its description. This categorization enables us to compare the risk disclosure of firms linked by shared directors and to determine whether interlocked firms disclose information on the same risk topics. Additionally, it allows us to determine new and repeated risk factors in the annual reports of individual firms (Tavakkolnia & Smeulders, 2023)

Interlocked firms are likely to have similar characteristics. These firms may disclose similar risk factors, i.e. risk factors on the same topics, due to shared directors, or rather due to similarities between them. To test the causal relationship between board interlocks and the disclosure of similar risk factors, we create an artificial difference-in-differences (DiD) framework. In this DiD setting, the treatment group comprises pairs of firms that are connected by sharing a director in any fiscal year within the sample period. To construct a valid control group, we use propensity score matching to identify pairs of firms that are similar to those in the treatment group but have no interlocking directors throughout the sample period. Our results show that pairs of firms in the treatment group disclose a higher number of similar risk factors during the years they are interlocked, compared both to other years and to similar firm pairs in the control group.

Additionally, our analysis reveals that the association between being interlocked and the number of similar disclosed risk factors is stronger when the shared director is an executive

director. In contrast, this association is weaker when the interlock involves a member of the risk or audit committee. As members of the risk and audit committee are more involved in the firms risk management process (McShane, Nair, & Rustambekov, 2011), they are more likely to scrutinize risk information and rely more on internal sources of risk information, while Other directors tend to share the risks they learn from one firm with other firms.

In an additional analysis, we compare disclosure of similar risk factors when the interlocked firms are from the same industry or not, and find that the positive association found in the main analysis is stronger when the firms are from different industries. This can be due to the spillover of risk information between industry peers (Tavakkolnia & Smeulders, 2023) leading to stronger awareness of risk factors, as well as stronger expectations of investors from firms in the same industry to cover the same risk topics. Furthermore, we find that linked firms not only disclose information about more risk factors with the same topics as linked firms, but that the likelihood of disclosing a specific risk factor is positively associated with a disclosure on that topic by linked firms in the previous year, emphasizing that when a specific risk is recognized and disclosed by one firm, the other interlocked firms follow and add that specific risk to the annual report.

Next, we examine if the risk information learned in one firm and disclosed by another firm through shared directors has higher or lower quality and informativeness. We measure textual quality of risk disclosures using the specificity of individual risk factors, as defined by Hope, Hu, and Lu (2016), as well as their length and readability, as identified by Nelson and Pritchard (2016) as two key attributes for informative or "meaningful" risk disclosure. We find that risk factors added to a firm's annual report after a risk factor with the same topic is disclosed by a linked firm, are less specific, shorter and harder to read. This may be because risk factors disclosed in response to a linked firm's disclosure may be less applicable to the second disclosing firm, or that the disclosing firm has less in-depth, first-hand information about the risk topic (Beyer, Cohen, Lys, & Walther, 2010; Linsley & Lawrence, 2007). These results are robust to controlling for average quality of the same risk factor disclosed by linked firms and the overall quality of the focal firm's risk report.

The contributions of this study are two-fold. First, we contribute to the literature on the informativeness of corporate risk disclosures. While prior research examines the influence of corporate governance and board characteristics such as director independence, board size, and board diversity on corporate risk disclosures (Abraham & Cox, 2007; Bravo, 2018; Elshandidy, Fraser, & Hussainey, 2013; Mokhtar & Mellett, 2013), research on the role of board interlocks

in corporate risk disclosure practices is scarce (Allini et al., 2016; Ibrahim, Hussainey, Nawaz, Ntim, & Elamer, 2022). In this study, we provide new insight into how board interlocks influence the recognition and disclosure of different risk factors by interlocked firms and their quality.

Second, we contribute to the literature on information transfer through networks of shared directors. Prior research highlights that firms with shared board members are more likely to demonstrate similar business practices such as earnings management and disclosure policies (Cai et al., 2014; Chiu et al., 2013). However, different corporate practices spread between linked firms differently depending on the nature of network ties (J. L. Brown & Drake, 2014) and different information transfers differently trough network ties depending on the nature of the information (Hansen, 1999). Risk factor disclosure provides a unique setting to examine the extent to which information with potentially negative implications for firms can be transferred between interlocked firms. This setting enables us to provide empirical evidence that the information about specific risk topics in one firm can be transferred to other firms by shared directors, and specifically more by executive directors than directors in risk or audit committees. However, the transferred information has a lower quality in disclosure, and therefore is less informative.

Furthermore, the literature on the spillover of corporate disclosure practices document the effect of disclosures of a firm on the peer firms' cost of capital (Shroff, Verdi, & Yost, 2017), stock prices (Han, Wild, & Ramesh, 1989), frequency of management forecasts (Seo, 2021), or risk disclosures informativeness (Tavakkolnia & Smeulders, 2023). This study contributes to this stream of literature by highlighting that beyond the effect of peer firm disclosure practices on other firms, directors with multi-board membership also pay an important role in transferring risk information between the linked firms and quality of their disclosure.

The findings of this study have significant implications for both practice and policy. First, they highlight the critical role of board interlocks in shaping corporate risk disclosures, demonstrating how shared directors influence the recognition and dissemination of material risk topics among linked firms. This underscores the importance of board composition in fostering a risk-aware culture and ensuring that firms disclose meaningful risk information. Second, the study reveals potential drawbacks of information transfer via board interlocks, as firms may disclose risk factors with lower specificity and textual quality, reflecting limited applicability or understanding. For regulators, these results suggest a need to evaluate the governance implications of board interlocks, particularly regarding their impact on disclosure quality. Finally, the findings inform investors and other stakeholders about how interlocks may affect the informativeness of corporate risk disclosures, offering a nuanced understanding of the trade-offs involved in such

governance structures.

In what follows, we first provide an overview of prior literature on risk reporting and on the role of the board in disclosure practices, and develop the hypotheses in section 2. In Section 3 we explain the methodology used to test our hypotheses. In section 4 we describe the data sample and the main variables used in this study. Next, the empirical results are summarized in section 5, and finally, conclusions, inferences and limitations are discussed in section 6.

2 Theoretical background and hypothesis development

In 2005, the U.S. Securities and Exchange Commission (SEC) implemented regulations mandating publicly traded companies to include a qualitative description of significant risks and uncertainties that could substantially affect their performance in annual reports (SEC, 2005). Following the financial crisis of 2007-2009, the SEC further stressed the need for companies to disclose more specific risk information, to address concerns over the usefulness of risk disclosures (Johnson, 2010) and to discourage the reporting of generic risk factors that could apply to any company (Abraham & Shrives, 2014). Both researchers and practitioners have suggested that the mandatory disclosure of risk information can result in the disclosure of uninformative, generic or "boilerplate" risk information (Duarte, Han, Harford, & Young, 2008; Miihkinen, 2012). However, prior empirical research shows that risk disclosures in annual reports contain a combination of useful information that affects investors' decision making and boilerplate content (Bao & Datta, 2014; Campbell et al., 2014; Kravet & Muslu, 2013; Tavakkolnia & Smeulders, 2023). It is yet unclear how firms decide to disclose specific risk information, and identifying the determinants of specific, useful risk disclosures remains difficult.

Prior literature discusses several benefits and costs of risk information disclosure. Disclosing risk information can reduce information asymmetry between external stakeholders and management, leading to a lower cost of capital for the firm (Heinle & Smith, 2017; Linsley & Shrives, 2005; Young & Guenther, 2003). Moreover, managers tend to disclose risk factors with material impacts on the firm's future performance to prevent being held accountable and to reduce the possibility of legal actions, i.e. litigation risks (Kothari et al., 2009; Nelson & Pritchard, 2016).

On the other hand, according to the theory of proprietary cost, the consequences of revealing critical firm information to rivals may discourage managers from disclosing accurate and firm-specific risk information. Managers and directors may use their discretion to obfuscate risk information or to disclose general, rather than detailed information to protect the firm's

competitive position and critical inside information from rivals (Beyer et al., 2010; Darrough & Stoughton, 1990). Furthermore, risks often have negative implications for the future performance of the firm, and disclosing them may have a negative effect on stock prices. This can in turn negatively affect managers' and directors' compensation and job security that are often tied to stock prices (S. V. Brown & Tucker, 2011; Kothari et al., 2009). Moreover, the presence of risk may indicate a lack of managerial competence or effort. This effect on managerial reputation can have a direct impact on future career prospects and incentivize managers to limit their risk disclosure.

Corporate governance literature highlights the critical role of boards of directors on firms' performance through monitoring and advising senior management (Adams et al., 2010; Dass, Kini, Nanda, Onal, & Wang, 2014). Directors also influence the managers' decisions on financial and non-financial reporting and are held responsible for the quality of disclosed accounting information (Armstrong, Core, & Guay, 2014; Brochet & Srinivasan, 2014). For example, Ke, Li, and Zhang (2020) finds that directors simultaneously serving in firms from related industries provide managers with additional information that increases the accuracy of their earnings forecasts.

Firms' transparency and disclosure policies is influenced by board structure and director characteristics (Armstrong et al., 2014). Several studies examine the effect of board structure and characteristics on firms' risk disclosure practices. Bravo (2018) studies the influence of board diversity on risk disclosure and finds that firms with boards of higher gender and ethnic diversity report more risk information in their annual reports. Smaili et al. (2023) recognizes the identification and communication of organizational risks as one of the responsibilities of directors and finds a positive association between board effectiveness, measured by shareholder confidence, independence, and financial expertise and the amount of disclosed information about cybersecurity risks in Canadian companies. Abraham and Cox (2007) show that in the annual reports of UK firms, the number of risk-related sentences is positively associated with the number of executive and independent directors while dependent non-executive directors have no significant effect on the firms' risk disclosure.

Multiple directorships or board interlocks create networks that help transfer valuable firm, industry, and market information between connected firms (Davis, 1996; Larcker et al., 2013) that, for example, help managers to improve the accuracy of earnings forecasts (Schabus, 2022). The role of directors with multi-board memberships on mandatory risk disclosures and their informativeness is less developed. Allini et al. (2016) examine the effect of multiple directorships

(along with several other board characteristics) on the number of risk sentences in the annual reports of state-owned firms in Italy and do not find any significant association (they find a significant positive effect for gender, education, and age diversity). W. Li, Zhang, and Ding (2023) study the role of board networks in the quality of CSR reports in China and finds that firms with higher network centrality disclose CSR reports with higher quality. Omer, Shelley, and Tice (2020) also find that the quality of financial reporting (based on misstatements in annual reports) is positively associated with the centrality (related to connectedness) of audit committee directors. Nevertheless, directors with too many board memberships could be too busy and have less time to be able to effectively monitor managers and the firm (Omer et al., 2020; Fich & Shivdasani, 2006).

Directors acquire awareness and information about various risk topics through their activity on boards. Directors with multi-board memberships are likely to have increased awareness of a broader range of risk topics, and have more varied information about them. These directors may introduce risk information from one board to another, e.g. driven by concerns over litigation risks (Brochet & Srinivasan, 2014) or a desire to enhance their firm's transparency and legitimacy (Crovini et al., 2022; Seo, 2021). Consequentially, transfer of risk-related information between firms via board interlocks could lead linked firms to disclose more similar risk factors, i.e. risk factors on the same topics. In other words, when one firm recognizes and discloses a specific risk topic, another interlocked firm may follow by adding the same risk topic to their annual report. Based on this argument, we hypothesize that:

H1 *Two firms disclose a higher number of similar risk factors if they are linked by a common director.*

Various studies use the length of risk disclosures, typically measured by the number of risk-related words or sentences in a report as a whole, as an indicator of disclosure quality (Abraham & Cox, 2007; Linsley & Shrives, 2006). Other studies recognize that text length is only one determinant of the quality and identify other quality attributes, such as readability and specificity. Readability scores measure the level of the complexity of a document for a reader to understand. For example, Linsley and Lawrence (2007) use Flesch reading ease ratings to study the readability of risk disclosures. They find that textual risk disclosures in annual reports of UK-listed firms are generally "difficult or very difficult" to comprehend. Nelson and Pritchard (2016) identify length, readability, and modification of risk disclosures as three key attributes that make them "meaningful" as per the guidelines of the 1995 Private Securities

Litigation Reform Act (PSLRA) and SEC recommendations for informative risk disclosures. They conclude that informative risk disclosures are comprehensive, are easy for investors to understand, and adapt in response to changes in the firm's risk profile.

Following the 2007-2009 financial crisis, researchers and practitioners called for firms to disclose more firm-specific risk information (Abraham & Shrives, 2014; Johnson, 2010). In this context, Hope et al. (2016) define the specificity of risk disclosures based on the relative number of names, quantitative values, dates, and times. Their findings suggest that greater specificity of risk disclosures is associated with stronger reaction in the market and improved accuracy in analysts' forecasts. This underscores the importance of providing detailed risk information to enhance the decision-making of investors and other stakeholders. In this study, we use specificity, readability, and length of risk factor descriptions as proxies for the quality of textual risk disclosures.

Possible discretion and flexibility in disclosure of risk information affects the quality and informativeness of risk factors. Considering that disclosures with higher quality are more informative and useful to users (Elshandidy et al., 2018), the quality, and consequently the informativeness, of risk factors disclosed by firms following the disclosure of the same risk by linked firms is another open question. Directors are generally held responsible for the quality of corporate disclosures (Intintoli, Kahle, & Zhao, 2018; Omer et al., 2020). Directors who form the link between two firms are expected to have better knowledge about specific risk topics by being exposed to information about the risk topic in (at least) two different settings. However, "copying" risk factors may simply be an attempt to increase the appearance of legitimacy. A risk topic being disclosed by multiple firms may appear more legitimate, benefiting both disclosing firms, as well as the director proposing the addition. It also provides directors with efficiencies of effort, enabling them to use any information they have gathered multiple times, increasing their perceived contribution without much additional effort. This could be reflected in disclosure of risk factors with lower quality, and therefore less informative. Based on these arguments, we explore the quality of risk information transferred from one firm to another by shared directors with the following hypotheses.

H2 *The quality of a risk factor is lower if it is disclosed following the disclosure of a similar risk factor by a linked firm.*

3 Research design

We utilize two sets of analyses to investigate the role and effect of directors with multi-board membership on transfer of risk information between firms and the quality of textual risk disclosures. In the first set, we test if shared board members between two firms result in a higher number of similar risk factors being disclosed. In the second setting, we examine the impact transfer of risk information between firms via shared directors on the quality of risk disclosures.

3.1 Board interlocks and disclosure of similar risk topics

Our first research objective is to investigate if firms linked by common directors disclose more similar risk information. Linked firms could be similar in their business, operations or market and therefore subject to similar risks which are disclosed in their annual reports. In order to test the causal effect of shared directors on the disclosure of risk factors on the same topics, we estimate a two-way fixed effects difference-in-differences (TWFEDID) model (Goodman-Bacon, 2021) in equation 1. Difference-in-differences (DID) frameworks are traditionally used to estimate causal effects between treated and control groups. In our sample, two firms can start to share a board member in a given year and lose this link later on, because the shared director leaves one or both of the firms, meaning that the treatment effect is dynamic in our setting. We construct the treatment group as all pairs of firms i and j that are linked by a common directors for at least 1 year during the sample period. Therefore, the treatment variable $Linked_{ij}$ is equal to 1 for firm pair ij in treatment group only for the years the two firms share at least one board member.

We use propensity score matching to create a representative control group. For every pair of firms i and j in treatment group in a given year t, we find two firms i' and j' where, i' is the most similar firm to i and j' is the most similar firm to j in that year, based on the control variables described in section 4.4[2]. The dependent variable $SharedRT_{ij}$ is the number of similar risk factors, defined as the risk factors on the same topics disclosed by both firms, in a specific year. The models also include control variables for firm pairs (average of control variables explained in section 4.4 for the firms in the pair), and board characteristics of the two firms), as well as year fixed effects and industry fixed effects based on the Fama-French 49 industry categorization (excluding finance and banking industries).

[2]The closest match for each firm is obtained using K-nearest neighbor (KNN) technique.

$$SharedRT_{ij} = \alpha + \beta_1 Linked_{ij} + \Sigma\beta_n CONTROL_{ijn} + FE_{Industry_i} + FE_{Industry_j} + FE_{Year} + \epsilon \quad (1)$$

3.2 Board interlocks and risk disclosure quality

Our second research objective is to investigate the effect of prior disclosure of a risk topics by interlocked firms on the specificity, readability, and length of new risk factors disclosed in a firm's annual report. For this, we estimate the regression models in equation 2.

$$RFQuality_{ri} = \alpha + \beta_1 LnkLstyrDisc_{rj} + \Sigma\beta_n CONTROL_{ni} + FE_{Industry_i} + FE_{Year} + FE_{Risk\ topic} + \epsilon \quad (2)$$

The dependent variable $Quality_{ri}$ denotes the specific quality measure of a new individual risk factor r disclosed by a firm i, namely, depending on the model, the specificity, as defined by Hope et al. (2016) ($RFSpec_{ri}$), the readability, measured by Fog index ($RFFog_{ri}$), or the length ($RFLength_{rj}$) of the risk factors' descriptions. The independent variable $LnkLstyrDisc_{rj}$ is a dummy variable equal to 1 if a risk factor with topic r is disclosed by any linked firm in the previous fiscal year. In addition to the control variables for firm and board characteristics, explained in section 4.4, we also control for the average specificity ($LnkSpec_r$), readability ($LnkFog_r$), and length ($LnkLength_r$) of risk factor disclosures on a risk topic r disclosed by linked firms. The models also include variables $RRSpec_i$, $RRFog_i$, and $RRLength_i$ to control for, respectively, specificity, readability and length of *Item 1A* section of firm i in previous year's annual report[3], as well as year, risk topic, and industry fixed effects.

4 Sample and variable measurement

4.1 Sample selection

Our dataset consists of textual risk disclosures, board composition and director characteristics, financial and stock price data of non-financial US public firms over the period from 2006 to 2023. The sample selection procedure is outlined in table 1.

We collect a sample of 87,065 *Item1A: Risk Factors* sections from the SEC EDGAR database. and train the Top2Vec topic model on this sample. We drop all firms with less than 3 years of observation in the sample. Since we compare the risk disclosures of consecutive years for

[3]We include the quality measures of the previous year's *Item 1A* to eliminate the effect of new risk factors disclosed in the current year's annual report

each firm to identify newly introduced risk factors, the first year of observation is automatically dropped from the analysis. This leaves at least 2 years of observations for each firm required in the analyses. We further collect the firms' board characteristics and network data from the BoardEx database, including directors sitting on other firms' boards and linked firms via shared board members. We collect financial information and stock prices from Compustat database. After matching the data based on CIK codes and dropping all observations with missing variables in BoardEx and Compustat databases, our final sample consists of $5,574$ unique firms and $45,281$ firm-year observations.

Table 1: Sample selection

Description	Unique CIKs	Item 1A sections
Top2Vec topic model training dataset	**12,923**	**87,065**
Firms with less than 3 years of observation	$-3,688$	$-5,479$
First year of observation of every firm	-	$-9,307$
Board or director characteristics missing in BoardEx database	$-2,704$	$-16,345$
Other missing control variables	-957	$-10,653$
Final Sample	**5,574**	**45,281**

4.2 Textual risk disclosure variables

In order to quantify textual risk disclosure, we measure multiple attributes for individual risk factors disclosed in the *Item 1A* section. First, we identify the topic of each individual risk factor based on its content or description. In the *Item 1A* section in 10-K fillings, each individual risk factor is specified as a subsection consisting of a heading followed by the corresponding explanation in "plain English" (SEC, 2005). Similar to (Tavakkolnia & Smeulders, 2023), we first use regular expressions and text processing packages in Python to extract these risk factors from the *Item 1A* sections collected in HTML or TXT formats.

For the HTML files, which constitute the majority of files in our sample, we identify elements with bold and/or italic formatting as headings and any text between two consecutive headings is assigned to the preceding heading as one individual risk factor. For the TXT files, first, the text is split into paragraphs. A risk factor heading is identified as a single paragraph consisting of only one sentence and starting with a capital letter. Then, the proceeding paragraphs that are more than one sentence or start with a small letter (such as in lists or bullet points) are added to the identified heading, until another title paragraph is identified.

Next, we train the Top2Vec clustering-based topic modeling technique (Angelov, 2020) on a sample of $3,245,668$ individual risk factors extracted from *Item 1A* sections to categorize them based on their semantic similarity and content. The model gives us a total of 6896 topics which are essentially clusters of semantically similar risk factors. We measure the total number of risk factors disclosed in a report ($TotalRFs$) as the total number of individual fine-grained risk topics, assuming that each risk factor has a unique topic.

Next, we combine very similar fine-grained risk topics using hierarchical clustering technique to obtain high-level risk topics (Tavakkolnia & Smeulders, 2023). We identify 105 unique risk topics in our sample, optimized on topic coherence and topic diversity measures (Angelov, 2020; Dieng, Ruiz, & Blei, 2020; Bianchi, Terragni, & Hovy, 2021). Each high-level risk topic (or simply risk topic) determines risk factors that are similarly related to a specific risk category, such as climate-related risks, cybersecurity risks, COVID-19, etc.

We use these risk topics to compare the content of *Item 1A* sections of individual firms over the years and also risk disclosures across firms. An individual risk factor disclosed in a report is identified as New if no risk factor with the same topic is disclosed in previous year's report, and *Repeated* otherwise. Moreover, for two firms that share a director on their boards, we define the variable $SharedRT$ as the number of risk factors on the same risk topic that is similarly disclosed in the annual reports of both linked firms in the same year.

We measure the specificity of risk disclosures similar to Hope et al. (2016). We define the variable $RFSpec$ ($RRSpec$) as the total number of people names (PERSON), nationalities or political groups (NORP), companies or institutions (ORG), names of places and locations (GPE or LOC), product names (PRODUCT), named events (EVENT), named documents made into laws (LAW), dates (DATE) and times (TIME), percentage (PERCENT), monetary values (MONEY), and other quantities (QUANTITY) mentioned in an individual risk factor (*Item 1A* section), divided by the length of the risk factor (*Item 1A* section).

The length of the individual risk factors ($RFLength$) or the whole *Item 1A* section in the annual reports ($RRLength$) is, in turn, measured as the total number of words and frequent 2-word phrases (such as *greenhouse gas*, *cyber attack*, *social distancing*, etc.) after removing punctuation, numerical values, and stop-words (common words such as *the*, *is*, *are*, etc.).

Finally, we use Gunning Fog readability index (FOG), which is the most commonly used readability index in the literature (F. Li, 2008; Nelson & Pritchard, 2016), to measure the readability of individual risk factors disclosed ($RFFog$) and the Risk Factors section as a whole ($RRFog$). Higher values of FOG indicates that the risk report is on average harder to read.

4.3 Board interlock measures

A director from one firm can be a board member in multiple other firms and a firm can share multiple directors with multiple firms. We define variable *Linked* as a dummy variable equal to 1 if two firms have board interlock or are simply linked by sharing at least one director in a fiscal year. Accordingly, we define *SharedDir* as the number of directors on a firm's board who are a member of at least one other board. In turn, *ED*, *RC*, and *AC* are dummy variables set equal to 1 if the shared director between the two firms is, respectively, an executive director, or a member of risk or audit committee in either firm. Similarly, we count the number of firms linked with a firm through a shared board member by variable *Links*.

4.4 Control variables

In our analysis, we control for multiple board characteristics including board size with the natural log of the number of board members (*BoardSize*), board age with average age of directors (*Age*), and gender ratio (*GenderRatio*) that are shown in previous studies to have influence on firms' disclosure behavior (Bravo, 2018; Mokhtar & Mellett, 2013). Prior research also finds that the independent directors can influence a firm's information environment and transparency (Armstrong et al., 2014). For example, Abraham and Cox (2007) and Smaili et al. (2023) find that firms with higher proportion of independent directors on board disclose lengthier risk reports. Therefore, we control for the proportion of independent directors on boards (*IndepDir*).

Prior research finds that the quantity and quality of risk disclosures is associated with the firms' risk level in the market (Campbell et al., 2014; Lyle, Riedl, & Siano, 2023; Tavakkolnia & Smeulders, 2023). We include the stock return volatility (*Volatility*) and market model *Beta* over 126 trading days before annual report filing date as proxies for firms' total risk and systematic risks, respectively.

Following prior corporate disclosure studies, we collect and control for firms' financial information including firm size with natural log of total assets (*FirmSize*), profitability with return on equity ratio (*ROE*), liquidity with current ratio (*Current*), and leverage with debt to total assets ratio. Other financial control variables include the ratio of book value to the market value of equities (*BtM*), and the ratio of R&D expenditure to total operating expenses (*R&D*). We also control for the number of analysts covering the firms (*#Analysts*) as a proxy for firms' information environment (Zhang, 2006). We further control for the number of internal control weaknesses reported by auditors (*ICW*) and whether a firm is audited by one of the Big 4 audit companies (*Big*4).

5 Empirical results

Table 2 shows the summary statistics of all dependent, independent, and control variables used in our analyses. Firms on average disclose 32.86 different risk topics in their annual reports every year where near 15 risk factors are new. In addition, firms on average share 3.4 board members with other firms where the majority of shared directors are from the audit committee as compared to executive directors and risk committee members.

Table 3 shows the pairwise Pearson correlation matrix for dependent, independent, and control variables.

Table 2: Descriptive statistics

Variable	N	Mean	Std. dev.	P10	Median	P90
$TotalRFs$	45281	32.86	15.55	15	30	55
$\#New$	45281	14.91	8.622	6	13	25
$RRSpec$	45281	2.508	1.171	1.312	2.262	3.989
$RRFog$	45281	23.95	2.936	20.68	23.34	28.18
$RRLength$	45281	52.46	38.23	16.13	42.02	104.8
$SharedDir$	45281	3.402	2.492	0	3	7
$SharedED$	45281	0.328	0.520	0	0	1
$SharedRC$	45281	0.051	0.350	0	0	0
$SharedAC$	45281	1.667	1.275	0	2	3
$Volatility$	45281	4.007	3.365	1.544	3.039	7.187
$Beta$	45281	1.057	0.631	0.303	1.040	1.835
$FirmSize$	45281	6.323	2.204	3.391	6.398	9.107
ROE	45281	-0.108	1.405	-0.868	0.058	0.367
DtA	45281	0.246	0.260	0	0.192	0.564
$Current$	45281	3.186	3.627	0.842	2.041	6.495
$R\&D$	45281	0.121	0.208	0	0.012	0.436
BtM	45281	0.504	0.673	0.046	0.393	1.167
$Big4$	45281	0.591	0.492	0	1	1
ICW	45281	0.082	0.295	0	0	0
$GenderRatio$	45281	0.856	0.130	0.667	0.875	1
$BoardSize$	45281	2.174	0.250	1.792	2.197	2.485
$Analysts$	45281	1.730	0.986	0	1.792	3.045
Age	45280	60.89	4.847	54.50	61.17	66.80
$IndepDir$	45281	0.776	0.161	0.571	0.800	0.900

All the variables are winsorized at the 1^{st} and 99^{th} percentiles.

5.1 Disclosure of similar risk topics

We start our main analysis by estimating the causal relation between sharing directors and disclosure of similar risk factors, using the two-way fixed effects difference-in-differences (TWFEDID) model in equation 1. The results are summarized in table 4.

In model (1) in table 4 the coefficient for treatment effect *Linked* is positive (equal to 1.07) and statistically significant at 1% level. This result suggest that firms disclose a higher number

Table 3: Pairwise correlation matrix

	TotalRFs	*#New*	*RRSpec*	*RRFog*	*RRLength*	*SharedDir*	*Volatility*
TotalRFs	1						
#New	0.8128*	1					
RRSpec	-0.0211*	0.0390*	1				
RRFog	0.4322*	0.3141*	-0.1411*	1			
RRLength	0.8718*	0.6399*	-0.0170*	0.5023*	1		
SharedDir	0.0683*	0.0254*	-0.0893*	0.2706*	0.1585*	1	
Volatility	0.1549*	0.1850*	0.0694*	-0.0570*	0.1383*	-0.2475*	1
Beta	0.1359*	0.1008*	-0.0055	0.1171*	0.1688*	0.1749*	0.0090
FirmSize	-0.0967*	-0.1058*	-0.0601*	0.2554*	-0.0322*	0.5768*	-0.4546*
ROE	-0.1089*	-0.0913*	0.0014	-0.0273*	-0.1148*	0.0351*	-0.1119*
DtA	0.0649*	0.0459*	0.0513*	0.1563*	0.0753*	0.1269*	0.0671*
Current	0.1706*	0.1115*	-0.0075	0.0404*	0.2242*	-0.0641*	0.0319*
R&D	0.4153*	0.2916*	-0.0442*	0.1921*	0.5079*	0.0705*	0.1798*
BtM	-0.0354*	-0.0305*	0.0273*	-0.0706*	-0.0566*	-0.0866*	-0.00730
ICW	0.0859*	0.1295*	0.0158*	-0.0197*	0.0382*	-0.1624*	0.2039*
GenderRatio	-0.1473*	-0.0962*	0.1353*	-0.3362*	-0.2168*	-0.2864*	0.1202*
BoardSize	-0.0792*	-0.0804*	-0.0632*	0.1985*	-0.0032	0.6138*	-0.3343*
Analysts	0.0828*	0.0171*	-0.0941*	0.2637*	0.1466*	0.5157*	-0.3436*
Age	-0.2005*	-0.1998*	-0.0043	-0.0263*	-0.1959*	0.0212*	-0.1391*
IndepDir	-0.0354*	-0.0252*	-0.0752*	0.1056*	-0.0019	0.3184*	-0.1862*

	Beta	*FirmSize*	*ROE*	*DtA*	*Current*	*RD*	*BtM*
FirmSize	0.2035*	1					
ROE	-0.0144*	0.1509*	1				
DtA	0.0391*	0.2283*	0.0819*	1			
Current	0.0394*	-0.2337*	-0.0533*	-0.2819*	1		
R&D	0.0869*	-0.3014*	-0.1585*	-0.1702*	0.4263*	1	
BtM	-0.0261*	0.0073	-0.1097*	-0.2834*	0.0814*	-0.1001*	1
ICW	-0.0427*	-0.2023*	-0.0313*	0.0145*	-0.0347*	-0.0215*	-0.0432*
GenderRatio	-0.0680*	-0.3156*	-0.0235*	-0.0963*	0.0408*	-0.0252*	0.0665*
BoardSize	0.1387*	0.6720*	0.0768*	0.1573*	-0.1657*	-0.1231*	-0.0505*
Analysts	0.2381*	0.6810*	0.0719*	0.1055*	-0.1018*	0.0025	-0.1418*
Age	-0.0369*	0.1349*	0.0473*	-0.0143*	-0.0157*	-0.1120*	0.0421*
IndepDir	0.0980*	0.2471*	0.0169*	-0.0226*	-0.0093	0.0403*	-0.0015

	ICW	*GenderRatio*	*BoardSize*	*Analysts*	*Age*	*IndepDir*	
GenderRatio	0.0628*	1					
BoardSize	-0.1844*	-0.3087*	1				
Analysts	-0.1797*	-0.2772*	0.5090*	1			
Age	-0.0877*	-0.0077	0.1004*	0.0135*	1		
IndepDir	-0.1257*	-0.2259*	0.2508*	0.2417*	0.1130*	1	

* $p < 0.01$

of similar risk factors in years when they are linked by sharing a director than other years and also compared to the similar non-linked firms (control group), supporting H1.

Next, we estimate the effect of two firms being linked and disclosure of similar risk factor when the two firms share an executive director, or a member of risk or audit committee. In models (2) to (5) in table 4, we include the interaction between the treatment effect *Linked* and indicator variables for sharing an executive director (ED), a member of risk committee (RC), or a member of audit committee (AC)[4].

In model (2), the coefficient for the interaction between *Linked* and ED is positive (equal to 0.84) and statistically significant at 1% level, suggesting that firms tend to disclose more similar risk factors if the shared director is an executive director. In models (3) and (4), the coefficients for the interaction of *Linked* with RC and AC are negative (respectively equal to -0.51 and -0.26) and statistically significant at 1% confidence level. These results suggest that the impact of sharing a director on disclosing more similar risk factors is less strong when the director forming the link is member of risk or audit committee in either of the two firms.

In table 4, model (5) shows the results when all interaction terms are included in the same model. The results are in line with results in models (1) to (4) and in all these models the coefficient for variable *Linked* is positive and statistically significant, supporting H1. Our results are robust to controlling for multiple firm and board characteristic variables for the firm pairs. In addition to control variables explained in section 4.4, we also control for the average of the total number of risk factors disclosed ($pairTotalRF$) by the two firms and average of the number of other firms that each of two firms share a director with ($pairLinks$)[5].

5.2 Risk disclosure quality

In section 5.1 we find evidence that firms linked with shared directors disclose more similar risk factors. In this section we estimate the models in equation 2 to test the impact on the quality of a new risk factor disclosed by a firm after a similar risk factor, i.e. with the same risk topic, is disclosed by a linked firm in previous fiscal year. The results are summarized in table 5.

In table 5 the results for the model with $RFSpec$ as dependent variable are shown in model (1). The coefficient for $LnkLstyrDisc$ is negative (equal to -0.13) and statistically significant at 1% confidence level, after controlling for the average specificity of the risk factors on the same

[4]Note that the dummy variables ED, RC, and AC can be equal to 1 only if the two firms are linked ($Linked = 1$). Therefore, the interaction terms $Linked \times ED$, $Linked \times RC$, and $Linked \times AC$ are always equal to ED, RC, and AC, respectively

[5]For the pairs of firms for which $Linked = 1$, this variable excludes the two firms forming the link

Table 4: Similarity of linked firms disclosures

DV	*SharedRT*				
Models	(1)	(2)	(3)	(4)	(5)
Linked	1.0774***	0.9344***	1.0937***	1.2618***	1.0570***
	(40.46)	(33.10)	(40.50)	(27.55)	(22.32)
Linked × *ED*		0.8410***			0.8026***
		(12.05)			(11.44)
Linked × *RC*			-0.5127***		-0.4309***
			(-3.99)		(-3.35)
Linked × *AC*				-0.2617***	-0.1451***
				(-4.95)	(-2.76)
pairTotalRFs	7.3984***	7.4050***	7.3987***	7.3956***	7.4035***
	(145.07)	(145.90)	(145.09)	(145.12)	(145.91)
pairLinks	0.7523***	0.7591***	0.7515***	0.7516***	0.7577***
	(26.35)	(26.65)	(26.33)	(26.33)	(26.60)
pairVolatility	-0.0097**	-0.0097**	-0.0095**	-0.0098**	-0.0096**
	(-2.18)	(-2.19)	(-2.15)	(-2.21)	(-2.18)
pairBeta	0.3237***	0.3248***	0.3234***	0.3242***	0.3248***
	(14.84)	(14.93)	(14.83)	(14.87)	(14.94)
pairFirmSize	-0.4603***	-0.4612***	-0.4597***	-0.4609***	-0.4611***
	(-36.09)	(-36.29)	(-36.05)	(-36.16)	(-36.29)
pairROE	0.0122**	0.0114*	0.0123**	0.0121**	0.0115*
	(2.00)	(1.88)	(2.02)	(2.00)	(1.90)
pairDtA	0.2547***	0.2649***	0.2520***	0.2552***	0.2624***
	(3.35)	(3.49)	(3.31)	(3.36)	(3.46)
pairCurrent	0.0052	0.0054	0.0052	0.0053	0.0053
	(1.05)	(1.07)	(1.03)	(1.05)	(1.06)
pairR&D	1.2071***	1.2083***	1.1996***	1.2025***	1.1994***
	(7.91)	(7.92)	(7.86)	(7.88)	(7.86)
pairBtM	0.0981***	0.0975***	0.0981***	0.0983***	0.0976***
	(4.79)	(4.78)	(4.79)	(4.80)	(4.78)
pairBig4	0.3331***	0.3315***	0.3338***	0.3348***	0.3332***
	(6.94)	(6.93)	(6.95)	(6.98)	(6.97)
pairICW	-0.2462***	-0.2456***	-0.2466***	-0.2466***	-0.2461***
	(-5.23)	(-5.23)	(-5.24)	(-5.24)	(-5.24)
pairGenderRatio	-1.0502***	-1.0651***	-1.0565***	-1.0584***	-1.0742***
	(-6.35)	(-6.46)	(-6.39)	(-6.40)	(-6.51)
pairAnalysts	0.5651***	0.5627***	0.5650***	0.5654***	0.5629***
	(21.75)	(21.73)	(21.74)	(21.78)	(21.74)
pairBoardSize	1.2120***	1.2098***	1.2135***	1.1876***	1.1976***
	(12.34)	(12.38)	(12.36)	(12.10)	(12.28)
pairAge	-0.0346***	-0.0340***	-0.0345***	-0.0344***	-0.0337***
	(-8.26)	(-8.14)	(-8.22)	(-8.20)	(-8.08)
pairIndepDir	0.8666***	0.9164***	0.8704***	0.8720***	0.9202***
	(7.78)	(8.30)	(7.82)	(7.84)	(8.34)
Constant	-18.3129***	-18.4009***	-18.3278***	-18.2575***	-18.3787***
	(-44.80)	(-45.18)	(-44.87)	(-44.68)	(-45.16)
N	270926	270926	270926	270926	270926
Adj. R^2	0.549	0.550	0.549	0.549	0.550

This table shows the results for the estimation of two-way fixed effects difference-in-differences (TWFE-DID) model in equation 1. The control variables are the average of variables explained in section 4.4 for the two firms in each pair. The model includes individual firm, industry and year fixed effects, and the standard errors are clustered at the firm-pair level. The values in parentheses are t-statistics and *, **, and *** indicate significance at the 1, 5, and 10% levels

risk topic disclosed by other linked firms ($LnkSpec$) and the focal firm's risk report specificity ($RRSpec$). These results suggest that a newly disclosed risk factor is less specific when a similar risk factor is previously disclosed by a linked firm.

In model (2) with $RFFog$ as the dependent variable, the coefficient for $LnkLstyrDisc$ is positive (equal to 0.09) and statistically significant at 5% confidence level, suggesting that a new risk factor disclosed after its disclosure by a linked firm is more difficult to read. This result is robust to controlling for $LnkFog$ and $RRFog$.

Lastly, model (3) shows the results for the estimation of equation 2 with $RFLength$ as dependent variable. In this model, the coefficient for $LnkLstyrDisc$ is negative (equal to -0.07) and statistically significant at 1% confidence level, after controlling for $LnkLength$ and $RRLength$. These results suggest that a newly disclosed risk factor is shorter when it is disclosed following a linked firm.

In line with the definition of a good-quality risk disclosure by Hope et al. (2016) and Nelson and Pritchard (2016), our results show that risk factors disclosed after the disclosure of a similar risk factor by a linked firm, have a lower quality and therefore are less informative for investors and other stakeholders, supporting H2. These results are robust to controlling for multiple firm and board characteristic variables, in addition to the proportion of firms disclosing the risk topic in the focal firm's industry ($IndDisc$) to control for the disclosure trend in the industry (Tavakkolnia & Smeulders, 2023). All the models also include risk topic, industry and year fixed effects and the standard errors are clustered at the firm level.

5.3 Additional analysis and robustness tests

In section 5.1 we find that linked firms by shared directors disclose more similar risk topics, and in section 5.2 we provide evidence that new risk factors disclosed after the disclosure of similar risk factors by linked firms have a lower quality. However, these results are based on the assumption that firms follow the firms with which they share a board member. To further test this assumption, we estimate the logistic regression model in equation 3 on a sample of individual risk topics that are not disclosed in the previous annual report (could be potentially disclosed as a new risk factor) but are disclosed at least once by the firms in the sample. In this equation, the independent variable is the likelihood of a risk topic r to be added ($New_{ri} = 1$) to the annual report of firm i in the fiscal year t.

Table 5: Risk factor quality

DVs	*RFSpec*	*RFFog*	*RFLength*
Models	(1)	(2)	(3)
LnkLstyrDisc	-0.1378***	0.0928**	-0.0742***
	(-3.81)	(2.37)	(-8.17)
LnkSpec	2.3220***		
	(4.90)		
RRSpec	0.3929***		
	(22.70)		
LnkFog		0.0004	
		(0.27)	
RRFog		0.4960***	
		(46.25)	
LnkLength			0.1491***
			(19.62)
RRLength			0.0055***
			(24.97)
IndDisc	0.0026**	0.0180***	0.0123***
	(2.49)	(14.89)	(36.97)
Volatility	0.0210***	0.0017	0.0143***
	(3.28)	(0.24)	(9.36)
Beta	0.0000***	0.0000***	-0.0000***
	(53.18)	(22.45)	(-4.01)
FirmSize	0.0026	0.1082***	0.0333***
	(0.13)	(5.57)	(7.42)
ROE	0.0187	-0.0200	-0.0031
	(1.37)	(-1.64)	(-0.85)
DtA	0.2442***	0.0881	0.0290
	(2.76)	(0.97)	(1.28)
Current	0.0047	-0.0002	0.0041**
	(0.77)	(-0.04)	(2.25)
R&D	0.2747*	-0.0572	0.0932**
	(1.77)	(-0.34)	(2.08)
BtM	-0.0086	-0.0273	-0.0321***
	(-0.28)	(-0.92)	(-4.26)
Big4	-0.0928*	0.0996*	-0.0304**
	(-1.84)	(1.79)	(-2.36)
ICW	0.2952***	0.0653	0.0946***
	(4.75)	(1.01)	(5.83)
GenderRatio	0.1259	-0.2017	0.0140
	(0.72)	(-1.03)	(0.31)
BoardSize	-0.0282	0.1495	0.0515**
	(-0.27)	(1.34)	(2.04)
Analysts	-0.0227	0.0296	-0.0197***
	(-0.81)	(0.99)	(-2.76)
Age	-0.0082**	-0.0138***	-0.0073***
	(-1.98)	(-3.12)	(-6.45)
IndepDir	0.0485	0.1713	0.0332
	(0.34)	(1.23)	(1.02)
Constant	2.4629***	11.2286***	0.7420***
	(6.16)	(23.07)	(7.53)
N	129549	107791	129549
Adj. R^2	0.137	0.200	0.202

This table summarizes the results for the estimation of regression models in equation 2 with the specificity (*RFSpec*), readability (*RFFog*), and length (*RFLength*) of a newly disclosed individual risk factor as dependent variables. All models include risk topic, industry, and year-fixed effects and the standard errors are clustered at firm level. The values in parentheses are t-statistics and *, **, and *** indicate significance at the 1, 5, and 10% levels.

$$Pr(New_{ri}) = \alpha + \beta_1 LinkDisc_{rj} + \Sigma\beta_n CONTROL_n + FE_{Industry} + FE_{Year} + FE_{Risk\ topic} + \epsilon \quad (3)$$

The results for the estimation of regression models in 3 are presented in table 6. In model (1), the independent variable *LinkDisc* is a dummy variable equal to 1 if at least one of interlocked firms disclose the same risk topic r in the annual report of the same fiscal year t. The coefficient for *LnkDisc* is positive (equal to 0.16) and statistically significant at 1% level, suggesting that a firm is more likely to add a specific risk topic to its annual report if it is disclosed by a linked firm. In model (2), we estimate the likelihood of disclosure of a new risk topic r when another firm linked for more than 1 year also adds the same risk topic to its annual report in the same fiscal year t, measured by the dummy variable *OldLnkNewDisc*. The positive (equal to 0.22) and statistically significant (at 1% confidence level) coefficient for *OldLnkNewDisc* suggests that two firms linked for more than 1 year tend to simultaneously disclose the same new risk topic. In model (3), we estimate the likelihood of disclosure of a new risk topic by a firm when the same risk topic was disclosed in the fiscal year $t-1$ by another firm that is linked with the firm in fiscal year t, measured by the dummy variable *NewLnkLstyrDisc*. The positive (equal to 0.15) and statistically significant (at 1% confidence level) coefficient for *NewLnkLstyrDisc* is in line with our expectation that a firm is more likely to disclose a new specific risk topic if it has been previously disclosed by another firm that is newly linked with the firm.

These results are robust to controlling for the same control variables described in section 4.4 as well as the percentage of firms disclosing the risk topic r in the firm i's industry (*IndDisc*). The models also include industry, year, and risk topic fixed effects, and standard errors are clustered at the firm level.

Disclosure of similar risk topics by two linked firms could be derived from the two firms operating in the same industry and therefore exposure to similar risks. To test this argument, we estimate the regression model in equation 1 for the two separate sub-samples where the two firms in the firm-pair come from the same industry or two different industry[6]. The results in table 7 show that the positive effect of sharing a board member on the disclosure of similar risk topics is significantly stronger[7] when the two linked firms are from different industries. This is in line with our expectations that firms from the same industry are exposed to and disclose similar risk factors, and therefore, sharing a director from the same industry has a lower effect

[6]Industry of a firm is determined by the Fama-French 49 industry classification

[7]The $p-value$ of the Wald test for the equality of the coefficient of *Linked* variable in models (1) and (2) is smaller than 5%

Table 6: Likelihood of disclosing a new risk factor

DV	$Pr(New = 1)$		
Models	(1)	(2)	(3)
$LinkDisc$	0.1622***		
	(16.23)		
$OldLnkNewDisc$		0.2250***	
		(20.53)	
$NewLnkLstyrDisc$			0.1501***
			(11.79)
$IndDisc$	0.0166***	0.0172***	0.0171***
	(57.53)	(60.21)	(59.63)
$Volatility$	0.0229***	0.0227***	0.0225***
	(10.38)	(10.23)	(10.27)
$Beta$	-0.0000***	-0.0000***	-0.0000***
	(-18.76)	(-17.84)	(-19.04)
$FirmSize$	0.0202***	0.0227***	0.0232***
	(3.22)	(3.61)	(3.71)
ROE	-0.0018	-0.0025	-0.0022
	(-0.44)	(-0.60)	(-0.55)
DtA	0.1239***	0.1250***	0.1260***
	(4.01)	(4.03)	(4.08)
$Current$	0.0066***	0.0068***	0.0064***
	(3.13)	(3.23)	(3.06)
RD	0.2345***	0.2553***	0.2583***
	(4.28)	(4.66)	(4.74)
BtM	0.0405***	0.0399***	0.0405***
	(3.70)	(3.63)	(3.72)
$Big4$	-0.1435***	-0.1363***	-0.1308***
	(-7.87)	(-7.48)	(-7.21)
ICW	0.2412***	0.2401***	0.2367***
	(10.97)	(10.87)	(10.80)
$GenderRatio$	0.0548	0.0448	0.0427
	(0.86)	(0.70)	(0.67)
$BoardSize$	0.0120	0.0390	0.0368
	(0.32)	(1.03)	(0.98)
$Analysts$	-0.0205**	-0.0187*	-0.0165
	(-2.00)	(-1.83)	(-1.62)
Age	-0.0257***	-0.0263***	-0.0255***
	(-16.71)	(-17.05)	(-16.57)
$IndepDir$	-0.1162***	-0.0948**	-0.1002**
	(-2.59)	(-2.11)	(-2.24)
$Constant$	-0.8914***	-0.8599***	-0.9263***
	(-2.85)	(-2.77)	(-2.98)
N	703152	703152	703152
$Pseudo\ R^2$	0.035	0.035	0.034

This table summarizes the results for the estimation of logistic regression models in equation 3. The dependent variable is the probability of disclosing a new risk topic $Pr(New = 1)$. $LinkDisc$ is a dummy variable equal to 1 if a linked firm discloses the risk topic r in current fiscal year. $OldLnkNewDisc$ is a dummy variable equal to 1 if an old linked firm discloses a new risk topic r and $NewLnkLstyrDisc$ is a dummy variable equal to 1 if a new linked firm has disclosed a risk topic r in previous year's annual report. All models include risk topic, industry, and year-fixed effects and the standard errors are clustered at firm level. The values in parentheses are t-statistics and *, **, and *** indicate significance at the 1, 5, and 10% levels.

Table 7: Similarity of linked firms disclosures (same or different industries)

DV	SharedRT	
Sample	Different industries	Same industry
	(1)	(2)
Linked (β)	0.8567***	0.2300***
	(29.50)	(3.96)
Constant	-17.3124***	-24.1906***
	(-42.41)	(-19.22)
Wald test for $\beta_{(1)} = \beta_{(2)}$		
χ^2	93.34	
$p - value$	0.000	
Control Variables	Included	Included
N	228353	42571
$N(Linked = 1)$	49445	15407
Adj. R^2	0.467	0.677

This table summarizes the results for the estimation of model in equation 1 for the sub-samples where the firms in the firm-pair are from the same industry or different industries. The $p - value$ of the Wald test for the equality of the coefficient for *Linked* in models (1) and (2) is smaller than 5% significance level, providing statistical evidence that the coefficients are not equal in the two models. All models include industry and year fixed effects, and the standard errors are clustered at firm level. The values in parentheses are t-statistics and *, **, and *** indicate significance at the 1, 5, and 10% levels.

on the similarity of their risk disclosures.

6 Conclusion

Firms are expected by outside stakeholders and mandated by regulation to disclose information about material risks and uncertainties. The risk disclosure literature provides evidence that firms' risk level, size, industry, and board structure and characteristics affects their risk reporting practices. However, it is still unclear how firms learn and decide to disclose about specific risks. This study provides novel insights into the role of board interlocks in shaping the content and quality of corporate risk disclosures.

By examining the individual risk factors disclosed in the annual reports of a large sample of non-financial U.S. public firms from 2006 to 2023, we find that directors with multi-board memberships act as conduits for transferring risk information between firms, leading to the disclosure of more similar risk factors by interlocked firms. We also find that this association is stronger for pairs of firms interlocked by an executive director and less announced for those interlocked by a director from risk or audit committee, and when the linked firms are from the same industry. While this tendency to disclose similar risk factors enhances the diversity of disclosed topics, our findings further reveals that this transfer often results in risk factors that are less specific, shorter, and harder to read, raising questions about their overall quality and

informativeness. These findings suggest that while board interlocks can improve awareness of risk topics, the transferred information may lack the depth necessary to inform stakeholders effectively.

These results have several important implications. For regulators, they highlight the need to monitor how board interlocks influence the quality of risk disclosures, ensuring that the information disclosed remains useful and relevant to stakeholders. For firms, the findings emphasize the necessity of balancing the benefits of information sharing with the risks of producing generic or lower-quality disclosures. Finally, for investors and other stakeholders, this study offers insights into how board interlocks influence the informativeness of risk disclosures, providing a more nuanced understanding of corporate governance practices.

This study contributes to risk disclosure and corporate governance literature. On the one hand, we provide novel empirical evidence on how risk disclosure quality and quantity is affected by the presence of directors with multi-board membership. On the other hand, we highlight the role of board interlocks in transfer of risk information between firms. The empirical base developed in this study have implications for other narrative corporate disclosures, such as CSR reporting and sustainability reporting, which can be examines in future studies. Additionally, future research could explore the conditions under which interlocks lead to higher-quality disclosures.

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Appendix A: Variable descriptions

	Description	Source
Dependent variables		
SharedRT	Number of risk topics that is similarly disclosed in the annual reports of two linked firms in the same year.	EDGAR
RFLength	Length of an individual risk factor measured as the total number of words and frequent 2-word phrases (such as *greenhouse gas*, *cyber attack*, *social distancing*, etc.) after removing punctuation, numerical values, and stop-words (common words such as the, is, are, etc.).	EDGAR
RFSpec	Specificity of an individual risk factor measured as the total number of mentioned named entities (PERSON, NORP, ORG, GPE, LOC, PRODUCT, EVENT, LAW, DATE, TIME, PERCENT, MONEY, QUANTITY) divided by the length of the risk factor.	EDGAR
RFFog	Gunning Fog readability of an individual risk factor.	EDGAR
Independent variables		
Linked	Dummy variable equal to 1 if two firms have board interlock or are simply linked by sharing at least one director in a fiscal year.	BoardEx
ED	Dummy variables set equal to 1 if the shared director between two firms is an executive director in either firms.	BoardEx
RC	Dummy variables set equal to 1 if the shared director between two firms is a member of risk committee in either firms.	BoardEx
AC	Dummy variables set equal to 1 if the shared director between the two firms is a member of audit committee in either firm .	BoardEx
New	Dummy variable indicating if an individual risk topic is disclosed in the firm's current annual report but not disclosed in the previous year's report.	EDGAR
LnkLstyrDisc	Dummy variable equal to 1 if a similar risk factor (with the same risk topic) is disclosed by any other firms interlocked with a firm in previous fiscal year.	EDGAR
LinkDisc	Dummy variable equal to 1 if an interlocked firm discloses a specific risk topic in current fiscal year.	EDGAR

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	Description	Source
$OldLnkNewDisc$	Dummy variable equal to 1 if a firm interlocked for more than 1 year (old link) discloses a new specific risk topic in current year annual report.	EDGAR
$NewLnkLstyrDisc$	Dummy variable equal to 1 if a firm interlocked for less than 1 year (new link) disclosed a specific risk topic in previous year annual report.	EDGAR
Control variables		
$RRLength$	Length of an *Item 1A* section measured as the total number of words and frequent 2-word phrases (such as *greenhouse gas*, *cyber attack*, *social distancing*, etc.) after removing punctuation, numerical values, and stop-words (common words such as the, is, are, etc.).	EDGAR
$LnkLength$	Average length of a specific risk topic when disclosed by other firms interlocked with a firm.	EDGAR
$RRSpec$	Specificity of an *Item 1A* section measured as the total number of mentioned named entities (PERSON, NORP, ORG, GPE, LOC, PRODUCT, EVENT, LAW, DATE, TIME, PERCENT, MONEY, QUANTITY) divided by the length of the *Item 1A* section.	EDGAR
$LnkSpec$	Average specificity of a specific risk topic when disclosed by other firms interlocked with a firm.	EDGAR
$RRFog$	Gunning Fog readability of an *Item 1A* section.	EDGAR
$LnkFog$	Average Fog readability a specific risk topic when disclosed by other firms interlocked with a firm.	EDGAR
$TotalRFs$	Total number of individual risk factors disclosed by firm in an annual report	EDGAR
$IndDisc$	Percentage of firms in the same industry that have disclosed a specific risk topic (within a one-year period)	EDGAR
$Links$	Number of firms linked with a firm by shared board members	BoardEx
$Volatility^{-}$	120-day standard deviation of stock daily returns ending 2 days before the filing date	Compustat
$Beta$	120-day market model Beta ending 2 days before the filing date as a proxy for the firm pre-disclosure systematic risk	Compustat

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	Description	Source
$FirmSize$	Natural log of the firms' total assets	Compustat
$\#Analysts$	Number of analysts covering the firm	Refinitiv Eikon
ROE	Net income divided by shareholders' equity	Compustat
DtA	Total debt divided by total assets	Compustat
$Current$	Total current assets divided by total current liabilities	Compustat
BtM	The ratio of book value to the market value of equities	Compustat
$R\&D$	Total R&D expenditure divided by total operating expenses	Compustat
ICW	Number of internal control weaknesses reported by auditors	Compustat
$Big4$	Dummy variable indicating if the firm is audited by one of the big 4 companies	Compustat
$GenderRatio$	Proportion of female board members to the total number of board members	BoardEx
$BoardSize$	Natural log of the number of board members	BoardEx
Age	Average age of board members	BoardEx
$IndepDir$	Proportion of independent directors to the total number of board members	BoardEx

ESG performance in small firms: the impact of the CEO's personal commitment and the moderating role of the external accountant

Abstract

This study explores the role of CEO commitment in driving Environmental, Social, and Governance (ESG) performance in small enterprises, a crucial yet underexplored subset of SMEs. While large firms are often the focus of ESG research due to regulatory and market pressures, small firms collectively contribute significantly to economic activity and environmental impact. Drawing on the upper echelons theory and the three-component model of commitment (continuance, affective, and normative commitment), this study examines how a CEO's personal commitment to ESG influences their firm's ESG performance. Additionally, it considers the moderating role of external accountants, specifically the size of the accounting firm, the frequency of ESG advisory services, and value alignment between CEO and accountant. By integrating leadership-driven ESG adoption with external advisory support, this research advances our understanding of sustainable business practices in small firms and highlights key mechanisms to enhance ESG implementation beyond compliance-driven approaches.

Key words: ESG, ESG performance, SME, ESG commitment, CEO, external accountant

Introduction

Since the Brundtland report introduced the concept of sustainable development as "meeting the needs and aspirations of the present generation without compromising the ability of future generations to meet their needs" (Brundtland, 1987, p. 292) many organizations have recognized the need for more sustainable practices and incorporated these into their operations and business models. Companies are also increasingly held accountable for Environmental, Social and Governance (ESG) issues due to legislative initiatives, with the implementation of the Corporate Sustainability Reporting Directive (CSRD) as its most well-known recent example within the European Union. These legislative initiatives, however, especially focus on large companies, as they are seen as both the main contributors and potential enablers of ESG-challenges. Therefore, quantitative research has also mainly explored ESG practices and engagements in the context of large enterprises.

However, taking accountability for sustainability issues is no longer only a question for large companies (Andersén et al., 2020). Small companies (defined by the European Commission as those companies which do not exceed the limits of at least two of the

three following criteria: a balance sheet total of 5 million euros, net turnover of 10 million euros and an average of 50 employees (Directorate-General for Financial Stability, 2019)) play a crucial role as well. While this subset of Small and Medium-sized Enterprises (SMEs) is often overlooked in academic research, they represent over 95% of the total SME population with almost 7 million small enterprises in Europe alone (Directorate-General for Financial Stability, 2019). Together, they significantly contribute to the global economy by employing approximately 70% of the global workforce (Amoah et al., 2022). In the same way, they play a critical role in the climate change discourse. Although a single small firm does not have a great impact on environmental issues compared to a single large organization, all together, small firms are estimated to create about 60-70% of industrial pollution (Cantele et al., 2020). Their substantial economic influence, environmental footprint, and social impact highlight the collective importance of small firms across all three pillars of ESG.

Building on this perspective, research has started to explore various internal and external drivers concerning ESG performance in small firms such as institutional pressures, sector and industry dynamics, stakeholder pressures and firm size (Crace & Gehman, 2023; Martiny et al., 2024; Yadav et al., 2018). However, recent literature consistently emphasizes the need for more in-depth examination of the CEO and his or her role in driving ESG initiatives leading to ESG performance (Kitsis & Chen, 2021; Martiny et al., 2024). Especially in small firms, it is the CEO who takes strategic and important operational decisions (Chassé & Courrent, 2018), making him or her play a crucial role in the successful implementation of ESG and its dimensions.

Building on the upper echelons theory (Hambrick & Mason, 1984), which suggests that executive characteristics shape organizational outcomes, some studies already examined some compositional characteristics of the CEO as driver of ESG-performance. However, deeper level characteristics are expected to be more influential than demographic variables when it comes to decision making in organizations (Wu & Tham, 2023). One such deep-level characteristic that is considered to have an important influence is personal commitment, defined as individual’s long-term orientation towards a goal (O'Riordan, 2007). However, current studies often use symbolic measures to assess CEO commitment to ESG, such as mission statements (Rahman et al., 2023) or sustainability certifications (Moursellas et al., 2023), while these do not fully capture the essence of personal commitment. Moreover, research predominantly focuses on only one aspect of commitment (Bielawska, 2022), namely continuance commitment (i.e. the awareness of costs and benefits associated to an initiative). This cost-benefit focus is prevalent in current literature but provides an incomplete picture of commitment.

Therefore, we integrate the three-component model of commitment by Allen and Meyer (Allen & Meyer, 1990; Meyer, 1997; Meyer & Allen, 1991). This model, widely used in the change literature, conceptualizes commitment as a force (mindset) that binds an individual to a course of action of relevance to one or more targets (referred to as "change"), in which this force consists of three components: continuance, affective and normative commitment (Herscovitch & Meyer, 2002). Within the context of ESG, continuance commitment can refer to the awareness of the costs associated with not engaging in ESG practices. Affective commitment captures an intrinsic motivation and emotional attachment to sustainability values. Normative commitment reflects a sense of obligation to act sustainably due to moral or social responsibility. By applying this framework, we can provide a nuanced understanding of how CEO commitment influences ESG performance in small enterprises. In general, it is expected that CEOs with a higher personal commitment to ESG, driven by the recognition of costs and benefits (continuance commitment), a genuine passion for sustainability (affective commitment) and the moral obligation to integrate ESG principles (normative commitment), will be more likely to enhance the ESG performance of their small enterprise.

However, being committed does not necessarily mean that their predetermined targets and action plans will be reached (Lindzon, 2022). This discrepancy between commitment and actual action can be attributed to various limitations inherent to the specific context of small firms such as awareness gaps, cost perceptions, regulatory dependencies and measurement challenges (Cassells & Lewis, 2011). This suggests that even highly committed CEOs may require external support to effectively translate their ESG ambitions into tangible outcomes. Adding to this, the potential role of the external accounting firm and individual external accountant in bridging this gap has been largely overlooked. Due to their expertise and close relationship with their clients, they can significantly aid in enhancing ESG performance by working with the CEO towards the effective realization and translation of their commitment (De Bruyckere, 2021).

Therefore, we distinguish three accountant-related moderators in our relationship between CEO commitment and ESG-performance; the size of the external accounting firm, the frequency of external accounting services provided and the extent to which the personal commitment of the CEO aligns with this of the individual external accountant. Regarding the size of the external accounting firm, larger accounting firms are considered to have the capacity to provide excellent ESG advisory services, but they may lack personalized engagement that is required to understand and translate the commitment of the CEO. In contrast, smaller accounting firms may align closely with CEOs' ESG visions but may be constrained by limited resources (Carey & Tanewski, 2016; Marriott & Marriott, 2000). Therefore, medium-sized accounting firms might strike the optimal

balance, offering both personalized guidance and sufficient expertise to translate CEO commitment into tangible ESG outcomes (Drempetic et al., 2020; Oosthuizen et al., 2020). Regarding the frequency of ESG advisory services provided, regular engagement with external accountants is found to enhance strategic planning, decision-making, and operational effectiveness (Oosthuizen et al., 2020) and will therefore also help in translating commitment into actual ESG-performance. Lastly, alignment between the commitment of the CEO and the external accountant may further strengthen the relationship between the CEO's commitment and ESG-performance. Value congruence fosters trust, collaboration, and shared strategic objectives (Cable & Edwards, 2004; Chatman, 1989) which can lead to more effective ESG implementation. When both parties share a mutual ESG commitment, they enhance communication and decision-making, amplifying the impact of the existing commitment of the CEO (Zhang & Bloemer, 2011) on ESG performance.

This study contributes to the ESG literature by shifting the focus from regulatory and market-driven ESG adoption to leadership-driven ESG integration in small firms. By using the three-component model of commitment by Allen & Meyer (Allen & Meyer, 1990; Meyer, 1997; Meyer & Allen, 1991), we move beyond demographic (Bhaskar et al., 2023; Manner, 2010) and cost-driven proxies (Bielawska, 2022) which have been widely studied. Instead, the three components (continuance, affective and normative) of commitment are included which enables us to have a complete understanding of the deeper-level factors influencing sustainable business practices in the small business context. Further, we highlight how the CEO's commitment interacts with his or her external accountant to shape ESG performance expanding the value of external advisors in corporate decision-making (De Bruyckere, 2021) to ESG performance.

Literature review and hypotheses development

ESG performance in small enterprises

While sustainability has been discussed for decades, the prioritization of the maximization of shareholders' profit was still, for a long rime, the dominant business idea. However, in more recent years, this financial model has been disputed as new demands for corporate behavior have been emerging. Growing social challenges (e.g. poverty, food security, social equality etc.), environmental issues (e.g. climate change, pollution, resource use etc.) and governance concerns (e.g. risk management and business conduct) have generated critical pressures on companies (Ioannou & Serafeim, 2017). As firms are now directly held accountable for these challenges, they are increasingly expected to disclose how they are utilizing, developing (or depleting) and affecting human capital, natural resources and society at large (Ioannou & Serafeim,

2017; Nyuur et al., 2019). This embodied a shift from the very traditional ideology of profit maximization to a modern and inclusive approach that incorporates social and environmental dimensions as well (Fatemi et al., 2018; Fenwick et al., 2022).

The specific shift to ESG began primarily in the context of financial markets where investors and financial institutions began to prioritize Environmental, Social and Governance (ESG) factors, recognizing not only their direct link to long-term financial performance, but also businesses' future viability (Shalhoob & Hussainey, 2022). Hence, ESG risks are viewed as direct investment risks since they use ESG disclosure as a means to assess future risk and evaluate how companies manage them (Bielawska, 2022). Therefore, next to financial performance and their drivers, sustainability performance also started to gain (academic) attention. This attention, however, has been mainly devoted to large companies. On the one hand, this is probably due to the fact that large companies are often considered to have the largest effect on natural resources and society at large (Dechow, 2023). On the other hand, their large data availability has made them more accessible for quantitative sustainability research (Markopoulos et al., 2023). This data availability is mainly the result initiatives by numerous organizations and formal structures aimed at providing standardized frameworks to facilitate corporate sustainability (reporting) such as the Task Force on Climate-Related Financial Disclosures (TCFD, 2022), Global Reporting Initiative (GRI, 1997) and IFRS Sustainability Standards (IFRS, 2023). Reports generated from these frameworks have been widely used by rating agencies such as MSCI and Refinitiv to assess companies' ESG scores, which in turn proved very useful for academic research to capture and evaluate ESG-performance (Crace & Gehman, 2023; Markopoulos et al., 2023). However, these frameworks have been mainly applied by the largest companies, leading to the fact that research has predominantly focused on these enterprises.

While we do not contest the value of ESG-research in large firms, it is essential that ESG-research starts to focus more on SMEs. Especially Small Enterprises (SEs) are still often neglected in the current ESG-debate, despite their large impact on both the economy and their environment. More specifically, Small Enterprises, defined by the European Commission as those companies which do not exceed the limits of at least two of the three following criteria: a balance sheet total of 5 million euros, net turnover of 10 million euros and an average of 50 employees (Directorate-General for Financial Stability, 2019), represent over 95% of the total SME population in Europe. Due to their large number, they play a substantial role in the provision of employment opportunities, resource consumption and environmental impact, including air and water pollution (Amoah et al., 2022). More specifically, they account for 67% of total employment and generate 60% to

70% of total industrial pollution in Europe (Cantele & Zardini, 2020), making them an important group to investigate as well.

Next to their value for society and the environment, ESG-research specifically focusing on small firms will also be highly valuable for the individual firms themselves. As the current competitive landscape stresses the growing importance of ESG, small firms' sustainability efforts are becoming integral to their overall strategy and business model (Fenwick et al., 2022). While it has been argued by Dinesh et al. (2024) that small companies are only able to grasp Corporate Social Responsibility (CSR) opportunities by offering innovative products and services to niche markets, the increasing market attention on ESG has broadened the scope of their competitive opportunities. More specifically, stakeholder interests are an important aspect to consider as they have become increasingly conscious of ESG practices (Shalhoob & Hussainey, 2022). While previous research primarily focused on investor and shareholder interests (Buniamin, 2020), the stakeholder theory suggests that it is essential to identify the stakeholders and assess whether the goals of the company align with those of the stakeholders - such as customers, suppliers, and local communities – as they can have an influence on the survival rate of the company. This is especially the case in the small business context where stakeholder relationships are an integral part of their competitive strategies (Camanzi & Giua, 2020). Consequently, by strategically adopting ESG practices, small firms can enhance their competitiveness, mitigate risks, and optimize operations (Shalhoob & Hussainey, 2022), while fostering strong stakeholder relationships that are essential for preserving and reinforcing their corporate legitimacy. This underscores both an economic and societal incentive to prioritize ESG factors.

In reality, small companies frequently contribute to many ESG goals such as generating employment opportunities for local workers and utilizing local resources. However, these efforts often go unrecognized due to high costs of data collection, leading to underreporting of their actual ESG performance (Markopoulos et al., 2023). It is therefore important to note that non-reporting does not equate non-engagement in sustainable activities (Kutzschbach et al., 2021). Aragón-Correa et al. (2008) further clarifies small businesses' potential by showing that smaller firms can exhibit similar environmental capabilities as larger firms due to their flexibility and innovation. Paradoxically, many of the strategic characteristics required for proactive environmental approaches are often inherent in smaller firms, enabling them to not only adopt ESG practices but also to excel in doing so. Understanding the dynamics that drive this strategic implementation of ESG practices leading to ESG performance is therefore crucial to understand in the specific context of small businesses as it will affect their reputation, business relationships, and long-term viability in an increasingly ESG-focused market.

Drivers of ESG performance in small enterprises

While the ESG-literature is primarily focusing on large firms, some studies have been investigating drivers of ESG performance in SMEs, encompassing a multifaceted interplay of factors that cascade from external influences down to the internal leadership dynamics within a firm.

On an external level, the government plays a key role in driving ESG performance among SMEs by influencing behavior through regulations, legislative mandates, economic support, and knowledge-sharing initiatives. Regulatory frameworks, in particular, are effective in encouraging small firms to implement sustainable practices by setting clear expectations (Yadav et al., 2018). For example, the introduction of the Corporate Sustainability Reporting Directive (CSRD) in Europe represents a significant development, requiring large companies to publish ESG reports with the aim of enhancing the comparability and reliability of sustainability disclosures among ESG reports (Kula, 2024). As a part of the reporting requirements, large companies need to evaluate their value chains to assess their own ESG-related impacts, risks and opportunities. SMEs that fall outside of the scope can therefore be indirectly impacted due to their position in the value chains of those large enterprises by being requested to deliver ESG data (Kutzschbach et al., 2021; Testa et al., 2016). Therefore, although small enterprises currently fall outside the scope of the CSRD, anticipating future regulatory changes can motivate them to proactively adopt corporate social responsibility (CSR) practices, helping them stay aligned with evolving sustainability reporting requirements (Bielawska, 2022). Additionally, it has been argued that institutional pressures encourage small firms to integrate environmental considerations into their strategies (Testa et al., 2016).

Sector and industry dynamics can play a critical role as well. The tangibility of the sector in which companies operate (i.e. the products and services offered in the specific sector) has an effect on the adoption of green practices and offering environmentally-friendly products, thus enhancing ESG performance (Yadav et al., 2018). Looking at the type of industry a corporation operates in, general characteristics such as the competitive intensity of the industry environment can also have a particularly strong influence on ESG performance. Companies in highly competitive industries may adopt robust ESG practices to differentiate themselves and gain a competitive edge (Crace & Gehman, 2023). Consequently, firms in ESG performance-leading sectors and industries often enjoy better brand loyalty, attract a more committed workforce, and have easier access to capital (Kramer & Porter, 2011).

Further, internal drivers such as firm characteristics have been shown to have a meaningful impact as effective ESG performance requires substantial resource allocation

for strategic planning, risk management and corporate governance (Martiny et al., 2024). Among these characteristics, firm size emerges as the most critical driver of ESG performance. SMEs often operate in unpredictable environments with limited resources, prioritizing survival over the adoption of ESG initiatives. Due to these limitations their ESG-performance tends to be lower compared to larger enterprises (Markopoulos et al., 2023). Even within the size range of SMEs, Yadav et al. (2018) found that the size of SMEs turns out to be a significant predictor for environmental performance, with Medium-sized Enterprises (MEs) engaging more in green practices compared to small firms. Thus, larger SMEs, in particular, are more likely to implement sustainability practices, motivated by both their organizational capacity and the perceived advantages these practices offer.

While organizational characteristics are important in understanding companies' ESG performance, they often overlook the human elements driving these outcomes. The allocation of resources and decision-making processes within enterprises are primarily fueled by its management. Therefore, multiple researchers highlighted the importance of the CEO as a key driver of ESG performance in large enterprises (Crace & Gehman, 2023). This argument can be extended and even intensified in small firms, where it is the CEO as the most powerful player who makes strategic decisions (Ghardallou, 2022; Lazareva, 2022). Furthermore, the strong organizational identification that exists between the company and the CEO further strengthens their influence (Chassé & Courrent, 2018).

This reasoning is supported by the upper echelons theory which posits that organizational outcomes are a reflection of the values, experiences and cognitive bases of top executives (Hambrick & Mason, 1984). Traditionally upper echelons research has been primarily focusing on demographic characteristics of the CEO such age, tenure, gender and education (Bhaskar et al., 2023; Manner, 2010). However, deeper level characteristics are expected to be more influential than demographic variables when it comes to decision making in organizations (Wu & Tham, 2023). One of such deep-level characteristic that can have an important influence is personal commitment which is mainly defined in the field of psychology as a long-term orientation towards a goal (O'Riordan, 2007). Especially in the small enterprise context, the CEO's direct control and influence over strategic decisions may cause their commitment to play a crucial role in shaping organizational practices and outcomes such as the strategic implementation of ESG practices. Furthermore, given their close-knit structure, the CEO's personal commitment can cascade throughout the organization and directly influence ESG practices and outcomes. While demographic characteristics can be a proxy for commitment towards ESG, actual commitment is likely to deviate from these proxies.

CEO’s ESG commitment

While some valuable research has already been done regarding the concept of commitment with regard to ESG, the notion of commitment is often oversimplified. For instance, Rahman et al. (2023) assessed CEO commitment through the lens of a company’s mission and vision statements, using personal commitment interchangeably with organizational commitment. In a multiple case study, Moursellas et al. (2023) interpreted the use of certifications as indicative of the CEO’s commitment to sustainability in European SMEs. These measures are symbolic rather than truly capturing the concept of commitment. Using the concept of construct validity by Libby (2017); Runkel and McGrath (1972) it can be stated that current methods fail to appropriately operationalize personal commitment, as there is a mismatch between the theoretical constructs and their empirical measures. This oversimplification highlights the need to more accurately measure personal commitment to understand how a CEO’s commitment directly influences the implementation and effectiveness of ESG policies and action plans in small enterprises.

Therefore, in this study, we take a more nuanced approach to commitment by applying the widely recognized three-component model of commitment by Allen & Meyer (Allen & Meyer, 1990; Meyer, 1997; Meyer & Allen, 1991). This model conceptualizes commitment as a force (mindset) that binds an individual to a course of action of relevance to one or more targets (referred to as “change”), in which this force consists of three components: continuance, affective and normative commitment (Herscovitch & Meyer, 2002). Continuance commitment (CC), also referred to as cost-based commitment (Allen & Meyer, 1990), refers to an individual's awareness of the potential costs or negative consequences of not supporting the change (Herscovitch & Meyer, 2002). Affective commitment (AC) refers to a desire to provide support for change based on a belief in its inherent benefits. Individuals with high affective commitment are likely to support and engage change efforts because they believe in the value of the change and want to engage in action because of their attachment to, identification with, or shared value within the organization (Matzler & Renzl, 2007; Shum et al., 2008). However, Meyer and Allen (1991) make a distinction between the desire to be loyal (affective commitment) and the obligation to be loyal. As a result, normative commitment (NC) is identified as the perceived obligation to pursue a course of action (González & Guillén, 2008). More specifically, it arises from a sense of duty or moral obligation to the organization, leading individuals to behave towards a change because they feel responsible for supporting this change (Allen & Meyer, 1996; Herscovitch & Meyer, 2002). In essence, individuals are committed to the change because they need to (CC), want to (AC) and feel obliged to (NC) (Bergman, 2006).

Applying this model is particularly relevant in the context of ESG performance within the context of small enterprises, where implementing sustainability initiatives requires a fundamental shift in strategies and operations due to increasing pressure from competitors, stakeholders, and regulatory bodies (Barnett & Carroll, 1995). While literature underscores the importance of employees' commitment during the process of organizational change (Matzler & Renzl, 2007; Olafsen et al., 2021) the close-knit structure of small enterprises even more necessitates strong commitment from the CEO. Consequently, strategically implementing ESG factors into organizational practices demands a CEO who is personally committed to leading the change and addressing pressures from competitors, stakeholders and regulatory bodies (Testa et al., 2016; Yadav et al., 2018).

Current sustainability research within the context of small enterprises is limited to only one aspect of commitment, namely, continuance commitment. For example, Testa et al. (2016) investigated the attitude of entrepreneurs as a part of a broader study examining the factors affecting environmental management in small and micro firms. However, the construct of entrepreneur's attitude was measured based on their economic perception towards environmental management, asking them about the expected cost reductions and potential benefits. In the same way, Cantele and Zardini (2020) found a positive influence of potential benefits perceived by entrepreneurs on the implementation of sustainable practices. A literature study by Bielawska (2022) further confirms this perspective by stating that it was often assumed as a research hypothesis that SMEs undertake corporate social responsibility (CSR) guided mainly by the benefits obtained by this activity. While these findings show the importance of the CEO's economic motivation to engage in sustainable practices, aligning primarily with continuance commitment, it is equally important to consider CEO's affective and normative commitment.

Strategic ESG performance is about making current decisions aimed at securing long term returns which are often unsure (Edmans, 2024). This makes strategic planning and decision-making with regards to ESG crucial. Given its long-term nature, the driving force behind ESG performance can not only be explained by the CEO's continuance commitment – their perception of the immediate costs and benefits associated to environmental practices. Instead, affective and normative commitment are particularly important as well as they foster a proactive approach to sustainability rather than a mere cost-benefit mindset (Olafsen et al., 2021).

Scholars widely studied affective commitment as it is considered to be the main driver of employee behavior within organizations (Matzler & Renzl, 2007). This is justified by the meta-analysis that was done by Herscovitch and Meyer (2002) and found that affective commitment had the strongest correlation with organization- and employee-relevant

outcomes, followed by normative commitment. However, in later years, Li (2013) stated that while a lot of useful research has been done regarding employees, managers are equally important to investigate in this context. By focusing on managers' affective commitment, organizations can foster a more committed leadership team, which is essential for driving organizational success and achieving strategic goals (Li, 2013). In the same way the CEO and his or her affective commitment is of significant importance when analyzing small enterprise's ESG performance. Affective commitment is then characterized by emotional identification and a shared sense of purpose with ESG goals. It can be argued that motivated CEOs who exhibit strong affective commitment are more likely to prioritize sustainable practices, integrate ESG goals into their strategic vision, and inspire their teams to align with these values, enhancing the overall ESG performance of their small enterprise.

Likewise, given the increasing (indirect) requirements by stakeholders and regulatory bodies (Barnett & Carroll, 1995), normative commitment plays a role. Stemming from a moral obligation rather than an emotional attachment to adapt and advance ESG practices (González & Guillén, 2008), the CEO's normative commitment is expected to ensure that ESG efforts are deeply rooted in responsibility and accountability, positively affecting ESG performance.

Thus, given the evolving (competitive) environment, increasing pressures from stakeholders and the long-term nature of sustainability practices, the CEO's commitment to ESG practices can be viewed through the lens of the three-component model of commitment by Meyer and Allen (1991). Continuance commitment emphasizes the CEO's recognition of the potential costs and risks of failing to integrate ESG principles. Affective commitment reflects intrinsic values related to CEO's perception of their own company's current ESG practices and the sense of a shared purpose and emotional identification, motivating CEOs to engage in sustainability practices. Normative commitment stems from a sense of obligation and accountability towards adopting ESG practices. As each dimension captures a unique motivation to engage in sustainable practices, together, they provide a much needed clear framework for increasing the positive impact of the CEO's commitment to ESG on the ESG performance of their small enterprise. Therefore, we propose the following hypothesis:

> *Hypothesis 1: The CEO's personal ESG-commitment has a positive influence on the ESG-performance of their small enterprise.*

The moderating role of the external accounting firm

It is often assumed that committed CEOs possess sufficient knowledge to eventually turn their ideas and visions into reality. Yet, when it comes to complex subjects like ESG, this

may not always be the case. Developing effective action plans and reaching specific ESG targets to enhance their companies' overall ESG performance requires executives to make present decisions that impact long-term outcomes while these are often uncertain (Edmans, 2024; Lindzon, 2022). Therefore, even though the CEO has the power and the commitment (willingness) to do so, this does not necessarily mean they have the resources and sufficient knowledge (ability) to make it happen. This is particularly challenging for SMEs, where integrating ESG metrics effectively and efficiently into a strategic ESG business model can be much more challenging (Markopoulos et al., 2023).

This is confirmed by Cassells and Lewis (2011) who investigated the attitudes of SMEs' owners/managers and the corresponding actions they take concerning environmental practices. They observed a discrepancy between positive attitudes towards environmental responsibility and the actual implementation of environmental practices in SMEs. This can be attributed to a number of factors including awareness gaps, cost perceptions, regulatory dependencies and measurement challenges which may indicate that SMEs often lack the ability or resources to effectively address these issues.

Given these challenges, SMEs frequently rely on external accountants for business advice to help overcome these obstacles (Carey & Tanewski, 2016). According to the resource-based view (RBV) theory (Barney, 1991), leveraging external advisors for specialized knowledge is a strategic move for SMEs seeking a competitive edge in complex markets. CEOs, particularly in smaller firms, often regard their external accountants as trusted advisors (De Bruyckere, 2021), seeking ESG-related insights to navigate multifaceted organizational challenges. As a result, external accounting firms can serve as a moderator, influencing the extent to which a CEO is able to convert his or her commitment to ESG into actual ESG performance. Due to their expertise in preparing financial statements, external accountants can significantly aid in ESG reporting and performance by working with the CEO towards the effective realization of their committed mission (De Bruyckere, 2021).

However, not every accounting firm may be equally equipped to add value to this process. As ESG is a relatively new area, external accountants too are still building up the necessary expertise. Therefore, the size of the external accounting firm may be an important moderator to consider. According to literature, larger accounting firms are often better equipped in this regard due to their substantial resources, disposing of specialized departments and in-house expertise regarding ESG matters (Drempetic et al., 2020). However, contributing to the translation of the CEO's ESG commitment into ESG performance requires more than just technical expertise—it also relies heavily on a close, personalized relationship with the client, which can diminish as the size of the external accounting firm increases. This can be due to a more standardized approach and less

individualized attention to each SME in larger firms (Greenwood et al., 2002). Smaller external accounting firms, in particular, often excel in responsiveness and personalized service, fostering an environment where ESG initiatives may be more closely aligned with the CEO's vision and commitment (Carey & Tanewski, 2016; Oosthuizen, 2023). However, their limited resources inherent to them being smaller, often results in potentially narrower expertise which may restrict the breadth of ESG strategies implemented (Marriott & Marriott, 2000).

Integrating these views, when external accountants provide ESG services alongside financial and other compliance-related services, they strengthen the positive relationship between the CEO's personal ESG commitment and their small business' ESG performance. However, this positive moderation is expected to be the strongest when the accountant works in a medium-sized accountancy firm as they might have just enough resources to gain specific ESG knowledge while maintaining the close relationship with their clients. The positive impact of CEO's ESG commitment on their SME's ESG performance might be weaker when the accountancy firm is (too) large or (too) small due to standardized advisory services and lack of specific expertise respectively. Therefore, we propose the following hypothesis:

> *Hypothesis 2a: The positive relationship between the CEO's personal ESG commitment and their small firm's ESG performance is stronger when the external accountant provides ESG services.*
>
> *Hypothesis 2b: The positive relationship between the CEO's personal ESG-commitment and their small firm's ESG performance is the strongest in case the SME relies on a medium-sized accounting firm, but comparatively weaker when the accounting firm size is large or small.*

Extending this argument, the frequency of ESG advisory services requested by CEOs from their accountants may also play a critical role in effectively translating their ESG commitment into actual performance. Oosthuizen et al. (2020) argues that when it comes to small business owners (SBOs), regular engagement in advisory services enhances their decision-making, operational effectiveness, and strategic planning. Barbera and Hasso (2013) found that external accountants positively impact sales growth and survival of family SMEs and that the degree to which the accountant is acquainted with the family and the firm's needs, which they term as embeddedness, moderates these positive outcomes. They further state that, once embedded, the external accountant can offer tailored advice, which implies that the external accountant becomes a valuable resource and a potential source of competitive advantage.

Just as a successful financial strategy requires ongoing advice, the same dynamic applies to ESG, as successful implementation of ESG metrics requires strategic planning and ongoing advisory support. By regularly seeking advice on ESG matters, CEOs can better translate their sustainability commitments into concrete actions. An external accountant who is regularly involved in monitoring and evaluating ESG initiatives can effectively support the CEO in this. This consistent involvement reinforces the translation of the CEO's commitment to ESG and fosters a culture of continuous improvement, ultimately leading to better ESG performance.

Therefore, the frequency of external accountants' involvement in small businesses' ESG matters is not merely transactional but plays a strategic role in moderating the relationship between the CEO's commitment and ESG performance, making it a critical factor in the overall ESG performance of small enterprises. We propose the following hypothesis:

> *Hypothesis 2c: The positive relationship between the CEO's personal ESG commitment and their small firm's ESG performance is stronger when ESG services are frequently provided by the external accounting firm.*

Delving even deeper, it is essential to not only examine the dynamics between small business CEOs and their external accounting firms but also to narrow the focus to the individual external accountant. More specifically, the congruence between the CEO's personal commitment and this of the external accountant may be an interesting moderator to investigate as well. This idea is rooted in the value congruence theory (Chatman, 1989), which highlights the benefits of shared values in fostering mutual understanding, trust, and compatibility (Cable & Edwards, 2004). Therefore, when the CEO and accountant share similar values, such as a mutual commitment to ESG, they create a foundation of trust and understanding. When external accountants and CEOs share similar values, they engage in common cognitive processing, leading to aligned expectations about ESG performance. This alignment strengthens communication, enhances decision-making, and fosters a collaborative approach to sustainability initiatives (Zhang & Bloemer, 2011). This shared perspective fosters an environment where ESG practices are seamlessly supported and implemented effectively.

Therefore, when the CEO and accountant hold a mutual commitment to ESG, they establish a foundation of trust and shared strategic vision, ensuring that sustainability efforts are not only supported but also seamlessly translated into tangible ESG performance outcomes. The CEO-accountant commitment fit serves as a critical moderating factor in ensuring that CEO commitment to ESG is effectively translate into performance outcomes of small enterprises. By fostering alignment through a shared

commitment this relationship can amplify the strategic implementation of ESG practices, driving both ecological and social value creation.

> *Hypothesis 2d: The positive relationship between the CEO's personal ESG commitment and their small firm's ESG performance is stronger when there is congruence between the personal commitment of the CEO and this of the individual external accountant.*

Research methodology

A quantitative research design with a (cross-sectional) survey approach will be utilized to investigate the relationship between the CEO's personal ESG commitment and the ESG performance of their small enterprise as well as the moderating role of the external accountant. The questionnaire was developed by adapting the constructs from the existing literature, where such measures have been validated to ensure reliability and validity. The sample will include CEOs of Belgian unlisted small enterprises falling outside the scope of the CSRD with a minimum sample size of at least 300 respondents. Through this approach, we aim to elucidate the relationship between the CEO's personal ESG commitment, professional advisory support from the external accounting firm and individual external accountant, and the overall ESG performance of their firm.

As for ESG performance we follow the work utilized by Garrido-Ruso et al. (2024) as it considers the specific context and limitations of small enterprises. Here, an index is developed consisting of 63 variables capturing indicators of environmental performance, corporate social responsibility and corporate governance.

The CEO's personal ESG commitment will be measured using the three-component model by Herscovitch and Meyer (2002). This model conceptualizes commitment in the context of organizational change. Given that ESG involves a transformation in corporate practices and decision-making processes, it can be seen as a significant change factor. Therefore, this model is appropriate for assessing the CEO's level of commitment to the integration and implementation of ESG principles within the organization. This variable will be measured using a 5 point Likert scale format: (1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly agree.

As for the moderating role of the external accountant, dummy variables will be used to make a distinction between small, medium and large external accounting firms (Oosthuizen, 2023). Further, respondents are asked if and how frequently they have used advisory services from their external accounting firm using the concept of advisor embeddedness by Uzzi (1996) as a measure of ESG service provision by the external accountant and frequency of requests for ESG services by the CEO. To measure the

shared commitment between the CEO and their external accountant, the CEO is asked about his or her perception of the external accountant's commitment to ESG, using the three-component model scale by Herscovitch and Meyer (2002).

To ensure comprehensive data collection, control variables regarding firm-specific characteristics and financial information will be sourced from the survey and the Bureau van Dijk's Belfirst database respectively. Control variables such as firm size, ROA, stakeholder pressures and industry type will be added. Research has shown that larger firms are more likely to engage in CSR practices because of the additional resources they have (Lamb & Butler, 2018). Moreover, due to the positive relationship between financial performance and ESG performance, the financial performance control variable return on assets (ROA) was taken (Rahman et al., 2023). Further, the influence of stakeholder pressures shapes executive's perception in shaping environmental practices. This is measured through indicators researched by Henriques and Sadorsky (1999). Also the specific industry the companies operate in, influences their ESG performance as the competitive intensity of the industry environment can be a particularly strong influence on ESG performance (Crace & Gehman, 2023).

Results

(data still to be collected)

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Collaboration or Control? The Impact of Board Culture on Firm Value

Abstract

While prior research on boards has primarily focused on structural characteristics, this paper examines the impact of board culture—specifically control-oriented versus collaboration-oriented—on firm value. Control-oriented boards are linked with traits that strengthen authority, whereas collaboration-oriented boards align with practices fostering inclusivity. Rooted in agency and stewardship theories, we hypothesize that both control- and collaboration-oriented board cultures are associated with firm value.

Using the competing values framework, we measure board culture through textual analysis of a sample of S&P 10640 firm-year observations from 2011 to 2022. We find that boards, on average, display a stronger orientation towards control than collaboration. Our findings further reveal that beyond structural board factors, a control-oriented board culture consistently enhances firm value. In contrast, a collaboration-oriented culture contributes to firm value only in well-performing firms but becomes detrimental in a context of financial losses. This suggests that effective boards should adopt a flexible approach, balancing collaboration and control based on organizational circumstances. Further analyses reveal that alignment between board and corporate culture—particularly when both are control-focused—further enhances firm value. These results can be interesting to practitioners as it underlines the importance of board culture beyond traditional structural factors.

Key words: Board Culture; Control; Collaboration; Agency Theory; Stewardship Theory; Firm Value

1. Introduction

Despite the recognized importance of boards of directors, a longstanding debate persist regarding the most effective governance approach they should adopt (Sundaramurthy & Lewis, 2003). This debate arises from the dual roles boards must fulfill: formally monitoring management while also serving as advisors and strategic partners. These roles often conflict, raising critical questions about whether, and under what circumstances, boards should foster a culture centered on control or collaboration to enhance shareholder value. As boards' responsibilities grow increasingly complex, identifying the ideal cultural approach becomes even more crucial (Mckinsey, 2024). Leading governance bodies like the National Association of Corporate Directors (NACD), have also recently emphasized the importance of board culture. For instance, the NACD's report, *"Culture as the Foundation: Building a High-Performance Board"*, highlights its critical role in effective governance within firms (NACD, 2023).

While board culture is critical, academic research offers little empirical guidance on its role in maximizing shareholder value. Prior literature has predominantly focused on structural characteristics like duality, board tenure, independence and gender diversity (Adams & Ferreira, 2009; Ahern & Dittmar, 2012; Carcello et al., 2002; Carter et al., 2003; Li & Wahid, 2018) while paying less attention to how boards function as a group (Boivie et al., 2021). Although more recent research has started to explore informal dynamics, such as tone at the top and social ties (He et al., 2017; Lail et al., 2015; Patelli & Pedrini, 2015), the cultural orientation of the board itself remains underexamined. This study addresses this gap by analyzing how board culture influences value creation and governance outcomes.

Our study explores board culture's role in decision-making, defined as implicit and explicit norms that guide behavior (Bénabou & Tirole, 2002, 2011; Tabellini, 2008). In the context of a board of directors, culture is particularly important because directors inevitably

face situations where formal rules and regulations cannot fully dictate their decisions (O'reilly 1989). As a result, implicit and explicit norms play a critical role in shaping behavior and decision-making within the boardroom. The theoretical framework of Sundaramurthy & Lewis's (2003) highlights the significance of two key governance approaches: a control- and collaboration-oriented approach. A control-oriented perspective, rooted in agency theory, suggests that the board should foster a culture where their primary role is to monitor management and protect shareholder interests. Conversely, a collaboration-oriented culture, grounded in stewardship theory, emphasizes fostering trust and guiding management through strategic advice and partnership.

Building on these concepts, we examine how board culture affects firm value. A collaboration-oriented board fosters strong stakeholder relationships, inclusivity and trust, promoting mentoring and strategic discussions that enhance management's motivation and drive value creation (Davis et al., 1997; Boivie et al., 2021). However, excessive collaboration may lead to groupthink and reduced oversight, increasing risks (Janis, 1982; Sundaramurthy & Lewis, 2003). In contrast, a control-oriented board centralizes authority, prioritizing tight oversight to ensure accountability and alignment with shareholder interests, thus reducing risk and maintaining stability (O'reilly, 1989). However, too much control may hinder adaptability and misalign the board with the organization, reducing long-term value (Boivie et al., 2021; Adams & Ferreira, 2009).

Taken together, existing theoretical perspectives offer conflicting predictions about how board culture might influence firm value. While some arguments suggest that a collaboration-oriented culture enhances value, others favor a control-oriented culture. Ultimately, determining which cultural orientation is most effective is an empirical question. Reflecting the divergent theoretical expectations on the relationship between board culture and firm value, we

propose a non-directional first hypothesis: board culture (control- or collaboration-focused) is associated with firm value.

A firm's context can matter in explaining the association between board culture and firm value. We examine how the effectiveness of a board's cultural orientation depends on a firm's past performance. Specifically, we explore whether collaboration-oriented boards, which encourage innovation in stable or growth periods, may fall into groupthink during poor performance, suppressing feedback and worsening issues (Sundaramurthy & Lewis, 2003). In contrast, a control-oriented culture during tough times may strengthen oversight, manage risks, and prevent further declines in firm value (Davis et al., 1997; Sundaramurthy & Lewis, 2003). We hypothesize that during periods of poor performance, a control-oriented culture is more beneficial for firm value than a collaboration-oriented one.

Beyond performance-driven dynamics, we also examine how the alignment between a firm's board culture and its broader corporate culture impacts value creation. Prior research suggests that the effectiveness of corporate culture depends on the alignment and interactions among values, norms and formal institutions (North, 1991). The board of directors plays a pivotal role among these formal institutions, with its culture and governance mechanisms potentially reinforcing or counteracting the firm's overall corporate culture (Graham et al., 2022). We therefore hypothesize that cultural alignment between the board and the overall organization enhance value creation.

We test our predictions using a sample of S&P 1500 firms, i.e. 10640 firm-year observations, spanning 2011 to 2022. Prior literature suggests that a firm's culture can be reflected in its written communications (Fiordelisi & Ricci, 2014; Levinson, 2003). For example, 10-K filings are used to assess corporate culture through textual analysis of management's tone and focus.

Building on this approach, we analyze the content of proxy statements to capture board culture. Proxy statements (Form DEF 14A) are formal communication documents from the board of directors to shareholders for the general meeting. They provide insights into board activities, structure, and decision-making, including director biographies, committee compositions, responses to shareholder proposals, and stances on governance issues. Board culture can impact the content of the proxy statements. For example, the board's response to shareholder proposals can indicate a collaborative or control culture. Building on existing methodologies to measure corporate culture, we apply a similar approach to board culture, using dictionary-based, bag-of-words textual analysis to uncover underlying cultural norms and values in written communications (Fiordelisi & Ricci, 2014; Levinson, 2003). Analyzing the Form DEF 14A we adapt the Competing Value Framework (Cameron et al., 2006) to the board context by adding particular words hinting at either control or cooperative board culture (e.g. committee, chair …). In line with previous literature we use the 10-K to measure corporate culture using the directory-based, textual analysis technique (Fiordelisi & Ricci, 2014).

Our descriptive statistics and univariate correlations show that boards, on average, display a stronger orientation towards control than collaboration. Moreover, board culture and corporate culture emerge as distinct constructs. Boards tend to display higher levels of both collaboration- and control-oriented cultures compared to the broader corporate culture. Furthermore, control-oriented boards are associated with characteristics that enhance board authority, such as duality, lower independence and longer board tenure. In contrast, collaboration-oriented boards are linked to governance practices that promote inclusivity, including greater independence and higher gender diversity.

Turning to the impact of board culture on value, our results show that a stronger control-oriented board culture is positively associated with Tobin’s Q, whereas a more collaborative culture is not directly linked to higher firm value, controlling for a wide range of variables,

including board characteristics and overall corporate culture. Hence, our results indicate that board culture exerts an independent effect on firm value, beyond the influence of other more structural board factors. Next, we document that a firm's performance plays a crucial role: following strong past performance, a collaborative approach is positively associated with firm value, whereas during periods of poor performance, it is negatively associated with value. In contrast, a stronger control orientation does not yield significant performance-contingent effects. A final set of results suggests that alignment between board and corporate culture further enhances firm value, particularly when both the board and organization adopt a control-oriented culture. To account for potential unobservable factors that could influence board culture, we include year and industry our initial tests and subsequently add firm fixed effects. The consistency fixed effects in of the results across different fixed effects models indicates that the association between board culture and firm value is robust. Specifically, it shows that this relationship is not only driven by cross-sectional variation in board culture across firms within an industry in a given year but also by time-series variation in board culture within a firm over time. Additionally, robustness tests confirm that the findings remain consistent when using alternative metrics for board culture, firm value and different performance contexts and alternative fixed effect models.

We contribute to the literature in several ways. First, our findings advance the ongoing debate on board culture, whereas prior board research has primarily examined structural characteristics such as board tenure, independence and gender diversity (Adams & Ferreira, 2009; Ahern & Dittmar, 2012; Carcello et al., 2002; Carter et al., 2003; Li & Wahid, 2018). Furthermore, we provide empirical evidence consistent with the theoretical framework by Sundaramurthy & Lewis (2003), showing that boards need to adapt their cultural approach depending on a firm's circumstances. Additionally, we make a methodological contribute by introducing a novel approach to measuring board culture through the textual analysis of proxy

statements. This method offers a direct lens into board processes and priorities, enabling more precise insights into the role of board culture in governance and firm performance. Our findings offer valuable insights for academics and consultants, as it expands theoretical frameworks and supports the development of practical strategies related to board dynamics. In addition to structural characteristics, culture plays a crucial role in shaping effective governance and board performance. Furthermore, the results hold significant implications for firms, highlighting the importance of fostering a board culture, in addition to a strong corporate culture. Finally, these insights are also crucial for regulators and policymakers. While regulators can influence board structure, it is important to recognize that board culture also matters although it is hard to regulate.

The remainder of the paper is structured as follows: The next section provides a short overview of prior literature, followed by the hypothesis development. Part three discusses the methodology and sample selection. Section four presents the descriptive statistics, correlation tables and multivariate results. Additional analyses are presented in section five. The conclusion summarizes the main findings and provides limitations and suggestions for future research.

2. Background & Hypothesis Development

Governing a company involves balancing diverse and often competing needs and perspectives, such as shareholder interests, regulatory requirements and organizational goals. Boards play a crucial rule in this process. Current literature examines the role of the board through both functional board characteristics and board dynamics. Functional as well as demographic board characteristics, including factors such as gender diversity and board independence, have been extensively shown to influence firm value (Adams & Ferreira, 2009; Carcello et al., 2002; Li & Wahid, 2018). However, next to structural characteristics, informal dynamics within the board, including social ties and the tone at the top, have been shown to play a significant role (Bezemer et al., 2014; Bruynseels & Cardinaels, 2014; Patelli & Pedrini, 2015). Specifically,

social ties between the CEO and the audit committee have a negative effect on various proxies for oversight quality (Bruynseels & Cardinaels, 2014). Furthermore, while board meetings may appear similar on the surface, the variation in interaction patterns underscores the complex and multifaceted nature of boardroom dynamics (Bezemer et al., 2014.).

While the critical role of boards is thus widely recognized, there has been a long-standing debate regarding the most effective cultural orientation for board functioning (Sundaramurthy & Lewis, 2003). This debate, which dates back several decades, centers on whether directors should primarily focus on monitoring executives or fostering a culture that empowers them (Dalton et al., 1998; Sundaramurthy, 2000; Westphal, 1999). On one hand, boards hold a formal responsibility to monitor management; on the other, they also serve as advisors and strategic partners. To explore these longstanding questions, we start by examining the fundamental conflicts, drawing on agency and stewardship theories to highlight the contrasts and convergences between control-oriented and collaborative cultures. It is often the case that boards adopt either a control-centric or collaborative approach, shaped by deeply held beliefs and internal political dynamics (Daily & Schwenk, 1996; Westphal & Zajac, 1995).

Control approach

Agency theory explores how to ensure accountability when a task is delegated from a principal to an agent (Jensen & Meckling, 1976). It addresses issues that arise when a superior delegates tasks to an agent, focusing primarily on two key issues in the principal-agent relationship: (1) conflicting interests between principals and agents and (2) how the principal can control the agent's actions (Eisenhardt, 1989). In an accounting context, this theory examines the relationship between shareholders (principals) and company executives (agents), highlighting potential conflicts due to differing interests and information asymmetry.

The board of directors is critical in mitigating agency conflicts by aligning executives' actions with shareholders' interests through monitoring. According to the shareholder primacy

Model (Friedman, 1970), boards of directors are responsible to firm's shareholders. In this theory, "control" centers on structural processes and hierarchies, using formal systems to reduce conflicts of interest. These structures define responsibilities and procedures, ensuring that executives are monitored and their actions aligned with shareholder interests.

A board that adopts a control-oriented culture emphasizes stringent monitoring through a clear hierarchical structure (Fiordelisi & Ricci, 2014). This approach aligns with agency theory, which highlights the need for effective oversight to manage conflicts of interest between shareholders (principals) and executives (agents). Control-oriented oversight emphasizes detailed financial reporting, compliance checks and adherence to formal processes, which improve the accuracy and reliability of information available to shareholders. This, in turn, has the potential to increase firm value.

However, a control-oriented culture may also introduce challenges. Excessive control can create distrust between the board and management, leading to polarization (Ghoshal & Moran, 1996). This can result in overly critical monitoring that reduces the trust necessary for effective executive performance. When board controls are perceived as overly stringent, they may signal higher risk and uncertainty to investors, negatively affecting firm value. Furthermore, a narrow focus on financial controls, rather than strategic considerations, can limit the board's ability to take a broader view of the company's long-term goals. Such an overemphasis on discipline and compliance can ultimately undermine shareholder value (Adams & Ferreira, 2009). Lastly, Boivie et al. (2021) highlight that directors often express concerns that "box-checking" compliance activities can detract from their ability to contribute to strategic decision-making and long-term value creation.

Collaborative Approach

Stewardship theory differs in its assumptions about agents' motivations, suggesting that agents are motivated to serve the organization's collective goals rather than acting out of self-interest,

prioritizing pro-organizational behavior over personal gain (Davis et al., 1997). It thus focuses on fostering conditions that encourage this loyalty and collective orientation, aiming to create an environment where agents willingly act in the best interest of the organization.

The Stewardship Theory suggests that collaboration between the board of directors and management can positively influence firm value. Within this framework, directors perceive themselves as strategic partners to the CEO and the executive team (Boivie et al., 2021). Such collaboration fosters a cohesive leadership environment, enhancing managers' intrinsic motivation, collective orientation and alignment with the firm's mission (Davis et al., 1997). Consequently, managers are more likely to act in ways that support organizational objectives, strengthening long-term stakeholder relationships and fostering a robust corporate identity. Furthermore, a board that emphasizes collaboration may also enhance perceptions of transparency and trustworthiness among shareholders, potentially leading to a more favorable evaluation of the firm.

Despite these benefits, excessive collaboration can introduce significant risks. Groupthink, as described by Sundaramurthy and Lewis (2003) and Janis (1982), may emerge in overly cohesive boards, where critical perspectives and dissenting opinions are suppressed. This can result in strategic persistence, with boards continuing to support outdated strategies even when they no longer align with the firm's needs. Such behavior, often referred to as the "paradox of success" (Audia et al., 2000), may weaken the firm's adaptability. Additionally, a strong culture of collaboration might inadvertently discourage conflicts or challenging discussions, which are crucial for fostering innovation and critical thinking (Eisenhardt et al., 1997). Finally, an overly collaborative dynamic may undermine the board's monitoring role. When the board acts more as a "partner" than as an independent watchdog, its ability to hold the CEO and management accountable may be weakened (Jensen & Meckling, 1976). This

reduced oversight can create opportunities for managerial discretion that conflicts with shareholder interests, potentially lowering firm value.

To summarize, compelling arguments exist both sides of the debate regarding board culture, suggesting that either approach could lead to positive or negative effects on firm value. The question of which cultural orientation a board should adopt remains an open empirical question. Considering these divergent perspectives in the literature, we take a non-directional approach to examine the potential for both positive and negative associations between specific board cultures and firm value.

Hypothesis 1a: *A control-oriented board culture is associated with firm value.*

Hypothesis 1b: *A collaboration -oriented board culture is associated with firm value.*

Board Culture in Challenging Times

Sundaramurthy and Lewis (2003) argue that the effectiveness of collaboration and control depends on a company's unique context. Therefore, the relationship between specific board cultures and firm value may not be static but can vary depending on the firm's situation and performance history.

Both collaboration- and control-oriented cultures have the potential to positively influence firm value under favorable conditions. In times of good performance, a collaborative culture can encourage open communication, innovation and joint problem-solving, fostering adaptability and sustaining growth. Similarly, a control-oriented culture can ensure stability and reinforce accountability, providing a strong foundation for continued success.

However, during periods of poor performance, the dynamics of these cultures may shift. While collaboration could encourage collective decision-making, it may also lead to groupthink, particularly when difficult decisions are needed to address performance issues (Kisfalvi, 2000). Groupthink can suppress critical viewpoints, hindering the board's ability to

identify and address underlying problems, which may contribute to continued poor performance and lower firm value. Moreover, the overconfidence resulting from groupthink may lead to risky decisions that are not thoroughly evaluated, exacerbating the company's struggles (Whyte, 1989). Thus, following periods of poor performance, a collaborative approach might fail to provide the necessary oversight and decisive action required for turnaround.

In contrast, in uncertain or unstable environments, a control-oriented board culture might intensify its monitoring efforts and impose stricter governance controls, as suggested by Davis et al. (1997). This increased oversight is beneficial to manage risks and preventing further decline. Distrust of inherent human limitations can prompt a critical examination of current assumptions and past decisions, highlighting the importance of control (Lewicki et al., 1998). Implementing procedures such as audits and formal reviews can help mitigate the risks associated with managerial opportunism and bounded rationality. Moreover, thoroughly scrutinizing existing structures and processes can improve decision quality. This type of constructive conflict promotes learning by enabling executives and directors to better understand the underlying causes of changes in firm performance (Lindsley et al., 1995).

Building on these dynamics, we hypothesize that following periods of poor past performance, a collaborative culture is less effective at mitigating declines in firm value compared to a stronger focus on control.

Hypothesis 2: *A controlling board culture is more beneficial for firm value than a collaborative one when past performance is weak.*

Board Culture versus Corporate Culture

As noted earlier, both collaboration- and control-oriented cultures have the potential to positively influence firm value. As hypothesized above, collaborative boards are particularly likely to thrive in stable environments. Similarly, we expect the effectiveness board culture may depend on firm-specific circumstances. Specifically, we posit that their impact on firm value is

influenced by the degree of alignment between the board's approach and the broader organizational context, especially the overall corporate culture.

Prior research highlights that the effectiveness of corporate culture is shaped by the alignment and interactions between values, norms and formal institutions (North, 1991). These formal institutions include corporate governance mechanisms such as the board of directors and executive compensation systems. Boards can either reinforce corporate culture or inadvertently counteract it, depending on their alignment with the executive team and the organization's overarching values (Graham et al., 2022).

As discussed earlier, a control-oriented board culture is designed to enhance oversight and mitigate managerial opportunism. However, its effectiveness may hinge on consistency with the broader corporate culture. For instance, a misalignment between a control-oriented board and a highly flexible or innovation-driven corporate culture could lead to internal conflict, reduced governance effectiveness and diminished firm value. Conversely, alignment between a control-oriented board and a similarly control-focused corporate culture may strengthen accountability and governance, ensuring that the board's monitoring efforts complement the organization's strategic priorities.

Furthermore, evidence from a Mckinsey survey suggests that alignment between directors and management can enhance value creation, as it facilitates trust, better communication and unified strategic direction (Mckinsey, 2024). Moreover, shared collaboration promotes stronger relationships across organizational levels, which can lead to greater employee engagement, innovation and adaptability.

Building on the preceding discussion, we propose the following hypothesis:

Hypothesis 3: *The alignment of board culture with corporate culture accentuates the relationship between board culture and firm value.*

3. Research design and data

Research Design

Building on the theoretical foundations of Sundaramurthy and Lewis (2003), this study explores the impact of board culture on firm value through an empirical lens. We operationalize their theoretical framework by measuring board culture using the Competing Values Framework (Cameron et al., 2006).

The specific models employed to evaluate our hypotheses are outlined as follows:

$$VALUE_{i,t} = \alpha_0 + \beta_1 COL_{Board_{i,t}} + \beta_2 CON_{Board_{i,t}} + \gamma' X_{i,t} + FE + \varepsilon_{i,t} \quad (1)$$

$$VALUE_{i,t} = \alpha_0 + \beta_1 COL.NOLOSS_{i,t} + \beta_2 COL.LOSS_{i,t} + \beta_3 CON.NOLOSS_{i,t} + \beta_4 CON.LOSS_{i,t} + \gamma' X_{i,t} + FE + \varepsilon_{i,t} \quad (2)$$

$$VALUE_{i,t} = \alpha_0 + \beta_1 COL_{Board_{i,t}} + \beta_2 CON_{Board_{i,t}} + \beta_3 COL_{Board_{i,t}} xCOL_{Corp_{i,t}} + \beta_4 CON_{Board_{i,t}} xCON_{Corp_{i,t}} + \gamma' X_{i,t} + FE + \varepsilon_{i,t} \quad (3)$$

To test the different hypotheses, we use Ordinary Least Squares (OLS) regression Models. In these Models, *i* indexes firms, *t* indexes years, *X* is a vector of Model-specific control variables and $\varepsilon_{i,t}$ is the error term.

As discussed in Section 2, we hypothesize in Model 1 that both a control-oriented board culture and a collaboration-focused culture may have an impact on firm value. Accordingly, we expect the coefficients β_1 and β_2 to be significant. Models 2 extends the main analysis by studying the association between board culture and firm value depending on past performance: it differentiates between firms with poor past performance and those without by introducing an interaction term between both board culture measures and Loss. We anticipate that the coefficient β_2 will be significantly lower than β_4. Model 3 examines the interaction between board culture and corporate culture. Here, we expect both β_3 and β_4 to be positive and significant. Standard errors are estimated robust to heteroscedasticity. We include industry and year fixed

effects, complemented by firm fixed effects in some analyses. All variables are defined in Appendix B.

Dependent Variable

To examine the impact of board culture on firm value, we use Tobin's Q as a proxy for firm value (Li et al., 2018; Van Peteghem et al., 2018). Tobin's Q (*TobinQ)* is the ratio of a firm's market value of total assets to the book value of its assets in a given year. It reflects how well a company converts its book value into market value, which is crucial for investors. A Tobin's Q less than one suggests that the firm's market value is lower than the replacement cost of its assets, potentially indicating a negative market perception. Conversely, a Tobin's Q greater than one suggests a positive market perception. Therefore, a high Tobin's Q is seen as an indicator of strong market confidence in the company's long-term potential, which may be influenced by effective governance and monitoring practices.

Independent Variables

Board Culture

Building on the theory proposed by Sundaramurthy and Lewis (2003), we focus on measuring the dimensions of collaboration- and control-orientation in board culture. A collaboration-oriented board culture, as mentioned before, emphasizes fostering strong relationships with management and stakeholders while promoting consensus-driven decision-making (Davis et al., 1997). Conversely, a control-oriented board culture prioritizes centralized authority and structured processes to monitor and align executive actions with shareholder interests.

To measure these cultural dimensions, we employ the Competing Values Framework (Cameron et al., 2006), a methodology widely used to analyze corporate culture (Bhandari et al., 2022; Fiordelisi & Ricci, 2014; Sundaramurthy & Lewis, 2003)[1].

[1] This framework, originating from organizational behavior research, identifies four cultural dimensions: Collaboration, Control, Competition and Creation. This study will use only the collaboration- and control

Studies using this framework often analyze corporate language, demonstrating that written communications reflect an organization's underlying culture (Fiordelisi & Ricci, 2014; Levinson, 2003). Common sources used to measure corporate culture include 10-K reports (Bhandari et al., 2022; Fiordelisi & Ricci, 2014), the Management's Discussion and Analysis (MD&A) section (Audi et al., 2016) and earnings call transcripts (Li et al., 2021). Form 10-K filings and MD&A section in particular, are crucial documents prepared by the management of publicly traded companies to provide external stakeholders with comprehensive information about the company's operations. These documents provide management's perspective on critical aspects of the firm, making them a rich source for cultural analysis (Audi et al., 2016).

Instead of analyzing solely traditional sources like 10-K reports to measure firms overall corporate culture, we also examine proxy statements, which serve as a key communication tool between boards and shareholders. These documents are typically issued annually ahead of the annual shareholder meetings and are designed to inform shareholders about critical matters requiring their vote, such as director elections and major corporate policies. In addition, they provide unique insights into board-level activities, structure and decision-making processes. Specifically, they document key governance elements, including director biographies, committee compositions, board responses to shareholder proposals, the rationale for leadership structures and stances on other governance issues. Given that these documents are explicitly tied to board processes and priorities, the proxy statements offer a direct lens into board cultural orientation.

To conduct the textual analysis on these documents, we build on the list of cultural synonyms developed by Fiordelisi and Ricci (2014). While the original framework is suitable for measuring culture in general, and its principles remain valid for assessing board culture, we

component, as they are more relevant cultural dimensions for their role (Sundaramurthy & Lewis, 2003). In untabulated results, we also include competition-oriented and creation-oriented board culture into the analysis. Results remain consistent.

have expanded the list by adding variables. This ensures a more precise assessment of board culture within its specific context, without altering or omitting any of the original elements designed for corporate culture. More specifically, the set of existing synonyms of the control-oriented culture includes words such as “chief”, “conflict”, “logic” and “monitor”. We add "board", “director”, “committee” and "chair" to this list, as they illustrate the board’s intent to assert authority and manage its own operations or decisions. For instance, "chair" signifies the role of a person in a position of authority, further emphasizing control and oversight. By including "committee," we acknowledge its function in retaining oversight and authority within an organization. For example, Target states in its 2023 proxy statement that “*The Board has an important role in overseeing the development, periodic review, and ongoing monitoring of our strategy. With a strong overall strategy in place, the Board and its Committees are focused on overseeing strategy execution by …”* (Target, 2023). This passage highlights control and authority, particularly through its focus on the committee structure and the board itself. This led us to consider it important to include these words as well. For collaboration-oriented culture, we focus on terms like “cooperate,” “participate,” “commit,” and “team,” while excluding “committee,” which may suggest hierarchy rather than collaboration. For example, EBAY states in its 2022 proxy statement that *“These programs enable the Board to establish a mutual understanding with management of the effectiveness of the Company’s risk management practices and capabilities, to review the Company’s risk exposure and risk tolerance, and to elevate certain key risks for oversight at the Board level.”* (EBAY, 2022). This passage implies the collaborative culture of the board. A complete list of terms is available in Appendix A2.

To measure board culture, we calculate the frequency of these synonyms in each firm’s proxy statement, creating two key variables of interest: **CON$_{Board}$** and **COL$_{Board}$.** These variables are expressed as percentages, representing the prominence of each cultural dimension in the text. Further methodological details can be found in Appendix A.

Loss

In the second part of the research, we introduce an interaction term between the board culture variables and poor past performance. The latter is captured by the variable *Loss*, which is a binary indicator: it takes the value of one if the firm has experienced a loss in the last three fiscal years and zero otherwise.

Corporate Culture

To test our last set of hypotheses, we also introduce two variables to the Model as proxies for corporate culture: collaboration *(COL_{Corp})* and control *(CON_{Corp})*. The calculation methodology for these proxies follows the approach used in previous literature on corporate control (Fiordelisi & Ricci, 2014; Bhandari et al., 2022). Following prior literature, these variables are constructed using data from 10-K filings (instead of proxy statements). The inclusion of these measures in our study allow us to assess whether the board culture variables capture a distinct aspect of organizational culture[2].

Control variables

In all models we also introduce other board director characteristics, as we want to exclude the possibility that board culture is simply measuring related structural board-characteristics. Specifically, we control for the size of the board (*BoardSize*), the age of board members (*BoardAge*), board tenure (*BoardTenure*), director independence (*Independence*) and the gender diversity present on the board (*GenderDiversity)*. Director-level variables are transformed into board-level variables by averaging the continuous variables and taking the natural logarithm of this average and computing percentages for the dummy variables. Furthermore, we include a dummy variable *Duality*, which equals one if the CEO of the firm also serves as the chair of the board and zero otherwise. The inclusion of those control variables

[2] In untabulated results, we also include competition-oriented and creation-oriented corporate culture into the analysis. Results remain consistent.

is also in line with previous research (Adams & Ferreira, 2009; Bruynseels & Cardinaels, 2014; Van Peteghem et al., 2018).

Alongside the board characteristics, we include some firm characteristics which have been shown to be related to board dynamics and firm value: *Log Number of Employees, Leverage, Capital Intensity, Sales growth, ROA_{t-1}* and *std_ROA* (Van Peteghem et al., 2018).

Data

We construct our sample by extracting proxy statements and 10-K's from S&P 1500 companies for the fiscal years 2011 to 2022 using the SEC's Edgar database via SEC API. This technique results in 21,418 firm-year observations. In the next step, we exclude proxy statements issued for special meetings and remove duplicates. This reduces the sample to 18,123 firm-year observations. We then merge this dataset with financial data from Compustat and director data from BoardEx. After excluding observations with missing information, our final dataset consists of 10,640 firm-year observations. More information on the sample selection process can be found in Table 1, Panel A.

Panel B of Table 1 provides information on the sample distribution across industries and years. As expected, the manufacturing industry (with 5,118 observations) and the services industry (with 1,792 observations) are the two largest industries in our sample. We also include firms active in the financial industry (SIC 6000-6799) and regulated industries (SIC 4000-4999)[3].

<<<<<Insert Table 1 about here>>>>>

4. Empirical results

Descriptive statistics

[3] In additional tests, we exclude those industries when testing our hypotheses. Untabulated results remain in line with our initial results.

Table 2 Panel A provides an overview of the descriptive statistics for the dependent, independent and control variables included in our analyses. We winsorize all continuous variables at the 1st and 99th percentiles to reduce the influence of outliers. First of all, the average firm in the sample reports a Tobin's Q of 2.397, reflecting its valuation relative to its assets. It also reveals that the average collaborative board culture is 1.819 percent, while the average control-oriented board culture is 5.344 percent. This suggests that boards generally lean more towards a control-oriented approach than collaboration.

Looking at the contextual variables, both corporate culture variables are consistent with prior literature (Fiordelisi & Ricci, 2014; Bhandari et al., 2022). Notably, our sample shows that, on average, management tends to be more collaboration-oriented (mean COL_{Corp} =1.273 > mean CON_{Corp}=1.156). Furthermore, 25 percent of the observations incurred a loss in the last three fiscal years (*Loss)*.

Turning to the control variables, the governance characteristics largely align with findings from prior research (Bruynseels & Cardinaels, 2014; Van Peteghem et al., 2018). In 40 percent of the firm-year observations, the roles of CEO and chair of the board are combined (Duality). Board independence is high, with an average of 82.3 percent of directors classified as independent *(Independence)*. However, gender diversity remains limited, as only 20 percent of board members are female (*GenderDiversity)*. The average board consists of 10 members (*BoardSize*), with directors having an average tenure of 8.5 years (*BoardTenure*) and an average age of 64 years (*BoardAge*).

Regarding financial control variables, S&P 1500 firms are large (with on average 29,367 employees). The mean lagged ROA equals 5.3 percent (ROA_{t-1}) and the standard deviation of the firm's ROA over the past three years equals 0.031 (*std_ROA*). Based on the firms' Altman Z score (*AltmanZ*), 56.22 percent of client firms is considered to be in the safe

zone, 22 percent in the gray zone and 21.78 percent in the distress zone[4]. The majority of firms thus have a low likelihood of bankruptcy.

Correlation Matrix

Table 3 presents the results of the correlation analysis between all variables. The correlation of -0.30 between COL_{Board} and CON_{Board} suggests that a more control-oriented board tends to be less collaboration-oriented and vice versa ($p<0.01$). This negative correlation highlights that control and collaboration represent distinct and contrasting approaches to board culture. Furthermore, the correlation between a control-oriented culture and Tobin's Q is positive (0.07, $p<0.01$), providing univariate evidence of the association between both. In contrast, a collaboration-oriented board culture is negatively correlated with Tobin's Q (-0.03, $p<0.01$).The correlation table also shows that our culture variables are related to board characteristics, but they do not measure the same constructs. This suggests that board culture provides additional insights into the board dynamics previously investigated. A control-oriented culture shows a positive significant correlation with duality (corr.= 0.10, $p<0.01$), board tenure (corr.=0.05, $p<0.01$) and average board age (corr.=0.07, $p<0.01$), while it is negatively correlated with board independence (corr.=-0.03, $p<0.01$) and board size (corr.=-0.05, $p<0.01$). In contrast, a more collaboration-oriented culture positively correlates with board independence (corr.=0.06, $p<0.01$), the size of the board (corr.=0.13, $p<0.01$) and gender diversity (corr.=0.18, $p<0.01$), while it negatively correlates with duality (corr.=-0.03, $p<0.01$) and the average tenure of the board (corr.=-0.05, $p<0.01$).

The positive correlations between collaboration-oriented board culture and variables such as Loss suggest that this approach may be more prevalent in firms facing financial challenges. The correlation between corporate control culture and board control culture is positive and

[4] A client firm with a Z-score greater than 2.99 is considered to be in the safe zone, indicating a low likelihood of bankruptcy. Firms with a Z-score between 2.99 and 1.80 fall into the gray zone, where there is a moderate risk of bankruptcy. A Z-score below 1.80 signals a high probability of bankruptcy, placing the firm in the distress zone.

significant, though relatively modest at 0.21 ($p<0.01$). Similarly, the correlation between corporate collaboration culture and board collaboration culture is positive and significant, but again modest at 0.14 ($p<0.01$). The relatively modest correlations could suggest that each culture type captures unique aspects of governance and organizational behavior.

<<<<<Insert Table 3 about here>>>>>

Finally, looking at the other control variables, multicollinearity is not a concern, with the highest correlations not exceeding 0.60 and the maximum variance inflation factor being 1.54. Taken together, univariate results suggest a positive correlation between a control-oriented board culture and firm value, whereas this correlation is negative when a collaboration-oriented culture is considered.

Multivariate results: Hypothesis one

Table 4 presents the results of the analyses testing Hypothesis 1. Model 1 includes only the control variables to isolate their independent effects. Model 2 builds on Model 1 by adding corporate culture variables, providing insights into the specific contribution of corporate culture. Model 3 introduces the full Model, combining all variables of interest and control variables. All models include year and industry fixed effects and employ robust standard errors. Finally, Model 4 extends the full model by incorporating firm fixed effects, enabling an examination of the dynamic structure within firms rather than solely differences between firms.

Results from the full model (Model 3) reveal a significant positive association between a control-oriented board culture and firm value. Specifically, a stronger focus on control corresponds to higher firm value (coef. = 0.090, $p < 0.01$). Given the average Tobin's Q of 2.397, a one standard deviation increase in CON_{Board} (SD=0.774) results in a Tobin's Q increase of 0.0697, representing a relative increase in value of 2.91 percent. These results show that CON_{Board} has a statistically significant and economically meaningful impact on firm value. In

contrast, a collaboration-oriented board culture does not appear to have a significant impact on firm value for the average firm (coef. = -0.050, p = 0.416).

Results from Model 4, which includes firm fixed effects, provide additional insights by focusing on variations within firms over time rather than differences between firms. The positive and significant association between a control-oriented board culture and firm value remains robust (coef. = 0.066, $p < 0.01$), suggesting that the observed effects are not merely driven by differences between firms but also hold when examining changes within firms. This reinforces the idea that adopting a control-oriented approach can contribute to higher firm value, even when accounting for firm-specific factors. Similarly, the lack of a significant effect for a collaboration-oriented board culture continues to hold in this Model (coef. = 0.006, p = 0. 856).

<<<<<Insert Table 4 about here>>>>>

The regression results reveal several significant associations between control variables and firm value. Focusing on Models 1, 2 and 3, the significant effects of the board characteristics in Model 1 remain significant after introducing corporate culture in Model 2 and board culture in Model 3. This suggests that board characteristics are distinct factors from culture and do not substitute one another. In Model 3, we find that longer board tenure, greater diversity, higher leverage, stronger financial health (measured by the Altman Z-score) and stable performance (lagged ROA and its standard deviation) are positively associated with firm value. In contrast, board age, firm size and capital intensity are negatively related to firm value. Finally, in Model 4, after adding firm fixed effects, duality, leverage, financial health (Altman Z-score) and past profitability (ROA_{t-1}) remain positively linked to firm value, while losses, firm size and sales growth show negative associations.

In sum, a stronger focus on control within the board may reflect effective monitoring and oversight, which can mitigate risks, ensure better resource allocation and reduce agency problems. This increased emphasis on accountability and governance could instill confidence

in investors, thereby enhancing firm value, as suggested by hypothesis 1a. In contrast, contrary to hypothesis 1b, the lack of a significant relationship between collaboration and firm value may indicate that, while collaboration promotes a more cohesive and cooperative board environment, it does not directly lead to measurable financial outcomes. Alternatively, collaboration could have a more nuanced or indirect impact on firm value, potentially influenced by specific situational factors such as times of instability.

Multivariate results: Hypothesis two

Table 5 presents the results of the analysis exploring the impact of culture on firm value, incorporating the firm's past financial performance. Consistent with Model 4 in Table 4, we apply firm fixed effects to capture within-firm variations. This approach reflects the dynamic nature of culture and allows us to focus on changes over time rather than cross-sectional differences.

<<<<<Insert Table 5 about here>>>>>

The results reveal distinct patterns in how collaboration-oriented and control-oriented board cultures influence firm value, depending on whether the firm has experienced financial losses in the past three fiscal years (*Loss*). For firms not operating in a loss context, the relationship between collaboration-oriented boards and firm value is positive and significant (ColNoLoss = 0.083, p=0.019). This indicates that collaboration-oriented boards can positively influence firm value under stable financial conditions, likely due to their focus on fostering trust, adaptability and innovation. Control-oriented boards also exhibit a strong positive and significant association with firm value in the absence of losses (ConNoLoss = 0.098, $p<0.01$), reaffirming their effectiveness in financially stable environments where oversight and efficiency are key drivers of value creation. Additionally, tests conducted to compare the significance of these coefficients show that their effects do not significantly differ from each

other (F-stat = 0.24, p=0.627). This suggests that in financially stable conditions, both collaboration- and control-oriented approaches are equally effective.

In a loss context, the dynamics shift. Collaboration-oriented boards display a significantly negative association with firm value (ColLoss = -0.205, p<0.01), suggesting that such boards may struggle to address the firm's challenges effectively during periods of financial distress. The emphasis on consensus and joint decision-making may hinder decisive actions required in these situations. For control-oriented boards, the relationship with firm value in a loss context becomes insignificant (ConLoss = -0.0307, p=0.403). This suggests that while control-oriented boards may face challenges in maintaining firm value during financial distress, their approach appears less detrimental compared to collaboration-oriented boards. Furthermore, a comparing test of the coefficients shows that these two approaches significantly differ (F-stat=9.49, p<0.01), indicating that in periods of financial distress, collaboration-oriented boards may be less equipped to handle the pressures of such a challenging context. In contrast, control-oriented boards seem to mitigate the negative impact more effectively. This is in line with our second hypothesis.

Multivariate results: Hypothesis three

Table 6 presents the multivariate results of our third hypothesis. The analysis adds an interaction term between a control (collaboration)-oriented board culture and a control (collaboration)-oriented corporate culture[5].

First of all, results show that the main results remain consistent, also after adding the interaction terms. A stronger orientation of control within the board is positively associated with firm value (coef.=0.062, p<0.01), while a stronger collaborative culture does not

[5] To reduce multicollinearity, the interaction terms ($CON_{Board} \times CON_{Corp}$ and $COL_{Board} \times COL_{Corp}$) are orthogonalized due to high correlations with the underlying variables (e.g., 0.66–0.82 for $CON_{Board} \times CON_{Corp}$, 0.75–0.80 for $COL_{Board} \times COL_{Corp}$). This method, following Little, Bovaird, and Widaman (2006), isolates the unique interaction effect by using the residuals from regressing the interaction terms on their main variables.

significantly influence firm value (coef.= 0.004, p=0.913). When turning to the interaction terms, we can see that the interaction between board culture and corporate control culture is significant at a 10% level (coef.=0.132, p=0.066). This suggests that when both the board and corporate management share a control-oriented culture, it reinforces the firm's value. This alignment likely enhances efficiency, accountability and risk management, creating a clear and consistent focus that drives improved performance and higher firm value. On the other hand, the combination of board collaboration culture and corporate collaboration culture does not appear to have a significant effect (coef.=-0.070, p=0.430). This suggests that a collaborative board approach, which emphasizes trust, adaptability and innovation, can function effectively across a broader range of corporate cultural settings and does not specifically thrives in a collaborative organizational culture. However, as indicated in Table 5, its effectiveness is evident primarily in settings of strong financial performance.

<<<<<Insert Table 6 about here>>>>>

5. Sensitivity analyses

Cultural Medians and Deciles

Our analyses suggest a positive association between a control-oriented board culture and firm value, while a collaboration-oriented board culture shows an insignificant association with these outcomes. To explore this further, we categorize both Collaboration and Control into medians (A_2CON_{Board} and A_2COL_{Board}) and top deciles ($D_{10}CON_{Board}$ and $D_{10}COL_{Board}$). For instance, $D10CON_{Board}$ equals one when CON_{Board} falls in the highest decile and zero otherwise. This approach helps us to determine if the association is present only for firms with particularly high levels of a certain board culture dimension, rather than being consistent across the entire range of the variable. We can thus assess if the effect is localized among the "extremes," which may suggest that outliers or particularly pronounced board cultures are driving the results. Table

7 Panel A shows the results using the median variables of CON_{Board} and COL_{Board}, while Panel B uses the decile variables.

<<<<<Insert Table 7 about here>>>>>

The results show that replacing the continuous culture variables with dummy variables based on the median and top decile provides findings consistent with our initial analysis. Specifically, control-oriented boards remain positively associated with firm value, particularly in firms where the board culture falls within the top median or decile and when aligned with a similarly control-oriented management culture. Collaboration-oriented boards, meanwhile, continue to show no significant overall effect on firm value. However, as in the initial analysis, their influence becomes significantly negative during periods of poor past performance, even when using these alternative specifications.

Alternative measures Firm Value

To ensure the robustness of our findings, we re-estimate our main analysis using alternative measures of firm value. In addition to Tobin's Q, we consider Return on Assets (ROA), Return on Equity (ROE), and ROA growth compared to the previous fiscal year as alternative proxies for firm value. These measures provide a broader perspective on firm performance, capturing both profitability and growth dimensions. The results, presented in Table 8, remain consistent with our primary analysis. This suggests that the influence of board culture on firm outcomes is not limited to Tobin's Q but extends to other key performance indicators.

<<<<<Insert Table 8 about here>>>>>

Alternative measure poor past performance

While the main analysis in hypothesis two considers poor performance over the last three fiscal years, Table 9 explores the potential moderating role of financial stability, providing further insights into how firm-specific conditions may influence the board dynamics. Specifically, we

will incorporate the AltmanZ score, and generate two dummy variables based on the median split of AltmanZ. We then follow a similar approach as in hypothesis two, generating four interaction terms (ColHighZ, ColLowZ, ConHighZ, ConLowZ). This Model reveals that in firms with low financial risk (ColHighZ and ConHighZ), both control-oriented and collaboration-oriented cultures positively impact firm value, supporting the results from our main analysis in hypothesis two. However, in periods of higher financial instability, the effect of a control-oriented culture becomes insignificant, while the effect of a collaboration-oriented culture turns negative and significant (coef.= -0.093, $p<0.01$). This indicates that focusing on collaboration is not helpful during times of financial instability, which aligns with our main results.

<<<<<Insert Table 9 about here>>>>>

Conclusion

As organizations navigate the complexities of governance, the role of boards emerges as a critical factor influencing decision-making, transparency and stakeholder relations. Where prior literature mainly focuses on structural characteristics, tone at the top and social ties (Bezemer et al.,2014; Bruynseels & Cardinaels, 2014; Patelli & Pedrini; 2015), we extend existing literature by investigating the cultural approach of the board. Understanding the dynamics of board culture is essential for fostering effective governance practices in today's competitive landscape.

In this paper, we specifically focus on the two main tasks of the board: control and collaboration. As specified by Sundaramurthy & Lewis (2003), the board needs to understand when to prioritize control versus collaboration, depending on the context and organizational needs. Control, stemming from the agency theory, emphasizes discipline and monitoring. Collaboration stems from the stewardship theory and values cooperation, advice-giving and

cohesive decision-making. By exploring the nuances of collaborative versus control-oriented board cultures, we shed light on their respective impacts on operational outcomes and stakeholder trust.

We test our hypotheses using a sample of S&P 1500 firms spanning the period from 2011 to 2022, resulting in a final sample of 10,640 observations. First of all, we observe that, on average, boards tend to have a stronger orientation towards control rather than collaboration. Moreover, control-oriented boards are associated with characteristics that enhance board authority, while collaboration-oriented boards are linked to governance practices that prioritize inclusivity. Our OLS regression analyses demonstrate that, in addition to other board characteristics, board culture is an important governance factor influencing firm value. A strong focus on control within board culture is positively associated with firm value. However, when past performance has been poor, collaborative cultures tend to have a detrimental impact on firm value. These results suggest that while control-oriented board cultures can consistently drive firm value in times of strong and poor performance, the effect of collaborative cultures is context-dependent—beneficial in times of strong performance but negative during periods of poor performance. Furthermore, alignment between board culture and corporate culture plays a crucial role, as a congruence in control-focused cultures between the two enhances firm value.

Ultimately, our study aims to contribute to the ongoing dialogue on governance best practices. More specifically, we add to the current debate on culture within firms and its potential impact on firm outcomes. The research shows the importance of not focusing on control or collaboration alone, but the need for seeing them as complements instead of substitutes. Furthermore, this research expands the organizational culture literature by not only focusing on corporate culture, but adding the dimension of board culture to it. By focusing on proxy statements, we offer a new valuable source of textual board information.

Future research could explore the interplay between corporate and board culture in more detail, examining when each cultural approach proves most valuable.

In conclusion, this research presents a first step towards opening a new perspective in the literature, highlighting the importance of board culture. Our findings offer valuable insights for academics and consultants, as it expands theoretical frameworks and supports the development of practical strategies related to board dynamics. Furthermore, the results hold significant implications for firms, highlighting the importance of fostering a board culture, in addition to a strong corporate culture. Finally, these insights are also crucial for regulators and policymakers. While regulators can influence board structure, it is important to recognize that they may not have a complete understanding of the full context of each company. This highlights the value of fostering flexible and context-sensitive approaches when considering the regulation of board culture.

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APPENDIX A1:

Construction of board culture measures

In this appendix, we provide more information on how we conducted the textual analysis to measure board culture.

Econometric Design

First, we collected Proxy Statements for all firms in the S&P 1500 index for the fiscal years 2011 to 2022. SEC API was used to acquire the necessary info. We convert the proxy statements into text files. To diminish the noise in the analysis, we clean up the text files. These cleanup tasks include removing special characters and punctuation, eliminating stop words and numbers. Next, we use lemmatization to convert all words to their root form. In a final cleaning step, we tokenize the text, which means that we split the text into words, to allow us to analyze words individually. After completing this preprocessing phase, we proceed to extract the cultural information.

The textual analysis method applied to measure board culture is in line with previous literature on corporate culture (Fiordelisi & Ricci, 2014; Bhandari et al., 2022). More specifically, we use the set of cultural synonyms by cultural dimension generated by Fiordelisi & Ricci (2014) as a starting point for our analysis. We then modified this list partially to meet the needs of assessing board culture instead of corporate culture as described in section two.

The set of existing synonyms of the **control**-oriented culture includes words such as “conflict”, “logic” and “monitor”. We add "board", “director”, “committee” and "chair" to this list, as they illustrate the board’s intent to assert authority and manage its own operations or decisions. For instance, "chair" signifies the role of a person in a position of authority, further emphasizing control and oversight. By including "committee," we acknowledge its role in governing and regulating processes, reflecting its function in retaining oversight and authority within an organization. Furthermore, we also add “indep” to the list, as it conveys the concept

of autonomy and self-governance, which are central to maintain control. Lastly, we added "ceo" to the list. While the original list only included "chief" to represent "chief executive officer," we noticed that the abbreviation "ceo" is more commonly used in practice. Therefore, we believe it is important to include this term as well.

Looking at the collaboration culture word list, words such as “cooperate”, “participate” and “team” are included in the original list of Fiordelisi & Ricci (2014). We’re not adding new words to the existing list; instead, we’re making an adjustment. The original list includes all terms starting with "commit", but we will specifically focus on words that begin with "commit" while excluding "committee." Including “committee” often implies a more formal, hierarchical structure that can sometimes hinder fluid collaboration. Retaining the term "commit" emphasizes individual and collective engagement without the formal constraints that the term "committee" might imply. The final list can be found in Appendix A2. The words added compared to prior literature are indicated in bold.

To assess the board culture, we calculate the frequency of synonyms within each firm's text. Following Fiordelisi et Ricci (2014), we compute COL_{Board} (CON_{Board}) as the number of Collaboration(Control)-related synonyms in the proxy statement divided by the total number of words in the proxy statement:

$$COL_{Board} = \frac{\sum_{i=1}^{n}\sum_{j=1}^{N}\beta(x_j, x_i)}{N}$$

$$CON_{Board} = \frac{\sum_{i=1}^{n}\sum_{j=1}^{N}\delta(y_j, y_i)}{N}$$

Where x_i and y_i are the synonyms in the corresponding lists, *n* represents the number of occurrences of each word in the text and x_j and y_j are the words in the text, with j ranging from 1 to N, the total number of words in the text. The functions $\beta(x_j, x_i)$ and $\delta(y_j, y_i)$ are indicator function that equal 1 if $x_j = x_i \; or \; y_j = y_i$, respectively and 0 otherwise.

By definition, both culture variables take values between zero and one hundred. The higher this value, the stronger the presence of this culture within the board. For instance, if the estimate for the collaboration-oriented board culture of Firm A is 1.5, this means that the synonyms used to capture this cultural dimension represent 1.5 percent of the entire document. If the collaboration score is 1.2 in Firm B, one can conclude that the board of Firm A has a stronger collaboration orientation than Firm B.

APPENDIX A.2 : Word lists used to measure cultural dimensions (Fiordelisi & Ricci, 2014)

Bag of Words	
Collaborate	Capab*, certain*, cohes*, collab*, collectiv*, commit*[6] consens*, cooperat*, coordin*, cultur*, decentr*, employ*, empower*, engag*, facilitator*, help*, hir*, human*, interper*, involv*, life*, loyal*, mentor*, mutual*, parent*, particip*, partner*, people*, relation*, retain*, reten*, skill*, social*, team*, train*, workgroup*
Control	Boss*, bureauc*, cautio*, chief*, conflict*, conservat*, control*, detail*, document*, efficien*, error*, expectat*, fail*, inform*, logic*, method*, monit*, norm*, outcom*, procedur*, regular*, solv*, standard*, uniform*, **committee*, director*, board[7]*, chair*, indep*, ceo***

[6] This refers to words such as commit and commitment. “Committee*” is removed from this selection.
[7] The presence of the phrase 'board of directors' is counted only once and not separately under 'board' and 'director'.

APPENDIX B
Variable definitions

Variable Name	Variable Definition [source]
	Dependent Variables
TobinQ	The ratio of the market value of total assets to the book value of total assets of this fiscal year. [Compustat]
	Independent Variables
COL_{Board}	The collaboration-oriented board culture estimate of firm i obtained using text analysis. [EDGAR]
CON_{Board}	The control-oriented board culture estimate of firm i obtained using text analysis. [EDGAR]
Col.NoLoss	The interaction term between COL_{Board} and the Loss dummy, where Loss equals 0 (no loss). It captures the effect of collaboration in firms without a loss.
Col.Loss	The interaction term between COL_{Board} and the Loss dummy, where Loss equals 1 (loss). It captures the effect of collaboration in firms with a loss.
Con.NoLoss	The interaction term between CON_{Board} and the Loss dummy, where Loss equals 0 (no loss). It captures the effect of control in firms without a loss.
Con.Loss	The interaction term between CON_{Board} and the Loss dummy, where Loss equals 1 (loss). It captures the effect of control in firms with a loss.
COL_{Board} COL_{Corp}	The orthogonalized interaction term between COL_{Board} and COL_{Corp}.
CON_{Board} CON_{Corp}	The orthogonalized interaction term between CON_{Board} and CON_{Corp}.
	Contextual variables
Loss	An indicator variable equal to one if firm i had a loss from continuing operations during the past three years and zero otherwise. [Compustat]
COL_{Corp}	The collaboration-oriented corporate culture estimate of firm i in year t obtained using text analysis. [EDGAR]
CON_{Corp}	The control-oriented corporate culture estimate of firm i in year t obtained using text analysis. [EDGAR]
	Control Variables
Duality	An indicator variable equal to one if the CEO of firm i serves as the chairman of the board in year t, zero otherwise. [BoardEx]
Independence	Proportion of independent directors in the board of firm i in year t. [BoardEx]
BoardSize	The natural logarithm of board size of firm i in year t. [BoardEx]
BoardTenure	The natural logarithm of the average years a board member is member of the board of directors of firm i in year t. [BoardEx]
BoardAge	The average age of board members of firm i in year t. [BoardEx]
GenderDiversity	The percentage of women on the board of directors of firm i in year t. [BoardEx]
FirmSize	The natural logarithm of the number of employees of a firm I in year t. [Compustat]
Leverage	Ratio between total debt (both short-term and long-term) and total assets of firm i in year t. [Compustat]
CapInt	The ratio of net plant, property and equipment over total assets of a firm i in year t. [Compustat]
AltmanZ	The Altman Z-score of firm i in year t, as defined by Altman (1968). [Compustat]
SalesGrowth	The percentage growth in sales over the previous year. [Compustat]
ROA_{t-1}	Ratio between operating income before depreciation and total assets of firm i in year t. [Compustat]
Std_ROA	The standard deviation of the firm's ROA over the past three years. [Compustat]

TABLE 1
Sample composition

Panel A: Selection process	
Firm-year observations of proxy statements in EDGAR	21,418
Less: Observations from special meetings and duplicates	(3,295)
Less: Merging with financial databases	(2,034)
Less: Missing values	(5,449)
Total	**10,640**

Panel B: Distribution over industry and year

	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Agriculture	2	2	2	2	2	2	2	2	2	3	3	2	26
Mining	28	29	32	34	35	36	37	39	45	48	47	48	458
Construction	9	9	9	9	10	11	11	11	10	12	12	12	125
Manufacturing	373	387	396	402	419	439	397	447	465	461	464	468	5,118
Transportation &PublicUtilities	101	103	104	105	108	110	99	115	111	112	110	112	1,290
Wholesale Trade	31	31	35	34	38	41	35	39	40	35	37	42	438
Retail Trade	57	56	62	63	71	72	69	76	76	74	75	79	830
Finance, Insurance & Real Estate	42	46	41	42	46	46	38	46	47	48	48	47	537
Services	123	127	129	132	142	155	144	160	168	168	173	171	1,792
Public Administration	2	2	2	2	2	2	2	2	2	2	3	3	26
Total	768	792	812	825	873	914	834	937	966	963	972	984	10,640

Table 1 displays the sample selection procedure in Panel A and the sample distribution across industries and years in Panel B.

TABLE 2
Descriptive Statistics

Panel A: Summary Statistics

	N	Mean	Q1	Median	Q3	Std. Dev.
Tobin's Q	10,640	2.397	1.384	1.831	2.714	1.687
COL_{Board}	10,640	1.819	1.528	1.780	2.065	0.394
CON_{Board}	10,640	5.344	4.808	5.364	5.858	0.774
Loss	10,640	0.251	0	0	1	0.434
COL_{Corp}	10,640	1.273	1.062	1.231	1.428	0.297
CON_{Corp}	10,640	1.156	1.004	1.139	1.290	0.215
Duality	10,640	0.402	0	0	1	0.49
Independence	10,640	0.823	0.778	0.867	0.900	0.102
BoardSize	10,640	2.239	2.079	2.303	2.398	0.225
BoardTenure	10,640	2.025	1.778	2.106	2.380	0.541
BoardAge	10,640	4.154	4.119	4.155	4.192	0.059
GenderDiversity	10,640	0.203	0.125	0.200	0.286	0.118
FirmSize	10,640	2.062	1.020	2.137	3.148	1.671
Leverage	10,640	0.288	0.139	0.277	0.403	0.201
CapInt	10,640	0.28	0.091	0.193	0.415	0.241
AltmanZ	10,640	4.521	1.983	3.303	5.077	6.558
SalesGrowth	10,640	0.301	0.001	0.067	0.155	14.879
ROA_{t-1}	10,640	0.053	0.024	0.053	0.091	0.085
Std_ROA	10,640	0.031	0.007	0.015	0.032	0.059

Table 2 contains descriptive statistics on the variables used in the empirical analyses. For variable definitions, please refer to Appendix B.

TABLE 3
Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) TobinQ	1.00								
(2) COL_{Board}	-0.026***	1.000							
(3) CON_{Board}	0.073***	-0.295***	1.000						
(4) Loss	-0.112***	0.039***	-0.098***	1.000					
(5) COL_{Corp}	0.206***	0.214***	-0.042***	0.030***	1.000				
(6) CON_{Corp}	0.216***	0.012	0.144***	-0.118***	0.198***	1.000			
(7) Duality	-0.027***	-0.028***	0.095***	-0.108***	-0.132***	0.010	1.000		
(8) Independence	-0.057***	0.060***	-0.031***	-0.015	-0.039***	-0.026***	0.074***	1.000	
(9) BoardSize	-0.116***	0.125***	-0.050***	-0.095***	-0.028***	-0.135***	-0.020**	0.261***	1.000
(10) BoardTenure	0.008	-0.049***	0.051***	-0.210***	-0.101***	0.060***	0.102***	-0.122***	0.004
(11) BoardAge	-0.105***	0.012	0.065***	-0.080***	-0.072***	0.026***	0.091***	-0.101***	-0.024**
(12) GenderDiversity	0.055***	0.180***	-0.009	-0.033***	0.176***	0.078***	0.004	0.279***	0.257***
(13) FirmSize	-0.135***	0.109***	-0.013	-0.224***	0.060***	-0.002	0.090***	0.165***	0.493***
(14) Leverage	-0.071***	0.103***	-0.076***	0.093***	-0.043***	-0.220***	-0.029***	0.110***	0.207***
(15) CapInt	-0.221***	0.011	0.076***	0.065***	-0.210***	-0.202***	0.048***	0.002	0.082***
(16) AltmanZ	0.497***	-0.062***	0.086***	-0.131***	0.079***	0.199***	0.001	-0.133***	-0.164***
(17) SalesGrowth	0.006	0.014	0.004	0.024**	0.005	0.004	-0.008	-0.003	-0.034***
(18) ROA_{t-1}	0.267***	-0.017*	0.098***	-0.509***	0.011	0.133***	0.060***	-0.028***	0.042***
(19) Std_ROA	0.093***	0.002	-0.060***	0.418***	0.038***	-0.042***	-0.078***	-0.018*	-0.136***

Variables	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(10) BoardTenure	1.000									
(11) BoardAge	0.477***	1.000								
(12) GenderDiversity	-0.095***	-0.094***	1.000							
(13) FirmSize	0.068***	0.012	0.259***	1.000						
(14) Leverage	-0.118***	-0.062***	0.162***	0.152***	1.000					
(15) CapInt	-0.008	0.052***	0.044***	-0.004	0.208***	1.000				
(16) AltmanZ	0.071***	0.013	-0.065***	-0.150***	-0.367***	-0.176***	1.000			
(17) SalesGrowth	-0.009	-0.011	-0.003	-0.033***	-0.017*	-0.013	-0.010	1.000		
(18) ROA_{t-1}	0.177***	0.054***	0.052***	0.208***	-0.125***	-0.080***	0.261***	-0.066***	1.000	
(19) Std _ROA	-0.214***	-0.098***	-0.049***	-0.283***	0.032***	0.005	0.037***	0.120***	-0.322***	1.000

Table 3 contains Pearson correlations on the variables used in the empirical analyses. * denotes significance at the 5 percent level. For variable definitions, please refer to Appendix A.

TABLE 4
OLS Regression Hypothesis 1

	Model 1		Model 2		Model 3		Model 4	
	Coef.	**T-stat.**	**Coef.**	**T-stat.**	**Coef.**	**T-stat.**	**Coef.**	**T-stat.**
COL_{Board}					-0.050	-0.814	0.006	0.181
CON_{Board}					0.090***	2.837	0.066***	3.809
Loss	-0.082	-1.165	-0.062	-0.890	-0.057	-0.816	-0.206***	-6.528
COL_{Corp}			0.566***	3.869	0.598***	4.085	0.482***	5.988
CON_{Corp}			0.588***	3.180	0.548***	3.005	0.321***	3.374
Duality	0.004	0.071	0.014	0.263	0.002	0.043	0.070**	2.496
Independence	-0.408	-1.312	-0.288	-0.933	-0.276	-0.896	-0.001	-0.007
BoardSize	-0.007	-0.052	0.037	0.259	0.045	0.319	-0.027	-0.314
BoardTenure	0.169***	2.643	0.181***	2.850	0.183***	2.873	-0.060	-1.285
BoardAge	-2.746***	-3.906	-2.742***	-3.906	-2.774***	-3.969	0.385	0.850
GenderDiversity	0.890***	3.131	0.827***	2.986	0.845***	3.053	0.121	0.802
FirmSize	-0.137***	-3.968	-0.135***	-4.004	-0.133***	-3.960	-0.117***	-2.872
Leverage	1.146**	2.546	1.289***	3.019	1.310***	3.079	0.794**	2.306
CapInt	-0.771***	-3.120	-0.637***	-2.667	-0.677***	-2.832	0.341	1.588
AltmanZ	0.108***	2.799	0.107***	2.813	0.106***	2.805	0.069**	2.012
SalesGrowth	0.001	0.389	0.001	0.355	0.001	0.329	-0.002**	-2.467
ROA_{t-1}	3.975***	3.673	3.975***	3.773	3.930***	3.746	1.039**	2.300
Std_ROA	3.082**	2.486	3.060**	2.550	3.068**	2.566	0.848	1.289
Intercept	13.023	4.27	11.313***	3.74	11.033***	3.67	-0.848	-0.45
Year FE	Included		Included		Included		Included	
Industry FE	Included		Included		Included		Not Included	
Firm FE	Not Included		Not Included		Not Included		Included	
N	10,640		10,640		10,640		10,640	
Adjusted-R^2	0.412		0.422		0.424		0.762	
P-value Model	<0.01		<0.01		<0.01		<0.01	

Table 4 contains the multivariate results on hypothesis 1. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent levels (two-tailed), respectively. Test statistics are based on robust standard errors. For variable definitions please refer to Appendix B.

TABLE 5
OLS Regression Hypothesis 2

	Coef.	T-stat.
Col.NoLoss	0.083**	2.348
Col.Loss	-0.205***	-3.520
Con.NoLoss	0.098***	5.445
Con.Loss	-0.031	-0.836
Loss	0.999***	3.801
COL_{Corp}	0.472***	5.872
CON_{Corp}	0.323***	3.404
Duality	0.066**	2.374
Independence	0.015	0.073
BoardSize	-0.030	-0.347
BoardTenure	-0.059	-1.267
BoardAge	0.358	0.789
GenderDiversity	0.116	0.767
FirmSize	-0.117***	-2.883
Leverage	0.787**	2.289
CapInt	0.323	1.500
AltmanZ	0.069**	2.018
SalesGrowth	-0.002**	-2.348
ROA_{t-1}	1.044**	2.320
Std_ROA	0.803	1.215
Intercept	-1.031	0.581
Year FE	Included	
Industry FE	Not Included	
Firm FE	Included	
N	10,640	
Adjusted-R^2	0.763	
P-value Model	<0.01	

Table 5 contains the multivariate results on hypothesis 2. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent levels (two-tailed), respectively. Test statistics are based on robust standard errors. For variable definitions please refer to Appendix B.

TABLE 6
OLS Regression Hypothesis 3

	Coef.	T-stat.
COL_{Board}	0.004	0.110
CON_{Board}	0.062***	3.638
COL_{Board} x COL_{Corp}	-0.070	-0.789
CON_{Board} x CON_{Corp}	0.132*	1.837
Loss	-0.208***	-6.592
COL_{Corp}	0.482***	5.924
CON_{Corp}	0.328***	3.408
Duality	0.071**	2.545
Independence	-0.003	-0.0128
BoardSize	-0.030	-0.356
BoardTenure	-0.059	-1.251
BoardAge	0.387	0.854
GenderDiversity	0.128	0.844
FirmSize	-0.117***	-2.878
Leverage	0.795**	2.314
CapInt	0.344	1.605
AltmanZ	0.069**	2.013
SalesGrowth	-0.002**	-2.462
ROA_{t-1}	1.042**	2.306
Std_ROA	0.839	1.274
Intercept	-0.832	-0.444
Year FE	Included	
Industry FE	Not Included	
Firm FE	Included	
N	10,640	
Adjusted-R^2	0.787	
P-value Model	<0.01	

Table 6 contains the multivariate results on hypothesis 3. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent levels (two-tailed), respectively. Test statistics are based on robust standard errors. For variable definitions please refer to Appendix B.

TABLE 7
Different Categories of Collaboration and Control

Panel A: Median Analysis

	Model 1		Model 2		Model 3	
	Coef.	**T-stat.**	**Coef.**	**T-stat.**	**Coef.**	**T-stat.**
A_2COL_{Board}	-0.034	-1.574			-0.037	-1.64
A_2CON_{Board}	0.060***	2.943			0.061***	3.00
A_2Col.NoLoss			0.016	0.745		
A_2Con.NoLoss			0.091***	4.291		
A_2Col.Loss			-0.197***	-4.271		
A_2Con.Loss			-0.050	-1.078		
A_2Col x COL_{Corp}					-0.089	-1.15
A_2Con x CON_{Corp}					0.202**	-2.27
Controls	Included		Included		Included	
Year FE	Included		Included		Included	
Firm FE	Included		Included		Included	
N	10,640		10,640		10,640	
Adjusted R^2	0.762		0.762		0.762	
P-value Model	<0.01		<0.01		<0.01	

Panel B: Decile Analysis

	Model 1		Model 2		Model 3	
	Coef.	**T-stat.**	**Coef.**	**T-stat.**	**Coef.**	**T-stat.**
$D_{10}COL_{Board}$	-0.0.3	-0.10			-0.002	-0.05
$D_{10}CON_{Board}$	0.081**	2.24			0.083**	2.28
D_{10}Col.NoLoss			0.042	1.11		
D_{10}Con.NoLoss			0.093**	2.45		
D_{10}Col.Loss			-0.114**	-2.17		
D_{10}Con.Loss			0.028	0.29		
D_{10} COL_{Board} x COL_{Corp}					0.031	0.35
D_{10} CON_{Board} x CON_{Corp}					0.276*	1.69
Controls	Included		Included		Included	
Year FE	Included		Included		Included	
Firm FE	Included		Included		Included	
N	10,640		10,640		10,640	
Adjusted R^2	0.761		0.762		0.761	
P-value Model	<0.01		<0.01		<0.01	

Table 7 contains the multivariate results on the additional test investigating alternative culture measures. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent levels (two-tailed), respectively. Test statistics are based on robust standard errors. For variable definitions please refer to Appendix B.

TABLE 8
OLS Regression of Firm Performance

	Model 1: ROA		Model 2: ROE		Model 3: ROAGrowth	
	Coef.	**T-stat.**	**Coef.**	**T-stat.**	**Coef.**	**T-stat.**
Collaboration	-0.001	-0.435	-0.005	-0.34	0.419	0.46
Control	0.003***	2.870	0.020***	2.67	0.675	1.62
Controls	Included		Included		Included	
Year FE	Included		Included		Included	
Firm FE	Included		Included		Included	
Controls, Intercept, Industry, Year & Firm FE	Included		Included		Included	
N	10,640		10,640		10,640	
Adjusted R²	0.567		0.184		0.096	
P-value model	<0.01		<0.01		<0.01	

Table 8 contains the multivariate results on additional test on the dependent variable. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent levels (two-tailed), respectively. Test statistics are based on robust standard errors. For variable definitions please refer to Appendix B.

TABLE 9
OLS Regression alternative Loss

	Coef.	**T-stat.**
Col.LowZ	-0.093***	-2.828
Con.LowZ	0.023	1.312
Col.HighZ	0.085**	2.090
Con.HighZ	0.095***	5.172
Controls	Included	
Year FE	Included	
Firm FE	Included	
N	10,640	
Adjusted R²	0.775	
P-value Model	<0.01	

Table 9 contains the multivariate results on the additional test for hypothesis two. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent levels (two-tailed), respectively. Test statistics are based on robust standard errors. For variable definitions please refer to Appendix B.

auditing

Determinants of Voluntary Audit following Reduced Obligations: the case of SMEs[1] *in France after the "PACTE" Law*

ABSTRACT:

This paper questions the determinants for voluntary audit in France following a legal change that raised the size thresholds above which entities should have their financial statements audited. The French "PACTE" law aligned to the European Directive #34 and exempted around 150,000 firms from audit by 2019, offering an interesting setting still unexplored. We extract data from the audit missions file recorded by the French auditors' authority (CNCC) between 2019 and 2022, adding financial information from Orbis. We observe that the demand for audit is associated to the size and the legal form, suggesting a role in reducing owners-managers and managers-employees agency issues. Also, the closer to the thresholds, the more demand for audit, which suggests mimetism or requirement anticipation. The financial distress is also a driver to the demand for audit. Besides, some elements suggest a form of opportunism from French exempted firms. The results are interesting to reveal, especially as the country just engaged into a new raise of thresholds.

Keywords: accountability, agency theory, voluntary audit, PACTE law, Directive 2013/34

1

1. Introduction

In 2019 France adopted a law (so called *"loi* PACTE") modifying the conditions under which entities should have their financial statements audited. The thresholds to identify entities exempted from mandatory audit were raised up to align to the European Directive 2013/34 (article 3 para. 2). Hence France chose to reduce pressure on more entities over their financial information duties. A lower administrative burden is supposed to facilitate the growth of entities and is one of the bricks of the government's "Action Plan for firms' growth and transformation" (*Plan d'Action pour la Croissance et la Transformation des Entreprises – PACTE*). The audit profession tried to warn about the risks on future fraud or mismanagement and failure (Bassin, 2023; Bušovová et al., 2016). Considering the benefits of maintaining voluntary audit, a reform of audit missions allowed small entities to request for audit missions over a shorter period of time (Jedidi & Jouanen, 2022). While audit missions are normally set for 6 years, shorter voluntary audit missions may be fixed over 3 years only.

Therefore, France excluded a number of entities from the mandated audit duty, then adapted the audit framework to favor voluntary missions. It generates an interesting setting where pressure for accountability has been relieved yet encouraged. Several studies in Europe have investigated on the consequences of similar relief in other European countries, such as Czech Republic (Bušovová et al., 2016), Romania (Popescu & Bança, 2019), Ukraine (Zubilevych, 2014). These studies underline that the European directive 2013/34 transposition into national laws, reduced charges for small and medium entities and should help them to develop. However, it may have negative implications on audit missions and information quality (Zubilevych, 2014).

In France, following the PACTE law many companies, which are no longer required to appoint an auditor, choose to keep the audit. Others, although they have never been required to appoint an auditor, opt for a voluntary audit. The study questions this demand for voluntary audit. To our knowledge, this is the first study on the French context.

We analyze data from audit missions' statement between 2019 and 2022, to understand why some French entities choose to maintain the audit process within their organization while they could avoid it. Even if the number of audited entities dropped after the reform, as many entities used this option, we observe that several entities maintained the audit exercise albeit the exemption. This resistance to a rare example of reduced pressure is surprising and deserves inquiry. We try to identify whether choosing to continue auditing one's accounts is explained

by the institutionalized status of the audit mission and the strength of habits, or if some specific features of the entity may facilitate the decision.

Our [preliminary] results confirm the agency roles of voluntary audit. However, some elements suggest a form of opportunism from French exempted firms, that are interesting to reveal, especially as the country just engaged into a new raise of thresholds.

The paper is organized as follows: section 2 reviews the literature on the role of audit assurance for entities, section 3 presents our methodology and data. We disclose and discuss our results in section 4 and conclude in section 5.

2. Literature review

2.1. The assurance role of external audits

Financial audit plays a key role in fostering transparency within companies by confirming financial data accuracy, assessing processes and ensuring adherence to rules and compliance to laws. The audit serves as a monitoring device and is thus part of the corporate governance mosaic ensuring sound financial reporting and deterring fraud (J. Cohen et al., 2002).

This primary function of auditing enables audited companies to comply with legislation and standards and increase their credibility (Davis et al., 2009). Several authors (Adousset, 2008; Carassus & Gardes, 2005; Piot, 2001) highlight the contribution of financial audit, as an external governance mechanism, to reduce information asymmetry. However an expectation gap exists between auditors and users or preparers of the financial information (Schelluch & Gay, 2006), that may be explained by a misunderstanding around the auditor's role (Abbadi, 2014). According to Moore & Ronen (1990), the external audit is part of the financial communication system of a company. Thus, audit services can be considered as an economic good acquired by the audited company, moreover, as a signal to potential investors who will be incurred to invest more in entities with certified financial statements (Ojala et al., 2016).

As an audit process incurs heavy and costly duties for entities the question of its usefulness is even more important. Empirical studies have discussed the role of audit quality on the value relevance of earnings and equity (Lee & Lee, 2013); on the pricing of Initial Public Offerings (Beatty, 1989) or in mitigating earnings management (Caramanis & Lennox, 2008; D. A. Cohen et al., 2008). The auditor's reputation may even influence the social responsibility ratings of their clients (Linthicum et al., 2010). Yet embarking into an audit process yields heavy and costly duties for entities, even more important as they choose a Big-4 auditor for higher quality. The size of the audit entity has long been a proxy for audit quality (DeAngelo, 1981; DeFond & Zhang, 2014). Despite continuous controversies as for the usefulness of audit, the role of external auditors has been reshaped and widened over time (Fraser & Pong, 2009). However audit could not prevent scandals and frauds.

The millennium began with "a tsunami of accounting scandals", in Europe yet mainly in the US, that resulted in a strong increase in regulation (Ball, 2009). After the Enron scandal though, an increase in fees was observed, partly due to the Sarbanes-Oxley Act, partly to the premium invoiced by big4 companies (Asthana et al., 2009). Hence in settings where audit is mandatory,

its role on information quality seems recognized, yet audit incurs heavy costs and is not enough in preventing fraud, leaving unsolved the question of its usefulness.

2.2. An evolving legal framework

In the second decade of the century, following heavy regulations on the audit itself, several countries tended to reduce the burden towards smaller entities, to facilitate their development[2]. This drove Europe to issue Directive #34 (2013), where size thresholds are proposed to discriminate between small, medium and larger companies. From this, several countries moved their local size thresholds upward to align to the Directive and relax pressure on a number of firms. This is not the first experience of that kind, as the former Fourth Directive had allowed Member States to exempt smaller companies from audits. Several countries had then raised their thresholds to align to the Fourth Directive. In the UK an audit exemption was introduced in 1994 with low thresholds that were raised in 2004. In Denmark the thresholds were raised in 2006 (Collis, 2010). Other countries exempted small entities with sole ownership, such as Malaysia or Australia. These reforms were subject to several studies. Willekens et al. (2004) in Belgium; Bušovová et al. (2016) in Czech Republic; Niemi et al. (2012) and Ojala et al., (2016) in Finland; Weik et al. (2018) in Germany; Popescu & Banța (2019) in Romania; Zubilevych, (2014) in Ukraine; and several studies in UK (Collis, 2010; Dedman et al., 2014; Tauringana & Clarke, 2000). At this stage, no study was made on the French setting. Overall, these settings have shown a decrease in audit practice, yet voluntary audit would be observed. Some studies focused on the consequences of audit for exempted entities, whereas other studies would try to understand the drivers of maintaining a voluntary audit.

2.3. Consequences of voluntary audit

These reforms were found to impact the financial information quality. According to Bušovová et al. (2016), Czech micro and small companies, which are exempted from having financial statements audited, are no more required to disclose their Profit and Loss Statement: they can disclose a Balance Sheet with Notes only. Therefore, analyses provided by financial analysts are reduced with a lower explanatory power.

In Denmark entities were relieved from having a joint audit. However, despite a decrease in audit fees, the audit quality was maintained, suggesting that price and quality are not associated (Lesage et al., 2017). Yet, as the authors observed a higher concentration around Big4 auditors

[2] See preliminary remarks of Pacte Law

after the reform, they suggest that quality would be searched through the size of the audit company.

Voluntary audits is also viewed as a signaling tool that could impact entities' access to credit. Lennox & Pittman (2011) show that firms that maintain audit attract upgrades in their credit ratings when firms that opt out send a negative signal and see a deterioration in their ratings. This result is also confirmed by Dedman & Kausar (2012) who add that firms that opt-out prove to have less conservative accounts. Kausar et al. (2016) conclude that firms with voluntary audit increase their access to debt, invest more and are more performant. Briozzo & Albanese (2020) confirm this improved access to financing and investing, adding an improvement of the working capital. These effects of audit appear all the more effective as firms are financially constrained. Palazuelos et al. (2018) also confirm the role of voluntary audit in credit granting. These results suggest that firms with financing needs should have voluntary audit to signal themselves to debtors.

2.4. Determinants of voluntary audit

Other studies questioned the reasons for having voluntary audit, underlining its role in reducing agency costs. Chow (1982) one of the seminal studies on voluntary audit, explores factors that influence the demand for voluntary audit, such as company size and debt level. These studies generally underline the role of audit in reducing agency costs. Barefield et al. (1993) list agency costs between managers and employees (proxied by the entity's size), owners and managers (through ownership structure), and owners and creditors (through debt covenants). In the UK Collis et al. (2004) show that audit is perceived as a tool in improving agency relationships with owners and lenders. In family businesses, the demand for audit appears to be influenced by the level of separation between ownership and control, as well as the proportion of nonfamily management (Carey et al., 2000; Niskanen et al., 2010). In Malaysia small exempted firms conduct voluntary audit for agency management that is, when managerial ownership is low (Mustapha et al., 2015). Abdel-Khalik (1993) relates voluntary audit to a demand to compensate for the loss of control from the owner.

Hence firms that are large, complex, with a dispersed ownership and debtors may need to be audited. The likelihood to opt for an audit increases with the size of the firm, the number of non-managing owners and with gearing (Ojala et al., 2016). The complexity of the firm – proxied through its legal form and belonging to a group – is also a driver to the demand for audit (Weik et al., 2018).

Access to credit may also determine voluntary auditing, as it may be used as a signal for small firms seeking a bank loan (Dharan, 1992): voluntary audit may help opaque firms to signal their quality, under the constraint of the audit cost. The financial situation plays a debated role. Seow's study (2001) was inconclusive on that point. Then a group of researchers tested different measures of financial distress: they first used Z-score measures and found that financially distressed firms are more willing to perform an audit (Niemi et al., 2012). Then they used negative result and negative equity to find an opposite result (Ojala et al., 2016), suggesting that firms "financially distressed tend to forgo audit because they cannot afford it" (p 17).

External audit is also associated to a qualitative corporate governance, as the likelihood to opt for audit increases with the independence and financial expertise of the audit committee (Mangena & Tauringana, 2008). Some studies note that external audits could be substitutes for other forms of control over the financial reporting quality such as external accounting experts (Niemi et al., 2012), or internal auditors (Carey et al., 2000).

One study denoted a possible opportunism from exempted firms as Qualified opinions are found to be negatively associated to opting for audit (Niemi et al., 2012).

Overall a collection of determinants have been explored to explain the demand for voluntary audit that Haapamäki (2018) have synthesized, identifying 5 major dimensions: firm attributes; separation of ownership and control attributes; agency relationship attributes; management attributes; signaling attributes.

2.5. Hypotheses

These studies show that the drivers of maintaining audit while exempted are not completely clear. As a signaling tool, voluntary audit may be chosen by opaque entities to signal the quality of their accounts. This suggests that younger and smaller entities with less tangible assets would opt for audit. On the other hand, maintaining auditing could be more important for the larger entities as they may forecast to pass the new thresholds in a close future. Hence the role of the entity's size is not clear. Besides, agency theories suggest that audit help to reduce information asymmetries between stakeholders: we may expect more complex entities – i.e. with external shareholders and debtors, to maintain voluntary audit. As previously observed, opportunism is also a possibility as the reforms relax entities from heavy duties with a questionable usefulness. Finally, the financial situation may also drive the decision to keep or forego auditing, especially in case of financial distress: it could either convey information in case of financial issues, or it could be viewed as a non-affordable cost.

The hypotheses we test are the following:

H1a- Audit is maintained in opaque firms

H1b- Audit is maintained in large firms

H2- Audit is maintained in complex firms with many stakeholders

H3- Audit is kept for opportunism that is, when positive audit opinion is easy to obtain

H4a- Audit is kept in case of financial distress

H4b- Audit is foregone in case of financial distress

The French case is interesting as it offers a new specific setting to these questions. Contrary to the progressive change in the UK, the thresholds were raised directly, offering an option to thousands of entities. The change was big enough to alarm professionals who denounced a major threat on their market. We question the drivers of maintaining audit at the time of this massive opportunity, to contribute to the debate around the protection role of audit in terms of information quality and financial safety.

3. Empirical study

We extract data from the audit missions file recorded by the French auditors' authority (*Compagnie Nationale des Commissaires aux Comptes*, CNCC). From an exhaustive list of audit missions in France, we extract the audit made on newly exempted entities. The file identifies the entities audited, their size and activity, the size of the mission and the final audit opinion. We also use Orbis to get 1/ further information on the profile of these audited entities, 2/ a control sample of similar entities that have foregone audit. The data is observed on the 2019-2022 period following the PACTE law. We first analyze the audited entities to understand why some would stop audit on the one hand, why some would choose short audit missions on the other hand.

Then we try to identify determinants of voluntary audit among exempted entities. We consider the entity's situation on the last audit tenure year and test whether this situation drives the choice to renew auditing the following year. We explore three sources of determinants: those related to the entity's business and profile (growth, industry, size and performance…), those related to the capital profile (level of independence, level of debt…), those related to the management's

profile (governance, shareholding management…). However, this latter group of determinants is generally not directly observable among smaller entities.

We consider the following collections of variables:

- Regarding the size we use the natural logarithms of the Total Assets and Turnover, as well as a variable that calculates how close the entity is to the new thresholds.
- The opacity of the firm is also made up of its age and its proportion of Tangible assets. The smaller, younger and less tangible, the opaquer a firm. We expect that opaque firms need to signal their quality through audit.
- Agency costs are considered more important for firms that are not a limited liability company (SARL in French), as other legal forms generally facilitate a greater number of shareholders. A firm that is not included in a group is also more likely to have a reduced number of (external) stakeholders. Finally, the more debt a firm incurs, the more pressure banks may have on the firm. The need for audited accounts may increase with external stakeholders such as non-managing shareholders and debtors.
- The performance of the firm is observed through sales growth and return on assets. Two variables are tested to measure financial distress, the negative result and negative equity. We expect financial issues to have a positive influence on the audit option. However, financial distress may have a negative impact as audit could appear too costly.
- Finally, we consider the features related to the audit mission on the renewal year that is, the audit opinion, the seniority of the relation with the audit company, and finally the volume of the mission in hours. We expect a positive opinion to facilitate the audit maintenance, as well as the seniority of the relation with the audit company.
- The dependent variable is a dummy equal to 1 if the entity takes an audit on year Y+1

The model takes the form of a logit with the following variables:

$$VOLAUDIT = \alpha_0 + \beta_i SIZE\_Var + \beta_j AGENCY\_Var + \beta_k PERF\_Var + \beta_l AUDIT\_Var$$

Variable	Description	Relation
VOLAUDIT	Dependent variable for Voluntary Audit	
MAINTAUD	Dummy equal to 1 if the audit is maintained on the year following the renewal year.	
SHORT	Dummy equal to 1 if the audit is maintained the year following the renewal, with a short format (ALPE).	
SIZE_Var	**Variables related to the entity's size**	
log(Total Assets)	Natural logarithm of total Assets	+ / –
Log(Sales)	Natural logarithm of Sales	+ / –
Threshold Completion in %	We take the Total Assets, Turnover and number of Employees and divide each by the new threshold value. The ratio is capped at 1 as the threshold is 100% achieved if passed. We then take the higher of the 3 possible pairs of threshold completion to be considered.	+
Tangible Assets/Total Assets	This ratio is a proxy of opacity. The higher the ratio, the less opaque the firm.	–
Entity's Age	We consider the age of the entity as a proxy of opacity. The older, the less opaque the firm.	–
AGENCY_Var	**Variables related to agency issues**	
Legal Form (llc)	Dummy equal to 1 if the entity is a limited liability company (SARL in French), 0 otherwise.	–
Independent entity	Dummy equal to 1 if the entity does not belong to a group as a holding or subsidiary, 0 otherwise.	–
PERF_Var	**Variables related to the entity's performance**	
Turnover growth	We consider the yearly turnover growth	+ / –
Return on Assets	Net Result / Total Assets	+ / –
Net Result is Loss	Dummy equal to 1 if the Net Result is negative, 0 otherwise. Used as a measure of financial distress.	+ / –
Financial Distress on Equity	Dummy equal to 1 if Equity is negative, 0 otherwise. Used as a measure of financial distress.	+ / –
AUDIT_Var	**Variables related to the audit mission**	
Positive Audit Opinion	Dummy equal to 1 if the Audit Opinion is positive with no reservation.	+
Auditor's Seniority	Number of years since the audit company was first appointed by the entity.	+
Audit Volume (in Hours)	The variable measures the size of the audit mission, used as a proxy of the audit cost.	–

4. (Preliminary) results

4.1.Descriptive statistics

We first draw an analysis from the list of audit missions computed in France between 2019 and 2022 for entities below the new thresholds. The file contains 429,321 observations of either standard audit missions (i.e. over 6 years) or shorter missions (over 3 years).

Nature of observations	Observations
Total file	429,321
Entities over the previous thresholds	148,797
Entities with no missing data	30,770

Figure 1: Building up the sample

Table 1 below shows the observations by year and by type of mission. We note that the number of missions decreases by more than 10% by 2021, even if short missions increase strongly over the period. In 2022 short missions only represent 4% of the total volume of activity on this market.

	2019	2020	2021	2022	Total
Standard Audit	117,181	113,774	99,847	87,402	418,204
Change (%)		*-2.9%*	*-12.2%*	*-12.5%*	
Short Audit	1,117	2,763	3,507	3,730	11,117
Change (%)		*+147.4%*	*+26.9%*	*+6.3%*	
Total	118,298	116,537	103,354	91,132	429,321
Change (%)		*-1.5%*	*-11.3%*	*-11.8%*	

Table 1: Number of Audit missions in France for entities below the new thresholds.

The sample used for further testing is rather similar to the main file.

	2019	2020	2021	Total
Audit stopped next year	512	596	658	1,766
Change (%)		*+16%*	*+10,4%*	*41,3%*
Audit maintained next year	836	822	854	2,512
Change (%)		*-1,7%*	*+3,9%*	*58,7%*
Of which:				
- Standard audits	753	763	801	2,317
Change (%)		*+1,3%*	*+4,9%*	*54,2%*
- Short audits	83	59	53	195
Change (%)		*-29%*	*-10%*	*4,6%*
Total mission's last year	1,348	1,418	1,512	4,278
Change (%)		*+5,2%*	*+6,6%*	*100%*

Table 2 Observations on mission's last year

We then compare entities according to the type of audit mission they choose.

Table 3 below shows that entities choosing the new short audit missions are on average smaller in terms of Assets and Financial Debt, bigger in terms of Sales. They are not different regarding how close they are to the thresholds. The choice for shorter missions could be related to the industry rather than to the size. Entities choosing short missions have on average renewed their audit mandate more recently, and they have a more recent relationship with their auditor. This suggests that entities opted for shorter missions when they had a renewal window to do so, or that they opted when their mandate was rather recent. There is no significant difference between subsamples in terms of performance, growth, weight of debt, or audit opinion.

	Standard Audit	Short Audit	Diff.
Threshold Completion in %	0.73	0.74	-0.01
Total Assets	15,637.59	5,821.03	9,816.55***
Financial Debt	3,624.54	1,221.09	2,403.45***
Turnover	4,284.07	4,527.98	-243.90**
Long-term assets / Total Assets	0.34	0.27	0.07***
Tangible Assets / Total Assets	0.20	0.17	0.03***
Financial Debt / Total Assets	0.16	0.15	0.01
Firm's Age	26.64	26.18	0.46
Legal Form	2.04	2.07	-0.03**
Independent entity (Y/N)	0.18	0.15	0.03**
Turnover growth	0.62	0.15	0.46
Result / Turnover	0.50	0.09	0.41
Return on Assets	0.04	0.05	-0.01
Positive Audit Opinion	0.99	0.98	0.00
First Audit mission year	0.15	0.47	-0.31***
Last Audit mission year	0.14	0.02	0.12***
Audit mission's Seniority	2.45	0.93	1.52***
Auditor's Seniority	11.55	10.24	1.31***
Audit Mission Volume (in Hours)	80.49	65.94	14.55***
Observations	30,770		

Table 3: Comparison of entities making voluntary audits whether they make standard missions or shorter audits

We then compare entities that are about to stop their audit missions and others in the same extract from the CNCC. Entities that are to stop the audit missions are older, larger in terms of Turnover, smaller in terms of Assets and Financial Debt, with lower density of tangible assets. They are not significantly different in terms of performance. They belong less often to a group. They tend to have a longer seniority of their auditors and missions.

	Audit stopped	Audit maintained	Diff.
Threshold Completion in %	0.71	0.73	-0.03***
log(Total Assets)	8.28	8.63	-0.35***
log(Sales)	8.19	8.22	-0.03
log(Debt)	5.18	5.46	-0.28**
Tangible / Assets	0.17	0.21	-0.04***
Entity's Age	29.41	27.59	1.81***
Legal Form	2.05	2.00	0.05***
Independent entity	0.20	0.15	0.04***
Financial Debt / Total Assets	0.15	0.17	-0.02*
Turnover growth	0.07	0.20	-0.13
Result / Turnover	0.13	-0.03	0.17
Return on Assets	0.05	0.03	0.01*
Positive Audit Opinion	0.97	0.98	-0.01*
Audit mission's Seniority	5.00	5.00	0.00
Auditor's Seniority	13.56	13.60	-0.04
Audit Volume (in Hours)	74.95	82.76	-7.81***
Observations	4278		

Table 4: Comparison between entities that stop audit missions and entities that maintain audits

4.2.Multivariate analysis

We test possible drivers of the decision to maintain auditing accounts on year *j* based on the situation on year *j-1*. For this, we focus on entities that are on their mission's last year. Hence, we observe the determinants of the decision to renew the audit 6-year (Standard) or 3-year (Short) audit mission.

Audit Maintained next year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
log(Sales)	1.323***	1.332***	1.314***						
	[0.000]	*[0.000]*	*[0.000]*						
Threshold Completion in %				3.044***	3.066***	3.017***			
				[0.000]	*[0.000]*	*[0.000]*			
log(Total Assets)							1.372***	1.373***	1.383***
							[0.000]	*[0.000]*	*[0.000]*
Tangible/Assets	1.687***	1.651***	1.659***	1.593***	1.562***	1.566***	1.315*	1.292*	1.276*
	[0.000]	*[0.003]*	*[0.000]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.073]*	*[0.089]*	*[0.097]*
Entity's Age	0.995**	0.995**	0.995**	0.994***	0.994***	0.994**	0.994**	0.995**	0.995*
	[0.010]	*[0.032]*	*[0.012]*	*[0.003]*	*[0.007]*	*[0.024]*	*[0.036]*	*[0.029]*	*[0.052]*
Legal Form (llc)	0.722***	0.734***	0.735***	0.680***	0.690***	0.691***	0.733**	0.744**	0.743**
	[0.010]	*[0.006]*	*[0.009]*	*[0.001]*	*[0.002]*	*[0.007]*	*[0.014]*	*[0.024]*	*[0.024]*
Independent entity	0.717***	0.716***	0.714***	0.720***	0.719***	0.717***	0.720***	0.720***	0.717***
	[0.000]	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.001]*	*[0.001]*	*[0.000]*
Financial Debt / Total Assets	0.988	1.028	0.999	0.985	1.026	0.994	0.976	1.017	0.974
	[0.920]	*[0.828]*	*[0.990]*	*[0.882]*	*[0.795]*	*[0.964]*	*[0.825]*	*[0.858]*	*[0.791]*
Turnover growth	1.016			1.019			1.017		
	[0.492]			*[0.627]*			*[0.593]*		
Return on Assets	0.571***			0.598***			0.626**		
	[0.004]			*[0.007]*			*[0.027]*		
Result is Loss		1.223***			1.191**			1.161*	
		[0.002]			*[0.022]*			*[0.051]*	
Negative Equity			1.366**			1.357**			1.420***
			[0.014]			*[0.024]*			*[0.008]*
Positive Audit Opinion	1.632*	1.624**	1.635*	1.643**	1.634**	1.649**	1.667***	1.654*	1.686**
	[0.054]	*[0.022]*	*[0.067]*	*[0.011]*	*[0.021]*	*[0.013]*	*[0.008]*	*[0.097]*	*[0.041]*
Auditor's Seniority	1.006	1.006	1.006	1.006	1.006	1.006	1.006	1.006	1.006
	[0.390]	*[0.319]*	*[0.317]*	*[0.440]*	*[0.290]*	*[0.258]*	*[0.383]*	*[0.276]*	*[0.351]*
Audit Volume (in Hours)	1.003***	1.003***	1.003***	1.003***	1.003***	1.003***	1.002**	1.002*	1.002**
	[0.000]	*[0.000]*	*[0.001]*	*[0.000]*	*[0.004]*	*[0.003]*	*[0.034]*	*[0.063]*	*[0.036]*
Constant	0.108***	0.0966***	0.101***	0.492***	0.464**	0.438***	0.0689***	0.0656***	0.0564***
	[0.000]	*[0.000]*	*[0.000]*	*[0.006]*	*[0.013]*	*[0.009]*	*[0.000]*	*[0.000]*	*[0.000]*
Fixed Effects	Year Industry	Year Industry	Year Industry	Year Industry	Year Industry	Year Industry	Year Industry	Year Industry	Year Industry
Observations	4278	4278	4278	4278	4278	4278	4278	4278	4278
Pseudo R2	0.0339	0.0336	0.0336	0.0348	0.0343	0.0346	0.0392	0.0387	0.0395
chi2	196.6	217.9	230.2	184.1	229.0	221.0	289.5	160.2	347.5
P	1.39e-32	1.91e-37	5.77e-40	4.32e-30	1.02e-39	4.31e-38	1.64e-51	7.46e-26	3.40e-64
Ll	-2801.6	-2802.5	-2802.4	-2799.1	-2800.4	-2799.7	-2786.3	-2787.6	-2785.4

Table 5: Determinants of the choice for Voluntary Audit by entities on their mission's last year. Exponentiated coefficients; p-values in brackets (* p < 0.1, ** p < 0.05, *** p < 0.01).

Table 5 shows that the size of the entity as per the sales (or the total assets) increases by more than 30% the odds to maintain audit after the renewal date. The closeness to the new thresholds is even more important as it increases by more than 200% the odds to renew audit missions. Tangibility is also positively associated to audit renewal, whereas the age has a negative impact. Hence opacity seems not to be a driver as audit missions are renewed by larger and more tangible entities. In terms of agency issues, the legal form and group belonging influence the choice for audit as independent entities and llc-type entities are less likely to renew their audit mission. The performance of the firm also plays a role in this decision as three variables show that financially distressed entities are more likely to renew audit missions: poor performing entities, those with negative net results, those with negative equity. Finally, the positive opinion on the mission's last year increases by more than 60% the odds to renew the mission. We computed a robustness check by testing these drivers based on the last but one year situation. The models confirm the role of the entity's size, tangibility, and low performance. Independent entities are also more likely to renew their auditors.

We then analyze the choice for short audits. The results (in **Table 6**) show that no clear driver appears for this specific mission's format.

Short Audit Next year	(1)	(2)	(3)	(4)	(5)	(6)
log(Sales)	1.134	1.155	1.139			
	[0.436]	*[0.310]*	*[0.445]*			
Threshold Completion in %				0.646	0.679	0.655
				[0.427]	*[0.374]*	*[0.454]*
Tangible / Total Assets	0.516*	0.521*	0.550	0.507*	0.515	0.544
	[0.059]	*[0.070]*	*[0.102]*	*[0.054]*	*[0.127]*	*[0.118]*
Entity's Age	1.005	1.005	1.005	1.006	1.006	1.005
	[0.254]	*[0.205]*	*[0.348]*	*[0.210]*	*[0.233]*	*[0.290]*
Legal Form (llc)	1.172	1.229	1.228	1.243	1.298	1.302
	[0.664]	*[0.437]*	*[0.500]*	*[0.516]*	*[0.330]*	*[0.435]*
Independent entity	0.855	0.851	0.866	0.848	0.843	0.858
	[0.437]	*[0.479]*	*[0.530]*	*[0.552]*	*[0.470]*	*[0.461]*
Financial Debt / Total Assets	1.118	1.051	1.109	1.134	1.045	1.101
	[0.607]	*[0.763]*	*[0.599]*	*[0.550]*	*[0.820]*	*[0.681]*
Turnover growth	1.018			1.018		
	[0.931]			*[0.870]*		
Return on Assets	1.363			1.522		
	[0.633]			*[0.509]*		
Negative Net Result		0.986			0.944	
		[0.937]			*[0.762]*	
Negative Equity			0.619			0.601
			[0.173]			*[0.158]*
Positive Audit Opinion	1.518	1.553	1.491	1.506	1.545	1.484
	[0.419]	*[0.478]*	*[0.518]*	*[0.509]*	*[0.424]*	*[0.497]*
Auditor's Seniority	0.997	0.998	0.997	0.997	0.998	0.998
	[0.879]	*[0.897]*	*[0.887]*	*[0.894]*	*[0.916]*	*[0.901]*
Audit Volume (in Hours)	0.995**	0.995**	0.995**	0.996**	0.996**	0.996**

	[0.017]	*[0.016]*	*[0.038]*	*[0.027]*	*[0.017]*	*[0.036]*
Constant	0.0712*	0.0620*	0.0796	0.255	0.251*	0.295
	[0.070]	*[0.053]*	*[0.120]*	*[0.129]*	*[0.065]*	*[0.152]*
Fixed Effects	Year Industry	Year Industry	Year Industry	Year Industry	Year Industry	Year Industry
Observations	2512	2512	2512	2512	2512	2512
Pseudo R2	0.0518	0.0495	0.0512	0.0518	0.0492	0.0512
chi2	42.52	88.12	68.67	66.60	85.87	120.3
P	0.000565	5.54e-12	1.70e-08	8.24e-08	1.43e-11	4.89e-18
Ll	-650.1	-651.7	-650.5	-650.1	-651.9	-650.5

Table 6: Determinants of the choice for Short Audit Missions by entities on their mission's last year. Exponentiated coefficients; p-values in brackets (* p < 0.1, ** p < 0.05, *** p < 0.01).

These elements confirm the role of agency issues with shareholders, not with debtors. They confirm that financial distress motivates entities to have their accounts audited externally. They suggest a form of institutionalism as the closer to new thresholds the more entities maintain audits, either by imitation of larger peers or by anticipation of the future mandate. However, signs of opportunism appear with the role of positive opinions on the last audit report, as in Niemi et al (2012). More, tangibility acts positively in the renewal choice, whereas tangible assets may simplify the audit mission compared to intangible assets or inventories.

We then compare these audited entities to other entities below the new thresholds and over the old ones that have *not* submitted their financial accounts to auditors. A sample of these is found in Orbis. We focused on unlisted entities and determined the size through the turnover and total assets, as the number of employees was frequently missing. We then gather financial information over the 2019-2022 period. The final sample with no missing data is made of 116,193 observations. **Table 7** shows the number of observations by year.

	2019	2020	2021	2022	Total
Not Audited	8,556	10,376	10,824	10,799	40,555
Audited	22,841	21,964	17,496	13,337	75,638
Total	31,397	32,340	28,320	24,136	116,193
Observations	116,193				

Table 7: number of entities by year, whether they are audited or not.

The comparison of both samples reveals some differences shown on **Table 8**. On average, audited entities have less turnover and are more intensive in tangible assets. They have no different return on sales, return on assets or growth rate, though they are more often in financial

distress. Audited entities seem to be on average more often included in a group as a subsidiary or holding, when entities that do not opt for audit appear to be single more often.

	Not Audited	Audited	Diff.
Threshold Completion in %	0.83	0.81	0.03***
log(Total Assets)	8.58	8.52	0.06***
log(Sales)	8.15	8.13	0.02***
Tangible Assets/Total Assets	0.18	0.20	-0.02***
Entity's Age	23.86	23.80	0.06
Legal Form	2.25	2.06	0.19***
Independent entity	0.23	0.19	0.04***
Financial Debt / Total Assets	0.17	0.16	0.02***
log(Financial Debt)	5.79	5.49	0.31***
Turnover growth	8.90	37.42	-28.52
Result / Turnover	0.12	-0.05	0.17
Return on Assets	0.08	0.03	0.05
Result is a Loss	0.18	0.23	-0.05***
Negative Equity	0.07	0.10	-0.02***
Observations	116193		

Table 8: Descriptive statistics on audited versus not-audited entities: average values per subsample.

Table 8 shows that on average, not audited entities tend to be larger, less tangible, with more leverage. They are more often independent from a group. Their performance is not significantly different on average, yet audited firms are more often in financial distress.

We finally perform logit models to identify possible explanations of these events. In the following models we explore the determinants to start audit missions wile below the thresholds. The dependent variable is equal to 1 if the entity is on its mission's first year in year j, 0 otherwise. We take lag values for independent variables related to the size and financial position. We add the situation of the entity as independent or group member (head or subsidiary). We also take the legal form and year fixed effects. The models confirm that the size is positively associated to the audit option, whereas tangibility is positively associated to audit. It also confirms that being a single entity is negatively associated to the audit option, as well as being a limited liability company. The financial performance is not significant whereas proxies of financial distress have a positive influence on the audit option.

New Audit Mission	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Audited Y/N	2.242***	2.239***	2.238***	2.210***	2.203***	2.206***	2.248***	2.242***	2.245***
	[0.000]	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*
log(Total Assets)	1.110***	1.110***	1.111***						
	[0.000]	*[0.000]*	*[0.000]*						
log(Sales)				1.110***	1.118***	1.113***			
				[0.000]	*[0.000]*	*[0.000]*			
Threshold Completion in %							1.926***	1.950***	1.941***
							[0.000]	*[0.000]*	*[0.000]*
Tangible Assets/Total Assets	1.075	1.069	1.058	1.224***	1.207***	1.206***	1.071	1.054	1.052
	[0.117]	*[0.153]*	*[0.215]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.111]*	*[0.276]*	*[0.307]*
Entity's Age	0.998***	0.998***	0.998***	0.997***	0.997***	0.997***	0.997***	0.997***	0.997***
	[0.005]	*[0.001]*	*[0.004]*	*[0.000]*	*[0.000]*	*[0.001]*	*[0.002]*	*[0.001]*	*[0.001]*
Legal Form (LLC)	0.709***	0.710***	0.709***	0.708***	0.708***	0.707***	0.677***	0.677***	0.676***
	[0.000]	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*
Independent entity	0.799***	0.799***	0.798***	0.794***	0.793***	0.793***	0.793***	0.792***	0.792***
	[0.000]	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*
Turnover growth	1.000			1.000			1.000		
	[0.970]			*[0.924]*			*[0.974]*		
Return on Assets	0.998			0.991			0.998		
	[0.892]			*[0.607]*			*[0.895]*		
Net Result is Loss		1.031			1.077**			1.069**	
		[0.340]			*[0.031]*			*[0.014]*	
Negative Equity			1.083**			1.089*			1.089**
			[0.018]			*[0.051]*			*[0.045]*
Constant	0.023***	0.023***	0.023***	0.024***	0.022***	0.023***	0.034***	0.033***	0.033***
	[0.000]	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*
Observations	92057	92057	92057	91715	91715	91715	92057	92057	92057
Pseudo r2	0.021	0.021	0.021	0.020	0.021	0.020	0.022	0.022	0.022
chi2	978.572	1452.819	1081.495	1504.960	880.606	1080.515	1126.084	1107.850	977.602
P	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 9: Determinants of the choice to start a new audit mission. Exponentiated coefficients; *p*-values in brackets

5. Conclusion

This study explores the determinants of the demand for voluntary audit in France following the PACTE law that raised the thresholds and relieved more than 150 000 entities from mandated audit. We extracted data from activity declarations completed by auditors between 2019 and 2022.

Our results suggest that audit may not act as a signaling tool for opaque entities. More, auditing appears to be chosen by larger entities that are closer to the new thresholds. This could be interpreted by mimetic behaviors.

Agency issues with shareholders may motivate voluntary audit, as llc-type entities are less likely to keep audit, contrary to group members. We also observe that financial performance is not a driver to auditing, apart from cases of financial distress that are positively associated to auditing.

Our results generally confirm past literature on this new setting. However, we also observe signs of opportunism. First, no clear driver appears to demand short audit missions. Second, positive audit opinions are associated to audit renewals. Third, more tangible entities tend to maintain audit, whereas the situation is probably easier to audit than assets with intangibles. Probably a longer time frame should be used to understand the situation better.

Our study aimed at better understand the individual motivation of companies for accountability. The multitude of frauds and financial scandals demonstrated the need to strengthen audit practices and accountability. However, accountability is a multi-layered concept including a variety of components as participants' behavior (Merchant & Otley, 2006; Peecher et al., 2013); individuals' expectation of being held to account (Hall et al., 2017; Hall et al., 2006; Hochwarter et al., 2007; Lerner & Tetlock, 1999), the need to fulfill certain role expectations and demands. By analyzing the raise in size thresholds for mandatory audit in France in 2019. Our results shed light on dimensions of accountability that endure beyond evolving legal frameworks. Our work may also question the way law is structured around audit mandates: the need for audit is settled based on the size whereas it could be defined based on the entity's complexity – as proxied by the legal form and group belonging.

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How Simultaneous and Non-Simultaneous Auditor Changes Affect Corporate Group Audits.

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Abstract

This paper studies the impact of audit firm changes by the parent and subsidiaries in corporate groups. Specifically, we differentiate between simultaneous auditor changes (the auditor of the parent company and the auditor of the subsidiary are changed simultaneously) and non-simultaneous auditor changes (the auditor of the parent company is changed while the auditor of the subsidiary is retained, or vice versa). We posit that non-simultaneous auditor changes allow the preservation of client-specific expertise in the audit of the corporate group. In line with this argument, we find that while simultaneous auditor changes are negatively associated with audit quality and positively associated with audit reporting lags, they are not significantly associated with non-simultaneous auditor changes. Moreover, we show some evidence that non-simultaneous auditor changes increase audit quality, suggesting that non-simultaneous auditor changes both benefit from preserved client-specific expertise and a 'fresh view.' We also show that auditor changes in groups are associated with lower audit fees, which is indicative of fee discounting by incoming auditors. Our findings help corporate groups mitigate negative consequences of losses in client-specific expertise due to auditor changes.

Keywords: *Corporate group audits, audit firm rotation, EU audit reform, knowledge transfer.*

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1. Introduction

Auditor changes are costly (Blouin et al., 2007; Guo et al., 2024). One particular challenge associated with an auditor change is that the client-specific expertise accumulated by the departing auditor over the duration of their tenure is lost. Rebuilding client-specific expertise by the incoming auditor can take several years and requires a significant investment from both the client firm and the incoming auditor (Bell et al., 2015; Blouin et al., 2007; Gul et al., 2009; Myers et al., 2003). In the initial years of the new audit engagement, therefore, auditor changes often adversely affect audit quality (Bell et al., 2015; Gul et al., 2009; Myers et al., 2003). In spite of potentially positive outcomes of auditor changes, such as increased independence and a 'fresh view' (Bamber & Iyer, 2007; Causholli, 2016; Laurion et al., 2017) for which there is also empirical evidence (Lennox et al., 2014; Singer & Zhang, 2018), the short-term negative effects may discourage firms from changing their auditors. This paper studies whether short-term negative effects of auditor changes in corporate groups can be mitigated by employing a non-simultaneous auditor change strategy.

The auditor change literature largely studies auditor changes of listed companies. An implicit assumption in these studies is that the auditor of the listed company is the sole producer of the audit of the consolidated financial statements. In practice, however, a substantial proportion of the audits of listed companies are corporate group audits (Burke et al., 2020; Carson et al., 2022; Docimo et al., 2021). In corporate groups, the auditor of the parent company (*principal auditor*) cooperates with auditors at the subsidiary level (*subsidiary auditors*) in order to produce an audit opinion on the consolidated financial statements (Sunderland & Trompeter, 2017). In this context, existing research on auditor changes of listed companies de facto studies changing the principal auditor while ignoring the subsidiary auditors. Having multiple audit firms involved in the production of the consolidated financial statements, however, suggests that the consequences of an auditor change within the group may depend on the auditor change strategy of the corporate group. Specifically, we differentiate

between simultaneous auditor changes and non-simultaneous auditor changes (i.e., where the auditor is changed at the principal level but not at the subsidiary level, or vice versa).

When changing auditors, the corporate group may change their auditors throughout the corporate group, or change the auditor at certain component companies of the group while retaining the incumbent auditor for other component companies of the group. As the principal and subsidiary auditors cooperate for the audit of the consolidated financial statements, the decision to change auditors simultaneously or not may have important implications for the transfer of client-specific knowledge during the group audit (Chang et al., 2023). When groups change their auditors simultaneously, client-specific knowledge is lost throughout the group, and incoming auditors need to redevelop this expertise. If the group, however, retains the incumbent auditor for one component company while changing the auditor for another component company (i.e., a non-simultaneous auditor change), the incoming auditor may be able to benefit from the client-specific knowledge of the incumbent auditor, smoothing the transition of the auditor change. Negative consequences of auditor changes, however, may remain and even be exacerbated due to considerable coordination and communication challenges associated with group audits (Barrett et al., 2005; Downey & Bedard, 2019; Downey & Westermann, 2021; Hanes, 2013; Sunderland & Trompeter, 2017). After an auditor change, working relationships need to be re-established regardless of which auditor is changed. These difficulties may complicate the cooperation between principal and subsidiary auditors, particularly in the early stage of a new engagement. Whether and how different auditor change strategies in corporate groups affect audit outcomes therefore remains an empirical question.

We study audit firm rotations within groups in the European setting of public-interest entities (PIEs). This is an interesting setting to study corporate groups, as public-interest entities (PIEs)[1] in Europe are mandated to appoint a statutory auditor. This applies both to PIE parents and to PIE

[1] Public-interest entities (PIEs) are defined by Directive 2006/56/EU and subsequently by Directive 2014/56/EU and generally include entities whose transferable securities are admitted to trading on a regulated market of any member state, credit institutions and insurance undertakings. Member states are also allowed to designate undertakings as PIEs for their public relevance due to the nature of their business, size, or number of employees.

subsidiaries. The audit of PIEs is tightly regulated in the EU (Directive 2006/43/EC, Directive 2014/56/EU, Regulation 537/2014). When the audit of the subsidiary is non-statutory, the principal auditor engages a local component auditor and instructs this auditor to execute certain audit tasks required for the audit of the consolidated financial statements. When the subsidiary audit is statutory, rather than merely executing audit work requested by the principal auditor, the statutory subsidiary auditor has its own statutory subsidiary audit to complete. This increases the potential for the development and transfer of firm-specific knowledge of the statutory subsidiary auditor. In the case of PIE audits, this potential is amplified due to the strict legislation on PIE-audits. Therefore, as the strict regulation and expanded scope of PIE audits require intensive cooperation between the principal auditor and the statutory subsidiary auditor, costs and benefits of knowledge sharing in relation to auditor changes are likely particularly salient in this setting. An additional advantage of this setting is that in 2016, mandatory audit firm rotation (MAFR) was introduced for PIEs (Regulation 537/2014). As PIEs are individually subject to one of 13 jurisdiction-specific rotation regimes ranging from 5 to 24 years, the coordination of a harmonized audit strategy throughout the group is difficult. Therefore, the introduction of MAFR has likely caused corporate groups to change their auditor more often in absolute terms and more often non-simultaneously. For these reasons, we use this setting to study the consequences of auditor change strategies in the context of corporate groups.

In this study, we first investigate how simultaneous versus non-simultaneous auditor changes affect audit quality by examining financial restatements. If learning benefits exist between the incumbent and incoming auditors, we expect the probability of a restatement to be lower for years where there is a non-simultaneous auditor change compared to years where there is a simultaneous auditor change. Second, we test whether simultaneous versus non-simultaneous rotations are associated with group audit fees. New audit engagements are often associated with an audit fee discount attributed to lowballing (DeAngelo, 1981). In this practice, incoming auditors charge a low fee in the initial years of a new engagement to attract clients in order to reap the benefits from audit fees earned in the remainder of the audit engagement. Finally, we examine whether simultaneous and non-

simultaneous auditor changes are associated with variance in coordination and communication challenges by examining the audit lag (i.e., how long it takes for the principal auditor to sign the audit opinion on the consolidated financial statements). If auditor changes within groups increase the complexity in the coordination between principal and component auditors, we may observe an increase in audit lag.

We test these hypotheses on a sample of 321 listed groups from 2009-2022 that have at least one PIE subsidiary in an EEA country, resulting in 1.490 group-years. Our findings demonstrate a positive association between simultaneous auditor changes and the likelihood of financial restatements, in line with group audit quality deteriorating after a simultaneous auditor change due to the loss of client-specific knowledge. For non-simultaneous auditor changes, however, we observe no or a negative association with financial restatements. This suggests that knowledge spillovers between the incumbent and incoming auditor in non-simultaneous auditor changes may attenuate negative consequences often associated with auditor changes. Further, the negative association may imply that a non-simultaneous auditor change strategy benefits both from retained client-specific knowledge from the incumbent auditor and a 'fresh view' from the incoming auditor. Auditor changes are furthermore associated with lowballing for all auditor change strategies. The association is most significant for simultaneous rotations. A change in subsidiary auditor is also associated with an audit fee discount, but only if the incoming auditor is a member of the same audit firm network as the principal auditor. This means either that the incumbent auditor offers a fee discount at the group level to expand its network's mandate throughout the group, or that cooperating with a network auditor leads to efficiency gains. A change of principal auditor where the subsidiary auditor is retained is also weakly associated with audit fee discounts. Finally, we find that simultaneous auditor changes are associated with increased audit lags, while non-simultaneous auditor changes are not significantly associated with audit lags. This suggests that increased coordination and communication challenges in the early engagement years of corporate group audits may be mitigated by non-simultaneous auditor changes. Taken together, our findings suggest that while auditor changes are negatively associated

with audit outcomes in corporate group audits, knowledge transfer between incumbent and incoming auditors during non-simultaneous auditor changes mitigates the negative consequences that are commonly associated with auditor changes and possibly even increases audit quality.

In a supplemental analysis, we examine whether the audit quality effects are more pronounced in a cross-border context. While it remains unclear whether negative audit quality effects of simultaneous auditor changes are more pronounced in domestic or international relations between parent and subsidiaries, the positive audit quality effect of non-simultaneous auditor changes where only the subsidiary auditor changes are more pronounced for international relations between the parent and subsidiary. A possible explanation for this may be the larger distance between the principal and subsidiary auditor which arguably increases the independence of the subsidiary auditor vis-à-vis the principal auditor, strengthening 'fresh-view' benefits.

Our contribution is threefold. First, we contribute to the literature on the audit of corporate groups, examining how various auditor change strategies may affect audit outcomes for corporate groups. The audit of corporate groups requires substantial coordinative and communicative effort between various auditors (Barrett et al., 2005; Downey & Bedard, 2019; Downey & Westermann, 2021; Hanes, 2013; Sunderland & Trompeter, 2017) and is associated with a substantial number of audit deficiencies (IFIAR, 2021). Non-simultaneous audit changes in corporate groups may improve knowledge transfer from incumbent to incoming auditors, and mitigate decreases in audit quality due to the loss of client-specific knowledge in the initial years of an audit engagement. Second, we extend the existing auditor change literature, which largely studies principal auditor changes in listed companies, by incorporating the interaction between principal and subsidiary auditors. A relevant exception in this regard is a working paper by Cantù, Olante, Pettinicchio, and Scimeca (2022), examining the spillover impact of MAFR on private subsidiary companies. Several factors distinguish our study from theirs, the most important one being their focus on the impact of MAFR on the subsidiaries of listed companies, as compared to our focus on the consolidated level. Furthermore,

while they use Italy as research setting (where MAFR was introduced in 1975), we use the EEA as research setting. This is important as MAFR does not apply to the subsidiaries in their study. As such, their aim is to capture spillovers from MAFR for listed PIEs companies on their subsidiary companies. In our setting, PIE-audit legislation does apply to the PIE-subsidiaries included in our sample. The broader literature mostly finds that longer auditor tenure is not negatively, and possibly even positively associated with audit quality (Bell et al., 2015; Bratten et al., 2019; Carcello & Nagy, 2004; Chen et al., 2008; Geiger & Raghunandan, 2002; Ghosh & Moon, 2005; Gul et al., 2009; Myers et al., 2003; Stanley & DeZoort, 2007; Van Johnson et al., 2002). Unclear, however, has remained why short tenure lowers audit quality (DeFond & Zhang, 2014). Our findings suggest that client-specific knowledge may be transferred from a retained auditor to an incoming auditor, which points toward a lack of client-specific knowledge in the initial year of the audit engagement. The potential for the transfer of knowledge between an outgoing auditor and an incoming auditor reaches beyond the setting of corporate groups. Our findings imply the relevance of transition management, which can be achieved by staggered auditor changes in corporate groups and dual audits, partner shadowing in the case of partner rotation (Gipper et al., 2021), or the quality of the departing auditor's working documents. Third, we provide timely initial evidence to policymakers on the potential consequences of the introduction of MAFR in the European Union. The patchwork implementation of MAFR has increased the occurrence of auditor changes in corporate groups and has furthermore raised concerns that corporate groups have been disproportionally affected by the consequences of MAFR (Willekens et al., 2019). In line with these concerns, we find evidence suggesting that auditor changes in corporate groups are negatively associated with audit quality and positively associated with communication and coordination efforts in the first year of a group audit when there is a new audit engagement. However, these negative effects may be mitigated by employing a non-simultaneous auditor change strategy that facilitates knowledge transfer between the incoming auditor and the incumbent auditor. This may be particularly beneficial when a corporate group involuntarily has to change its auditor. This is an important finding, as the European Commission expects non-simultaneous rotations, leading to different statutory

auditors auditing companies of the same group, to occur more frequently due to MAFR (European Commission, 2016). Moreover, this study carries practical relevance, informing corporate groups of the consequences of various auditor change strategies.

In the remainder of this study, we first give an overview of related literature on auditor tenure, auditor changes, and corporate group audits in section 2. In section 3, we describe the institutional setting of the study, particularly the introduction of MAFR in the EAA. This is followed by the development of hypotheses in section 4. The sample selection procedure and the methodology are outlined in section 5. Section 6 describes the results of the analyses, and section 7 concludes.

2. Related literature

How auditor changes affect audit outcomes

Over their tenure, an auditor develops client-specific expertise due to increased familiarity with their client's operations and processes, enabling the auditor's to deliver a higher quality audit (Bratten et al., 2019; Callen & Fang, 2017; Carcello & Nagy, 2004; Chen et al., 2008; DeFond & Zhang, 2014; Ghosh & Moon, 2005; Myers et al., 2003; Patterson et al., 2019; Stanley & DeZoort, 2007). When changing the auditor, the client-specific expertise of the departing auditor is lost. The incoming auditor lacks client-specific expertise as this needs to be redeveloped over time (Beck & Wu, 2006; Gul et al., 2009), a process that may take several years (Bell et al., 2015; Causholli, 2016). A consequence of this is that in earlier years of the audit engagement, when the auditor's client-specific knowledge is underdeveloped, the incoming auditors have to rely more heavily on the client firm's estimates and representations (Gul et al., 2009). These arguments suggest that auditor changes negatively affect audit quality in the initial years of the audit engagement.

Furthermore, auditor changes are linked to the application of professional skepticism. As tenure increases, two types of bonding occurs between the client and the auditor: social bonding and economic bonding (Bell et al., 2015). Social bonding results from the auditor becoming more familiar with company management. This may reduce the auditor's skepticism towards potential

misstatements (Patterson et al., 2019). Similarly, economic bonding may reduce the exertion of professional skepticism by the auditor. Audit firms earn audit fees annually for the horizon of the audit engagement. As such, longstanding clients of an audit firm may be viewed as a source of perpetual annuity (Bell et al., 2015; Carcello & Nagy, 2004). This may create economic incentives compromising the auditor's exertion of professional skepticism. In an attempt to safeguard auditor independence, it is often proposed that the auditor's tenure be restricted in order to benefit from a "fresh look" when appointing a new auditor (Carcello & Nagy, 2004; Patterson et al., 2019). In this case, an auditor change is positively associated with audit quality.

Empirical evidence mostly supports the notion auditor changes are negatively associated with short-term audit quality. Initial years of audit engagements are associated with a negative internal assessment of audit quality for SEC registrants (Bell et al., 2015), decreased earnings quality (Cameran et al., 2015; Gul et al., 2009; Van Johnson et al., 2002), increased incurrence of fraudulent reporting (Carcello & Nagy, 2004), and a higher likelihood of issuing a clean audit opinion prior to bankruptcy filing (Geiger & Raghunandan, 2002). Notable exceptions to this are Singer and Zhang (2018), who relate low auditor tenure to more timely discovery of misstatements, and Lennox et al. (2014), who relate Chinese partner switches to an increase in audit adjustments, providing evidence of 'fresh look' benefits. These exceptions illustrate that positive and negative effects of auditor changes on audit quality are not mutually exclusive and are likely context-dependent.

Alongside changes in audit quality, auditor changes have been associated audit report lags and lowballing. Schwartz and Soo (1996) argue that an auditor change increases the audit report lag as the incoming auditor has to familiarize themselves with the client's operations, controls, and previous working papers. Furthermore, the increased risk of litigation with new clients likely motivates auditors to exert more effort in the audit of a new client. Audit report lags may also decrease, however, if the auditor exerts more effort to fulfill the client's perception of the quality of their services. New audit engagements, furthermore, are often associated with audit fee discounts attributed to low-balling

(DeAngelo, 1981). With this practice, incoming auditors charge a low fee in the initial years of the new engagement to attract clients in order to reap the benefits from audit fees for the remainder of the audit engagement. This does not, however, indicate their auditors exert lower effort in earlier years of the audit engagement (Bell et al., 2015).

It is important to note, however, that the studies described in this section examine auditor changes of listed companies and implicitly assume that the auditors of those listed companies are the sole producers of the audit opinion on the consolidated financial statements. In practice, however, a substantial proportion of the audits of listed companies are corporate group audits (Burke et al., 2020; Carson et al., 2022; Docimo et al., 2021). By merely examining the auditor changes at the level of the listed company, these studies do not incorporate the interrelations between all auditors that contribute to the corporate group audits.

Audits of corporate groups

The audit of corporate groups is a complex exercise due to the international dispersion of operational activities. At the group level, a principal auditor is appointed to produce an audit opinion on the consolidated financial statements. In order to audit international operational activities and subsidiaries, the principal auditor cooperates with local subsidiary auditors. Besides saving on travel expenses, these local auditors have more knowledge of local tax and other regulations and are more familiar with local languages and business customs (Sunderland & Trompeter, 2017). These local subsidiary auditors are separate audit firms[2], and as such, substantial communication and coordination efforts are required between the local subsidiary auditors and the principal auditor to successfully complete the audit of the consolidated financial statements (Downey & Bedard, 2019; Downey & Westermann, 2021; Hanes, 2013; Nolder & Riley, 2014; Sunderland & Trompeter, 2017).

[2] Local subsidiary auditors may be audit firms that belong to the same global audit firm network as the principal auditor (Burke et al., 2020; Carson et al., 2022; Croughs et al., 2024; Docimo et al., 2021; Labro et al., 2023). Even though these auditors belong to the same network and share audit methodology and training resources, they are independent legal entities that operate semi-autonomously within their networks (Carson, 2009; Downey & Westermann, 2021).

The cooperation between principal and subsidiary auditors is associated with substantial challenges (Barrett et al., 2005; Downey & Bedard, 2019; Downey & Westermann, 2021; Hanes, 2013; Sunderland & Trompeter, 2017). Geographic distance is necessarily associated with spatial, linguistic, cultural, and temporal differences. Hence, geographic distance between the principal and subsidiary auditor may cause coordination and communication barriers, disturb effective knowledge sharing, complicate efficient work design, and may be impacted by social group identities (Hanes, 2013). Even when the principal and subsidiary auditor are members of the same audit firm network, problems caused by sociocultural, regulatory, and institutional differences may persist (Downey & Westermann, 2021).

The use of local component auditors is a prevalent practice in the audit of corporate groups. In the US, they are included in 30-40% of audits, representing 60% of US market capitalization (Burke et al., 2020; Docimo et al., 2021). Carson et al. (2022) observe that a local auditor is used in approximately half of the Australian group audits, whereas Burke et al. (2020) find this to be the case for over 80% of US group audits. Receiving a median of 24% of the group audit fees and accounting for 17.7% of group audit hours in those respective studies, the contribution of the local subsidiary auditor to the group audit is substantial. Several studies, moreover, show that local subsidiary auditors indeed affect audit quality at the subsidiary level (Docimo et al., 2021) and the group level (Burke et al., 2020; Carson et al., 2022), suggesting the work of local subsidiary auditors is consequential in the audit of the consolidated financial statements.

Notably, there is one working paper investigating auditor changes within corporate groups. Cantu et al. (2022) study the impact of simultaneous versus non-simultaneous auditor changes on audit outcomes of mostly privately owned subsidiary companies in the Italian setting of mandatory audit firm rotation. Specifically, they examine whether mandated auditor changes at the group level lead to spillover auditor changes at the subsidiary level and how this affects audit outcomes at the subsidiary level. They find that simultaneous auditor switches positively affect the earnings quality of

the subsidiaries, which they suggest stems from subsidiaries being smaller and less complex. Furthermore, as the rotations likely result from pressure from the parent company (who themselves are mandated to change its auditor), they suggest that these subsidiaries are less likely to engage in 'opinion shopping.' Additionally, they find that these are associated with lower audit fees paid by the subsidiaries, which they suggest results from either reduced coordination costs between the parent and subsidiary company or strategic negotiation of the principal auditor. Importantly, while Cantu et al. (2022) study the effects of auditor changes on audit outcomes for the subsidiaries of listed companies, we study the influence of subsidiary auditor changes on the audit outcomes of the listed company. Further, while Cantu et al. (2022) study the Italian institutional setting, we study a European (international) setting. The European institutional setting has specific characteristics that affect the audit of corporate groups, particularly in an international setting.

3. Institutional setting

The auditing of public-interest entities (PIEs) is strictly regulated in the European Economic Area (EEA), mandating statutory audits of all public-interest entities (PIEs), irrespective of whether the company is a parent or subsidiary company (Directive 2006/43/EC, Directive 2014/56/EU, Regulation 537/2014). PIEs are entities of significant public relevance due to their size, number of employees, or nature of their business. Croughs et al. (2024) outline important differences between the statutory audit of subsidiaries as compared to the audit of non-PIE subsidiaries. If the principal auditor requires audit work for the consolidated financial statements on a subsidiary not subject to statutory audits, it engages a local component auditor to execute the required audit work at their request. In this case, the component auditor operates at the direction of the principal auditor. As the financial statements of the subsidiary itself are not required to be audited, the component auditor of the subsidiary has no interest in the audit beyond the work required by the principal auditor. If a statutory audit is required for the subsidiary, however, the subsidiary statutory auditor carries the responsibility for the full

subsidiary audit, in addition to group audit-related duties.[3,4] Rather than merely executing audit work requested by the principal auditor, the statutory subsidiary auditor has its own statutory subsidiary audit to complete. Following this, the interests and responsibility of the subsidiary auditor are greater for statutory subsidiary audits than for non-statutory component audits. Therefore, the potential to develop and transfer firm-specific knowledge is likely greater for subsidiary statutory audits. The PIE-status of the audit, moreover, increases its importance to all parties involved: (i) to the parent, as it is more important to the parent that the financial statements of a PIE-subsidiary are appropriately consolidated into their financial own statements, (ii) to the principal auditor, as they need to assure the consolidation and cooperate with the subsidiary statutory auditor, (iii) to the statutory subsidiary auditor, as they are fully responsible for the statutory subsidiary audit, and (iv) the subsidiary company, as their financial statements are individually subject to statutory audit under strict PIE regulation. Therefore, as the strict regulation and expanded scope of PIE audits require intensive cooperation between the principal auditor and the statutory subsidiary auditor, costs and benefits of knowledge sharing in relation to auditor changes are likely particularly salient in this setting.

An additional benefit is that mandatory audit firm rotation (MAFR) for PIEs was introduced in this setting in 2016 (Regulation 537/2014, Article 17). This measure limits the maximum duration of the audit engagement for PIEs to a baseline of 10 years yet allows EU member states to decrease or extend the maximum duration up to a maximum of 14 years. This has resulted in a patchwork of 13 different MAFR regimes ranging from 5 years to 24 years across the 30 EAA countries (Accountancy

[3] As the subsidiary statutory auditor needs to assure the financial statements at the subsidiary level, subsidiary statutory audit requires a full-scope audit of the subsidiary financial statements. For a non-statutory component audit, the scope depends on the audit work required for the assurance of the consolidated financial, and hence may be partial.

[4] Note that it is possible the subsidiary statutory auditor and the component auditor may different audit firms. The principal auditor may leverage the work of the subsidiary statutory auditor for the purpose of the consolidated financial statements, or may engage another component auditor to assist in the audit of the consolidated financial statements. Our data does not allow us observe the component auditor, so we cannot verify our implicit assumption that the subsidiary statutory auditor also acts as component auditor in the CGA. Often, however, the principal auditor leverages the work of the subsidiary statutory auditor (Docimo et al., 2021). The high auditor alignment rate (89%) in Croughs et al. (2024), who use the same research setting, suggests that there is a high level of coordination in appointing principal auditors and subsidiary statutory auditors, suggesting principal auditors are indeed likely to leverage the work of the subsidiary statutory auditors.

Europe, 2022). MAFR also applies to all PIEs individually, regardless of whether they are parent companies or subsidiary companies (European Commission, 2016). Where multiple PIEs are part of the same corporate group, each PIE-component is individually subject to the maximum duration of the audit engagement set by their own respective jurisdictions (European Commission, 2016). This could mean that while the parent company of Group X may be required to change its auditor after 24 years, the subsidiary company may be required to change its auditor after ten years. This patchwork implementation of MAFR has raised concerns about increased complexity in the audit of corporate groups (Willekens et al., 2019), making it more difficult for corporate groups to coordinate a harmonized audit strategy throughout the group. Indeed, the European Commission acknowledges that having different statutory auditors auditing companies of the same group on a more frequent basis is a potential outcome of the MAFR policy (European Commission, 2016). The introduction of MAFR has likely caused corporate groups to change their auditor more often, and moreover, at multiple components in the corporate groups, creating additional variation in our setting that we can exploit. Therefore, we use this setting to study how auditor changes within a corporate group affect audit outcomes that are commonly studied in the context of auditor changes: audit quality, audit fee discounting, and audit delays.

4. Hypothesis Development

The audit of corporate groups is an inherently challenging endeavor in which the principal auditor of the corporate group cooperates with local auditors at the subsidiary level in order to produce an audit opinion on the consolidated financial statements. As multiple auditors are involved in the audit of the corporate group, the group may *simultaneously* change their auditors at both the principal level and the subsidiary level, or *non-simultaneously* change their auditor. In the latter case, the group can change its principal auditor and retain a subsidiary auditor or vice versa. Due to the cooperative nature of the corporate group audit, it is characterized by coordination and communication challenges across spatial distances (Barrett et al., 2005; Downey & Bedard, 2019;

Downey & Westermann, 2021; Hanes, 2013; Sunderland & Trompeter, 2017). Over the tenure of their cooperation, the principal and subsidiary auditors establish a working relationship in the audit of the consolidation financial statement. In a simultaneous audit firm rotation, a new working relationship will need to be established between the incoming principal and subsidiary auditors on the engagement. Also, after a non-simultaneous rotation, a new working relationship will need be established between the incumbent and the incoming auditor. This has led to the concern that coordination and communication between the principal auditor and a subsidiary auditor is disrupted in the event of an audit firm change (Willekens et al., 2019), regardless of whether the change is simultaneous or non-simultaneous. This may negatively affect audit quality at the group level.

Regarding the loss of client-specific expertise, however, it is relevant to make a differentiation between simultaneous and non-simultaneous audit firm rotations. When the group only has one single auditor, client-specific expertise will inevitably be lost upon an auditor change. When there is more than one auditor, however, client-specific may be (partially) preserved in the case of a non-simultaneous rotation, as this creates an overlap between incumbent and incoming auditors working on the same engagement. This notion has been studied outside of the context of group audits. Chang et al. (2023), for instance, study the situation in which partners temporarily audit a company simultaneously during an audit partner change. This practice is consistent with “shadowing” in the period before a mandatory rotation of audit partners. In order to facilitate the learning process of new incoming audit partners, the incoming partner shadows the outgoing partner to familiarize themselves with the client and the audit procedure in place (Gipper et al., 2021). Chang et al. (2023) find that these staggered (or non-simultaneous) audit partner rotations are positively associated with audit quality, concluding overlapping partner experience for succession planning on audits facilitates knowledge continuity. While not specifically studying rotations, Ittonen and Trønnes (2015) find that engaging two partners rather than one benefits audit quality. Importantly, however, these positive effects only apply when partners are co-located in the same audit office. What sets corporate group audits apart from cooperations between audit partners of the same audit firm (Chang et al., 2023) and joint audits

(Ittonen & Trønnes, 2015) is the geographic distance between the principal auditor and the subsidiary auditor. Here, knowledge transfer *across* organizations is required rather than knowledge transfer *within* an organization. Temporal, cultural and control differences between geographically dispersed audit firms may create communication and coordination challenges (Barrett et al., 2005; Downey & Bedard, 2019; Downey & Westermann, 2021; Hanes, 2013), which could complicate the transfer of knowledge between principal and subsidiary auditors. As such, we test the following set of non-directional hypotheses:

H1a: Simultaneous audit firm rotations affect audit quality of the consolidated financial statements in corporate group audits compared to non-rotations.

H1b: Non-simultaneous audit firm rotations affect audit quality of the consolidated financial statements in corporate group audits compared to non-rotations.

Further, we investigate audit fees to determine how auditor changes within corporate groups affect audit costs. In the first year of a new audit engagement, incoming auditors generally spend more effort on the audit in an attempt to provide a high-quality audit service in spite of a lack of client-specific expertise. This increased effort in the first year of the new engagement could be translated into increased audit fees. Contrarily, however, audit firms may engage in low-balling in initial years (DeAngelo, 1981), where they attract new clients by giving fee discounts in initial engagement years with the intention of recuperating these discounts over the horizon of the audit engagement. In line with this, Bell et al. (2015) show that audit effort in terms of hours worked on an audit engagement is higher in first-year audits, even though audit fees are discounted.

Downey and Westermann (2021) provide qualitative insight into rather complex audit fee allocations within corporate group audits. Depending on the structure of the audit (centralized versus decentralized), the principal auditor may negotiate a single group audit fee with the parent company, or each subsidiary auditor negotiate their own portion of the group audit fee with the local subsidiary management. In our PIE setting, where the subsidiary auditor is also a statutory auditor, the subsidiary

may charge a separate fee for the statutory subsidiary audit. Much is still unknown regarding audit fee allocation in such a complex group audit. Moreover, it is unclear how simultaneous versus non-simultaneous rations affect group audit fees in the first engagement year. If rotations are simultaneous, there likely is more coordination between the principal auditor and the subsidiary auditor regarding group audit fees, and lowballing may be most valuable. It is unclear whether this extends to non-simultaneous audit firm rotations. When either the principal of the subsidiary auditors changes, the incumbent auditor may already have an established fee. The incumbent auditor is already on the audit engagement and has no interest in engaging in lowballing. Lowballing incentives are further reduced by the MAFR legislation in our setting, as the maximum audit duration limits the horizon over which the lowballing investment can be recuperated. Following this discussion, we come to the following non-directional hypotheses:

H2a: Simultaneous audit firm rotations are associated with group audit fees compared to non-rotations.

H2b: Non-simultaneous audit firm rotations are associated with group audit fees compared to non-rotations.

It is often suggested that audit fees also capture audit effort (Hay et al., 2006; Simunic, 1980). Particularly during the first year of the audit engagement, though, lowballing may disturb the measurement of audit effort through audit fees (Bell et al., 2015). As an alternative, audit report lags are often associated with auditor effort (Blankley et al., 2014; Knechel et al., 2009; Knechel & Payne, 2001). The underlying notion of this is that an increasing number of hours consumed in an engagement extends the audit report lag. As auditors exert more effort in the initial year of the audit engagement (Bell et al., 2015), auditor changes are associated with increases in the audit report lag (Schwartz & Soo, 1996).

In group audits, a significant part of the audit effort may be allotted to coordinating the audit at the group level. An auditor change may disrupt cooperation and communication between the

principal and subsidiary auditor and hence increase the audit report lag of the consolidated financial statements. As both simultaneous and non-simultaneous audit changes disrupt the status quo of communication between the principal and subsidiary auditor, both of them may be associated with increased audit report lags. A loss in client-specific expertise, requiring additional effort from the auditor in the first engagement year, may further prolong the audit lag. Similar to our argumentation above, if knowledge transfer soothes the coordination issues between the principal and subsidiary auditors in the first engagement year, non-simultaneous auditor changes may not be associated with an increased audit report lag. We test this proposition with the following hypotheses:

H3a: Simultaneous audit firm rotations are associated with audit report lags for the consolidated financial statements, compared to non-rotations.

H3b: Non-simultaneous audit firm rotations are associated with audit report lags for the consolidated financial statements, compared to non-rotations.

5. Data and Method

Sample selection

Panel A of Table 1 outlines the sample selection procedure followed in this study. The unit of observation is a group-year. We start with all companies that have an ISIN number in Analytics Europe and Audit Analytics North America in the timeframe 2009-2022. We start from 2009 due to data availability on the identities of PIEs, allowing us to identify parent-subsidiary relations between PIEs from this year onwards. For these companies, we recreate their corporate tree following Croughs et al. (2024) using Orbis Historical. By matching data from the Audit Analytics Transparency Report database to the corporate trees, we identify the presence of other PIE subsidiaries within those corporate groups.[5] Henceforth, we consider the listed companies from audit analytics the *group companies* and their financial statements the consolidated financial statements, and we consider the

[5] Note that as the parent company is listed, the listed company itself is also a PIE under EU legislation.

identified PIE subsidiaries the *subsidiary companies*. As we perform analyses at the group level, the unit of observation in our study is a group-year. We continue by dropping groups that include multiple listed firms. While these groups are relevant to our research question, having multiple listed firms within a group may create additional complexity in the corporate group, and we want to avoid any results that may be driven by such specific instances.[6] Subsequently, we drop group-years for which we could not determine the presence of at least one PIE subsidiary. As corporate groups with PIE subsidiaries may be inherently more complex than corporate groups without PIE subsidiaries, removing these observations may alleviate some concerns of endogeneity. The resulting 1.034 groups and 4.329 group-years are observations that may be affected by simultaneous and non-simultaneous auditor changes. We successively drop groups with dual auditors and insufficient information to impute auditor changes, as well as groups in the financial services industry. Finally, we drop observations with missing data for control variables, and singleton observations as all our analyses include panel fixed effects. Our final sample consists of 321 individual corporate groups and 1.490 group-years. Panel B of Table 1 shows the headquarter locations of the corporate groups. The headquarters of the groups in our sample are mostly located in Europe; however, a significant number of US-based groups have PIE subsidiaries in Europe.

[INSERT TABLE 1 HERE]

Methodology

H1a and H1b will be tested with a binary logistic regression model with year, country, and industry fixed effects displayed below. The subscripts *i* and *t* denote observation *i* and year *t*,

[6] As research on PIEs is very limited, we provide some raw descriptive information on PIEs to underscore their importance to the European Economy. At the time of collecting the data in January 2024, the Audit Analytics EU Audit Fee database lists 9011 unique companies with an ISIN number (listed companies). As listed companies are by definition PIEs, the number of PIEs is necessarily greater than the number of listed companies. In fact, the number of unique PIEs identified in the EU Transparency Report Database of Audit Analytics is with 46.771 vastly greater than the number of listed companies. Furthermore, the number of listed companies that have another PIE in their corporate group is substantial. After eliminating groups with more than one listed company, 1.281 out of 9.011 (14.22%) listed companies remain that during at least one year between 2009-2022 had at least one other PIE in their corporate group. In the full Audit Analytics EU Audit Fee file, these 1.281 listed companies represent 79.74% of the value of all assets and 68.48% of all revenues in that file.

respectively. Standard errors are clustered at the parent level. The dependent variable in this model is the likelihood that the financial statements of year *t* are subsequently restated (*RESTATED*). We select restatements as they are a relatively direct measure of audit quality with low measurement error (Aobdia, 2019; DeFond & Zhang, 2014; Stanley & DeZoort, 2007). Furthermore, longer auditor tenure has been negatively associated with financial restatements (Stanley & DeZoort, 2007). Due to the loss of observations in the logistic model resulting from collinearity between the binary variable and fixed effects, we additionally test these hypotheses using a linear probability model with panel and year fixed effects and clustered standard errors at the parent level.

$$Prob(RESTATED_{it}) = \beta_0 + \beta_1 PARENT\_ROTATION_{it} + \beta_2 SUBSIDIARY\_ROTATION_{it} + \beta_3 SIMULTANEOUS\_ROTATION_{it} + \sum \beta_k Restatement\ Controls_{it} + Country\ FE + Year\ FE + Industry\ FE + \varepsilon_{it} \qquad (Equation\ 1)$$

The three independent variables of interest each capture an auditor change strategy. The first two variables capture non-simultaneous auditor changes. We differentiate between non-simultaneous auditor changes where the parent auditor is retained and the subsidiary auditor is not, and vice versa, as these may differently affect group-level audit outcomes.[7] Because parents may have multiple subsidiaries, subsidiary rotations are be aggregated into a dummy variable.[8] *PARENT_ROTATION*, then, is an indicator variable equal to 1 when the parent company has changed its auditor in year *t* and no subsidiary has changed its auditor in year *t*, and zero otherwise. *SUBSIDIARY_ROTATION* is an indicator variable equal to 1 when at least one subsidiary has changed its auditor while the parent company has

[7] In the hypothesis development we have not made an explicit conceptual differentiation between these two types of non-simultaneous auditor changes as transfer of client-specific expertise between the retained auditor and incoming auditor may occur regardless of which auditor (parent auditor or subsidiary auditor) is the retained auditor and which is the incoming auditor. Empirically, however, as the parent's auditor has a larger influence on the parent's audit quality, grouping both types of non-simultaneous auditor changes together may cause concern that either type is driving the effect. To mitigate concerns regarding fundamental difference between non-simultaneous auditor changes where only the parent auditor is changed and non-simultaneous auditor changes where only the subsidiary auditor is changed, we make an empirical distinction between the two.

[8] We have chosen to aggregate rotation variables into dummy variables as generally the number of PIE subsidiaries per group-year is small with a median of 1 and an average of 2.24.

retained the incumbent auditor, and zero otherwise. The third variable, *SIMULTANEOUS_ROTATION*, captures simultaneous auditor changes and is an indicator variable equal to 1 when the parent company and at least one other subsidiary both change their auditor in year *t*.[9]

The vector of control variables of the restatement model is based on audit quality literature (Aobdia & Petacchi, 2023; Chan et al., 2012; Choudhary et al., 2022; DeFond & Zhang, 2014). We control for several client characteristics at the group level that may affect audit risk and complexity: firm size (*SIZE*), the leverage (*LEVERAGE*), whether a net loss is reported for the year (*LOSS*), profitability (*ROA*), the one-year growth rate of sales (*SALES_GROWTH*), the one-year growth rate of assets (*ASSET_GROWTH*), whether new debt or equity was issued during the year (*ISSUANCE*), the number of countries in which the group has a subsidiary (*COUNTRIES*), and whether the parent company was involved as an acquirer in a significant merger or acquisition (*MERGER5*). Further, we control for several engagement characteristics: whether the principal auditor is a Big 4 firm (*BIG4*), the length of the audit report lag (*AUDIT_LAG*), and whether the financial statements were restated for any of the three previous financial years (*RESTATED_LAG*).

H2a and H2b will be tested with a linear audit fee model with panel and year fixed effects, and clustered standard errors at the parent level (Equation 2). The dependent variable in this model is *AUDIT_FEES*, defined as the natural logarithm of total audit fees.

$$AUDIT\_FEES_{it} = \beta_0 + \beta_1 PARENT\_ROTATION_{it} + \beta_2 SUBSIDIARY\_ROTATION_{it} + \beta_3 SIMULTANEOUS\_ROTATION_{it} + \sum \beta_k Audit\ Fee\ Controls_{it} + Year\ FE + Parent\ FE + \varepsilon_{it} \quad (Equation\ 2)$$

The vector of control variables of the audit fee model is based on models used in audit fee literature (Bronson et al., 2017; Chan et al., 2012; Choudhary et al., 2022; DeFond & Zhang, 2014; Jha & Chen, 2015; Knechel & Williams, 2023; Zhang, 2018). In addition to *SIZE, LEVERAGE, LOSS, ROA*,

[9] Note that *SIMULTANEOUS_ROTATION* is identical to creating an interaction term between *PARENT_ROTATION* and *SUBSIDIARY_ROTATION*.

COUNTRIES, and *MERGER5,* which were previously defined, we further control for the absolute value of special items scaled by assets (*SPECIAL_ITEMS*) as a client characteristic in the audit fee model. Regarding the engagement characteristics, alongside *BIG4*, we further control for the industry expertise of the principal auditor (*INDUSTRY_EXPERT*), the importance of the parent company as a client to the principal auditor (*CLIENT_IMPORTANCE*), whether the audit takes place during the busy season (*DECEMBER_YE*), whether the parent company received a going-concern opinion (*GCO*), and whether the financial statements are restated (*RESTATED*). As Regulation 537/2014 introduced regulation on non-audit fees, we additionally control for the level of non-audit service fees (*NAS_FEES*) and the change in non-audit service fees (*NAS_FEE_CHANGE*).

H3a and H3b will be tested with a linear audit reporting lag model with panel and year fixed effects, and clustered standard errors at the parent level (Equation 3). The dependent variable in this model is *AUDIT_LAG*, defined as the number of days between the fiscal year-end and the signature date of the audit opinion on the consolidated financial statements.

$$AUDIT\_LAG_{it} = \beta_0 + \beta_1 PARENT\_ROTATION_{it} + \beta_2 SUBSIDIARY\_ROTATION_{it} + \beta_3 SIMULTANEOUS\_ROTATION_{it} + \sum \beta_k Audit\ Lag\ Controls_{it} + Year\ FE + Parent\ FE + \varepsilon_{it} \quad (Equation\ 3)$$

The vector of control variables of the audit lag model is based on models used in audit lag literature (Aobdia & Petacchi, 2023; Chan et al., 2012; Jha & Chen, 2015; Zhang, 2018). The client controls included in this model (*SIZE, LEVERAGE, LOSS, ROA*, *COUNTRIES*, *ISSUANCE*, *SPECIAL_ITEMS,* and *MERGER5*) were all defined earlier. As engagement control variables, a low principal auditor tenure indicator (*TENURE*) and an indicator equal to one if a restatement was filed during the year (*RESTATEMENT_FILED_FY*) were added to the previously defined variables *BIG4, INDUSTRY_EXPERT, DECEMBER_YE*, and *GCO.*

6. Results

Descriptive statistics

Table 2 presents the descriptive statistics of the final sample. In 11.9% of the group-years we observe at least one auditor change. In 3.8% of the group-years both the parent and at least one subsidiary change their auditors simultaneously (*SIMULTANEOUS_ROTATION*), while in 3.2% only the parent changes its auditor (*PARENT_ROTATION*) and in 4.9% only the subsidiary changes its auditor (*SUBSIDIARY_ROTATION*). In 6.5% of group-years there was a restatement for the financial year (*RESTATED*). The mean audit report lag is 67.8 days (*AUDIT_LAG*), and the average audit fee in our sample is approximately 2.4 million USD. The majority of principal auditors was a big 4 auditor (*BIG4*), and are industry experts in the majority of instances (*INDUSTRY_EXPERT*). Due to a large number of auditor changes, the number of observations in which tenure was three years or shorter is relatively high with 30.9% (*TENURE*).

[INSERT TABLE 2 HERE]

In the correlation table (Table 3), we see little correlation between our independent variables and the likelihood of financial restatement (*RESTATED*). Financial years that are subsequently restated are positively correlated with audit fees but negatively with the audit lag, which could suggest opportunistic behavior by the auditor leading to financial restatements. The positive correlation with *RESTATED_LAG* evidences the stickiness of restatements over time. Further, we see group complexity (*RESTATED, LEVERAGE*) and size (*COUNTRIES, SIZE*) are positively correlated with audit fees. *PARENT_ROTATION* and *TENURE* are negatively correlated with audit fees, exhibiting signs of audit fee discounting in early engagement years. Big 4 auditors (*BIG4*) and industry experts (*INDUSTRY_EXPERT*) moreover appear to be able to charge a fee premium (*AUDIT_FEES*) in our setting. Interestingly, group size variables (*SIZE, COUNTRIES*) are negatively associated with audit lags. This suggests that auditors prioritize such large, prestigious groups.

[INSERT TABLE 3 HERE]

Main results

Table 4 displays the results of the restatement analysis, testing H1a and H1b. Model 1 shows the results of the logistic model. The positive coefficient of *SIMULTANEOUS_ROTATION* suggests that auditor changes where both the parent and the subsidiary simultaneously change their auditor are positively associated with the likelihood of a financial restatement. Contrarily, of the non-simultaneous rotation strategies, *PARENT_ROTATION* is not significantly associated, and *SUBSIDIARY_ROTATION* is weakly negatively associated with the likelihood of a financial restatement. The inclusion of industry, year, and country fixed effects in the logistic model (Model 1) leads to a substantial reduction in observations due to collinearity between the fixed effects and *RESTATED*. Therefore, in Model 2 of Table 4, we use a linear probability model with panel and year fixed effects. While this model replicates the positive coefficient of *SIMULTANEOUS_ROTATION,* the *SUBSIDIARY_ROTATION* loses the significant negative association, and *PARENT_ROTATION* gains a significant negative association. Combining the insights of Model 1 and Model 2, there is evidence that simultaneous rotations are detrimental to audit quality in the first year of the auditor's tenure, while non-simultaneous rotations are not or are weakly positively associated with audit quality. This could be explained by the loss of client-specific knowledge in a simultaneous rotation, while this knowledge may be retained and transferred by the incumbent auditor in the case of non-simultaneous rotation. The negative signs of *SUBSIDIARY_ROTATION* and *PARENT_ROTATION* observed in Models 1 and 2, respectively, may furthermore suggest that non-simultaneous rotations may generate a 'fresh perspective' by the new incoming auditor while retaining the client-specific knowledge of one incumbent auditor (at the parent or subsidiary level).

[INSERT TABLE 4 HERE]

Then, we test H2a and H2b with the audit fee model, the results of which are presented in Table 5. In Model 1, we observe that all types of auditor changes are negatively associated with group audit fees, which is suggestive of audit fee discounting. While the coefficient is largest in magnitude

for *PARENT_ROTATION*, the negative association is statistically most significant for *SIMULTANEOUS_ROTATION*. This is intuitively apparent, as new auditors are appointed at both the parent and the subsidiary levels, and they may both engage in audit fee discounting. Interestingly, we also observe an audit fee discount at the parent level in the case of an auditor change at the subsidiary level (*SUBSIDIARY_ROTATION*). This could be driven by the appointment of subsidiary auditors who are members of the same global audit firm network as the principal auditor. Croughs et al. (2024) refer to this practice as *auditor alignment*. When, for instance, the principal auditor at the parent level is a member of audit firm network X, the principal auditor may be more inclined to give a fee discount if the group appoints another audit firm from audit firm network X at the subsidiary level. The principal auditor partially does this due to directives in place at the major global audit firm networks, referring audit work at the subsidiary level to network-affiliated audit firms (Carson et al., 2022; Downey & Westermann, 2021). Alternatively, the shared audit methodology in place within these audit firm networks may lead to increased efficiency in the corporate group audit and, hence, reduce audit costs. We test this proposition by splitting up *SUBSIDIARY_ROTATION* into *ALIGN* and *NONALIGN*. *ALIGN* refers to an audit change towards more alignment between the principal and subsidiary auditors within the corporate group after the auditor change, whereas *NONALIGN* refers to an auditor change that results in less alignment between the principal auditor and subsidiary auditors within the corporate group. The results of Model 2 show that audit fee discounts at the group in the case of subsidiary auditor changes are indeed mostly driven by subsidiary auditor changes that result in more auditor alignment between the principal auditor and the component auditor.

[INSERT TABLE 5 HERE]

In Table 6, we display the results of the audit lag regression. Model 1 shows the results for the non-transformed *AUDIT_LAG* variable, while Model 2 uses the natural logarithm of *AUDIT_LAG* as the dependent variable for robustness. None of our variables of interest, nor any of the other independent variables in our models appear to be significantly associated with the audit report lag. This is

remarkable, given the strong correlations with various independent variables and AUDIT_LAG in Table 3. The high R-squared of the models (around 0.90) suggests that a substantial amount of variation is captured by the panel fixed effects. This implies that there is a substantial amount of consistency in the timing of financial reporting for a given firm, explaining a substantial part of the variation. This is in line with the importance of consistency in reporting accounting information towards investors for companies (Dichev et al., 2013; Peterson et al., 2015). Therefore, in Models 3 and 4, we slightly ease the fixed effects structure of our audit lag model by replacing the panel fixed effects with industry and country fixed effects. The drop in the R-squared of models 3 and 4 indeed suggests that panel fixed effects accounted for a substantial part of the variation in *AUDIT_LAG*. By dropping these, several control variables that were strongly correlated with *AUDIT_LAG* in the correlation Table 3 became statistically significant. Importantly, also *SIMULTANEOUS_ROTATION* is now statistically and positively associated with *AUDIT_LAG*, while the non-simultaneous audit changes *PARENT_ROTATION* and *SUBSIDIARY_ROTATION* remain insignificantly associated with *AUDIT_LAG*. This suggests that while auditor changes increase the audit report lag, non-simultaneous auditor changes may smoothen the transition between departing and incoming auditors.

[INSERT TABLE 6 HERE]

Supplemental analysis

Corporate groups generally cross international borders, but parent companies may also have domestic subsidiaries. In this supplemental analysis, we differentiate between foreign and domestic relationships between parents and subsidiaries within the corporate group and determine whether these differences affect audit quality. In Table 7, we split up *SUBSIDIARY_ROTATION* and *SIMULTANEOUS_ROTATION* to reflect international and domestic relations between the parent and the subsidiary. Models 1 and 3 display the main results of Table 4, while Models 2 and 4 show the split between foreign and domestic rotations for *SUBSIDIARY_ROTATION* and *SIMULTANEOUS_ROTATION*. Simultaneous rotations are positively associated with financial restatements both for domestic

(*SIMULTANEOUS_DOMESTIC*) and international (*SIMULTANEOUS_INTERNATIONAL*) relations between parent and subsidiary companies. As the significance varies depending on the model (logistic model in Model 2, LPM in Model 4), it is unclear whether this effect is driven by either domestic or international relations. Regarding instances in which only the subsidiary auditor is changed, the negative association with the likelihood of financial restatements appears to be driven by international relationships (*SUBSIDIARY_INTERNATIONAL*, Model 2). To the extent this increase in audit quality may result from a 'fresh look', this could be explained by the larger distance between the principal and subsidiary auditor, which arguably increases the independence of the subsidiary auditor vis-à-vis the principal auditor. However, due to the weak significance of the *SUBSIDIARY_ROTATION* and *SUBSIDIARY_INTERNATIONAL,* we should be cautious in drawing conclusions from these models.

[INSERT TABLE 7 HERE]

Robustness

A primary concern of research on auditor changes is that auditor tenure is endogenous to audit quality, meaning that high-quality auditors may terminate engagements in which there is a high propensity for lower audit quality (Ghosh & Moon, 2005; Zhou et al., 2023). While in this study we focus on the effects of short tenure rather than long tenure, our main analysis includes firms that have never changed auditors in our sample as a control group. If these companies have a higher endogenous propensity to have higher quality financial statements, our finding of increased propensity to restate their financial statements may be because rotating companies may have a higher endogenous propensity to be restated. In our main analyses, we employ panel fixed effects with the objective of reducing the impact of unobserved firm characteristics that may correlate with an endogenous propensity to be restated. In an attempt to further reduce this concern, we remove all groups that did not have an auditor change during our sampling range from our sample, creating a sample of rotating companies that should have a more homogenous propensity to produce low-quality financial statements as compared to our main sample. Table 8 displays the results of this robustness test and

shows that our results are more pronounced when focusing only on companies that have changed their auditor at least once in the time frame. Specifically, while *SIMULTANEOUS_ROTATION* is positively associated with *RESTATED*, both non-simultaneous auditor change strategies are negatively associated with *RESTATED* in Model 1. Even though the statistical significance of *PARENT_ROTATION* is weakened and disappears for *SUBSIDIARY_ROTATION*, Table 8 increases our confidence that simultaneous auditor changes are negatively associated with audit quality, but non-simultaneous auditor changes may reduce the negative impact of auditor changes.

[INSERT TABLE 8 HERE]

7. Conclusion

Theory suggests auditor changes may lead to increased auditor independence and the loss of client-specific knowledge (Laurion et al., 2017; Reid & Carcello, 2017). Particularly in initial engagement years, empirical research primarily documents decreases in audit quality after auditor changes (Bell et al., 2015; Cameran et al., 2015; Carcello & Nagy, 2004; Geiger & Raghunandan, 2002; Gul et al., 2009; Van Johnson et al., 2002). In this study, we examine how simultaneous (i.e., when the principal auditor and a subsidiary auditor are simultaneously changed) versus non-simultaneous (i.e., when either the principal or subsidiary auditor is changed, while the other is retained) auditor change strategies in corporate groups affect group audit outcomes. Particularly in corporate groups, auditor changes may further complicate the already complex working relationships between principal and subsidiary auditors (Downey & Bedard, 2019; Downey & Westermann, 2021; Hanes, 2013). By not changing auditors simultaneously, however, incoming auditors may benefit from client-specific knowledge of incumbent auditors to smoothen the transition between the departing and incoming auditors.

We find that simultaneous auditor changes are associated with an increased likelihood of financial restatements and increased audit reporting lags. Non-simultaneous auditor changes are not significantly associated with audit lags and are weakly negatively associated with financial restatements. This suggests that negative consequences of auditor changes within corporate groups

may be mitigated by employing a non-simultaneous auditor change strategy that enables knowledge transfer between incumbent and incoming auditors. While we find evidence of increased complexity and decreased audit quality in the first year of new audit engagements in corporate groups, as suggested by Willekens et al. (2019), it appears that these negative effects may mitigated by groups employing a non-simultaneous auditor change strategy. Moreover, we even document positive audit quality effects of non-simultaneous auditor rotations. This suggests that non-simultaneous auditor changes retain client-specific expertise on the engagement from the incumbent auditor while benefiting from a 'fresh view' from the incoming auditor. Furthermore, our audit fee analyses show evidence of audit fee discounting in the first year of new engagements. While all types of auditor change strategies are associated with audit fee discounts, the association with simultaneous auditor changes is statistically most significant.

Interestingly, our findings differ from those of Cantù et al. (2022). While they find a positive association between simultaneous auditor changes and audit quality, we find a negative association. This may be due to several differentiating factors of our study compared to theirs. First, while we look at the audit quality of the listed parent company, they examine the audit quality of the subsidiaries. As subsidiary financial statements are consolidated into the financial statements of the parent company, the coordination and communication challenges between parent companies and subsidiaries may more negatively affect the consolidated financial statements than the subsidiary's financial statements. These challenges may be further exacerbated by our cross-border relationships in our international setting, as compared to their Italian domestic setting. Finally, Cantu et al. (2022) argue that the subsidiaries in their setting are typically smaller and less complex. As the subsidiaries in our sample are PIEs, their audit is strictly regulated and, hence, likely more complex. Therefore, the complexity in the cooperation between the parent and subsidiary in the group audit is likely higher in our setting compared to the setting of Cantù et al. (2022).

This study is subject to several limitations. First, while MAFR was introduced in our setting and timeframe, we are unable to differentiate between mandatory and voluntary audit firm changes. As audit fee data of European listed companies and data on PIEs goes back only until 2009, we cannot calculate the tenure of auditors appointed before 2009. Second, despite our efforts to mitigate concerns of endogeneity by including panel fixed effects in our research design and excluding non-changing companies in a robustness test, we cannot fully eliminate the possibility that the groups that change auditors simultaneously are somehow different to groups that do not change their auditors simultaneously, and hence may have a different endogenous propensity to have higher or lower audit quality. Finally, while we observe the identity of the statutory subsidiary auditor and statutory principal auditors, we do observe the identity of the component auditors who assist in the audit of the consolidated financial statements. While we know that the subsidiary statutory auditor often acts as a component auditor in the corporate group audit (Docimo et al., 2021), we cannot confirm that the observed statutory subsidiary auditors, in fact, contribute to the audit of the consolidated financial statements. This, however, would bias against finding any results. The specificity of the research setting may furthermore inhibit generalizability towards other research settings, such as the group audit setting where a subsidiary is not subject to a statutory audit requirement but is required to be (partially) audited for the consolidated financial statements. While staggering auditor changes may facilitate knowledge transfer as well in this case, it is not evident to retain the component auditor when the principal auditor departs because the component auditor is often engaged by the principal auditor. Regardless of this, the amount of PIEs in the EAA far exceeds the number of listed companies, and a substantial part of European listed companies have multiple PIEs within their group structure, making PIEs a subset of companies of particular importance. More broadly, however, we contribute to insights on transition and knowledge management. Given the relevance of client-specific knowledge, this is critical in an audit setting, particularly relating to auditor changes. Adding to insights on knowledge sharing between audit partners (Chang et al., 2023; Gipper et al., 2021; Ittonen & Trønnes, 2015), we demonstrate the relevance of knowledge transfer across audit firms.

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Appendices

Appendix I: List of variables

Dependent variables	Definition	Source
AUDIT_FEES	The natural logarithm of total audit fees.	Audit Analytics
AUDIT_LAG	The number of days between the end of the fiscal year and the signing date of the audit opinion.	Audit Analytics
RESTATED	Indicator vairable equal to 1 if the earnings of year *t* were subsequently restated, zero otherwise.	Audit Analytics
Variables of interest		
SUBSIDIARY_ROTATION	Indicator variable equal to 1 when at least one component company has changed their auditor for the financial year, but not the parent company. Otherwise zero.	Audit Analytics
PARENT_ROTATION	Indicator variable equal to 1 when the parent company has changed their auditor for the financial year, but no component company has changed its auditor. Otherwise zero.	Audit Analytics
SIMULTANEOUS_ROTATION	Indicator variable equal to 1 when both the parent and the component company have changed their auditor for the financial year, zero otherwise.	Audit Analytics
Control variables		
ASSET_GROWTH	One-year growth rate of client assets.	Compustat
BIG4	Indicator variable equal to 1 when the auditor of the parent company is a Big 4 auditor, zero otherwise.	Audit Analytics
CLIENT_IMPORTANCE	The total assets of the parent company divided by the total assets of all companies audited by the audit firm in country by year. (Choudhary, Merkley, and Schipper, 2022)	Audit Analytics
COUNTRIES	Natural logarithm of the number of countries in which a subsidiary has been identified for the corporate group.	Orbis Historical
DECEMBER_YE	Indicator variable equal to 1 if the client has a December fiscal year-end and 0 otherwise.	Audit Analytics
GCO	Indicator variable equal to 1 if the client receives a going concern opinion and 0 otherwise.	Audit Analytics
INDUSTRY_EXPERT	Indicator set to 1 if a company's auditor has a market share greater than 30% of the total audit fees paid in the company's two-digit SIC and country for year *t*, and set equal to zero otherwise. (Aobdia and Petacchi, 2023;McGuire, Omer, and Wang (2012)	Audit Analytics
ISSUANCE	Indicator variable equal to 1 if the sum of change in long-term debt and change in equity is larger than 20 percent of total assets and 0 otherwise. (Aobdia and Petacchi, 2023)	Compustat
LEVERAGE	Total liabilities divided by total assets.	Compustat

LOSS	Indicator vairable equal to 1 if net income before extraordinary items is negative, and zero otherwise.	Compustat
MERGER5	Indicator variable equal to 1 if the client was involved as acquirer in the completion of an M&A deal with a deal value of >5% of total assets.	Zephyr
NAS_FEE_CHANGE	Change in NAS fees deflated by total fees ((NAS fees in year *t* - NAS fees in year *t-1*) / total fees).	Audit Analytics
NAS_FEES	Natural logarithm of 1 + total NAS fees.	Audit Analytics
RESTATED_LAG	Indicator variable equal to 1 if earnings of the any of the prior three years were restated.	Audit Analytics
RESTATEMENT_FILED_FY	Indicator variable equal to 1 if the client announces restatements during the year and 0 otherwise.	Audit Analytics
ROA	Income before extraordinary items divided by average total assets	Compustat
SALES_GROWTH	Growth rate in sales over the previous fiscal year.	Compustat
SIZE	Natural logarithm of total client assets.	Compustat
SPECIAL_ITEMS	Absolute value of special items, divided by total assets	Compustat
TENURE	Indicator variable equal to one when the tenure of the parent auditor is smaller than or equal to 3 years (Knechel, Rouse, and Schelleman 2009).	Audit Analytics

Tables

Table 1: Sample

Panel A: Sample selection.	**Groups**	**Group-years**
Audit Analytics Europe + Audit Analytics North America (2009-2022)	17,720	162,323
Less: no ownership data in Orbis Global	*(4,037)*	*(45,640)*
Balance	13,683	116,683
Less: groups with more than one ISIN in corporate group	*(552)*	*(9,446)*
Balance	13,131	107,237
Less: group-years without at least one other PIE component	*(12,097)*	*(102,908)*
Balance	1,034	4,329
Less: insufficient information to impute auditor changes and dual audits	*(172)*	*(865)*
Balance	862	3,464
Less: firms from financial services industry (SIC 6000 - 6999)	*(334)*	*(1,572)*
Balance	528	1,892
Less: missing control variable information	*(77)*	*(272)*
Balance	451	1,620
Less: singleton observations	*(130)*	*(130)*
Final sample	**321**	**1,490**

Panel B: Headquarter countries.			
Austria	20	Japan	20
Belgium	19	Luxembourg	26
Bermuda	12	Malta	4
Croatia	4	Netherlands	27
Czech republic	3	Norway	10
Denmark	48	Poland	23
Estonia	3	Portugal	20
Finland	16	Romania	2
France	8	Slovakia	6
Germany	164	Slovenia	2
Greece	4	Spain	53
India	2	Sweden	34
Ireland	26	Switzerland	58
Israel	11	United kingdom	314
Italy	332	United States	219

Note. The sample range runs from 2009-2022.

Table 2: Descriptive statistics.

Variable	N	Mean	SD	Min	p25	p50	p75	Max
Dependent variables								
AUDIT_LAG	1,490	67.7953	22.07	25.00	52.00	62.00	86.00	120.00
AUDIT_FEES	1,490	14.6898	1.84	10.15	13.15	15.05	16.20	17.75
RESTATED	1,490	0.0651	0.25	0.00	0.00	0.00	0.00	1.00
Variables of Interest								
PARENT_ROTATION	1,490	0.0322	0.18	0	0	0	0	1
SUBSIDIARY_ROTATION	1,490	0.0490	0.22	0	0	0	0	1
SIMULTANEOUS_ROTATION	1,490	0.0376	0.19	0	0	0	0	1
Control Variables								
BIG4	1,490	0.9450	0.23	0	1	1	1	1
DECEMBER_YE	1,490	0.7919	0.41	0	1	1	1	1
GCO	1,490	0.0215	0.15	0	0	0	0	1
INDUSTRY_EXPERT	1,490	0.6517	0.48	0	0	1	1	1
ISSUANCE	1,490	0.0322	0.18	0	0	0	0	1
LEVERAGE	1,490	0.6495	0.18	0.20	0.53	0.65	0.75	1.28
LOSS	1,490	0.1846	0.39	0	0	0	0	1
MERGER5	1,490	0.0503	0.22	0	0	0	0	1
RESTATEMENT_FILED_FY	1,490	0.0329	0.18	0	0	0	0	1
ROA	1,490	0.0328	0.06	-0.18	0.01	0.04	0.06	0.17
SIZE	1,490	22.6536	2.24	17.27	20.92	22.96	24.40	26.58
SPECIAL_ITEMS	1,490	0.0164	0.03	0.00	0.00	0.01	0.02	0.19
TENURE	1,490	0.3094	0.46	0	0	0	1	1
CLIENT_IMPORTANCE	1,490	0.0635	0.18	0.00	0.00	0.01	0.03	0.99
COUNTRIES	1,490	2.8153	1.24	0.00	2.08	3.14	3.81	4.62
NAS_FEE_CHANGE	1,490	-0.0363	0.23	-1.30	-0.08	0.00	0.05	0.47
NAS_FEES	1,490	12.1516	4.51	0.00	11.65	13.57	14.79	17.03
ASSET_GROWTH	1,490	0.0201	0.15	-0.27	-0.06	0.01	0.07	0.79
RESTATED_LAG	1,490	0.0993	0.30	0	0	0	0	1
SALES_GROWTH	1,490	0.0110	0.16	-0.48	-0.07	0.01	0.09	0.63

Note. The sample period is from 2009 to 2022. All variables are defined in Appendix I. All continuous variables are winsorized at the *1st and 99th percentile.*

Table 3: Pairwise correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) AUDIT_LAG	1											
(2) AUDIT_FEES	-0.546	1										
(3) RESTATED	-0.109	0.127	1									
(4) PARENT_ROTATION	0.055	-0.108	0.014	1								
(5) SUBSIDIARY_ROTATION	-0.005	0.034	0.003	-0.041	1							
(6) SIMULTANEOUS_ROTATION	0.093	-0.064	0.048	-0.036	-0.045	1						
(7) BIG4	-0.225	0.356	0.064	-0.073	-0.027	-0.014	1					
(8) DECEMBER_YE	0.245	-0.057	-0.113	0.028	0.024	0.049	-0.029	1				
(9) GCO	0.209	-0.135	-0.020	-0.001	0.074	0.019	-0.086	0.042	1			
(10) INDUSTRY_EXPERT	-0.042	0.214	0.033	-0.010	0.003	-0.026	0.188	0.042	-0.037	1		
(11) ISSUANCE	0.066	-0.057	-0.002	0.010	-0.041	0.024	-0.056	0.019	0.052	-0.050	1	
(12) LEVERAGE	-0.002	0.160	0.034	0.006	0.037	0.018	0.000	-0.058	0.148	-0.008	0.040	1
(13) LOSS	0.242	-0.146	-0.013	-0.018	-0.012	0.006	-0.151	0.073	0.204	-0.001	0.031	0.208
(14) MERGER5	-0.041	0.077	0.039	-0.025	0.005	0.003	0.029	0.050	-0.034	0.007	0.254	0.000
(15) RESTATEMENT_FILED_FY	-0.076	0.119	0.348	0.009	-0.007	-0.036	0.045	-0.035	0.025	-0.031	-0.012	0.008
(16) ROA	-0.315	0.187	-0.006	-0.001	-0.012	-0.037	0.164	-0.036	-0.198	-0.008	-0.067	-0.286
(17) SIZE	-0.572	0.891	0.130	-0.071	0.067	-0.052	0.364	-0.136	-0.165	0.223	-0.048	0.119
(17) SPECIAL_ITEMS	-0.010	0.046	0.019	-0.016	0.014	0.010	-0.084	-0.007	0.120	-0.053	0.028	0.209
(19) TENURE	0.236	-0.251	-0.030	0.264	-0.004	0.295	-0.087	0.100	0.021	-0.004	0.084	-0.027
(20) CLIENT_IMPORTANCE	0.049	0.119	0.014	0.014	0.065	-0.018	-0.234	0.027	0.030	0.113	0.005	-0.080
(21) COUNTRIES	-0.472	0.713	0.045	-0.090	0.052	-0.052	0.243	0.062	-0.123	0.229	-0.062	-0.045
(22) NAS_FEE_CHANGE	-0.026	0.052	0.014	-0.105	-0.012	-0.078	0.014	0.015	-0.045	0.024	0.008	-0.023
(23) NAS_FEES	-0.475	0.709	0.061	-0.086	0.004	-0.135	0.343	-0.112	-0.118	0.161	-0.028	0.098
(24) ASSET_GROWTH	-0.092	0.094	0.013	-0.012	-0.025	-0.035	0.003	-0.009	-0.109	0.009	0.447	-0.030
(25) RESTATED_LAG	-0.128	0.173	0.485	0.028	-0.003	-0.018	0.080	-0.106	0.013	-0.021	-0.010	-0.011
(26) SALES_GROWTH	-0.047	0.043	-0.017	-0.027	0.033	-0.036	0.000	0.007	-0.122	-0.002	0.107	-0.057

Table 3: Pairwise correlations - continued

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
(14) MERGER5	-0.054	1											
(15) RESTATEMENT_FILED_FY	0.019	-0.008	1										
(16) ROA	-0.712	0.057	0.002	1									
(17) SIZE	-0.213	0.072	0.095	0.196	1								
(18) SPECIAL_ITEMS	0.424	0.016	0.017	-0.470	0.011	1							
(19) TENURE	0.063	0.025	-0.034	-0.075	-0.214	-0.039	1						
(20) CLIENT_IMPORTANCE	0.052	0.036	-0.016	-0.098	0.154	0.069	-0.014	1					
(21) COUNTRIES	-0.140	0.088	0.096	0.243	0.623	0.019	-0.225	0.095	1				
(22) NAS_FEE_CHANGE	-0.013	0.025	0.034	0.039	0.040	-0.029	-0.064	0.002	0.053	1			
(23) NAS_FEES	-0.179	0.075	0.072	0.201	0.702	0.029	-0.248	0.003	0.503	0.101	1		
(24) ASSET_GROWTH	-0.253	0.331	-0.033	0.258	0.115	-0.156	0.013	-0.003	0.041	0.104	0.109	1	
(25) RESTATED_LAG	-0.019	-0.005	0.480	0.021	0.160	0.007	-0.067	-0.006	0.097	0.006	0.101	-0.016	1
(26) SALES_GROWTH	-0.218	0.138	-0.035	0.239	0.043	-0.104	0.059	-0.031	0.018	-0.018	0.052	0.479	-0.007

Table 4: Results of the restatement regression.

	(1)	(2)
Variable	**RESTATED**	**RESTATED**
PARENT_ROTATION	-0.461	-0.059*
	(0.369)	(0.034)
SUBSIDIARY_ROTATION	-0.518*	-0.008
	(0.284)	(0.020)
SIMULTANEUS_ROTATION	1.025***	0.094***
	(0.312)	(0.034)
AUDIT_LAG	0.000	-0.001
	(0.006)	(0.001)
ASSET_GROWTH	0.884	0.02
	(0.839)	(0.052)
BIG4	-	0.029
	-	(0.062)
COUNTRIES	-0.087	0.067
	(0.111)	(0.044)
ISSUANCE	-0.576	-0.023
	(0.705)	(0.038)
LEVERAGE	0.411	0.025
	(0.609)	(0.114)
LOSS	0.031	0.008
	(0.302)	(0.026)
MERGER5	0.272	0.025
	(0.314)	(0.037)
RESTATED_LAG	1.801***	0.128*
	(0.250)	(0.070)
ROA	-4.060*	-0.134
	(2.452)	(0.247)
SALES_GROWTH	0.022	0.032
	(0.562)	(0.033)
SIZE	0.176***	0.032
	(0.060)	(0.047)
Model	Logistic	LPM
Observations	965	1490
(Pseudo) R-squared	0.4247	0.53
Firm FE	No	Yes
Year FE	Yes	Yes
Country FE	Yes	
Industry FE	Yes	
Clustered SE	Firm	Firm

Note. This table presents the results of the audit lag regression. Coefficients marked with ***, **, or * are significant at the 1%, 5%, or 10% levels, respectively. Robust standard errors are presented below their respective coefficients. Variable definitions are reported in Appendix I. *BIG4* is excluded from the logistic model as BIG4 = 0 predicts RESTATED = 0 perfectly.

Table 5: Results of the audit fee regression.

	(1)	(2)
Variable	**AUDIT_FEES**	**AUDIT_FEES**
PARENT_ROTATION	-0.209*	-0.210*
	(0.111)	(0.112)
SUBSIDIARY_ROTATION	-0.083***	
	(0.031)	
ALIGN		-0.187**
		(0.092)
NONALIGN		-0.04
		(0.033)
SIMULTANEUS_ROTATION	-0.170***	-0.171***
	(0.032)	(0.032)
RESTATED	0.065	0.067
	(0.041)	(0.041)
BIG4	0.900*	0.902*
	(0.480)	(0.480)
CLIENT_IMPORTANCE	0.415	0.41
	(0.309)	(0.310)
COUNTRIES	0.057	0.055
	(0.051)	(0.051)
DECEMBER_YE	0.106*	0.107*
	(0.056)	(0.056)
GCO	0.066	0.072
	(0.084)	(0.086)
INDUSTRY_EXPERT	0.071**	0.069*
	(0.036)	(0.036)
LEVERAGE	0.491***	0.495***
	(0.170)	(0.173)
LOSS	0.048**	0.048**
	(0.022)	(0.022)
MERGER5	0.005	0.002
	(0.028)	(0.028)
NAS_FEE_CHANGE	0.006	0.007
	(0.050)	(0.051)
NAS_FEES	0.003	0.003
	(0.006)	(0.006)
ROA	-0.309	-0.305
	(0.300)	(0.303)
SIZE	0.361***	0.361***
	(0.076)	(0.076)
SPECIAL_ITEMS	-0.228	-0.211
	(0.338)	(0.339)
Observations	1490	1490
R-squared	0.986	0.986
Firm FE	Yes	Yes
Year FE	Yes	Yes
Clustered SE	Firm	Firm

Note. This table presents the results of the audit lag regression. Coefficients marked with ***, **, or * are significant at the 1%, 5%, or 10% levels, respectively. Robust standard errors are presented below their respective coefficients. Variable definitions are reported in Appendix I.

Table 6: Results of the audit lag regression.

	(1)	(2)	(3)	(4)
Variable	**AUDIT_LAG**	**Ln(AUDIT_LAG)**	**AUDIT_LAG**	**Ln(AUDIT_LAG)**
PARENT_ROTATION	-1.383	-0.017	-0.948	-0.018
	(2.191)	(0.029)	(2.298)	(0.031)
SUBSIDIARY_ROTATION	1.699	0.019	1.975	0.018
	(1.107)	(0.016)	(1.414)	(0.023)
SIMULTANEUS_ROTATION	0.802	0.009	3.526**	0.058**
	(1.116)	(0.018)	(1.787)	(0.029)
BIG4	0.728	0.008	-3.288	-0.029
	(2.499)	(0.034)	(2.913)	(0.043)
COUNTRIES	-0.875	-0.024	-1.271	-0.018
	(1.343)	(0.020)	(0.812)	(0.013)
DECEMBER_YE	0.209	0.044	7.136***	0.135***
	(4.400)	(0.071)	(2.409)	(0.044)
GCO	2.715	0.034	9.438***	0.095**
	(3.423)	(0.041)	(3.018)	(0.044)
INDUSTRY_EXPERT	-0.37	-0.001	0.813	0.013
	(0.989)	(0.015)	(1.540)	(0.024)
ISSUANCE	-0.955	-0.005	2.288	0.05
	(1.712)	(0.021)	(2.250)	(0.031)
LEVERAGE	6.228	0.081	5.182	0.056
	(5.690)	(0.089)	(4.226)	(0.069)
LOSS	-0.321	-0.002	0.27	-0.005
	(1.087)	(0.015)	(1.513)	(0.024)
MERGER5	1.937	0.03	2.43	0.037
	(1.528)	(0.022)	(2.008)	(0.030)
RESTATEMENT_FILED_FY	1.31	0.014	4.063*	0.068*
	(1.466)	(0.022)	(2.134)	(0.037)
ROA	-16.265	-0.265	-46.930***	-0.820***
	(11.221)	(0.167)	(14.669)	(0.280)
SIZE	1.078	0.014	-1.842***	-0.030***
	(1.515)	(0.023)	(0.574)	(0.009)
SPECIAL_ITEMS	3.307	-0.041	-25.332	-0.53
	(13.283)	(0.199)	(18.858)	(0.327)
TENURE	0.841	0.008	-0.075	-0.01
	(0.802)	(0.013)	(1.147)	(0.018)
Observations	1490	1490	1490	1490
R-squared	0.905	0.907	0.688	0.653
Firm FE	Yes	Yes		
Year FE	Yes	Yes	Yes	Yes
Country FE			Yes	Yes
Industry FE			Yes	Yes
Clustered SE	Firm	Firm	Firm	Firm

Note. This table presents the results of the audit lag regression. Coefficients marked with ***, **, or * are significant at the 1%, 5%, or 10% levels, respectively. Robust standard errors are presented below their respective coefficients. Variable definitions are reported in Appendix I.

Table 7: Results of the supplemental restatement analyses on international rotations

	(1)	(2)	(3)	(4)
Variable	**RESTATED**	**RESTATED**	**RESTATED**	**RESTATED**
PARENT_ROTATION	-0.461	-0.47	-0.059*	-0.059*
	(0.369)	(0.372)	(0.034)	(0.034)
SUBSIDIARY_ROTATION	-0.518*		-0.008	
	(0.284)		(0.020)	
SUBSIDIARY_INTERNATIONAL		-0.825*		-0.001
		(0.457)		(0.026)
SUBSIDIARY_DOMESTIC		-0.242		-0.016
		(0.376)		(0.034)
SIMULTANEUS_ROTATION	1.025***		0.094***	
	(0.312)		(0.034)	
SIMULTANEOUS_INTERNATIONAL		0.708*		0.210**
		(0.413)		(0.092)
SIMULTANEOUS_DOMESTIC		1.034**		0.037
		(0.415)		(0.031)
AUDIT_LAG	0.000	-0.001	-0.001	-0.001
	(0.006)	(0.006)	(0.001)	(0.001)
ASSET_GROWTH	0.884	0.865	0.02	0.011
	(0.839)	(0.892)	(0.052)	(0.052)
BIG4	-	-	0.029	0.032
	-	-	(0.062)	(0.058)
COUNTRIES	-0.087	-0.079	0.067	0.066
	(0.111)	(0.113)	(0.044)	(0.044)
ISSUANCE	-0.576	-0.613	-0.023	-0.016
	(0.705)	(0.730)	(0.038)	(0.039)
LEVERAGE	0.411	0.465	0.025	0.025
	(0.609)	(0.602)	(0.114)	(0.113)
LOSS	0.031	0.033	0.008	0.009
	(0.302)	(0.306)	(0.026)	(0.026)
MERGER5	0.272	0.294	0.025	0.027
	(0.314)	(0.307)	(0.037)	(0.037)
RESTATED_LAG	1.801***	1.807***	0.128*	0.127*
	(0.250)	(0.251)	(0.070)	(0.071)
ROA	-4.060*	-4.105*	-0.134	-0.117
	(2.452)	(2.445)	(0.247)	(0.245)
SALES_GROWTH	0.022	0.086	0.032	0.03
	(0.562)	(0.563)	(0.033)	(0.033)
SIZE	0.176***	0.171***	0.032	0.031
	(0.060)	(0.059)	(0.047)	(0.048)
Model	Logistic	Logistic	LPM	LPM
Observations	965	965	1490	1490
(Pseudo) R-squared	0.425	0.426	0.530	0.533
Firm FE	No	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes		
Industry FE	Yes	Yes		
Clustered SE	Firm	Firm	Firm	Firm

Note. This table presents the results of the audit lag regression. Coefficients marked with ***, **, or * are significant at the 1%, 5%, or 10% levels, respectively. Robust standard errors are presented below their respective coefficients. Variable definitions are reported in Appendix I. *BIG4* is excluded from the logistic models as BIG4 = 0 predicts RESTATED = 0 perfectly.

Table 8: Results of the restatement regression for the rotation sample.

	(1)	(2)
Variable	**RESTATED**	**RESTATED**
PARENT_ROTATION	-0.771*	-0.064*
	(0.452)	(0.035)
SUBSIDIARY_ROTATION	-0.819**	-0.01
	(0.342)	(0.020)
SIMULTANEUS_ROTATION	1.093***	0.084***
	(0.334)	(0.032)
AUDIT_LAG	-0.008	-0.002*
	(0.011)	(0.001)
ASSET_GROWTH	0.407	0.032
	(1.107)	(0.090)
BIG4	-	0.011
	-	(0.069)
COUNTRIES	0.004	0.117**
	(0.152)	(0.058)
ISSUANCE	0.135	-0.019
	(1.107)	(0.090)
LEVERAGE	0.686	0.161
	(1.177)	(0.123)
LOSS	-0.341	-0.016
	(0.326)	(0.026)
MERGER5	0.057	0.056
	(0.671)	(0.055)
RESTATED_LAG	1.768***	0.252***
	(0.321)	(0.085)
ROA	1.675	0.349
	(2.759)	(0.213)
SALES_GROWTH	-0.558	0.004
	(0.802)	(0.043)
SIZE	0.558***	0.062
	(0.178)	(0.053)
Model	Logistic	LPM
Observations	325	761
(Pseudo) R-squared	0.4674	0.52
Firm FE	No	Yes
Year FE	Yes	Yes
Country FE	Yes	
Industry FE	Yes	
Clustered SE	Firm	Firm

Note. This table presents the results of the audit lag regression. Coefficients marked with ***, **, or * are significant at the 1%, 5%, or 10% levels, respectively. Robust standard errors are presented below their respective coefficients. Variable definitions are reported in Appendix I. BIG4 is excluded from the logistic models as BIG4 = 0 predicts RESTATED = 0 perfectly.

Noise in Audit Judgments

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Noise in Audit Judgments

Abstract

Prior research has tried to improve judgment and decision making in auditing by focusing on factors that cause an average error in a set of judgments, also called *statistical bias.* This study focuses on *noise*, the unwanted variability in professional judgment, which, like *statistical bias*, causes deviations from the 'optimal' judgment. We conduct a *noise* audit wherein auditors evaluate three different audit cases at two points in time. This approach allows us to measure the total amount of *noise* and decompose it into different types of *noise*. Our findings based on the judgments of 217 auditors indicate significant *noise* in auditors' judgments. *Level noise*, *stable pattern noise*, and *occasion noise* equally contribute to the overall *noise* level. Further analysis reveals that *noise* is higher among auditors exhibiting more burnout symptoms. Our results can assist audit firms in reducing the unwanted variability in audit judgments and provide direction for future research in this area.

Keywords: noise; audit; judgment and decision making; professional skepticism

1. Introduction

Judgment and decision making research has documented many factors that lead to impediments or flaws in auditors' judgment and decision making. In these studies, the examined factors usually cause an average error in a set of judgments, also called *statistical bias*. For example, auditors are susceptible to anchoring. That is, auditors often concentrate on an initial value and then make insufficient adjustments from that value in their judgments (Kinney Jr & Uecker, 1982). As yet another example, it has been shown that auditors' social interaction with the client can decrease professional skepticism, affecting auditors' judgment and decision making (e.g., Eutsler et al., 2018; Hobson et al., 2020; Kachelmeier & Van Landuyt, 2017). Research on *statistical bias* in audit settings is important as it helps to decrease error and improve auditors' judgment and decision making.

In addition to *statistical bias*, *noise* – unwanted variability in professional judgment – also contributes to the overall error in judgments. Prior research across fields has shown that *noise* is often overlooked, yet it is a significant source of error (Kahneman et al., 2021). For instance, different measures of client pressure and client affinity – representing *statistical bias* – explain up to 10% of the variance in auditor-proposed audit adjustments in Koch and Salterio, (2017), leaving up to 90% of the variance unexplained. While *statistical bias* leads to a systematic deviation in a set of judgments, *noise* averages out and does not cause an error when considering the average of multiple judgments. However, at the level of an individual judgment, *noise* can be as harmful as *statistical bias,* as both cause deviations from the 'optimal' judgment. Clancy et al. (1981) illustrate this by having 208 criminal judges give punitive recommendations on different cases. For one case, the average recommended prison years was 1.1 years, but one judge recommended 15 years. Although *noise* averages out over multiple judgments, it would have been perceived as unfair if the judge who recommended 15 years had handled this case in reality. Similarly, in auditing, the average judgment made by

different auditors about the accounts receivable for all audited firms does not matter to the audited firm or the users of audited information for a specific firm. What matters is the individual judgment that the auditor makes about a particular firm's accounts receivable.

Noise can have a wide variety of causes, such as cognitive biases, emotional reactions, skill differences, mood, or group dynamics (Kahneman et al., 2021). Although prior literature looks at how these different factors influence auditors' judgments, an empirical assessment of *noise* in auditors' judgments is missing. Examining *noise* is important, as trying to mitigate error by targeting the wide variety of different causes of *noise* is often not feasible. Also, in many situations, the direction of the error is not known beforehand, as the effect of the psychological biases and other aforementioned causes varies among people, and it is often unclear which psychological biases and other causes play a role in a certain setting (Kahneman et al., 2021). However, to develop interventions targeted at mitigating *noise*, we first need to understand how *noise* manifests in the auditing setting.

This study examines *noise* in the audit setting. First, this study provides descriptive evidence on the total level of *noise* in a set of auditor judgments observed in a controlled setting. This evidence aids in assessing the significance of the *noise* problem in auditing. Second, this study aims to investigate the relative magnitude of different types of *noise* by decomposing the total level of *noise* into *level noise*, *stable pattern noise,* and *occasion noise*, as proposed by Kahneman et al. (2021). *Level noise* refers to the variability in the average level of judgments by different auditors. In auditing, one auditor may have a more skeptical personality than another auditor, often referred to as trait skepticism. Considering judgments in different cases, this can lead to a more skeptical average judgment for one auditor than for another auditor (e.g., Hurtt et al., 2013). *Level noise* could also arise from differences in education. *Stable pattern noise* arises from differences in how decision-makers react in certain circumstances. This variability in judgment stems from the interaction between a particular auditor and a

particular case. *Stable pattern noise* is fundamentally different from *level noise*: whereas auditor A might on average be more skeptical than auditor B (*level noise*), auditor A might decrease its skepticism when presented with case Z, while auditor B might increase its skepticism when presented with case Z (*stable pattern* noise). In other words, *stable pattern noise* is about how people respond differently to the same situation regardless of their average difference. For instance, dark triad auditors are more resistant to decreases in professional skepticism when the particular audit case requires social interaction (Hobson et al., 2020). Also, *stable pattern noise* can result from an auditor's prior experience with the specific task or situation. *Occasion noise* is the variability in judgments of the same case by the same person at different points in time, arising from factors that vary over time. These factors can include an auditor's mindset (Griffith et al., 2015) or mood (Chung et al., 2008; Cianci & Bierstaker, 2009). Being able to distinguish between different types of *noise* is crucial when designing potential interventions. More specifically, interventions focused on reducing *level noise* could be, for instance, focused at aligning skepticism levels, where interventions focused at reducing *stable pattern noise* should be more focused on aligning reactions to different specific circumstances, and interventions focused at reducing *occasion noise* should be focused on aligning judgments within the auditor. Research across fields shows that, generally, *stable pattern noise* contributes the most to the total amount of *noise*, while *occasion noise* contributes the least. However, these results might not directly translate to the specific audit setting. Auditors' judgment is largely constrained by standards and regulations (e.g., PCAOB, IFRS, GAAP) and must follow structured methodologies. This could limit the extent of *level noise* present in auditors' judgement. Similarly, auditors are trained to be professionally skeptical, which also includes questioning assumptions, verifying evidence, and being aware of cognitive biases. This could counteract some biases that lead to *stable pattern noise*. Also, auditors' working environment varies more than that of a judge or an insurance employee. Auditors

typically alternate working at their clients' offices, in the audit firms' office, and at home. This changes the working circumstances extensively and could lead to more *occasion noise.* A third aim of this study is to examine factors that could lead to differences in *noise*, such as mindfulness and burnout. Both factors are known to influence cognitive functions, such as attentional processing and executive functioning (Deligkaris et al., 2014; Van Den Hurk., 2010), and could potentially contribute to *noise* via this influence. This focus is especially relevant in the audit setting, where burnout symptoms and the challenges of managing a high workload are common (e.g., Bucheit et al., 2016; Jefferson et al., 2024; Persellin et al., 2019).

To examine *noise* in the audit setting, we employ a *noise* audit, as proposed by Kahneman et al. (2021). In our *noise* audit, multiple auditors make judgments about the same cases at different points in time. Next to measuring the total level of *noise*, this method allows us to measure *level noise* by examining the difference in the average level of judgments of the participating auditors, *stable pattern noise* by examining the variability due to the interaction between the specific auditor and a specific case, and *occasion noise* by examining the difference in judgments that one auditor makes on the same case at different points in time. We recruited professional auditors with an average of 5 years of experience. In the first round, 163 auditors participated, and in the second round, 132 auditors participated. 78 auditors participated in both rounds. The auditors in our sample are appropriate to examine our research questions as they are used to make auditing judgments similar to the cases we used in the noise audit, allowing us to mitigate the concern that the observed *noise* is caused by a lack of experience. In the *noise* audit, participants are asked to judge which specific accounts need extra work for the audit of SG&A expenses, accounts payable, and accounts receivable. Lastly, participants fill out a questionnaire where we measure demographics and personality characteristics, including trait skepticism (Hurtt et al., 2013). This allows us to examine which factors contribute to the *noise* and to examine how much *noise* is left after controlling for these

factors. Additionally, we measure participants' mindfulness and burnout to examine whether these factors influence the *noise* in participants' judgments.

First, we provide descriptives on the total amount of *noise* in our study and find that there indeed is *noise* in the number of items the auditors select, but also in which items the auditors select. We construct a measure to assess the total amount of *noise* in the number of items auditors select. The numerator of our measure is the *mean absolute difference* and is calculated by (1) creating all possible pairs between participants, (2) calculating the absolute difference in judgments between participants in a pair, and (3) calculating the mean of all these absolute differences. The denominator is the average judgment. This metric is 64.72% for the SG&A expense audit, 71.67% for the accounts payable audit, and 61.99% for the accounts receivable audit and reveals that there is substantial *noise* in the judgments of our participants. Second, we decompose the total amount of *noise* into its different categories and find that *level noise*, *stable pattern,* and *occasion noise* contribute a similar portion to the total *noise*. These results are robust to excluding participants who are not familiar with the type of tasks and participants who remember the tasks. Third, we examine the factors explaining *level noise* and find that including *level noise* (by using participant fixed effects) explains 37% more of the variance than only including trait skepticism and demographics, suggesting that *level noise* consists of many more factors. Fourth, we examine the effect of burnout on *noise* and find that *noise* is lower for groups with lower burnout symptoms. This difference seems to be driven by a difference in *stable pattern noise* and *occasion noise*. We find mixed results for the role of mindfulness, suggesting that more research is needed to draw a conclusion.

This study examines *noise* in auditors' judgment and decision-making, the relative size of different types of *noise* in the audit setting, and some potential determinants of noise. We first contribute to the literature on auditor judgment and decision-making by empirically assessing the importance of *noise*. Having insights into *noise* besides *statistical bias* is useful,

because reducing *statistical bias* and *noise* by the same amount, has the same effect on accuracy (Kahneman et al., 2021). Our study thus provides a starting point for a literature examining *noise* in auditors' judgment and decision-making. Second, by examining the relative sizes of the different *noise* components, we provide guidance to future research about the relative importance of the different types of *noise* and thus the most fruitful avenues for future research. Similarly, information about the relative size of the different types of *noise* informs audit firms about which interventions could potentially be most effective in reducing *noise*. Third, we contribute by exploring which factors explain *noise* and whether the amount of *noise* in a group is affected by burnout and mindfulness.

2. Theoretical Background

2.1 Error: Statistical bias and noise

Error in judgments can arise from two components: *statistical bias* and *noise*. *Statistical bias* causes the average judgment of several judges to deviate from the 'optimal judgment'. For example, on average, auditors might request less additional audit evidence or argue for a smaller adjustment than what would be considered optimal. *Noise,* on the other hand, does not cause the average judgment to deviate from the 'optimal judgment' but introduces unwanted variability around the 'optimal judgment'. In other words, *noise* averages out across a set of judgments. For example, one auditor might request more additional audit evidence than what is deemed optimal, while another requests less. While the average judgment of these two auditors may align with the 'optimal judgment', the variability in their judgments remains significant. Although the average judgment might be equal to the 'optimal judgment', *noise* can be as problematic for audit quality as s*tatistical bias*. This is because the individual judgment matters most: the audited firm cares about the judgment of its auditor, not the average judgment across all SG&A expense audits conducted by all auditors of an audit office. Similarly, users of audited information are concerned with the judgment of the auditor who

evaluated the information they are interested in. As yet another example, even if the average judgment aligns with the 'optimal judgment', if too little audit evidence was requested in half of the engagements, it remains problematic. In these engagements, there is a risk that insufficient audit evidence could leave misstatements or other irregularities undiscovered..

2.2 Prior research

Prior research in auditor judgment and decision-making typically focuses on factors that cause *statistical biases* (e.g., Nelson & Tan, 2005; Simnett & Trotman, 2018) . In other words, factors that affect the average of a set of judgments. For example, Bhaskar et al. (2019) find that the publication of earnings releases before the completion of the audit decreases the likelihood of auditors recommending an initial adjustment, but this effect can be mitigated by a strong audit committee. These are findings of a *statistical bias* because the average likelihood of recommending an adjustment is lowered when the earnings are released before the completion of the audit. Similarly, Griffith et al. (2015) find that auditors give, on average, lower assessments of the reasonableness of a fair value after a deliberative mindset is triggered. Another example of a *statistical bias* is Koch and Salterio (2017), who find that the proposed audit adjustment is, on average, lower when auditors perceive client pressure and have affinity for the client.

However, the factors causing the *statistical bias* in the aforementioned studies do not explain all the variance in the auditors' judgments. To be more specific, the effect of the timing of the earnings release and the effect of the audit committee strength together explain 6% of the variance in the likelihood of recommending an initial adjustment in Bhaskar et al. (2019), leaving 94% of the variance unexplained.[1] Similarly, the deliberative mindset intervention in Griffith et al. (2015) explains 7% of the variance in the reasonableness assessment of the fair

[1] The variance explained by the timing of the earnings release and audit committee strength is calculated using the sum of squares for the variables and error in the ANOVA as displayed in Table 2, Panel B in Bhaskar et al. (2019).

value, leaving 93% of the variance unexplained.[2] Also, different measures of client pressure and client affinity explain up to 10% of the variance in auditor-proposed audit adjustments in Koch and Salterio, (2017), leaving up to 90% of the variance unexplained.[3] These examples reveal that the unexplained variance, which is called *noise*, is not negligible. The main goal of this study is to further explore *noise* in auditors' judgments and decisions.

2.3 Different types of noise

Kahneman et al. (2021) develop three categories of *noise*. The first split is between *level noise* and *pattern noise*. *Level noise* refers to the variability in the average level of judgments made by different auditors. For instance, one auditor might, on average, always ask for more additional audit evidence than another auditor. This can be caused by, for example, differences in trait skepticism (Hurtt, 2010), differences in education, or the audit firm that an auditor is working for. *Pattern noise* encompasses the variability in auditors' responses to particular cases and can be seen as the error in an auditor's judgment that cannot be explained by the sum of the individual effects of the case and the auditor. *Pattern noise* can be categorized into *stable pattern noise* and *occasion noise*. *Stable pattern noise* arises from systematic differences in how auditors interact with particular cases, influenced by factors such as personality traits or prior experiences (Kahneman et al., 2021). *Stable pattern noise* is fundamentally different from *level noise*: whereas auditor A might on average be more skeptical than auditor B (*level noise*), auditor A might decrease its skepticism when presented with case Z, while auditor B might increase its skepticism when presented with case Z (*stable pattern* noise). In other words, *stable pattern noise* is about how people respond differently to the same situation regardless of their average difference. For example, dark triad auditors may resist reductions in professional skepticism during social interactions more than other auditors (Hobson et al., 2020). Also,

[2] The variance explained by the deliberative mindset intervention is calculated using the sum of squares for the condition and error in the ANOVA as displayed in Table 1, Panel B in Griffith et al. (2015).
[3] Based on the Adjusted R^2 for the OLS regression displayed Table 2, Panel C in Koch and Salterio (2017).

prior experiences with certain situations can play a role. For example, an auditor who experienced a severe misstatement in the inventory accounts of a production firm might ask for more additional evidence or do a more elaborate inventory count than an auditor who has no experience with such a misstatement in such a firm. Similarly, some auditors might be more affected by ESG information than others. *Occasion noise* is the variability in judgments of the same case by the same person on different occasions. This type of *noise* arises from temporary factors affecting the auditor's judgment, such as an auditor's mindset (Griffith et al., 2015), mood (Chung et al., 2008; Cianci & Bierstaker, 2009), or even the weather. Research in various fields typically finds that *stable pattern noise* contributes most to total *noise*, followed by *level noise*, with *occasion noise* contributing the least (Kahneman et al., 2021). However, these results might not directly translate to the specific audit setting. Auditors' judgment is largely constrained by standards and regulations (e.g., PCAOB, IFRS, GAAP) and must follow structured methodologies. This could limit the extent of *level noise* present in auditors' judgement. Similarly, auditors are trained to be professionally skeptical, which also includes questioning assumptions, verifying evidence, and being aware of cognitive biases. This could counteract some biases that lead to *stable pattern noise*. Also, auditors' working environment varies more than that of a judge or an insurance employee. Auditors typically alternate working at their clients' offices, in the audit firms' office, and at home. This changes the working circumstances extensively and could lead to more *occasion noise.* This study aims to investigate how these different types of *noise* contribute to the total *noise* in auditors' judgments and decision-making.

It could be that factors causing *statistical bias* can also contribute to *noise.* For instance, differences in mindset, which caused *statistical bias* in Griffith et al. (2015), may explain some of the *noise* in, for example, Koch and Salterio (2017). However, a multitude of factors likely influence an auditors' judgment simultaneously, making it challenging to determine which

factors should be addressed to mitigate errors. Additionally, in many situations, the direction of error caused by a particular factor is unknown beforehand, as the impact of psychological biases and other factors varies among different individuals and situations (Kahneman et al., 2021). Therefore, examining *noise* in general, in addition to these specific causes, is crucial, as trying to mitigate error by addressing the wide range of noise-causing factors is likely to be ineffective.

3. Research Design

We examine *noise* in audit judgments using a survey in which professional auditors make judgments about three fictive cases. This approach is similar to the '*noise* audits' used by Kahneman et al. (2021) in the insurance setting. By collecting judgments about the same three cases from different auditors and asking these auditors to assess the same cases several weeks later, we can estimate the total amount of *noise* as well as decompose *noise* into *level noise*, *stable pattern noise,* and *occasion noise*.

3.1 Case Materials and Procedures

Participants engaged in two surveys using the same case materials, conducted 10 to 17 weeks apart to ensure they did not remember specific case details. Participants were instructed not to communicate during the survey. On average, it took the auditors 29 minutes to complete the survey in the first round and 22 minutes in the second round.[4] After the initial survey, participants were not informed about the upcoming second round to prevent deliberate memorization of the case material.

[4] One reason why the time to complete the first survey is longer than the time to complete the second survey is that the post-experimental questionnaire was somewhat longer in the first round than in the second round. It could still be that participants in the second survey spent less time because they recognized the cases. However, we find no significant difference in the time spent in the survey by participants who participated in both rounds and those who participated in the second round only ($t = 0.49$, $p = 0.62$).

To identify *stable pattern noise*, multiple cases are required. We developed these cases based on a finding from PCAOB inspections, which indicated that 40% of the inspected audit engagements had deficiencies due to insufficient appropriate audit evidence to support the opinion on the client's financial statement (PCAOB, 2023). In each of the three cases, participants need to make judgments about the need for additional inquiry. The cases differ in terms of the financial statement item being audited and the type of firm. In each case, participants received general information about the firm and the specific audit, including a general description of the firm's activities, sales figures, materiality, performance materiality, and clearly trivial threshold.

In the first case, the auditors were presented with a numerical assessment of the SG&A expenses and asked to identify specific items (e.g. rent expense, insurance) requiring further inquiry, such as requesting additional documentation, reviewing the ledger, or posing questions to the client. Participants were informed that a colleague had already completed some work, including filling out the model for the numerical assessment and asking questions to the controller. They received the filled-out numerical assessment, the e-mail exchange with the controller, and an invoice. In the second case, the auditors were given an accounts receivable aging report, specific transactions recorded in the accounts receivable for subsequent cash receipts testing, and an accompanying bank statement. Participants were informed that a colleague already started reconciling the accounts receivable aging report with the sub-ledger and the financial statement, and identified items for subsequent cash receipt testing. They were asked to determine which accounts required further inquiry, such as requesting additional documentation, asking questions to the client, proposing reclassifications, or including an item in the error evaluation. In the third case, participants were presented with an accounts payable aging report and five invoices for cut-off testing. Participants were informed that a colleague already started reconciling the accounts payable aging report with the sub-ledger and the

financial statement, and started the cut-off testing but still needed to address five invoices. They were asked to assess which accounts required further inquiry, such as requesting additional documentation, asking questions to the client, proposing reclassifications, or including an item in the error evaluation.[5]

After completing the cases, participants answered questions in a post-experimental questionnaire. To avoid unnecessary repetition and reduce the survey length, the post-experimental questionnaires are not the same in the first and second surveys. Following the first survey, participants answered questions regarding demographics, work experience, their experience with the case, trait skepticism (following Hurtt (2010)), and burnout (following Maslach et al. (1997)). After the second survey, participants responded to questions regarding their expectations of the noise in their own and their colleagues' judgments, the extent to which they recognized the cases, and mindfulness (following Brown and Ryan (2009)). In both surveys, participants have to compose a code based on their personal information, allowing us to match surveys from the first and second wave.

3.2 Participants

We recruit professional auditors from a professional education program at a large Dutch university and during internal training sessions of 3 mid-sized audit firms. Participants in our sample have an average of 4.9 years of auditing experience (std. dev. = 6.7), and are 26.0 years

[5] A potential concern regarding the experimental materials would be that it does not reflect the tasks that auditors normally do well enough. Potentially this would make the tasks more difficult and induce *noise* in the judgments. In the post-experimental questionnaire after the first round, participants were asked to evaluate the statement "I found the audit of (audit task) at (client firm) difficult" on a 5-point scale where 1 represents "Completely disagree" and 5 represents "Completely agree" for all three tasks. On average, participants evaluate this statement 2.53 (std. dev. = 1.00) for the SG&A expenses, 2.49 (std. dev. = 0.97), and 2.47 (std. dev. = 1.01) for the accounts payable, which is all in the middle of the scale around the neutral point. This indicates that participants did not find the tasks difficult. We also asked participants how familiar they were with the different audit tasks on a 5-point scale where 1 represents "Not at all, never performed" and 5 represents "Very familiar, performed often" for every task. We find that participants' assessment of the difficulty is correlated with how familiar they are with the tasks ($\rho = -0.52$, $p = 0.00$; $\rho = -0.48$, $p = 0.00$; $\rho = -0.59$, $p = 0.00$), providing more comfort that the perceived difficulty is driven by how familiar someone is with the task and is not due to unclear case materials.

old (std. dev. = 5.5). 71% of our sample are male and 28% work for a Big4 audit firm.[6] We run the survey during a lecture of the educational program we recruit from or during an internal training session. We recruited 163 participants in round 1 and 132 participants in round 2. 78 participants participated in both rounds. Some tests are based on only round 1, only round 2 or only the observations from participants who participated in both rounds.

3.3 Measure

To investigate *noise*, we need to separate the error into *statistical bias* and *noise*. To identify *statistical bias*, a 'correct' judgment needs to be determined. However, in auditing and our case materials, the 'correct' or 'optimal' judgment is often unclear. For examining *noise*, we assume that the average judgment made in the cases is the 'optimal' or 'correct' judgment, implying that there is no *statistical bias*. Consequently, *noise* refers to an auditor's deviation in judgment from the average judgment. In our study, this judgment is the number of accounts that the auditor identifies as needing further inquiry.

The SG&A expense case had 40 possible items for further inquiry, the account receivables case had 104 possible items for further inquiry and the accounts payable had 45 possible items for further inquiry. To allow comparability, all judgments are normalized by dividing the judgment by the maximum number of items (40, 45, or 104) when used in inferential tests.

4. Results

4.1 Total amount of noise

We provide summary statistics about the number of items that the participants identify for further inquiry. We provide these statistics for all participants in round 1 (163 participants), all

[6] These demographics are collected during the first survey. There is no complete match between the sample of the first and second survey. As we collected responses from the same educational program and accounting firms in the second round, we do not expect the demographics of participants in the second round to significantly differ from those of the first round.

participants in round 2 (132 participants), and all participants that participated in both round one and two (78 participants). However, given the qualitative similarity of the descriptive statistics, we only discuss the descriptive statistics for round 1. Table 1 provides summary statistics and Figures 1A-1C provide a boxplot of the number of items that the participants identify for further inquiry.

For the SG&A expense audit, participants on average indicate that 9.27 of the 40 items need further inquiry. For the accounts payable audit, the average was 15.67 out of 104 items. For the accounts receivable audit, participants on average indicate that 8.13 of the 45 items need further inquiry. The standard deviations (6.29, 11.56, and 5.66 respectively) and visual inspection of the boxplots indicate some variation in the participants' judgments. While part of the standard deviation is due to largely deviating judgments, there is also clear variation within the 25th to 75th percentile. The distribution of judgments is wider for the accounts payable audit task, likely due to the larger amount of items.

We aim to make the amount of variation, or *noise*, more intuitive to interpret by answering two questions: '*By how much do the judgments of two randomly chosen participants differ*?' and '*By how much do the judgments of one participant at two points in time differ*?' Table 2 shows the *mean absolute difference*. This measure is calculated by creating all possible pairs between participants, calculating the absolute difference in judgment between the participants in the pair, and calculating the mean or median from this. For the SG&A expense audit, the average (median) difference between the judgments of two randomly chosen participants is 6.00 (4.00). For the accounts payable audit, the average (median) is 11.23 (9.00). For the accounts receivable audit, the average (median) is 5.04 (3.00). Next, we divide this measure by the average judgment to provide a relative measure. This metric is 64.72% for the SG&A expense audit, 71.67% for the accounts payable audit, and 61.99% for the accounts receivable audit and reveals substantial *noise* in our participants' judgments. This metrics are

similar but somewhat higher than what has been found in sentencing decisions (Clancy et al., 1981; Kahneman et al., 2021). More specifically, with a *mean absolute difference* of 3.8 years and an average sentence of 7.0 years, the metric leads to 54.29% for sentencing decisions.

Table 3 shows the difference in judgments made by one participant at two points in time. For the SG&A expense audit, the average (median) difference in judgment over time is 4.50 (3.00). For the accounts payable audit, the average (median) difference is 7.04 (4.50). For the accounts receivable audit, the average (median) difference is 3.83 (3.00). Comparing these results to the results in Table 2, which shows the difference in judgments between two randomly chosen participants, reveals that the variation within participants is lower than the variation between participants. Next, we divide this measure by the average judgment to provide a relative measure. This metric is 48.54% for the SG&A expense audit, 44.93% for the accounts payable audit, and 47.11% for the accounts receivable audit and reveals substantial *noise* in the judgments that participants make at different points in time.

Finally, we provide insights into how the variation is distributed across the different items selected for further inquiry. We aim to examine whether the variation is solely in the number of items identified for further inquiry, meaning participants with the same number of items would choose the same items, or if there is also variation in the specific items chosen, independent of the number of items identified for further inquiry. Figures 2A-C show the percentage of participants who identified a specific item as needing additional inquiry based on the results from round 1. The items are ordered from most to least frequently cited. The figures clearly indicate that the selection of items is not random, with some items being chosen more often than others. However, there is also variation in the items chosen, as evidenced by the relatively high amount of items chosen by at least 25% of the participants. This suggests that there is variation not only in the number of items identified as needing additional inquiry but also in the specific items identified.

4.2 Decomposition of different types of noise

In the following analysis, we decompose the total *noise* into its different types. To do so, we first modify our data structure by creating an observation for each task completed by a participant. This results in three observations per round per participant: one for the SG&A expenses, one for the Accounts Receivable, and one for the Accounts Payable. The dependent variable in this analysis is the number of items identified as needing additional inquiry for each task, normalized by dividing the number of items identified by the total number of items.

To decompose the different types of noise, we use an ANOVA with different fixed effects representing the various *noise* types. First, we include task-fixed effects (i.e. whether the task is on SG&A, Accounts Payable, or Accounts Receivable) to account for variation between the different tasks. This variation is not identified as *noise* since it is inherent to the tasks and not due to the participants. Therefore, total *noise* is computed as the total variation in judgments minus the variation captured by task-fixed effects. Second, we include participant-fixed effects to capture *level noise*, which is the variability in the average level of judgments by different auditors. Third, we include participant x task fixed effects to capture *stable pattern noise*, which represents variation in judgments due to the interaction between the auditor and the specific situation or case.

In analyses with only one round of observations, the combination of task, participants, and participant x task fixed effects will explain all the variation. In analyses with two rounds of observations, these fixed effects will not explain all the variation. The variation captured by the residual will represent *occasion noise*, which is variability in judgments of the same case by the same person on different occasions. Thus, analyses with one round of observations will allow us to examine the relative size of *level noise* compared to *stable pattern noise*. Analyses with two rounds of observations will allow us to examine the relative size of all noise components: *level noise, stable pattern noise,* and *occasion noise.* We calculate the relative size

of the *noise* components by dividing the partial sum of squares accounted for each fixed effect by the total *noise*, which is the total sum of squares minus the partial sum of squares accounted for by the task fixed effects.

Table 4 shows the *noise* decomposition for observations from round 1, where we had 163 participants, resulting in 489 data points. Using the partial sum of squares as explained earlier, we find that *level noise* accounts for 45% of the *noise*, and *stable pattern noise* accounts for 55% of the *noise*.[7] Table 5 shows the *noise* decomposition for observations from round 2, with 132 observations and 396 data points. We find that *level noise* accounts for 61% of the *noise* and *stable pattern noise* accounts for 39% of the *noise*. Table 6 provides the *noise* decomposition for observations from the 78 participants who participated in both rounds, leading to 468 data points. We find that *level noise* accounts for 34% of the noise, *stable pattern noise* accounts for 30%, and *occasion noise* for 36%. Based on these analyses, we conclude that *level noise*, *stable pattern,* and *occasion noise* contribute a similar portion to the total *noise*. This is a notable finding, as prior research in other fields typically finds that *stable pattern noise* contributes most to the total *noise*, followed by *level noise*, with *occasion noise* being the smallest contributor (Kahneman et al., 2021).

4.2.1 Robustness

To ensure the robustness of our findings regarding the relative size of the different *noise* components, we conducted robustness tests. First, we examine whether the results remain consistent when conditioned on participants who reported being familiar with the tasks. Table

[7] The relative size of level noise is calculated by dividing the sum of squares accounted for by the participant fixed effects by the total noise, which is the total sum of squares minus the sum of squares accounted for by the task fixed effects. Thus, total noise is 9.12 – 0.55 = 8.57 and level noise is 3.84/8.57 * 100% = 45%. Similarly, the relative size of stable pattern noise is calculated by dividing the sum of squares accounted for by the participants x task fixed effects by the total noise. Thus, stable pattern noise is 4.73/8.57 * 100% = 55%.

7 shows the *noise* decomposition for participants who indicated that they are at least somewhat familiar with the three tasks. Table 8 shows the *noise* decomposition for participants who indicated that they are at least familiar with the tasks.[8] In Table 7, we find that *level noise* accounts for 46% of the *noise*, and *stable pattern noise* accounts for 54% for the 144 participants who are at least somewhat familiar with the tasks. In Table 8, we find that *level noise* accounts for 50% of the *noise*, and *stable pattern noise* accounts for 50% for the 99 participants who are at least familiar with the tasks. These results are similar to the findings above in that *level noise* and *stable pattern noise* contribute similarly to the total *noise*.

Next, we examine whether the results remain similar for participants who do not remember the task from the previous round. Potentially, participants remember the task from the previous round, which could lead to an underestimation of the *occasion noise.* Table 9 shows the *noise* decomposition for participants who did not remember the exact answers given in the previous round and reported that they still had to think about the answers.[9] In Table 9, we find that *level noise* accounts for 35% of the *noise*, *stable pattern noise* accounts for 30% of the *noise*, and *occasion noise* accounts for 36% of the noise for the 50 participants who do not remember the task. These findings correspond to the findings in Table 6, leading to the conclusion that our initial analysis does not underestimate *occasion noise.*

4.3 What explains *level noise*?

In the following analysis, we aim to examine which characteristics contribute to *level noise* and to what extent these characteristics can explain the *level noise*. First, we estimate a

[8] The participants are asked: 'How familiar are you with auditing the SG&A expenses?', 'How familiar are you with auditing the accounts payable?' and 'How familiar are you with auditing the accounts receivable?'. All these questions are asked on a 1-5 scale where 1 = not at all, never performed; 2 = not familiar; 3 = somewhat familiar; 4 = familiar; 5 = very familiar, performed often.

[9] The participants are asked to evaluate the following statements: 'I still remembered exactly which answers I had previously given to the questions in the audit tasks' and 'I didn't have to think while performing the audit tasks because I recognized them' on a 1-5 scale, where 1 = completely disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = completely agree. In Table 9, we condition on participants who answer completely disagree, disagree or neutral to both statements.

regression with only task-fixed effects to estimate a baseline of the variance explained by the task-fixed effects. Then, we add participant-fixed effects to determine how much variance can be explained by *level noise*. Next, we remove the participant-fixed effects and add auditor characteristics to assess how much of the *level noise* can be attributed to these factors. Since we gather information about these personal characteristics in the first round, we use observations from the first round for this analysis.

Table 10, column 1 shows that task-fixed effects explain 6% of the variance, while column 2 shows that task- and participant-fixed effects explain 48% of the variance. In column 3, we remove the participant-fixed effects but add a measure for trait skepticism following Hurtt (2010) and add several demographics (i.e. the years of experience, gender, whether the participants work in a Big4 audit firm, and the function level).[10] Together with trait skepticism and the task-fixed effects, these factors account for 11% of the variance. Since this is significantly lower than the 48% explained by the task- and participant-fixed effects, we conclude that *level noise* consists of many more factors than trait skepticism and demographics.

4.4 Potential determinants of noise

In the following two sections, we explore the effect of two factors – burnout and mindfulness – on *noise*.

4.4.1 Burnout

In this analysis, we explore the effect of burnout on *noise*. The idea behind exploring the effect of burnout is that having burnout or burnout symptoms can impair an individual's cognitive functions, including attention and executive functioning (Deligkaris et al., 2014). Examining this is especially relevant in the audit setting, where burnout symptoms and the

[10] We transform the Hurtt scale to a 100-point scale by dividing by 180 and multiplying by 100. The average in our sample is 68.77, with a standard deviation of 6.28.

challenges of managing a high workload are common (Bucheit et al., 2016; Jefferson et al., 2024; Persellin et al., 2019). One consequence of burnout could be more *noise* in decision-making. To measure burnout, we follow Buchheit et al. (2016) and Jones III et al. (2010) in using a nine-item subset of the Maslach Burnout Inventory (Maslach et al., 1997). Cronbach's alpha for the nine-item scale is equal to 0.76, indicating acceptable reliability.

We first analyze the effect of burnout on total *noise* using observations from the first round and from participants who participated in both rounds. We split each sample into two groups based on the median score on the burnout inventory. We then run an ANOVA with only task-fixed effects and compare the Mean Square Error of the two ANOVA's. For the analysis using observations from the first round, Table 11 shows that the Mean Square Error is higher for the group scoring above the median (panel B, 0.023) than for the group scoring below the median on the burnout inventory (panel A, 0.012). The F-test indicates a significant difference between the two groups, with an F-statistic of 1.83 (df = 249, 240) and a p-value smaller than 0.01. For the analysis using observations from participants who participated in both rounds, Table 12 shows that the Mean Square Error is higher for the group scoring above the median (panel B, 0.018) than for the group scoring below the median on the burnout inventory (panel A, 0.010). The F-test again indicates a significant difference between the two groups, with an F-statistic of 1.80 (df = 243, 219) and a p-value smaller than 0.01. Based on these analyses, we conclude that *noise* is higher among auditors exhibiting more burnout symptoms.

Next, we analyze the *noise* decomposition separately for groups scoring low and high on the burnout inventory to explore the origin of the *noise* differences between the groups. Table 13 shows the *noise* decomposition for the two groups for observations from the first round. The difference in *noise* appears to stem mainly from *stable pattern noise*, as the Mean Square for the task x participant fixed effect is bigger for the participants scoring above the median in the burnout inventory (Panel B, 0.020) compared to those scoring below the median

(Panel A, 0.009). The F-test confirms that this difference is significant, with an F-statistic of 2.35 (df = 164, 158) and a p-value smaller than 0.01. Additionally, there seems to be some difference in *level noise*, as the Mean Square corresponding to the participant-fixed effect is higher for participants scoring on or above the median in the burnout inventory (0.028) compared to those below (0.020). The F-test indicates that this difference is marginally significant, with an F-statistic of 1.38 (df = 82, 79) and a p-value of 0.07.

Table 14 presents the *noise* decomposition for observations from participants who participated in both rounds. As with the previous results, there is a noticeable difference in the *stable pattern noise*. The Mean Square for the task x participant fixed effect is higher for those scoring above the median in the burnout inventory (Panel B, 0.018) compared to those scoring below the median (Panel A, 0.007). The F-test confirms this significant difference, with an F-statistic of 2.71 (df = 80, 72) and a p-value smaller than 0.01. Additionally, there is a difference in *level noise*, with the Mean Square for the participant-fixed effects being higher for those scoring above the median in the burnout inventory (Panel B, 0.036) compared to those scoring below the median (Panel A, 0.021). The F-test indicates that this difference is marginally significant, with an F-statistic of 1.69 (df = 40, 36) and a p-value of 0.06. There is also a difference in the *occasion noise*, as the Mean Square Error is higher for those scoring above the median in the burnout inventory (Panel B, 0.012) compared to those scoring below the median (Panel A, 0.008). The F-test shows that this difference is significant, with an F-statistic of 1.41 (df = 123, 111) and a p-value of 0.03. In conclusion, the differences in *noise* between participants scoring on or above the median in the burnout inventory compared to those scoring below the median appear to be primarily driven by differences in *stable pattern noise* and *occasion noise*, with some modest evidence for a difference in *level noise.*

4.4.2 Mindfulness

In this analysis, we investigate the impact of mindfulness on *noise*. The underlying hypothesis is that mindfulness enhances attentional processing (Van Den Hurk et al., 2010), which may result in less *noise*. For instance, mindful participants, who may possess a heightened awareness of relevant circumstances, might be better at weighing various aspects of a case. Also, mindful participants might be more likely to use reflective versus impulsive thought processes. To measure mindfulness, we use the Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003, 2009). Cronbach's alpha for the 15-item scale is equal to 0.81, indicating acceptable reliability.

We examine the effect of mindfulness by analyzing the observations from the second round as well as by analyzing observations from participants who participated in both rounds. We split the observations into two groups based on the median MAAS score. We then run an ANOVA with only task-fixed effects and compare the Mean Square Error in both analyses. For observations from the second round, Table 15 shows similar Mean Square Error values for both groups (0.014 vs 0.015). The F-test indicates no significant difference in the Mean Square Error between the two groups, with an F-statistic of 1.08 (df = 198, 192) and a p-value of 0.30. In contrast, Table 16 reveals that for participants who participated in both rounds, the Mean Square Error is higher for the group scoring above the median on the MAAS (panel B, 0.017) than for the group scoring below the median (panel A, 0.011), suggesting more *noise* among mindful participants. The F-test demonstrates a significant difference in Mean Square Error between the two groups, with an F-statistic of 1.62 (df = 237, 225) and a p-value smaller than 0.01. Due to the inconsistency of the current analyses, we conclude that more research is needed to understand the effect of mindfulness on *noise* in auditors' judgment and decision making.

5. Conclusion

Prior research in auditing has tried to improve judgment and decision-making by focusing on factors that cause an average error in a set of judgments, known as *statistical bias.* However, *noise*, the unwanted variability in professional judgment, can be equally detrimental as both *statistical bias* and *noise* cause a deviation from the 'optimal' judgment (Kahneman, 2021). This study examined *noise* in audit judgments by analyzing auditor judgments about three different cases at two points in time.

Based on judgments of a sample of auditors with on average 5 years of auditing experience, we find that *level noise*, *stable pattern noise,* and *occasion noise* each contribute similarly to the total *noise*. This is a notable finding as prior research in other fields usually identifies *stable pattern noise* as the largest contributor to total *noise*, followed by l*evel noise*, with *occasion noise* contributing the least (Kahneman et al., 2021). Additionally, our findings indicate that *level noise* is influenced by a wider array of factors than just trait skepticism and demographics, offering further avenues for research. We also demonstrate that *noise* is lower in groups with lower burnout symptoms. The inconclusive findings in our data indicate that additional research is needed to better understand the impact of mindfulness on *noise*.

This study offers several opportunities for further research. First, the considerable amount of *noise* identified indicates the need for future research to examine interventions aimed at reducing total *noise*. Since the decomposition reveals that *level noise*, *stable pattern noise*, and *occasion noise* each contribute similarly to the total *noise*, it is equally important to investigate the determinants of each type of *noise* in order to mitigate *noise* in audit judgments. The methodological approach developed in this study can serve as a foundation for future research examining the effects of interventions on *noise*. Similarly, audit firms can use the methodological approach of a '*noise* audit' to monitor *noise* within their firm and to examine the effectiveness of interventions. Typical interventions used to reduce *noise* are, amongst

others, training, the implementation of standards, and selection of the best auditors to make the judgments (e.g. during recruitment). As might be noted, these interventions are typically already implemented in the audit sector. However, usually they are not focused on reducing *noise* and future research could examine how these practices can be redesigned to also help in reducing *noise.* Second, this study uses relatively simple tasks, asking auditors to identify whether additional inquiry is needed on the SG&A expenses, accounts receivable, and accounts payable. Future research could explore *noise* in more complex audit judgments, such as fair value estimates. Third, this study includes auditors from different audit firms but lacks sufficient observations per firm to conduct a between or within audit firm analysis. Such an analysis could be an interesting avenue for further research, as differences may be driven by variations between audit firms. Fourth, while this study focuses on individual auditor judgments, auditors often make judgments in teams or consult with team members. Prior research shows that group decision-making can either increase or decrease *noise*, depending on how the discussion is structured (Kahneman et al., 2021). Similarly, auditors' work is often reviewed at least once. While combining multiple judgments should theoretically reduce *bias* and *noise,* this is only the case when these judgments are independent. When the second judgment was made while aware of the first, such as in a review setting, it could further increase *bias* or *noise*. Future research could examine existing approaches in auditing regarding colleague consultations, reviewing, and team decision-making to assess their impact on *noise* and study how these practices can be redesigned to reduce *noise.* In short, this paper is the first to examine *noise* in audit, yet the area of *noise* remains largely underdeveloped in the auditing literature, but offers many opportunities to improve auditors' judgment and decision-making.

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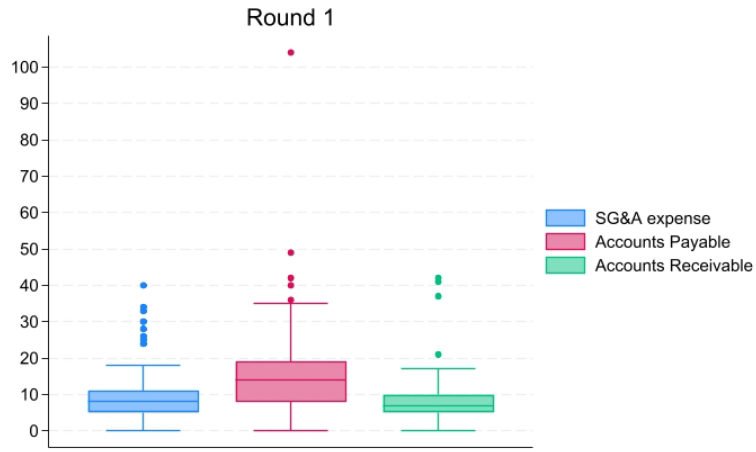
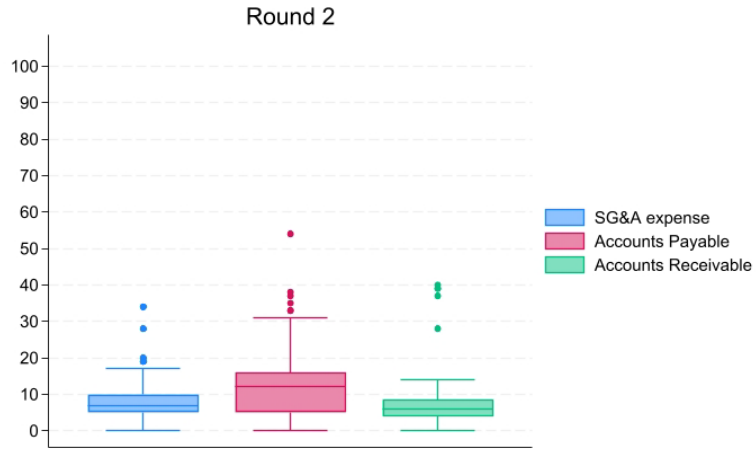
Figure 1A: Boxplot of judgments for round 1



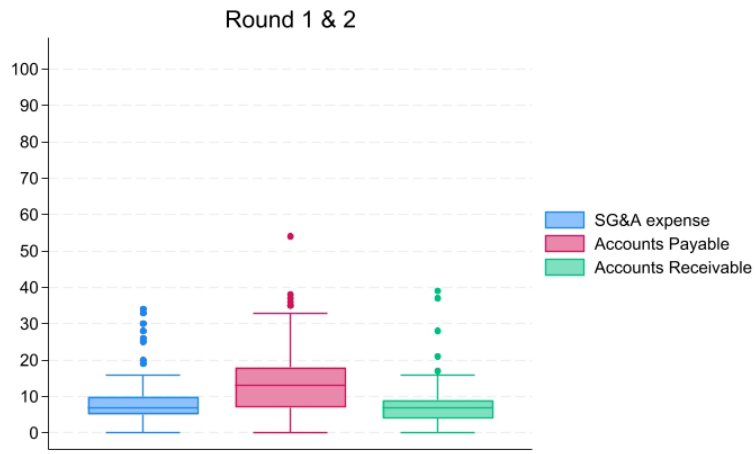
Notes: Figure 1A shows a boxplot of the judgments on the SG&A expense, Accounts Payable, and Accounts Receivable for round 1. Participants were asked to assess for which items they see the need for further inquiry. The judgment provided in the boxplot is the sum of items assessed as needing further inquiry.

Figure 1B: Boxplot of judgments for round 2



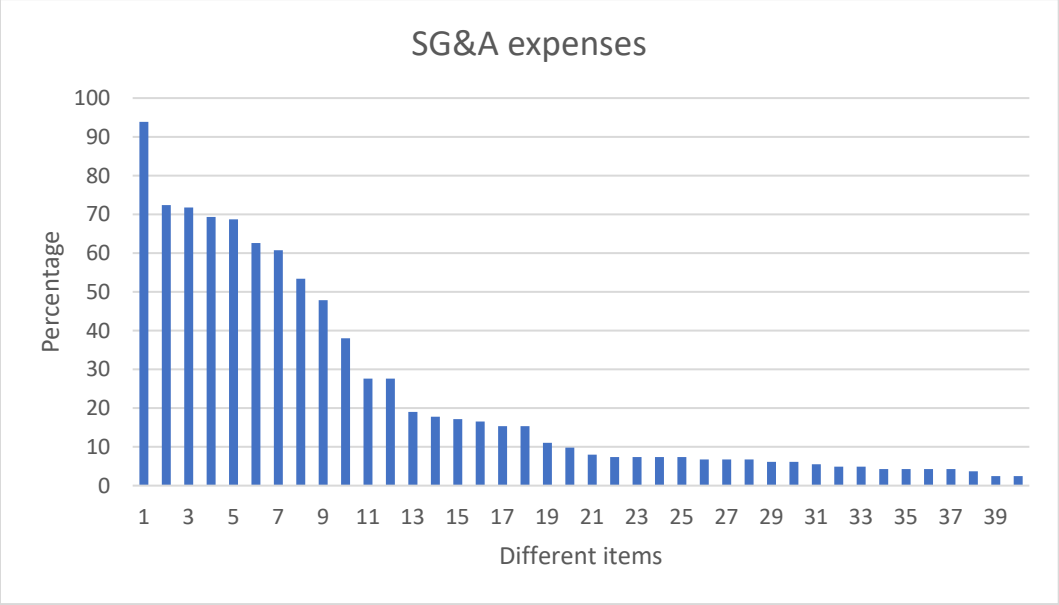
Notes: Figure 1B shows a boxplot of the judgments on the SG&A expense, Accounts Payable, and Accounts Receivable for round 2. Participants were asked to assess for which items they see the need for further inquiry. The judgment provided in the boxplot is the sum of items assessed as needing further inquiry.

Figure 1C: Boxplot of judgements for participants who participated in round 1 & 2



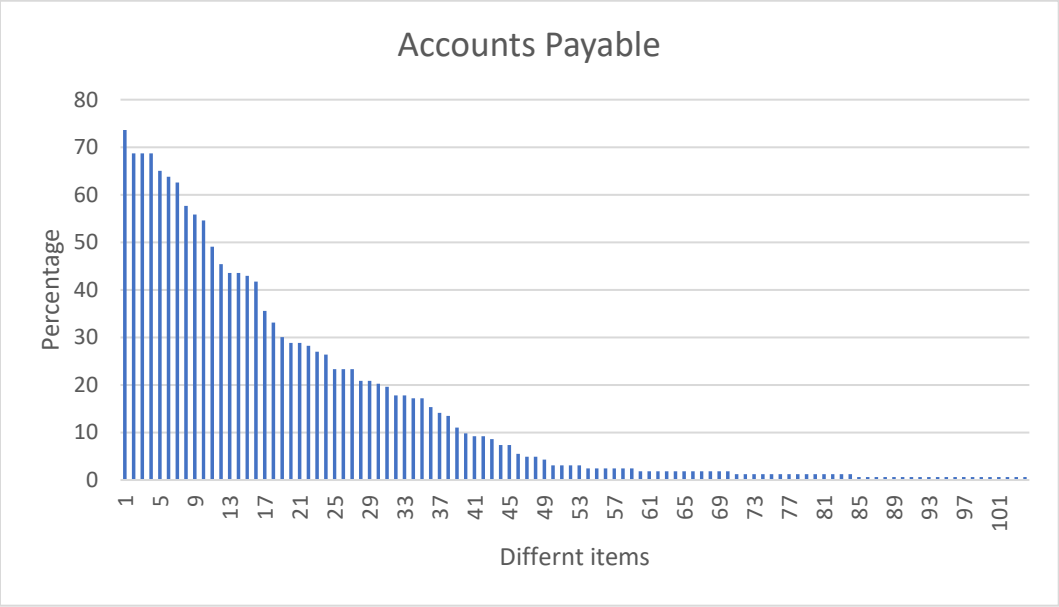
Notes: Figure 1C shows a boxplot of the judgments on the SG&A expense, Accounts Payable, and Accounts Receivable for participants who participated in both round 1 and 2. Participants were asked to assess for which items they see the need for further inquiry. The judgment provided in the boxplot is the sum of items assessed as needing further inquiry.

Figure 2A: Percentage of participants choosing specific item for further inquiry: SG&A expenses



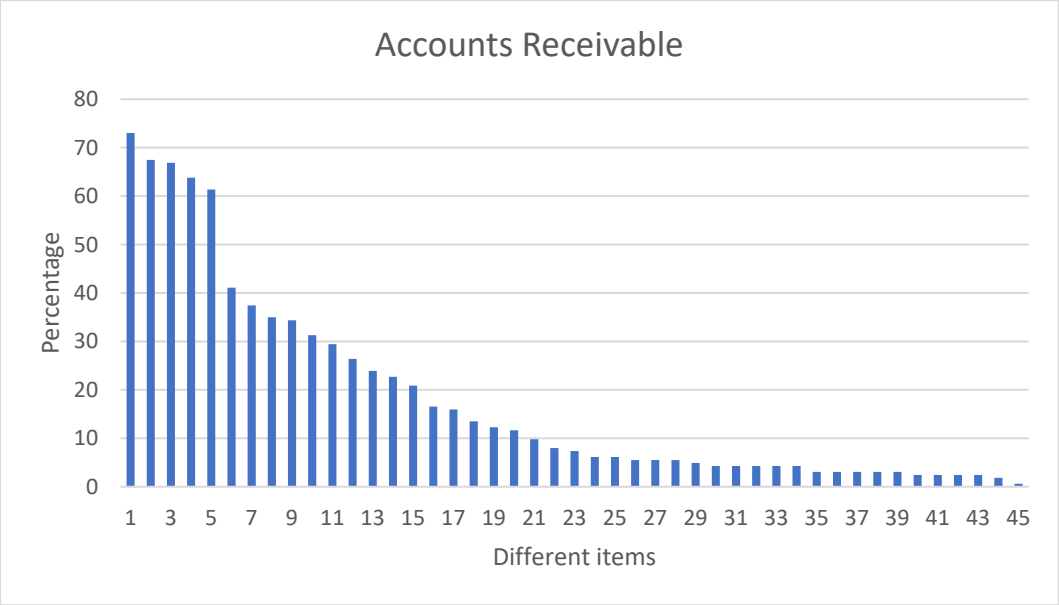
Notes: Figure 2A shows which percentage of participants chose the specific item for further inquiry in round 1 per SG&A item. The items are listed from most chosen to least chosen.

Figure 2B: Percentage of participants choosing specific item for further inquiry: Accounts Payable



Notes: Figure 2B shows which percentage of participants chose the specific item for further inquiry in round 1 per accounts payable item. The items are listed from most chosen to least chosen.

Figure 2C: Percentage of participants choosing specific item for further inquiry: Accounts Receivable



Notes: Figure 2C shows which percentage of participants chose the specific item for further inquiry in round 1 per accounts receivable item. The items are listed from most chosen to least chosen.

Table 1: Descriptive Statistics

Round 1					
Variables	N	Mean	St. dev.	Min	Max
SG&A expense	163	9.27	6.29	0	40
Accounts Payable	163	15.67	11.56	0	104
Accounts Receivable	163	8.13	5.66	0	42
Round 2					
Variables	N	Mean	St. dev.	Min	Max
SG&A expense	132	7.98	4.86	0	34
Accounts Payable	132	12.76	9.15	0	54
Accounts Receivable	132	7.18	6.65	0	40
Observations in Round 1 and Round 2					
Variables	N	Mean	St. dev.	Min	Max
SG&A expense	156	8.44	5.88	0	34
Accounts Payable	156	13.51	9.06	0	54
Accounts Receivable	156	7.34	5.26	0	39

Notes: Table 1 provides descriptive statistics on the judgments on the SG&A expense, Accounts Payable, and Accounts Receivable. Participants were asked to assess on which items they see the need for further inquiry. The judgment provided in the descriptive statistics is the sum of items assessed as needing further inquiry.

Table 2: Difference in judgments between randomly chosen participants

By how much do the judgments of two randomly chosen participants differ?				
	Round 1		Round 2	
Variables	Mean	Median	Mean	Median
SG&A expense	6.00	4.00	4.92	4.00
Accounts Payable	11.23	9.00	9.75	8.00
Accounts Receivable	5.04	3.00	5.49	3.00

Notes: Table 2 provides an answer to the question '*By how much do the judgments between two randomly chosen participants differ?*' for the judgments on the SG&A expense, Accounts Payable, and Accounts Receivable. This measure is calculated by creating all possible pairs between participants, calculating the absolute difference in judgment between the participants in the pair, and calculating the mean and median from this. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry.

Table 3: Difference in judgments of one participant at two points in time

By how much do the judgments of one participant at two points in time differ?			
Variables	Mean	Median	St. dev.
SG&A expense	4.50	3.00	5.80
Accounts Payable	7.04	4.50	6.88
Accounts Receivable	3.83	3.00	4.94

Notes: Table 3 provides an answer to the question '*By how much do the judgments of one participant at two points in time differ?*' for the judgments on the SG&A expense, Accounts Payable, and Accounts Receivable. This measure is calculated by taking the absolute difference between the first and second judgment of a participant for all participants who participated in both rounds and calculating the mean and median from this. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry.

Table 4: Noise decomposition round 1 (ANOVA)

Source	**Partial SS**	**df**	**MS**
Model	9.12	488	0.019
Task	0.55	2	0.274
Participant	3.84	162	0.024
Task x Participant	4.73	324	0.015
Residual	0	0	
Total	9.12	488	0.019

Notes: Table 4 shows an ANOVA for the judgments in round 1. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of three observations for all 163 participants. The analysis includes task fixed effects, participant fixed effects (representing *level* noise), and task x participant fixed effects (representing *stable pattern noise*). F-statistics and p-values are not displayed as all variance is explained by the fixed effects structure.

Table 5: Noise decomposition round 2 (ANOVA)

Source	Partial SS	df	MS
Model	6.20	395	0.016
Task	0.39	2	0.195
Participant	3.56	131	0.027
Task x Participant	2.26	262	0.009
Residual	0	0	
Total	6.20	395	0.016

Notes: Table 5 shows an ANOVA for the judgments in round 2. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of three observations for all 132 participants. The analysis includes task fixed effects, participant fixed effects (representing *level* noise), and task x participant fixed effects (representing *stable pattern noise*). F-statistics and p-values are not displayed as all variance is explained by the fixed effects structure.

Table 6: Noise decomposition for observations from participants who participated in both rounds (ANOVA)

Source	Partial SS	df	MS	F-statistic	p
Model	4.77	233	0.020	2.00	<0.01
Task	0.52	2	0.260	25.38	<0.01
Participant	2.24	77	0.029	2.85	<0.01
Task x Participant	2.00	154	0.013	1.27	0.05
Residual	2.40	234	0.010		
Total	7.16	467	0.015		

Notes: Table 6 shows an ANOVA for the judgments of participants who participated in both round 1 and round 2. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable) at one point in time, meaning that the data consists of six observations for all 78 participants. The analysis includes task fixed effects, participant fixed effects (representing *level* noise), and task x participant fixed effects (representing *stable pattern noise*). The residual represents *occasion noise.*

Table 7: Noise decomposition for participants who are at least somewhat familiar with the tasks (ANOVA)

Source	Partial SS	df	MS
Model	7.53	431	0.017
Task	0.56	2	0.280
Participant	3.20	143	0.022
Task x Participant	3.77	286	0.013
Residual	0	0	
Total	7.53	431	0.017

Notes: Table 7 shows an ANOVA for the judgments in round 1 for participants who answer that they are at least somewhat familiar with the three tasks. The participants were asked: 'How familiar are you with auditing the SG&A expenses?', 'How familiar are you with auditing the accounts payable?' and 'How familiar are you with auditing the accounts receivable?'. All these questions are asked on a 1-5 scale where 1 = not at all, never performed; 2 = not familiar; 3 = somewhat familiar; 4 = familiar; 5 = very familiar, performed often. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of three observations for all 144 participants. The analysis includes task fixed effects, participant fixed effects (representing *level* noise), and task x participant fixed effects (representing *stable pattern noise*). F-statistics and p-values are not displayed as all variance is explained by the fixed effects structure.

Table 8: Noise decomposition for participants who are at least familiar with the tasks (ANOVA)

Source	Partial SS	df	MS
Model	4.98	296	0.017
Task	0.49	2	0.246
Participant	2.25	98	0.023
Task x Participant	2.24	196	0.011
Residual	0	0	
Total	4.98	296	0.017

Notes: Table 8 shows an ANOVA for the judgments in round 1 for participants who answer that they are at least familiar with the three tasks. The participants were asked: 'How familiar are you with auditing the SG&A expenses?', 'How familiar are you with auditing the accounts payable?' and 'How familiar are you with auditing the accounts receivable?'. All these questions are asked on a 1-5 scale where 1 = not at all, never performed; 2 = not familiar; 3 = somewhat familiar; 4 = familiar; 5 = very familiar, performed often. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of three observations for all 99 participants. The analysis includes task fixed effects, participant fixed effects (representing *level* noise), and task x participant fixed effects (representing *stable pattern noise*). F-statistics and p-values are not displayed as all variance is explained by the fixed effects structure.

Table 9: Noise decomposition for observations from participants who participated in both rounds and did not remember the task from the previous round (ANOVA)

Source	Partial SS	df	MS	F-statistic	p
Model	2.94	149	0.020	2.08	<0.01
Task	0.36	2	0.18	18.90	<0.01
Participant	1.38	49	0.028	2.96	<0.01
Task x Participant	1.21	98	0.012	1.30	0.07
Residual	1.42	150	0.009		
Total	4.36	299	0.015		

Notes: Table 9 shows an ANOVA for the judgments of participants who participated in both round 1 and round 2 and did not remember the exact answers given in the previous round and report that they still had to think about the answers. The participants are asked to evaluate the following statements: 'I still remembered exactly which answers I had previously given to the questions in the audit tasks' and 'I didn't have to think while performing the audit tasks because I recognized them' on a 1-5 scale, where 1 = completely disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = completely agree. In Table 9, we condition on participants who answer completely disagree, disagree, or neutral to both statements. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable) at one point in time, meaning that the data consists of six observations for all 50 participants. The analysis includes task fixed effects, participant fixed effects (representing *level* noise), and task x participant fixed effects (representing *stable pattern noise*). The residual represents *occasion noise.*

Table 10: What explains level noise? (first round)

	Judgment Coefficient (p-value)	Judgment Coefficient (p-value)	Judgment Coefficient (p-value)	Judgment Coefficient (p-value)
Trait skepticism			0.001	0.001
			(0.33)	(0.17)
Experience				-0.001
				(0.38)
Male				-0.019
				(0.16)
Big4				0.045
				(0.00)
Constant	0.232	0.181	0.169	0.081
	(0.00)	(0.01)	(0.01)	(0.27)
Task fixed effects	YES	YES	YES	YES
Participant fixed effects	NO	YES	NO	NO
Function level fixed effects	NO	NO	NO	YES
R^2	0.06	0.48	0.06	0.11
Adjusted R^2	0.06	0.22	0.06	0.09
N	489	489	489	408

Notes: Table 10 shows a regression analysis for the judgments in round 1. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable) at one point in time, meaning that the data consists of three observations for all 163 participants. *Trait skepticism* is measured using the Hurtt (2010) scale. *Experience* refers to the number of years auditing experience. *Male* equals 1 for participants identifying as male, and zero otherwise. *Big4* equals 1 for participants working at a Big4 audit firm, and zero otherwise.

Table 11: The effect of Burnout (first round)

Panel A: 1st 50% Burnout (n = 240)			
Source	**Partial SS**	**df**	**MS**
Model	0.20	2	0.098
Task	0.20	2	0.098
Residual	2.94	237	0.012
Total	3.14	239	0.013
Panel B: 2nd 50% Burnout (n=249)			
Source	**Partial SS**	**df**	**MS**
Model	0.37	2	0.184
Task	0.37	2	0.184
Residual	5.60	246	0.023
Total	5.97	248	0.024

Notes: Table 11 shows an ANOVA for the judgments in round 1, split using the median from the Maslach Burnout Inventory (Maslach et al., 1997). Panel A shows the ANOVA for the 80 participants who score under the median for the Maslach Burnout Inventory and Panel B shows the ANOVA for the 83 participants who score on or above the median for the Maslach Burnout Inventory. Participants were asked to assess on which items they see need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of three observations for all participants. The analysis includes task-fixed effects.

Table 12: The effect of Burnout (both rounds)

Panel A: 1st 50% Burnout (n = 222)			
Source	**Partial SS**	**df**	**MS**
Model	0.13	2	0.063
Task	0.13	2	0.063
Residual	2.19	219	0.010
Total	2.31	221	0.010
Panel B: 2nd 50% Burnout (n=246)			
Source	**Partial SS**	**df**	**MS**
Model	0.44	2	0.219
Task	0.44	2	0.219
Residual	4.36	243	0.018
Total	4.80	245	0.020

Notes: Table 12 shows an ANOVA for the judgments of participants who participated in both rounds, split using the median from the Maslach Burnout Inventory (Maslach et al., 1997). Panel A shows the ANOVA for the 37 participants who score under the median for the Maslach Burnout Inventory and Panel B shows the ANOVA for the 41 participants who score on or above the median for the Maslach Burnout Inventory. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of six observations for all participants. The analysis includes task-fixed effects.

Table 13: Noise decomposition by Burnout (first round)

Panel A: 1st 50% Burnout (n = 240)			
Source	**Partial SS**	**df**	**MS**
Model	3.14	239	0.013
Task	0.20	2	0.098
Participant	1.57	79	0.020
Task x Participant	1.37	158	0.009
Residual	0	0	
Total	3.14	239	0.013
Panel B: 2nd 50% Burnout (n = 249)			
Source	**Partial SS**	**df**	**MS**
Model	5.97	248	0.024
Task	0.37	2	0.184
Participant	2.26	82	0.028
Task x Participant	3.35	164	0.020
Residual	0	0	
Total	5.97	248	0.024

Notes: Table 13 shows an ANOVA for the judgments in round 1, split using the median score on the Maslach Burnout Inventory (Maslach et al., 1997). Panel A shows the ANOVA for the 80 participants who score under the median for the Maslach Burnout Inventory and Panel B shows the ANOVA for the 83 participants who score on or above the median for the Maslach Burnout Inventory. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of three observations for all participants. The analysis includes task fixed effects, participant fixed effects (representing *level* noise), and task x participant fixed effects (representing *stable pattern noise*). F-statistics and p-values are not displayed as all variance is explained by the fixed effects structure.

Table 14: Noise decomposition by Burnout (both rounds)

Panel A: 1st 50% Burnout (n = 222)					
Source	**Partial SS**	**df**	**MS**	**F-statistic**	**p**
Model	1.38	110	0.125	1.48	0.02
Task	0.13	2	0.063	7.44	<0.01
Participant	0.76	36	0.021	2.51	<0.01
Task x Participant	0.49	72	0.007	0.80	0.84
Residual	0.94	111	0.008		
Total	2.31	221	0.010		
Panel B: 2nd 50% Burnout (n = 246)					
Source	**Partial SS**	**df**	**MS**	**F-statistic**	**p**
Model	3.34	122	0.027	2.31	<0.01
Task	0.44	2	0.219	18.49	<0.01
Participant	1.43	40	0.036	3.02	<0.01
Task x Participant	1.47	80	0.018	1.55	0.01
Residual	1.46	123	0.012		
Total	4.80	245	0.020		

Notes: Table 14 shows an ANOVA for the judgments of participants who participated in both rounds, split using the median score on the Maslach Burnout Inventory (Maslach et al., 1997). Panel A shows the ANOVA for the 37 participants who score under the median for the Maslach Burnout Inventory and Panel B shows the ANOVA for the 41 participants who score on or above the median for the Maslach Burnout Inventory. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of six observations for all participants. The analysis includes task-fixed effects. The analysis includes task fixed effects, participant fixed effects (representing *level* noise), and task x participant fixed effects (representing *stable pattern noise*). The residual represents *occasion noise.*

Table 15: The effect of Mindfulness (second round)

Panel A: 1st 50% Mindfulness (n = 195)			
Source	**Partial SS**	**df**	**MS**
Model	0.18	2	0.089
Task	0.18	2	0.089
Residual	2.75	192	0.014
Total	2.93	194	0.015
Panel B: 2nd 50% Mindfulness (n = 201)			
Source	**Partial SS**	**df**	**MS**
Model	0.22	2	0.110
Task	0.22	2	0.110
Residual	3.05	198	0.015
Total	3.27	200	0.016

Notes: Table 15 shows an ANOVA for the judgments in round 2, split using the median score on the Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003, 2009). Panel A shows the ANOVA for the 65 participants who score under the median for the MAAS scale and Panel B shows the ANOVA for the 67 participants who score on or above the median for the MAAS scale. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of three observations for all participants. The analysis includes task-fixed effects.

Table 16: The effect of Mindfulness (both rounds)

Panel A: 1st 50% Mindfulness (n = 228)			
Source	**Partial SS**	**df**	**MS**
Model	0.20	2	0.102
Task	0.20	2	0.102
Residual	2.43	225	0.011
Total	2.63	227	0.012
Panel B: 2nd 50% Mindfulness (n = 240)			
Source	**Partial SS**	**df**	**MS**
Model	0.33	2	0.164
Task	0.33	2	0.164
Residual	4.13	237	0.017
Total	4.46	239	0.019

Notes: Table 16 shows an ANOVA for the judgments of participants who participated in both rounds, split using the median score on the Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003, 2009). Panel A shows the ANOVA for the 38 participants who score under the median for the MAAS scale and Panel B shows the ANOVA for the 40 participants who score on or above the median for the MAAS scale. Participants were asked to assess on which items they see the need for further inquiry. The judgment is the sum of items assessed as needing further inquiry, divided by the total items available. Every observation provides the judgment of one participant in one of the tasks (SG&A expenses, Accounts Payable, and Accounts Receivable), meaning that the data consists of six observations for all participants. The analysis includes task-fixed effects.

DO AUDITORS CHARGE A PREMIUM FOR BANKRUPTCY RISK? THE SWISS BANKING SECTOR AS A QUASI EXPERIMENT

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Abstract

The audit literature documents that auditors charge higher fees for clients with higher risk profiles. This phenomenon is typically explained by increased audit effort (DeFond and Zhang 2014) and by a premium compensating for higher client business risk exposure, referred to as a business risk premium (Ranasinghe et al. 2022). This study examines whether a client's bankruptcy risk affects such a business risk premium. Utilizing the Swiss banking context, where state-owned banks face no bankruptcy risk due to their inability to declare bankruptcy, we investigate whether this condition reduces the business risk premium, and hence audit fees. If auditors charge such a business risk premium, we would expect lower audit fees when bankruptcy risk is zero, which is the case for state-owned banks. Our analysis shows that banks with no bankruptcy risk pay about 23% less in audit fees than other banks. This gap widened during the recent economic crisis caused by the COVID-19 pandemic. Further findings suggest that there is no indication of diminished audit quality. Absent lower absolute abnormal loan loss provisions for state-owned banks, it can be excluded that reduced audit fees for banks with zero bankruptcy risk are attributable to reduced audit effort (DeFond and Zhang 2014). Finally, we observe no significant disparities between listed and private state-owned banks, indicating that financial market pressures did not influence our results. Overall, our results demonstrate that the absence of bankruptcy risk significantly reduces audit fees without compromising audit quality.

Keywords

Bankruptcy risk, Business risk premium, Audit fees, Audit quality, State-owned banks.

DO AUDITORS CHARGE A PREMIUM FOR BANKRUPTCY RISK? THE SWISS BANKING SECTOR AS A QUASI EXPERIMENT

1. Introduction

Prior research has established that auditors charge higher audit fees for riskier clients (DeFond & Zhang, 2014; Hay, Knechel, & Wong, 2006). However, a significant limitation of these studies lies in their inability to determine whether the fee increases are attributable to a risk premium, greater audit effort, or enhanced audit quality (DeFond & Zhang, 2014). Ranasinghe et al. (2022) present the first evidence of a business risk premium in audit fees that is independent of heightened audit effort and quality. Their study examines derivative hedging practices in U.S. oil and gas companies, where derivatives mitigate business risks associated with oil and gas price volatility. Despite this innovative approach, a limitation of their setting is that the observed results may also reflect broader risk aversion. Hence, further investigation is needed to explore the potential existence of a business risk premium in audit fees. This study examines whether a client's bankruptcy risk affects the presence of an auditor business risk premium in audit fees.

Auditors' engagement risk comprises three interrelated components: client business risk, auditor business risk, and audit risk (Huss & Jacobs, 1991; Johnstone, 2000; Johnstone & Bedard, 2003). Client business risk refers to the risk of a client's financial deterioration, while auditor business risk encompasses potential losses from litigation, reputational damage, or fee collection issues (Johnstone, 2000; AICPA, 1983; Bell et al., 2001). Audit risk, as defined by the PCAOB (2010), is the risk that the auditor expresses an inappropriate audit opinion when the financial statements are materially misstated.[1] Research shows that client business risk

[1] https://pcaobus.org/oversight/standards/auditing-standards/details/AS1101

influences both auditor business risk and audit risk (St. Pierre & Anderson, 1984; Palmrose, 1987; Pratt & Stice, 1994). For instance, client bankruptcies can heighten an auditor's litigation exposure and harm their reputation, while financially distressed clients may engage in aggressive accounting practices, increasing audit risk.

In his landmark audit fee study, Simunic (1980) argues that in a competitive audit market, audit fees align with marginal costs, resulting in a production (cost)-oriented audit fee model. He further posits that an auditor's cost function comprises two components: a resource cost component, which increases with the level of auditor effort, and an expected future loss component. While both increased audit effort and a litigation risk premium can lead to a positive association between bankruptcy risk and audit fees, he emphasizes the importance of distinguishing between the two, as they may result in different audit outcomes and varying levels of audit assurance. Building on this, Simunic and Stein (1996) highlight litigation risk as a key component of expected future losses. They argue that, since audit fees typically cannot be adjusted retrospectively to account for actual litigation or reputational losses, auditors have a strong incentive to minimize such losses and incorporate expected losses into their fee structures. An auditor business risk premium arising from bankruptcy risk and, by extension, litigation risk, can be considered a crucial element of the expected future loss component in audit fees.

In this study, we build on the arguments of Simunic (1980) and Simunic and Stein (1996) and hypothesize that if auditors incorporate a business risk premium due to litigation and bankruptcy risk, audit fees should be lower for clients without bankruptcy risk compared to those facing bankruptcy risk (Hypothesis 1). We also conjecture that the auditor business risk premium attributable to client's bankruptcy risk increases during an economic crisis, as the expected future loss premium becomes larger (Hypothesis 2). As the likelihood of financial problems increases, related litigation and reputation risks increase as more clients may face

bankruptcy. To rule out the possibility that increased audit fees in the presence of bankruptcy risk are driven by audit effort rather than a business risk premium, we conduct two additional tests. First, if auditors indeed exert less effort when a client faces no bankruptcy risk, these clients should be associated with lower audit quality (DeFond & Zhang, 2014; Aobdia, 2019). If no difference in audit quality is observed between the two types of audit clients, this would support our hypotheses. Second, previous literature suggests that companies listed on the stock market pay higher fees than private companies (e.g., Hay et al., 2006), because they face a higher litigation risk. If an audit client faces no bankruptcy risk, the litigation risk is largely reduced whether or not the client is listed on the stock exchange. Therefore, a non-significant difference in audit fees between privately held and listed clients that do not have bankruptcy risk would also support our hypothesis.

We employ the unique institutional setting of the Swiss banking sector to test our hypotheses. In Switzerland banks are subject to the same audit and banking regulations, except that state-owned banks (SBs) have no bankruptcy risk due to a state guarantee, while the other banks do face bankruptcy risk. This approach allows us to directly capture the bankruptcy risk of a firm, while previous literature frequently used weak proxies to do so, such as a negative income (loss) or the leverage of the firm (Simunic and Stein, 1996; Hay et al., 2006). In the Swiss setting we therefore expect that auditors charge higher audit fees (i.e., an audit business risk premium) to non-SBs than to SBs, and the gap should increase during the economic crisis triggered by the Covid 19-pandemic.

Our main findings are the following. First, SBs indeed pay lower audit fees than the other banks registered in Switzerland that could default. The audit fee discount is around 23%, a statistically significant result that is economically important. This is consistent with a reduction in the auditor business risk premium for clients facing no bankruptcy risk compared to when bankruptcy risk is present. Second, we document an increase of the auditor business

risk premium charged to banks with bankruptcy risk (i.e., non-SBs) during the recent economic crisis triggered by the Covid-19 pandemic. In particular, comparing audit fees of banks facing no bankruptcy risk (SBs) with those which do face bankruptcy risk (especially cooperative banks and other banks having a majority shareholder), we observe increased audit fees charged to non-SBs while the fees paid by SBs did not change during the economic crisis.

To rule out whether our results are driven by increased auditor effort instead of an increase in the business risk premium, we investigate whether audit quality differs between banks that face no bankruptcy risk (SBs) versus the other banks. Since we did not find restatements in the Swiss banking industry, we capture audit quality with absolute abnormal loan loss provisions (e.g., Lobo et al., 2024). The results show no significant difference between banks with and without bankruptcy risk, both in normal times and during the economic crisis. In fact, when compared to some banks, audit quality is even higher in banks that have no bankruptcy risk. We therefore conclude that auditors charge significantly lower audit fees when bankruptcy risk is zero, without any impairment of audit quality. These findings indicate the presence of a larger auditor business risk premium for banks that do face bankruptcy risk.

Finally, within the sample of banks that have no bankruptcy risk, we compare SBs that are listed on the stock market (i.e. the state still owns more than 50% of the voting rights and minority shareholders hold the rest) with private SBs (i.e., the state owns 100% of the voting rights), to better understand whether the financial market pressure (i.e., the presence of minority shareholders) influences auditors' outcomes. Previous literature shows that listed companies usually pay higher audit fees than private companies (e.g., Hay et al., 2006). However, no difference in audit fees appears between these two groups of SBs, suggesting that the auditors do not charge an auditor business risk premium for listed SBs. This finding supports our conclusion that auditors do not charge an auditor business risk premium in the absence of

bankruptcy risk, as litigation risk is significantly reduced. Note that this finding also supports our argument that the premium is not driven by auditor effort.

Overall, our findings contribute to two streams of literature. First, we add to the audit pricing literature by documenting the existence of an auditor business risk premium. Our findings show that an auditor business premium exists due to bankruptcy risk and that it is economically important. Second, we add to the audit pricing literature in the banking industry (Alexeyeva and Meija-Likosova, 2016; Cameran and Perotti, 2014; DeBoskey and Jiang, 2012; Ettredge et al., 2014; Kanagaretnam et al., 2010; Lobo et al., 2024).[2] By showing that SOBs pay lower audit fees when the bankruptcy risk is nil, without an impaired audit quality (i.e., no significant difference in earnings management and income smoothing), we highlight a new factor that explains the audit fees charged to clients. This new factor (i.e., going concern certainty) is very important in auditors' pricing policy. Moreover, our findings should also be of interest to boards of directors and audit committees that hire external auditors. These stakeholders should be aware that auditors negotiate a risk premium not in exchange for additional effort or improved audit quality, but rather due to their expectation of higher litigation costs, particularly those arising from bankruptcy-related lawsuits.

The rest of this paper is structured as follows. Section 2 is devoted to the presentation of the institutional framework, the literature review, and the development of our hypotheses. Section 3 exposes our research design. We present and discuss our main results in section 4. Finally, we conclude in section 5.

2. Institutional context, literature review and hypotheses

2.1. Audit fees and client business risk

[2] Liu and Subramaniam (2013) analyze audit pricing for firms controlled by the government, but they do not consider the banking industry.

Simunic (1980) argues that in a competitive audit market, audit fees align with marginal costs, leading to a production (cost)-oriented audit fee model. He further contends that an auditor's cost function comprises two components: a resource cost component, which increases with the level of auditor effort, and an expected future loss component. The expected loss component is the product of the expected size of future losses and the probability that such losses will occur in the future. Simunic and Stein (1996) argue that in a competitive market, audit fees should be set to ensure auditors earn a normal return. Expanding on the future loss component in audit fees, they argue that ex post litigation costs, which are a part of the expected future loss component in audit fees, may result in a negative realized return, both for individual engagements and potentially across an auditor's client portfolio. Since audit fees typically cannot be adjusted retrospectively to cover actual litigation or reputational losses, auditors have a strong incentive to minimize these losses and incorporate expected losses into their fees.

Empirical studies consistently find a positive association between client business risk and audit fees. For example, Simunic (1980) show that audit fees are higher when a company has a negative net income. O'Keefe et al. (1994) link audit fees to leverage, while Bell et al. (2001) show that auditors charge higher fees when they perceive greater business risk. Additional evidence links higher audit fees to corruption risk (Lyon & Maher, 2005), political connections (Gul, 2006), and market competition (Wang & Chui, 2015). The rationale behind this relationship is that riskier clients require greater audit effort, such as increased engagement hours or a more experienced audit team, to mitigate risks (Johnstone, 2000).

A key unresolved question is whether, beyond greater audit effort, auditors charge a business risk premium to compensate for their exposure to higher client risk (DeFond & Zhang, 2014). While greater effort improves audit quality, the presence of a risk premium implies that audit fees can increase without a corresponding quality improvement. Disentangling auditor effort from a risk premium is challenging because client business risk and audit effort often

move in the same direction (Ranasinghe et al. 2022). Some studies use proprietary data to analyze engagement hours and billing rates separately (Bell et al., 2001; Bedard & Johnstone, 2004; Schelleman & Knechel, 2010). Findings suggest that auditors increase engagement hours for riskier clients, but evidence on whether they charge a separate risk premium remains inconclusive. Bell et al. (2008) examine audit fees after controlling for hours and labor mix and find a risk premium for new engagements but not for continuing ones. Thus, the existence of a client business risk premium in audit fees remains a relevant empirical question (DeFond & Zhang, 2014). Though both increased audit effort and a litigation risk premium would result in a positive association between bankruptcy risk and audit fees, it is an important distinction as it could lead to different audit outcomes and hence different levels of audit assurance supplied.

2.2. Bankruptcy risk as a part of litigation risk

Carcello and Palmrose (1994) note that lawyers emphasize that one of the most frequent sources of litigation against auditors is client bankruptcy. This statement is supported by empirical research (Lathan and Linville, 1998; DeFond and Zhang, 2014). Indeed, several studies find a significant association between the probability of bankruptcy and litigation. They also highlight that, besides the probability of bankruptcy and actual bankruptcy occurrences, several studies have shown the association between other financial distress measures and litigation.

Carcello and Palmrose (1994) analyze 665 public companies that declared bankruptcy and show that the majority (76%) of bankrupt companies have no litigation, but auditors are defendants in the majority (74%) of litigation that occurs. Moreover, they document that the auditor litigation rate (18%) for bankrupt clients is higher than an estimated rate (3%) for all public clients. In an experiment involving 243 audit partners and managers of Big four firms, Pratt and Stice (1994) confirm poor financial condition of potential clients is associated with higher levels of litigation risk, collection of more audit evidence, and higher fees. Lyss and

Watts (1994) and Simunic and Stein (1996) also find a significant association between the probability of bankruptcy and litigation.

As suggested by Lyss and Watts (1994), bankruptcy risk (or financial distress) and litigation risk are related because managers' incentives to mislead increase when the firm is in financial distress. The litigation risk is particularly high when an auditor does not include a going concern opinion in the audit report before the client announces its bankruptcy (i.e., a type I error). However, in their analysis of 24 publicly-traded savings and loans that failed, Blacconiere and DeFond (1997) conclude that a going concern report in the year prior to failure does not prevent audit litigation. Finally, the litigation risk is also higher for bankrupt firms when the auditor is a Big Four firm, as a large audit firm has more financial resources and is therefore able to pay larger damages (i.e., the 'deep pocket hypothesis').

To document a relationship between bankruptcy risk and litigation risk, researchers have used several proxies to capture client bankruptcy risk, especially the existence of a loss (i.e., a negative net income, which also captures client profitability) and the level of debt. In their meta-analysis (Hay et al., 2006) show that these two variables are frequently used and that they are generally positively and significantly associated with audit fees. In this paper, we are able to compare banks that cannot go bankrupt with other banks and, therefore, we use a direct way to measure the bankruptcy risk of the client. Such bankruptcy captures the probability that a bank will go bankrupt and such can be directly related to the expected future loss component in Simunic's (1980) theoretical specification audit fees (which equal marginal audit costs). In particular, bankruptcy risk affects the probability (not the expected size) that future losses will effectively occur. When a bank cannot go bankrupt, the probability of bankruptcy equals zero, and as a result the expected future losses due to bankruptcy for such a an audit client are zero, irrespective of the financial condition of the client.

2.3. The banruptcy risk in the swiss banking industry

To analyze the existence of an audit fee discount when going concern is certain, we focus on Swiss banks. More precisely, we compare audit fees paid by state-owned banks (SBs), for which going concern is certain, with audit fees paid by other banks registered in Switzerland that can go bankrupt.[3]

In prior research, SBs have often been criticized. One key weakness of these banks relates to the influence of politicians on strategic and operational decisions (La Porta et al., 2002; Shleifer and Vishny, 1994). These banks can notably favor political rather than social objectives; politicians are deemed to extract private benefits from such organizations by transferring resources to their supporters in the form of lower interest rates or abnormal volumes of loans (Berger et al., 2005; La Porta et al., 2002). However, this banks cannot go bankrupt, because the state will support them.

In Switzerland, the independent financial-markets regulator (FINMA) is responsible for the supervision of all the banking institutions, but delegates most of the monitoring tasks to private accounting firms (IMF, 2014). In this context, these accounting firms providing external audit services are given two different tasks. First, external auditors are required to conduct financial audits and provide an opinion on whether bank annual (or consolidated) accounts comply with the statutory provisions and the chosen set of financial reporting standards. Audits of bank financial statements are conducted according to Swiss Audit Standards (SAS), which are based on the International Standards on Auditing (ISA). Second, external auditors are also in charge of regulatory audits, meaning that they determine whether banks comply with supervisory requirements and whether they can continue to adhere to these requirements for the foreseeable future. The requirements are set at the federal-level. This second task goes far

[3] In 2023, the Global Systemically Important Banks (GSIB) Crédit Suisse failed, suggesting that even very large banks can go bankrupt when the State does not provide a guarantee.

beyond the role attributed to auditors in other European countries (IBRD, 2016). As a consequence, accounting firms through their audit services play a significant role in the reduction of the asymmetry of information between bank insiders and outsiders in Switzerland. Regulatory audits are conducted according to a set of standards released by FINMA.

2.4. Hypotheses

Overall, we expect that Swiss SBs pay lower audit fees than other banks registered in Switzerland, ceteris paribus, because bankruptcy risk is nil for SBs because of the guarantee provided by the state, and because auditors face the same banking regulations and supervision, and follow the same auditing standards and perform the same procedures in every financial institution owning a banking license. Since this risk is nil for SBs, we therefore consider that audit fees will be larger for the other banks that do face bankruptcy risk, due to a business risk premium capturing a compensation for expected future losses due to higher litigation risk, compared to SBs (Simunic, 1980). Moreover, we also conjecture that the auditor business risk premium attributable to bankruptcy risk increases during an economic crisis, as the expected future loss premium becomes larger. As the likelihood of financial problems increases, related litigation risk increase as more clients may face bankruptcy. Thus, we state the two following hypotheses:

> **H1:** *Ceteris paribus, auditors charge lower fees when a client faces no bankruptcy risk compared to when bankruptcy risk is present, due to a reduction in the business risk premium.*
>
> **H2:** *Ceteris paribus, the audit fees of clients without bankruptcy risk did not increase during the economic crisis triggered by the COVID-19 pandemic, whereas the audit fees of clients facing bankruptcy risk did increase during that period.*

3. Research design

3.1. Sample

To analyze the influence of state ownership on audit fees and audit quality, we started with the 248 financial institutions owning a banking license in Switzerland as of 31.12.2021. We removed four very large banks (UBS, Credit Suisse, Raiffeisen and PostFinance) and their subsidiaries, given their specific characteristics and business models. We also removed financial institutions for which data were not available. Our final balanced sample includes 108 banks domiciled in Switzerland for the period 2014-2021, representing 864 bank-year observations. We start in 2014 because the Swiss accounting rules for banks did not require the disclosure of audit fees in annual reports before that year. We stop in 2021, because it was the latest year of data available when we started our study, and because it is second and the last year of the Covid-10 pandemic.

Since state-owned banks have specific characteristics in terms of ownership structure, we allocate each bank from our sample to a specific group depending on their ownership concentration (i.e., diluted vs concentrated) and owners' objectives (i.e., shareholders' value vs stakeholders' value[4]). Panel A of Table 1 describes our sample.

[**INSERT TABLE 1**]

The first group (G1) includes state-owned banks (i.e., stakeholders' value (STV) banks with a concentrated ownership). In Switzerland, there are 24 cantonal banks in which the state (i.e., the cantons) has a legal obligation to own more than one third of the shares and more than one third of the voting rights. In practice, each canton holds more than 50% of the shares and voting rights to keep its ability to use state-owned financial institutions as a lever to implement public policies. The state has several objectives such as financing the development of the local

[4] Jensen (2001) discuss the weaknesses of firms adopting a stakeholder approach, while Kontolaimou and Tsekouras (2010) specifically discuss the weaknesses of cooperative/mutual banks.

economy even if it may lead to higher risk-taking (i.e., financing new projects with low solvency).

The second group (G2) includes 20 cooperative banks. These banks are also known as mutual banks. As per their legal status, the maximization of bank value is not their main goal, even if the owners of such financial institutions receive a fraction of the net income every year. This group of banks operates at the local level in many European countries such as Switzerland, Germany and France.[5] The functioning of cooperative banks is based on the key principle "one person, one vote" and have, therefore, a diluted ownership (i.e., there is no blockholder in cooperative banks).

The third group (G3) includes 29 banks with concentrated ownership and interested in maximizing shareholders' value (SHV). This group of firms typically includes subsidiaries of foreign and national firms. For instance, several large European and non-European banks own a subsidiary in Switzerland to gain access to a stable market with extensive knowledge of the wealth management business. Banks included in this third group of banks are supposed to maximize shareholder value.

The last group (G4) includes 35 SHV banks with a diluted ownership. In such banks, numerous minority shareholders hold a small fraction of shares, and managers are generally incentivized to maximize shareholders' interests with compensation plans including a large percentage of variable compensation.

3.2. Models

To test our set of hypotheses, we develop two models. In the first model (eq. 1), we compare the audit fees of state-owned banks (*SBs*) with audit fees paid by the other banks included in our sample. This model writes as follows:

[5] The European Association of Cooperative Banks represents 3,000 cooperative financial institutions, 81 million members and 209 million customers in Europe (http://www.eacb.coop/en/home.html).

$$Ln(Audit\_Fees) = \beta_0 + \beta_1 BR + Controls + \varepsilon \quad (eq.\ 1)$$

BR is dummy variable equal to 1 if there is no bankruptcy risk (i.e., all SBs are concerned), and 0 otherwise. In line with H1, we expect a coefficient $\beta 1 < 0$, that is audit fees (AF) charged are lower when there is no bankruptcy risk. Controls is a vector of control variables that are explained in section 3.4.

Based on prior literature, we use the natural logarithm of audit fees (Ln(Audit_Fees)) as our first dependent variable (Alexeyeva and Meija-Likosova, 2016; Cameran et al., 2014; Ettredge et al., 2014; Fields et al., 2014; Lobo et al., 2024). One key difference with data from countries where previous studies have been conducted is that audit fees in Switzerland include both financial and regulatory audit services, as explained in subsection 3.2.1.

Table 2 shows the evolution of the audit by year and group of banks. Panel A highlights that SBs pay larger fees than the other banks. The average (median) audit fees is close to CHF 790 thousands (420) versus about 230 (140) for the non-SBs. However, there is some difference in this group, as banks from Group 3 (with a concentrated ownership and trying to maximize shareholder value) pay higher fees than the banks included in the two other groups (G2 and G4). Panel B shows that audit fees paid by SBs are smaller than those paid by the other banks, when adjusting for the size of the bank. This result reflects the idea that SBs are larger than the other banks and audit fees are not proportional to the size of the bank (i.e., measured with the total assets).

[**INSERT TABLE 2**]

3.3. Control variables

We include several variables in our models to control for bank ownership features and financial profiles, auditor characteristics, and the Swiss institutional context. Each variable has been manually collected from bank annual reports.

Based on previous empirical studies (Alexeyeva and Meija-Likosova, 2016; Cameran and Perotti, 2014; DeBoskey et al., 2012; Ettredge et al., 2014; Kanagaretnam et al., 2010), we also include variables capturing bank financial profiles: Ln(TA), the natural logarithm of firms' total assets; Loans_TA, the ratio of loans divided by total assets; Deposit_TA, the ratio of deposits divided by total assets; Equity_TA, the ratio of equity by total assets; ROA, the return on assets calculated as the net income divided by the total assets; NPL_Loan, a proxy for the quality of bank lending portfolios calculated as the non-performing loans divided by the gross loan year.

With regard to auditors, we include NAF_Total fees, the ratio of non-audit fees divided by total fees; EY, KPMG and PWC are three dummy variables equal to 1 when the incumbent external auditor is one of these providers of audit services, and 0 otherwise; Auditor_Change is equal to 1 if banks change their incumbent auditor, and 0 otherwise.[6]

Finally, we also control for the institutional context, with the variable REGION, which is a dummy variable equal to 1 when banks are in the German-speaking part of Switzerland, and 0 otherwise. This last variable captures a cultural frontier in Switzerland also known as the "Röstigraben", which may impact earnings management (i.e., financial reporting quality) and auditor effort. Appendix A summarizes the definitions of all variables, and Table 3 provides descriptive statistics.[7]

[INSERT TABLE 3]

4. Results

4.1. Audit fees paid by Swiss SOBs

[6] Since all banks have the same year-end date (31 December), there is no need to control for the busy season.
[7] We check for multicollinearity issues in our research design. Each variable in our various models presents a variance inflation factor (VIF) lower than 5.

We start by presenting the results of the cross-sectional analysis. Table 4 shows the results for the association between BR and audit fees. The results of our main model in column (1) suggest that banks with no bankruptcy risk (*BR*) pay lower fees than the other banks. The coefficient equal to -0.226 is statistically significant at the 5%-threshold and economically important: the discount is close to 25% ($e^{0,226}$-1). The coefficient of the variable *BR* is negative and significant in other regressions. In column 3, we also control for banks in Group 2 (cooperative banks) and Group 3 (banks having a shareholder approach and a concentrated ownership), and the coefficient on *BR* is almost the same (-0,234) as in column 2. In the three last columns, we compare SBs that have no bankruptcy risk with one group of banks. The coefficients on *BR* are always negative and significant, suggesting that our results ae not driven by the control group. Overall, these findings support our hypothesis 1, which suggest that banks pay lower audit fees when the going concern is certain (i.e., bankruptcy risk is nil), which is the case for state-owned banks due to the state guarantee. In such context, auditors significantly reduce their effort and their risk premium due to reduced litigation and reputation risks, translating into a lower amount of fees charged to state-owned banks.

Several control variables are also significant in our regressions. Audit fees are higher when: the banks is larger (LN(Audit_Fees), the deposits are higher (Deposits_TA), and when EY and KPMG are the auditors. However, banks with more loans (Loans_TA) pay, as well as banks with higher non-audit services (NAF_Total_fees), and when the bank is located in a Swiss German region. The fact that PWC does not charge higher fees than other auditors may be related to a pricing strategy that helps capturing numerous banks and being the dominant auditor in the banking industry (i.e., PYC audits 59.4% of the banks; see Table 3). Finally, we note that our R-squared are between 0.769 and 0.894, which is in line with those found in similar studies for banks (Alexeyeva and Meija-Likosova, 2016; Cameran et al., 2014; Ettredge

et al., 2014; Fields et al., 2004; Lobo et al., 2024), suggesting that our models are well-specified.

[**INSERT TABLE 4**]

4.2. Changes in Audit fees during the economic crisis

The results of the difference-in-differences analysis reported in Table 5 allow us to better understand whether the economic crisis triggered by the Covid-19 pandemic impacted the audit fees paid by the banks without bankruptcy risk. The findings suggest that audit fees significantly decreased during the economic crisis, as shown by the coefficients on CRISIS in four columns out of five. The coefficient on *BR # CRISIS* is not significant in columns 1 and 2, suggesting that the audit fees paid by banks without bankruptcy risk did not change more than those paid by the other banks during the economic crisis. This is also the case when comparing SBs with banks from group 4 (i.e., banks with a shareholder approach and diluted ownership), in column 5. However, in columns 3 and 4, the coefficient on the interaction variable is negative and significant. Thus, the audit fees paid by SBs decreased more during the crisis than those paid by cooperative banks, when compared to the pre-crisis period (column 3), by about 13% (= $e^{0.121}$-1). When compared to banks from group 3 (i.e., banks with a shareholder approach and a majority blockholder), the marginal decrease is close to 22% (= $e^{0.198}$-1) for SBs.

Overall, these findings suggest that, even if the bankruptcy may increase during an economic crisis, the auditors did not increase the audit fees charged to the SBs because the going certain is certain. This is not the case for other banks, especially those from group 2 and group 3, for which audit fees increased during the economic crisis.

[**INSERT TABLE 5**]

To reinforce our results, we run the same analysis with bank fixed-effects. This approach allows us to capture unobservable factors, such as a better internal control in SBs for

instance, which may also explain the lower audit fees paid by these banks. The results of our difference-in-difference analysis reported in Appendix B confirm that the audit fees decreased during the crisis, but the coefficient are smaller (i.e., -0.139 and -0.188 in the two first columns versus -0.342 and -0.410 in the two first columns of table 5, without bank fixed effects). The coefficient on the interaction variable *BR # CRISIS* is non-significant is four cases out of five. In column 4, we find a negative and significant coefficient on the interaction variable, suggesting a marginal decrease of the audit fees paid by SBs during the crisis, when compared to those paid by banks from group 3 (i.e., banks with a shareholder approach and a majority blockholder). The marginal increase for the banks of group 3 is also confirmed in column 2, as the coefficient on Share_Concent is positive and significant. Overall, this additional analysis suggest that banks without bankruptcy risk did not pay higher audit fees during the economic crisis, as auditors did not make more effort to assess the bankruptcy risk of these banks because they knew that the going concern is certain.

4.3. Audit quality of SBs

One may argue that our main results are driven by the demand for audit services of lower quality by SBs. If politicians and managers from SBs extract more private benefits, by transferring resources to their supporters in the form of lower interest rates or abnormal volumes of loans, they would probably demand less effort to the auditor.

DeFond and Zhang (2014) note that various measures of audit quality can be used, but some of them also capture financial reporting quality. We acknowledge that it is difficult to measure audit quality, especially when no going-concern opinions or restatements are available, which is the case for Swiss banks. We therefore follow prior literature and use the absolute abnormal loan loss provisions (AALLP). This is a key measure, as suggested by Beatty and Liao (2014), Jin et al. (2019) and Kanagaretnam et al. (2010), because LLP is a key item in the income statement used by insiders to manage earnings.

We follow Kim and Kross (1998) and Beatty and Liao (2014) to compute AALLP, but we acknowledge that the number of variables used in our models is more limited because of the restricted scope of data available in the annual reports of Swiss-domiciled private banks. The variables used in the first step are: Ln(TA), the logarithm of total assets; Loans_TA, the total loans divided by the total assets; Var_Loans, the relative change from one year to the next of the loans; NPL_Loans, the non-performing loans divided by gross loans; Var_NPL, the relative change of the non-performing loan from one year to the next. We also include year fixed effects in our models, and cluster by banks.

We start by presenting the results of the cross-sectional analysis. Table 6 shows a non-significant coefficient on *BR* in three columns out of five. However, in columns 2 and 3, that coefficient is negative and significant, suggesting that banks without bankruptcy risk have lower abnormal loan loss provisions and, therefore, higher audit quality and/or financial reporting quality. This finding suggest that the lower audit fees paid by banks without bankruptcy risk are related to a lower audit effort, which would lead to more earnings management through larger absolute abnormal loan loss provisions. It also reinforces the idea that lower fees are charged by auditors because going concern is certain, which reduces auditor litigation and reputation risks.

[INSERT TABLE 6]

We report the results of the difference-in-differences analysis in Table 7. The findings do not suggest that audit quality and/or financial reporting quality decreased during the economic crisis, which the audit fees were much lower, as the coefficient on CRISIS is non-significant in four cases out of five. However, when compared to other banks, banks without bankruptcy risk display lower AALLP in column 2 and column 3, suggesting that these banks managed less their earnings than other banks during the CRISIS (*BR # CRISIS)*. An additional analysis with bank fixed-effects, reported in Appendix C, supports the idea that banks without

bankruptcy risk managed less the earnings during the CRISIS than banks from group 2 (coefficient of -0.004*** in column 3) and from group 4 (coefficient of -0.025* in column 5). Overall, these findings suggest that, while the audit fees paid by banks without bankruptcy risk did not increase during the crisis triggered by the COVID-19 pandemic, audit quality and/or financial reporting quality were not impaired.

[**INSERT TABLE 7**]

4.4. Comparison of listed and private state-owned banks

We deepen our analysis investigation of audit fees and audit quality of Swiss state-owned banks by comparing SBs that are listed on the stock market with private ones (i.e., SBs in which the state owns 100% of the shares). In their meta-analysis, Hay et al. (2006) note that public companies (i.e., companies listed on the stock market) pay higher fees than private companies. This result supports the fact that some forms of ownership are considered to increase the auditor's potential exposure to liability and lead to higher audit fees. However, since all SBs cannot go bankrupt, which limits auditor litigation risk, we expect no significant difference in audit fees between pubis and private SBs.

The results of the cross-sectional analysis in Table 8 indicate that the coefficient on SB_Listed is no significant in columns 1 and 2, suggesting that listed SBs do not pay higher audit fees than private SBs (column 1) and displays a similar audit quality/financial reporting quality (column 2). Moreover, while the audit fees paid by SBs decreased during the crisis (column 3), and audit quality/financial reporting quality increased (column 4), no different change is found for listed SBs and private SBs (i.e., the coefficient on *SB_Listed # CRISIS*) is not significant in columns 3 and 4).

Overall, we conclude that auditors did not make more effort during the economic crisis, which would have been reflected into higher fees, for SBs listed on the stock market than for private SBs. This also support the idea that auditors know that the litigation risk and reputation

may not increase during the crisis if they do not issue a going-concern opinion for SBs, because they know that the risk of bankrupty is nil thanks to the state guarantee.

[**INSERT TABLE 8**]

5. Conclusion

This study builds on Simunic's (1980) audit pricing theory to examine the role of bankruptcy risk in audit pricing. It finds that banks with zero bankruptcy risk pay approximately 23% lower audit fees than other banks that could default. This audit fee discount is statistically significant and suggests that auditors charge a business risk premium to clients facing bankruptcy risk. During the COVID-19 crisis, audit fees for banks with bankruptcy risk increased, while those for banks with zero bankruptcy risk remained unchanged, reinforcing the idea that auditors adjust their pricing based on expected future losses they may incur. Importantly, the results show no significant difference in audit quality between banks with and without bankruptcy risk. In fact, in some cases, audit quality was higher for banks with zero bankruptcy risk.

These findings contribute to the audit pricing literature by providing empirical evidence of an economically significant auditor business risk premium tied to bankruptcy risk and highlight that auditors charge risk premiums due to expected future losses rather than increased audit effort or improved audit quality.

While we are aware of the limitations of this research, especially its focus on a specific context (i.e., a small sample of state-owned banks in Switzerland), we nevertheless believe that our findings should be of interest to audit committees that are responsible for hiring external auditors and negotiating audit fees.

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Table 1. Sample description

This table shows the distribution by group of banks of our balanced sample including 108 banks (864 firm-year observations).

		Ownership structure	
		Concentrated ownership [53 banks; N=424]	Diluted ownership [55 banks; N=440]
Objective of the bank	Stakeholder value [44 banks; N=352]	**Group 1** State-owned banks [24 banks; N=192]	**Group 2** Cooperative banks [20 banks; N=160]
	Shareholder value [64 banks; N=512]	**Group 3** Other banks with a majority blockholder [29 banks; N=232]	**Group 4** Other banks with diluted ownership [35 banks; N=280]

Table 2. Evolution of the audit fees by year and by group of banks

Balanced sample of 108 banks, for the period 2014-2021 (864 bank-year observations). The groups of banks are defined in Table 1

Group	**Group 1** SBs (N=192)		Non-SBs (N=672)		**Group 2** Coop_banks (N=160)		**Group 3** Concent_share (N=232)		**Group 4** Diluted_share (N=280)	
year	mean	p50	mean	p50	mean	p50	mean	p50	mean	p50
Audit fees (k. chf)										
2014	721.2	422.5	232.8	150.0	127.1	112.0	396.2	244.0	158.0	123.0
2015	740.9	409.0	230.4	149.5	127.2	113.0	393.2	267.0	154.4	122.0
2016	867.3	444.5	245.5	157.0	134.7	118.0	437.3	359.0	149.9	113.0
2017	903.6	476.0	254.2	139.0	122.1	103.0	475.2	371.0	146.6	119.0
2018	869.4	436.5	249.0	146.0	129.1	104.5	455.2	360.0	146.8	113.0
2019	757.4	454.5	210.9	126.0	103.1	84.5	384.8	329.0	128.5	106.0
2020	717.0	407.0	208.1	129.0	103.9	88.0	383.0	328.0	122.8	87.0
2021	731.8	371.0	221.7	124.5	108.7	87.5	413.6	265.0	127.3	96.0
Total	*788.6*	*420.0*	*231.6*	*139.0*	*119.5*	*103.0*	*417.3*	*316.5*	*141.8*	*112.0*
Total Fees/Total assets X 100										
2014	.0044	.0033	.0286	.0183	.0190	.0194	.0360	.0152	.0281	.0189
2015	.0040	.0029	.0245	.0164	.0184	.0159	.0256	.0157	.0271	.0178
2016	.0041	.0042	.0234	.0172	.0192	.0184	.0234	.0154	.0258	.0185
2017	.0039	.0041	.0225	.0153	.0166	.0149	.0236	.0140	.0249	.0162
2018	.0036	.0032	.0218	.0153	.0161	.0143	.0224	.0165	.0246	.0154
2019	.0030	.0028	.0192	.0129	.0122	.0099	.0217	.0136	.0212	.0130
2020	.0025	.0023	.0172	.0109	.0113	.0099	.0187	.0115	.0194	.0106
2021	.0025	.0021	.0170	.0117	.0118	.0093	.0178	.0145	.0194	.0117
Total	*.0035*	*.0029*	*.0218*	*.0144*	*.0156*	*.0143*	*.0236*	*.0146*	*.0238*	*.0142*

Table 3. Descriptive statistics

Balanced sample of 108 banks, for the period 2014-2021 (864 bank-year observations). All variables are described in Appendix A.

Variables	Mean	SD	p.25	p.50	p.75
Audit_Fees (thousands chf)	355	720	103	188	380
Ln (Audit_Fees)	5.313	0.917	4.635	5.236	5.941
LLP_Loans	0.033	0.847	0.000	0.000	0.001
AbsAbnLLP	0.025	0.133	0.005	0.011	0.018
Total_Assets (millions chf)	7,657	18,700	524	1,358	5,283
Ln_TA	14.47	1.60	13.17	14.15	15.48
Loans_TA	0.714	0.242	0.712	0.818	0.860
Deposits_TA	0.660	0.160	0.618	0.676	0.744
Equity_TA	0.093	0.043	0.074	0.086	0.098
ROA	0.003	0.009	0.002	0.003	0.004
NPL_Loans	0.015	0.021	0.004	0.009	0.019
NAF_TF	0.052	0.094	0.000	0.000	0.078
	%				
EY	16.7				
KPMG	8.9				
PWC	59.4				
Auditor_change	3.4				
Swiss_German	75.0				

Table 4. Cross-sectional analysis of audit fees

The full sample includes 108 Swiss-domiciled banks over the period 2014-2021 (N = 864 bank-year observations). All variables are described in Appendix A. Robust t-statistics in parentheses (*** p<0.01; ** p<0.05 and * p<0.1).

Dependent variable: Ln(Audit_fees)	Full Sample	Full sample	SBs vs Coop. Banks	SBs vs Concent_ share	SBs vs Diluted_ share
	(1)	(2)	(3)	(4)	(5)
BR	**-0.226****	**-0.234****	**-0.307***	**-0.288****	**-0.279****
	(0.095)	**(0.108)**	**(0.175)**	**(0.138)**	**(0.115)**
Cooperative_Banks		-0.131*			
		(0.066)			
Concent_Ownership		0.025			
		(0.102)			
Ln(TA)	0.517***	0.511***	0.455***	0.540***	0.528***
	(0.035)	(0.039)	(0.045)	(0.067)	(0.036)
Loans_TA	-0.987***	-0.921***	-3.787***	-1.000***	-1.404***
	(0.145)	(0.180)	(0.773)	(0.238)	(0.469)
Deposits_TA	0.443**	0.487**	0.031	0.617***	-0.154
	(0.189)	(0.187)	(0.431)	(0.196)	(0.676)
Equity_TA	1.421*	1.287	-6.458***	1.266	0.141
	(0.810)	(0.822)	(1.987)	(1.073)	(2.077)
ROA	-0.743	-1.158	63.387	-2.266	-4.069
	(1.806)	(1.914)	(49.519)	(2.452)	(6.067)
NPL_Loan	1.037	1.301	2.996*	3.448**	-0.718
	(1.115)	(1.099)	(1.726)	(1.509)	(0.908)
NAF_Total fees	-0.545*	-0.523*	-0.437*	-0.489	-0.742*
	(0.287)	(0.286)	(0.258)	(0.428)	(0.372)
EY	0.223**	0.195*	0.188	0.328*	-0.011
	(0.103)	(0.104)	(0.159)	(0.169)	(0.144)
KPMG	0.296**	0.270**	0.221	0.312*	0.334
	(0.118)	(0.113)	(0.169)	(0.168)	(0.242)
PWC	0.029	0.001	0.095	0.082	-0.099
	(0.080)	(0.076)	(0.107)	(0.166)	(0.111)
Auditor_Change	-0.091	-0.100	-0.277***	-0.076	-0.307***
	(0.072)	(0.071)	(0.097)	(0.073)	(0.067)
Swiss_German	-0.360***	-0.354***	-0.191*	-0.402***	-0.252*
	(0.080)	(0.077)	(0.103)	(0.099)	(0.128)
Constant	-1.488***	-1.436***	2.330**	-2.043**	-0.586
	(0.529)	(0.529)	(1.023)	(0.977)	(0.794)
Year FE	YES	YES	YES	YES	YES
Observations	864	864	352	424	472
R-squared	0.857	0.860	0.914	0.769	0.894

Table 5. Difference-in-differences analysis of audit fees

The full sample includes 108 Swiss-domiciled banks over the period 2014-2021 (N = 864 bank-year observations). All variables are described in Appendix A. Robust t-statistics in parentheses (*** p<0.01; ** p<0.05 and * p<0.1).

Dependent variable: Ln(Audit_fees)	Full sample	Full sample	SBs vs Coop_ banks	SBs vs Concent_ share	SBs vs Diluted_ share
	(1)	(2)	(3)	(4)	(5)
CRISIS	-0.342***	-0.410***	-0.524***	-0.123	-0.509***
	(0.048)	(0.045)	(0.091)	(0.084)	(0.054)
BR	-0.211**	-0.240**	-0.274	-0.233*	-0.266**
	(0.096)	(0.109)	(0.171)	(0.139)	(0.111)
BR # CRISIS	-0.056	0.021	**-0.121***	**-0.198*****	-0.047
	(0.043)	(0.047)	**(0.068)**	**(0.070)**	(0.055)
Cooperative_Banks		-0.131**			
		(0.061)			
Cooperative_Banks # CRISIS		0.000			
		(0.051)			
Concent_Ownership		-0.032			
		(0.103)			
Concent_Ownership # CRISIS		0.213***			
		(0.066)			
Ln(TA)	0.517***	0.512***	0.453***	0.541***	0.527***
	(0.035)	(0.039)	(0.046)	(0.067)	(0.036)
Loans_TA	-0.992***	-0.937***	-3.835***	-1.024***	-1.418***
	(0.146)	(0.181)	(0.768)	(0.241)	(0.474)
Deposits_TA	0.439**	0.481**	-0.016	0.603***	-0.173
	(0.190)	(0.188)	(0.433)	(0.198)	(0.683)
Equity_TA	1.395*	1.253	-6.662***	1.177	0.039
	(0.813)	(0.826)	(1.991)	(1.071)	(2.131)
ROA	-0.826	-1.480	62.804	-2.654	-4.053
	(1.816)	(1.953)	(49.798)	(2.450)	(5.943)
NPL_Loan	1.037	1.338	3.134*	3.521**	-0.737
	(1.114)	(1.136)	(1.688)	(1.502)	(0.914)
NAF_Total fees	-0.550*	-0.539*	-0.446*	-0.513	-0.745**
	(0.286)	(0.283)	(0.256)	(0.426)	(0.372)
EY	0.222**	0.192*	0.185	0.328*	-0.012
	(0.103)	(0.103)	(0.158)	(0.167)	(0.144)
KPMG	0.297**	0.273**	0.223	0.321*	0.338
	(0.118)	(0.111)	(0.173)	(0.165)	(0.241)
PWC	0.029	0.002	0.096	0.090	-0.098
	(0.080)	(0.075)	(0.108)	(0.165)	(0.112)
Auditor_Change	-0.089	-0.114	-0.266***	-0.077	-0.303***
	(0.072)	(0.071)	(0.095)	(0.073)	(0.065)
Swiss_German	-0.360***	-0.353***	-0.187*	-0.401***	-0.250*
	(0.080)	(0.077)	(0.103)	(0.099)	(0.128)
Constant	-1.480***	-1.407***	2.431**	-2.048**	-0.544
	(0.530)	(0.527)	(1.032)	(0.972)	(0.810)
Year FE	YES	YES	YES	YES	YES
Observations	864	864	352	424	472
R-squared	0.857	0.861	0.915	0.772	0.895

Table 6. Cross-sectional analysis of audit quality

The full sample includes 108 Swiss-domiciled banks over the period 2014-2021 (N = 864 bank-year observations). All variables are described in Appendix A. Robust t-statistics in parentheses (*** p<0.01; ** p<0.05 and * p<0.1).

Dependent variable: AALLP	Full sample	Full sample	SBs vs Coop. Banks	SBs vs Concent_ share	SBs vs Diluted_ share
	(1)	(2)	(3)	(4)	(5)
BR	0.004	**-0.033***	**-0.007****	-0.007	-0.001
	(0.015)	**(0.019)**	**(0.003)**	(0.015)	(0.011)
Cooperative_Banks		-0.001			
		(0.008)			
Concent_ownership		**-0.063****			
		(0.025)			
Ln(TA)	-0.008	-0.002	0.000	0.003	-0.009*
	(0.005)	(0.005)	(0.001)	(0.006)	(0.005)
Loans_TA	-0.178*	-0.231**	-0.058***	-0.176	-0.304***
	(0.098)	(0.107)	(0.013)	(0.113)	(0.084)
Deposits_TA	-0.135	-0.149	-0.004	-0.156	-0.005
	(0.117)	(0.117)	(0.010)	(0.128)	(0.051)
Equity_TA	-0.444	-0.482	-0.047	-0.813	-0.436
	(0.538)	(0.518)	(0.047)	(0.625)	(0.417)
ROA	1.487	1.247	2.404**	1.031	1.086
	(1.419)	(1.279)	(0.949)	(1.366)	(1.891)
NPL_Loan	-0.349	-0.157	-0.015	-0.310	0.276
	(0.235)	(0.203)	(0.053)	(0.296)	(0.397)
NAF_Total fees	0.108	0.113	0.002	0.196	-0.001
	(0.094)	(0.094)	(0.006)	(0.160)	(0.036)
EY	-0.002	0.013	-0.000	0.016	0.016
	(0.017)	(0.013)	(0.003)	(0.017)	(0.011)
KPMG	-0.015	-0.002	-0.009**	-0.013	0.041
	(0.032)	(0.029)	(0.004)	(0.017)	(0.042)
PWC	-0.009	-0.001	-0.002	0.007	0.015
	(0.012)	(0.011)	(0.002)	(0.014)	(0.010)
Auditor_Change	-0.013	-0.002	0.009	-0.002	0.001
	(0.011)	(0.009)	(0.008)	(0.011)	(0.005)
Swiss_German	0.022	0.012	-0.001	0.030	0.002
	(0.019)	(0.017)	(0.002)	(0.023)	(0.009)
Constant	0.417	0.407	0.062**	0.289	0.436**
	(0.254)	(0.246)	(0.027)	(0.253)	(0.189)
Year FE	YES	YES	YES	YES	YES
Observations	756	756	308	371	413
R-squared	0.150	0.170	0.295	0.176	0.387

Table 7. Difference-in-differences analysis of audit quality

The full sample includes 108 Swiss-domiciled banks over the period 2014-2021 (N = 864 bank-year observations). All variables are described in Appendix A. Robust t-statistics in parentheses (*** p<0.01; ** p<0.05 and * p<0.1).

Dependent variable: AALLP	Full sample	Full sample	SBs vs Coop. banks	SBs vs Concent_ share	SBs vs Diluted_ share
	(1)	(2)	(3)	(4)	(5)
CRISIS	-0.050	-0.045*	-0.001	-0.097	-0.036
	(0.031)	(0.025)	(0.002)	(0.075)	(0.024)
BR	0.003	**-0.031***	**-0.006***	-0.015	-0.001
	(0.016)	**(0.018)**	**(0.003)**	(0.020)	(0.011)
BR # CRISIS	0.005	-0.005	**-0.005*** **	0.025	-0.002
	(0.008)	(0.015)	**(0.001)**	(0.028)	(0.006)
Cooperative_Banks		-0.005			
		(0.010)			
Cooperative_Banks # CRISIS		0.013			
		(0.012)			
Concent_ownership		-0.055**			
		(0.025)			
Concent_ownership # CRISIS		-0.028			
		(0.038)			
Ln(TA)	-0.008	-0.002	0.000	0.003	-0.009*
	(0.005)	(0.005)	(0.001)	(0.006)	(0.005)
Loans_TA	-0.178*	-0.229**	-0.060***	-0.173	-0.305***
	(0.098)	(0.106)	(0.013)	(0.112)	(0.083)
Deposits_TA	-0.135	-0.148	-0.005	-0.154	-0.006
	(0.117)	(0.117)	(0.010)	(0.127)	(0.051)
Equity_TA	-0.441	-0.483	-0.056	-0.804	-0.440
	(0.539)	(0.520)	(0.048)	(0.618)	(0.413)
ROA	1.496	1.327	2.360**	1.106	1.086
	(1.426)	(1.345)	(0.950)	(1.435)	(1.901)
NPL_Loan	-0.350	-0.174	-0.008	-0.322	0.274
	(0.235)	(0.215)	(0.054)	(0.305)	(0.401)
NAF_Total fees	0.108	0.115	0.002	0.198	-0.001
	(0.094)	(0.096)	(0.006)	(0.162)	(0.036)
EY	-0.001	0.013	-0.000	0.016	0.016
	(0.017)	(0.013)	(0.003)	(0.017)	(0.011)
KPMG	-0.016	-0.002	-0.009**	-0.014	0.041
	(0.032)	(0.030)	(0.004)	(0.017)	(0.042)
PWC	-0.010	-0.001	-0.002	0.006	0.015
	(0.012)	(0.011)	(0.002)	(0.014)	(0.010)
Auditor_Change	-0.013	0.000	0.010	-0.002	0.002
	(0.011)	(0.008)	(0.008)	(0.011)	(0.005)
Swiss_German	0.022	0.012	-0.001	0.030	0.002
	(0.019)	(0.017)	(0.002)	(0.023)	(0.009)
Constant	0.417	0.405*	0.066**	0.290	0.438**
	(0.254)	(0.244)	(0.027)	(0.254)	(0.186)
Year FE	YES	YES	YES	YES	YES
Observations	756	756	308	371	413
R-squared	0.150	0.173	0.305	0.177	0.387

Table 8. Comparison of listed and private state-owned banks (SBs)

The full sample includes 24 Swiss state-owned banks over the period 2014-2021 (N = 192 bank-year observations). All variables are described in Appendix A. Robust t-statistics in parentheses (*** p<0.01 and ** p<0.05).

Dependent variable	Ln(Audit_fees)	AALLP	Ln(Audit_fees)	AALLP
	(1)	(2)	(3)	(4)
SBs_Listed	-0.173	0.000	-0.139	0.000
	(0.112)	(0.000)	(0.108)	(0.000)
CRISIS			-0.645***	-0.013***
			(0.124)	(0.001)
SBs_Listed # CRISIS			-0.159	0.001
			(0.110)	(0.001)
Ln(TA)	0.389***	0.007***	0.387***	0.007***
	(0.100)	(0.000)	(0.100)	(0.000)
Loans_TA	-5.392***	-0.009***	-5.410***	-0.009***
	(1.099)	(0.002)	(1.111)	(0.002)
Deposits_TA	0.619	-0.002	0.541	-0.001
	(0.930)	(0.003)	(0.922)	(0.003)
Equity_TA	-8.901***	-0.022	-9.150***	-0.021
	(2.736)	(0.017)	(2.775)	(0.017)
ROA	107.279*	0.135	108.680*	0.130
	(59.829)	(0.166)	(58.961)	(0.168)
NPL_Loan	4.626	-0.101***	5.240	-0.103***
	(5.283)	(0.023)	(5.406)	(0.024)
NAF_Total fees	-0.252	-0.003**	-0.237	-0.004**
	(0.275)	(0.002)	(0.269)	(0.002)
EY	0.259	0.001	0.243	0.001
	(0.185)	(0.001)	(0.189)	(0.001)
KPMG	0.301	0.001	0.309	0.001
	(0.222)	(0.001)	(0.221)	(0.001)
PWC	0.202	0.001	0.191	0.001
	(0.201)	(0.001)	(0.206)	(0.001)
Auditor_Change	-0.219**	-0.000	-0.235**	-0.000
	(0.084)	(0.000)	(0.093)	(0.000)
Swiss_German	-0.220	-0.000	-0.207	-0.000
	(0.136)	(0.001)	(0.140)	(0.001)
Constant	4.013*	-0.079***	4.088*	-0.079***
	(2.139)	(0.008)	(2.140)	(0.008)
Year FE	YES	YES	YES	YES
Observations	192	168	192	168
R-squared	0.885	0.960	0.887	0.960

Appendix A: Definition of the variables

All variables described above are manually collected from bank annual reports.

Name	Definition
AUDIT_FEES	Audit fees paid to the external auditor for financial and regulatory audit services.
LN_AF	Natural logarithm of audit (financial and regulatory) fees paid to the external auditor.
AALLP	Absolute abnormal loan loss provisions
LLP_TA	Loan loss provisions to total assets.
NAF_TF	Non-audit fees to total fees (audit and non-audit services) paid to the external auditor.
TA (in BCHF)	Total assets.
LN_TA	Natural logarithm of total assets.
LEVERAGE	Total liabilities to total assets.
LOANS_DEPOSITS	Non-mortgage and mortgage loans to total deposits.
NPL_{NET}_$LOANS_{AVG}$	Uncover non-performing loans to average loans during the financial year.
ROE	Net income to total equity.
$LOANS_{t-1}$	Total loans (non-mortgage and mortgage) as of the end of the previous financial year.
LOANS_GROWTH	Growth of total loans (non-mortgage and mortgage) during the financial year.
LLP_LOANS_{t-1}	Loan loss provisions to total loans as of the end of the previous financial year.
DUMMY VARIABLES	
BR	Equal to 1 if the bank does not face bankruptcy risk, and 0 otherwise.
PWC	Equal to 1 if the incumbent audit firm is PwC, and 0 otherwise.
EY	Equal to 1 if the incumbent audit firm is EY, and 0 otherwise.
KPMG	Equal to 1 if the incumbent audit firm is KPMG, and 0 otherwise.
AUDITOR_CHANGE	Equal to 1 if the incumbent audit firm changes, and 0 otherwise.
LISTED	Equal to 1 if the Swiss-domiciled bank is listed on the SIX Swiss exchange, and 0 otherwise.
FOREIGN	Equal to 1 if foreigners with a qualified participation in the bank directly or indirectly hold more than half of its voting shares, or if they exercise a controlling interest in any other manner, and 0 otherwise.
REGION	Equal to 1 if the bank is located in the German-speaking part of Switzerland, and 0 otherwise.

Appendix B. Difference-in-differences analysis of audit fees with bank fixed-effects

Dependent variable: Ln(Audit_fees)	Full sample	Full sample	SBs vs Coop. banks	SBs vs Concent_ share	SBs vs Diluted_ share
	(1)	(2)	(3)	(4)	(5)
CRISIS	-0.139**	-0.188***	-0.418**	-0.018	-0.118*
	(0.057)	(0.050)	(0.192)	(0.074)	(0.068)
BR # CRISIS	-0.011	0.030	0.012	**-0.101***	0.033
	(0.040)	(0.040)	(0.060)	**(0.056)**	(0.040)
Cooperative_Banks # CRISIS		0.004			
		(0.055)			
Concent_Ownership # CRISIS		**0.127****			
		(0.051)			
Ln(TA)	0.078	0.088	0.919**	0.095	-0.270
	(0.131)	(0.119)	(0.451)	(0.121)	(0.223)
Loans_TA	0.621**	0.530**	0.782	0.452	0.225
	(0.272)	(0.266)	(0.544)	(0.330)	(0.620)
Deposits_TA	-0.387	-0.392	-1.022**	-0.284	-0.835
	(0.305)	(0.294)	(0.498)	(0.321)	(0.501)
Equity_TA	0.387	0.413	1.581	0.469	-0.627
	(0.553)	(0.521)	(4.244)	(0.513)	(2.247)
ROA	0.602	0.653	38.344	0.608	2.264
	(1.697)	(1.813)	(47.652)	(2.630)	(2.807)
NPL_Loan	0.303	0.357	1.420	2.122*	-0.122
	(0.543)	(0.601)	(2.704)	(1.086)	(0.431)
NAF_Total fees	-0.239**	-0.251**	-0.206	-0.201	-0.158
	(0.115)	(0.113)	(0.151)	(0.151)	(0.131)
EY	0.086	0.087	0.135	0.084	0.088
	(0.067)	(0.064)	(0.110)	(0.078)	(0.062)
KPMG	0.099	0.102	-0.043	0.117	-0.045
	(0.088)	(0.082)	(0.103)	(0.111)	(0.062)
PWC	0.154***	0.155***	0.152**	0.145	0.075*
	(0.043)	(0.044)	(0.066)	(0.101)	(0.040)
Auditor_Change	-0.105*	-0.115*	-0.150	-0.111**	-0.128***
	(0.060)	(0.061)	(0.106)	(0.050)	(0.041)
Swiss_German	0.439***	0.433***	-1.347	-2.379***	0.636***
	(0.081)	(0.076)	(1.093)	(0.249)	(0.155)
Constant	2.714	2.678*	-7.252	4.856**	8.005**
	(1.761)	(1.605)	(6.209)	(1.818)	(3.184)
Year FE	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES
Observations	864	864	352	424	472
R-squared	0.967	0.968	0.975	0.961	0.982

Appendix C. Difference-in-differences analysis of audit quality with bank fixed-effects

Dependent variable : AALLP	Full sample	Full sample	SBs vs Coop. banks	SBs vs Concent_ share	SBs vs Diluted_ share
	(1)	(2)	(3)	(4)	(5)
CRISIS	-0.085	-0.071	-0.002	-0.155	-0.050
	(0.069)	(0.052)	(0.005)	(0.126)	(0.042)
BR # CRISIS	-0.011	-0.021	**-0.004*** **	0.008	**-0.025***
	(0.008)	(0.019)	**(0.001)**	(0.015)	**(0.013)**
Cooperative Banks # CRISIS		0.004			
		(0.012)			
Concent_Ownership # CRISIS		-0.035			
		(0.037)			
Ln(TA)	0.168	0.158	0.006	0.251	0.241
	(0.166)	(0.155)	(0.015)	(0.209)	(0.174)
Loans_TA	0.045	0.080	-0.003	0.225	0.316
	(0.109)	(0.133)	(0.018)	(0.256)	(0.265)
Deposits_TA	-0.302	-0.297	0.006	-0.647	0.420*
	(0.273)	(0.269)	(0.020)	(0.568)	(0.222)
Equity_TA	-0.847	-0.983	-0.011	-0.096	-4.196**
	(0.872)	(0.863)	(0.121)	(0.421)	(2.019)
ROA	-1.533	-1.298	0.078	-2.451	3.445***
	(1.558)	(1.416)	(1.594)	(1.806)	(1.244)
NPL_Loan	-0.213	-0.337	-0.016	-0.515	0.085
	(0.258)	(0.355)	(0.088)	(0.634)	(0.777)
NAF_Total fees	0.035	0.041	-0.002	0.081	-0.048
	(0.060)	(0.065)	(0.004)	(0.106)	(0.043)
EY	0.013	0.012	0.001	0.009	0.014
	(0.017)	(0.017)	(0.002)	(0.018)	(0.011)
KPMG	-0.007	-0.008	-0.005	0.006	-0.047
	(0.015)	(0.014)	(0.006)	(0.024)	(0.037)
PWC	-0.014	-0.015	-0.002	-0.027	0.001
	(0.016)	(0.016)	(0.004)	(0.031)	(0.007)
Auditor_Change	0.011	0.013	0.009	0.012	0.016
	(0.009)	(0.010)	(0.010)	(0.015)	(0.014)
Swiss_German	-0.163	-0.161	-0.014	0.338	-0.346*
	(0.114)	(0.112)	(0.039)	(0.262)	(0.189)
Constant	-1.852	-1.738	-0.066	-3.269	-3.226
	(2.024)	(1.910)	(0.194)	(2.758)	(2.388)
Year FE	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES
Observations	756	756	308	371	413
R-squared	0.390	0.393	0.484	0.392	0.572

Financial reporting

Do More Prominent Going Concern Opinions Deter or Reassure Users? Evidence from Lenders' Economic Reaction in the Private Market

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Do More Prominent Going Concern Opinions Deter or Reassure Users? Evidence from Lenders' Economic Reaction in the Private Market

Abstract

This paper examines the incremental users' economic reaction to visual cues highlighting material going concern (GC) uncertainties in the audit report. To do so, we exploit a natural experiment in the Belgian audit market, provided by a change in ISA 570 requiring auditors to more prominently disclose material GC uncertainties in the audit report via a separate section under the heading "Material Uncertainty Related to Going Concern" (MURGC), rather than less prominently disclose material GC uncertainties in a more general Emphasis of Matter (EOM) paragraph. Our analyses reveal that lenders of financially stressed firms react significantly more positively by requiring a lower cost of debt to audit reports that mention a material GC uncertainty via a more prominent MURGS compared to those using a less prominent EoM paragraph. While this may seem somewhat counterintuitive at first glance, these results might suggest that more clearly addressing the GC matter, including the reference to the disclosures management has been made in the financial statements, enhances perceptions of management credibility outweighing any potential daunting effect on users. Overall, our study supports the notion that the standard setter's goal of enhancing user awareness of material GC uncertainty disclosures through more prominent disclosures has been achieved, without any inadvertent lender economic overreaction.

Keywords: *Auditing standards, Going concern reporting, Audit report, Visual cues, Lender*

I. INTRODUCTION

Auditor reporting on going concern (GC) related uncertainties is of great interest to numerous stakeholders (investors, lenders, suppliers, employees) who all want an early warning of imminent corporate insolvency (Knechel et al., 2015; Lennox, 2005). However, especially in the aftermath of the global financial crisis, users criticized the audit report to be rather uninformative and also considered the GC reporting to be insufficiently explicit (IAASB, 2011, 2013, 2015). In response to these stakeholder concerns, standard setters around the globe worked on enhancing auditor communication by providing greater transparency into the financial statement audit. For example, by including a new section to address key audit matters (KAM) (AICPA, 2017; FRC, 2015; IAASB, 2015).

Concerning the commentary on the business' GC (i.e., the *Going- Concern Opinion* (GCO)), the IAASB requires since 2016 that material uncertainties related to GC, for which adequate disclosure has been made in the financial statements, are explicitly highlighted in the audit report in a separate section under the specific heading '*Material Uncertainty Related to Going Concern'* (MURGC) (International Standard on Auditing, ISA 570 (revised)). Prior to that revision, material GC uncertainties needed to be reported in a general Emphasis of Matter (EoM) paragraph, that was not limited to solely material GC uncertainties. The key difference between both formats is the *prominence* of the GC matter, that is brought more to the forefront in a separate MURGC than in a more general EoM. In both formats, however, the auditor needs to draw the attention to the management GC disclosures in the notes in the financial statements and the audit opinion is not modified. In other words, the GCO in the separate MURGC does not contain any *extra* information compared to the previous EoM. While more salient or prominently disclosed material GC uncertainties in the audit report are intended to draw users' attention to the GCO and, hence, enhance the informational value of the audit report (Sirois et

al., 2018), visual cues may also have some perverse effects. Previous studies on investors' reaction to more salient financial information, show that more salient disclosures are often overweighted, leading users to overreact (Khaleghi et al., 2018; Lim & Teoh, 2010). Moreover, if the information that is more prominently disclosed highlights uncertainty or risk, people tend to interpret the information as carrying a higher level of uncertainty or risk (Mormann & Frydman, 2016). Therefore, when the salience of the GCO increases this might have a daunting effect on users of the financial statements increasing negative economic reactions. The objective of standard setters to 'improve users' ability to make informed decisions based on the financial statements and the audit (IAASB, 2012) may then be compromised (Sirois et al., 2018).

However, there is also evidence that indicates an alternative perspective. Information that is more salient, in the sense of prominent, should be easier for users of financial reports to understand and might therefore help to reduce information asymmetries (Barth & Schipper, 2008). As information asymmetries typically enhance uncertainty, they might ultimately lead to imprecise investment decisions (Zhang et al., 2022). Moreover, the negative user's reaction to more salient financial information in prior studies, may be driven by 'warning' effects of augmented ('extra') auditor commentary (e.g., discussions of key audit matters and audit procedures performed) (Kelton & Montague, 2018). Given however that the MURGS (compared to the previous EOM) only 'highlights' an area of audit emphasis without adding additional commentary might positively impact, rather than decrease, users' confidence. More clearly addressing the GC matter, including the reference to the adequate disclosures management has been made in the financial statements, might lead to more positive perceptions of management credibility, which in turn will be positively associated with investment related judgments. This credibility-enhancing effect of an audit report that clearly highlights management's uncertainty disclosures in the financial reporting, was previously already shown

by the experiment of Kelton and Montague (2018).

In this paper we exploit a natural experiment provided by the Belgian audit market to assess the incremental impact of a more prominently disclosed GCO. In line with EU-regulation, Belgium already adopted the ISAs in 2012 (2014) for audits of financial statements of listed (private) firms. The revised ISA 570 introducing MURGC in 2016 was in Belgium, however, only applicable as of 2019. Meanwhile, Belgian auditors were allowed to express their material GC uncertainty, either by using the less prominent EoM paragraph, or the more prominent separate MURGC section. To test the incremental informativeness of a more over less prominently disclosed material GC uncertainties in the audit report, we examine over the period 2017-2018 (when both practices were allowed) whether users, more specifically lenders, react differently to both formats of auditor GC disclosures.

Whilst the Belgian environment differs from that of Anglo-Saxon countries, it is comparable to other Continental-European countries. An important characteristic of Continental-European countries is that their market is dominated by private firms, as is the case in Belgium (Willekens & Gaeremynck, 2005). Due to the limited access of private firms to public capital markets, debt financing is of greater value to private companies compared to public ones (Degryse & Van Cayseele, 2000; Hope & Vyas, 2017; Selleslagh & Ceustermans, 2024; Szczesny & Valentincic, 2013).

We find that lenders of financially distressed firms react significantly more positively by requiring a lower cost of debt, to audit reports that mention a material GC uncertainty via a more prominent MURGS than a less prominent EoM paragraph, suggesting that clearly highlighting uncertainty in the audit report has a more credibility-enhancing effect than a daunting effect on users.

We make several important contributions to the existing literature. Our study is the first to provide evidence on users' reaction to more prominently disclosed material GC

uncertainties in the audit report. As such, our study responds to the long-awaited (Birnberg & Shields, 1984) and recent calls (Lynch & Andiola, 2019) to answer questions on the role of visual attention in accounting and the effect thereof on users' economic decision-making. Because of their novelty, evidence on the impact of more prominently disclosed material GC uncertainties on users' economic decisions to date is yet non-existent. Consequently, standard setters' decision to employ such prominent disclosures, in an attempt to increase the informativeness of the audit report, is largely based on untested assumptions about how individuals make decisions upon visual cues incorporating GC uncertainty. Our study provides evidence that users react positively to the revised ISA 570 requiring material GC uncertainties to be more prominently disclosed. Alternatively, our results suggest that merely highlighting the same information may provide incremental value to lenders. As such, our findings have important implications for standard setters who are currently evaluating the effectiveness of recently adopted standards and exploring initiatives to enhance the informative value of the audit report (IAASB, 2021).

Second, as noted in the review of Eberhard (2023), the effect of visual cues on individuals' economic decision-making under uncertain conditions remains unclear. By investigating the effect of visual cues aiming to direct attention to uncertain information (i.e. the doubt regarding a company's financial viability) on individuals' economic decision-making, our study extends theory on visual cues incorporating uncertainty, incorporating as well credibility-enhancing effects as daunting effects.

Third, most of the literature regarding the effect of visual cues is experimental, and thus fails to capture *real* market reactions. Our study quantifies the real reaction of lenders to more prominently disclosed GC uncertainties in the audit report by assessing the firm's cost of debt. While it is not unlikely that institutional lenders have set up entire systems to decide whether a loan should be granted or not, and at which rate, our results also indicate that the individual

behavior of loan officers can have an impact on the granting and rating of loans.

Finally, most research regarding GC reporting has almost exclusively focused on public companies, whilst private companies form a significant majority of companies worldwide, and their economic contributions are substantial (Niemi & Sundgren, 2012; Vanstraelen & Schelleman, 2017). As such, our paper focusing on private firms complements existing literature and contributes to a better understanding of the private market audit environment.

II. BACKGROUND, THEORY AND HYPOTHESES

Revised Standard Setting on Going Concern

The International Standards on Auditing (ISAs) are issued by the International Auditing and Assurance Standards Board (IAASB) and are currently globally used in over 100 jurisdictions worldwide (Boolaky & Soobaroyen, 2017). Member States of the European Union are enforced to carry out their statutory audits in compliance with ISAs in accordance with the European Directive 2014/56/EC (art. 26).

ISA 570 addresses the auditor's responsibility in the audit of financial statements relating to GC and the implications for the auditor's report (ISA 570 revised, par. 1). The standard requires the auditor to evaluate whether there is a material uncertainty regarding the entity's ability to continue as a GC (ISA 570 (revised), par. 6 (6)). If such material uncertainty exists, the auditor should assess the adequacy of the GC disclosures in the financial statements (ISA 570 (revised), par. 18 (19)).

Prior to its 2016 revision, ISA 570 stipulated that in cases where the material uncertainty related to GC was adequately disclosed in the financial statements, the auditor should issue an unmodified opinion and include an *Emphasis of Matter paragraph* (EoM) in the auditor's report to highlight the existence of a material GC uncertainty and to draw the attention to the (adequate) management GC disclosures in the notes in the financial statements (ISA 570, par.

19).[1] The EoM paragraph was, however, not limited to communicating GC uncertainties alone, but could also encompass other matters that the auditor wanted to bring to the attention of users (ISA 706). As a result, the auditor's GC disclosure could potentially be obscured within an obfuscated text, thereby impeding its identification and the ability of users to make informed economic decisions.

While during the deliberation process of the IAASB on ways to enhance auditor reporting related to GC matters, voices were raised for including a GC section in *all* auditor's reports (even if a material uncertainty related to GC was non-existent) the IAASB determined to adopt the exception-based reporting model and only required it necessary for the auditor to report on a *material uncertainty related to GC* if existent. In her basis for conclusion, the IAASB argued that an explicit statement about the non-existence of a material uncertainty related to GC would add standardized language in the auditor's report and could desensitizes users to GC matters when they actually exist (IAASB, 2015).

However, to respond to calls by users of the financial statements for a greater prominence of GC matters, when they exist, in the auditor's report, the IAASB requires since 2016 that material uncertainties related to GC, for which adequate disclosure has been made in the financial statements, are explicitly highlighted in a separate section under the specific heading '*Material Uncertainty Related to Going Concern'* (MURGC) (ISA570 revised, par. 22)[2-3], rather than in a more general EoM paragraph that was not limited to solely material GC

[1] Under the pre-revised ISA 570 (par. 19), "if adequate disclosure is made in the financial statements, the auditor shall express an unmodified opinion and include an Emphasis of Matter paragraph in the auditor's report to:(a) Highlight the existence of a material uncertainty relating to the event or condition that may cast significant doubt on the entity's ability to continue as a going concern; and (b) Draw attention to the note in the financial statements that discloses the matters".

[2] Under the ISA 570 revised (par. 22), "If adequate disclosure about the material uncertainty is made in the financial statements, the auditor shall express an unmodified opinion and the auditor's report shall include a separate section under the heading "Material Uncertainty Related to Going Concern" to: (a) Draw attention to the note in the financial statements that discloses the matters; and (b) State that these events or conditions indicate that a material uncertainty exists that may cast significant doubt on the entity's ability to continue as a going concern and that the auditor's opinion is not modified in respect of the matter."

[3] ISA 570 (revised) was published by the International Auditing and Assurance Standards Board in 2016 and became effective for audits for periods ending on or after December 15, 2016.

uncertainties.

The standard setter believed that if not sufficiently brought to the fore, a material GC uncertainty in the audit report might remain unnoticed or considered to be unimportant by users (IAASB, 2022). Using a separate section and heading, the material GC uncertainty including the reference to the management disclosures in the notes of the financial statements is brought more to the fore as shown in Figure 1. By explicitly highlighting the GC matter in the audit report, the auditor's GC disclosure is prevented from being lost among other disclosures. In doing so, the IAASB aims to alert users of material GC uncertainties (IAASB, 2022) and improve the overall informativeness of audit reports for users' decision making purposes.

Figure 1 EoM paragraph vs. MURGC section

INDEPENDENT AUDITOR'S REPORT

Emphasis of Matter

We draw your attention to Note 1 describing the uncertainty surrounding the outcome of a restatement note from the National Social Security Office regarding various remuneration benefits granted to staff members.

Further, we draw attention to Note 2 in the financial statements, which indicates that the Company incurred a net loss of ZZZ during the year ended December 31, 20X1 and, as of that date, the Company's current liabilities exceeded its total assets by YYY. As stated in Note 2, these events or conditions, along with other matters as set forth in Note Z, indicate that a material uncertainty exists that may cast significant doubt on the Company's ability to continue as a going concern. Our opinion is not modified in respect of this matter.

Finally, we draw attention to Note 3 of the financial statements, which describes the effects of a fire in the Company's production facilities. Our opinion is not modified in respect of this matter.

INDEPENDENT AUDITOR'S REPORT

Material Uncertainty Related to Going Concern

We draw attention to Note 2 in the financial statements, which indicates that the Company incurred a net loss of ZZZ during the year ended December 31, 20X1 and, as of that date, the Company's current liabilities exceeded its total assets by YYY. As stated in Note 2, these events or conditions, along with other matters as set forth in Note 6, indicate that a material uncertainty exists that may cast significant doubt on the Company's ability to continue as a going concern. Our opinion is not modified in respect of this matter.

Emphasis of Matter

We draw your attention to Note 1 describing the uncertainty surrounding the outcome of a restatement note from the National Social Security Office regarding various remuneration benefits granted to staff members.

Further, we also draw attention to Note 3 of the financial statements, which describes the effects of a fire in the Company's production facilities. Our opinion is not modified in respect of this matter.

Figure 1. Less (left) vs. more (right) prominent disclosure of going concern uncertainties in the audit report. For illustration purposes, we highlighted the disclosed uncertainty related to going concern.

Prior studies have established that users of financial statements encounter information overload and possess limited cognitive resources to assimilate all the information presented to them (Daniel et al., 2002; Hirshleifer, 2001; Hirshleifer & Teoh, 2003). Consequently, they may overlook important information and experience difficulties in identifying and analyzing the truly relevant information, which can impact their decision-making. To address this issue, incorporating visual cues that increase visibility of critical information can help attract users' attention and aid in information processing. Individuals tend to respond more strongly to stimuli that are salient (Fiske & Taylor, 2020).

The *limited attention theory* suggests that visual cues attract individuals' attention, requiring less cognitive resources to identify and integrate information (Files et al., 2009; Fiske & Taylor, 2020; Lavie et al., 2004). Accordingly, visual cues, for example under the form of greater prominence , allow individuals to better interpret information and facilitate greater recall, which leads to an increased level of incorporation of the information into individuals' decision-making (Keller & Block, 1997; MacLeod & Campbell, 1992; McGill & Anand, 1989). Research in cognitive psychology (Taylor & Thompson, 1982) and other domains, such as marketing (Clement, 2007), consistently shows that visual cues are effective in increasing attention which enhances users' understanding of information and facilitates improved decision-making (for an overview, see Bordalo et al. (2022)).

Transferring these findings to the field of accounting is, however, not straightforward. Decision-making in accounting, much like other economic decisions, is characterized by uncertainty[4], and it is well-documented that individuals' decision-making processes are often biased (i.e. deviate from expected utility models) when dealing with uncertainty

[4] Uncertainty in accounting practice can arise from estimating financial statement items or the need to predict the future (Rose et al. 2022).

(Tversky & Kahneman, 1974). In fact, when evaluating uncertainty, individuals commonly resort to heuristics or simplified decision rules (Maldonato & Dell'Orco, 2015; Tversky & Kahneman, 1974). However, research on the effect of visual cues on decision-making under uncertainty is limited (Eberhard, 2023). Despite the long-awaited calls to answer questions on the role of visual attention in accounting (Birnberg & Shields, 1984), only recently researchers have started to investigate the effect of visual cues on decision-making under uncertainty. Rose et al. (2022) conducted an experimental study demonstrating that visualizing uncertainty (with graphs) increases auditors' attention, leading to better incorporation of uncertainty into their decision-making. The limited research that exists is, however, inconclusive and demonstrates that visual cues can increase or reduce risk-taking behavior depending on the context (Dambacher et al., 2016).

Files et al. (2009) showed in an archival study that more prominent (versus less prominent) accounting restatements disclosures in press release (i.e., in the heading, with a heading on a different subject, or in a footnote) are associated with stronger negative market reactions. Additionally, Dennis et al. (2019) found, in an experimental study, that nonprofessional investors react more strongly by taking an incremental price protection when the audit report includes KAM disclosures related to a material measurement uncertainty *with* visual cues[5] (as compared to KAMs *without* visual cues).

Also the research by Dong and Hayes (2012) shows that visualizations of uncertain information can increase awareness of uncertainty. Accordingly, Mormann and Frydman (2016) experimental research shows that – given the same set of information - increasing the salience of information highlighting risk, increases the perceived risk. Consequently,

[5] "Specifically, the body of the auditor's report defines a label (i.e., ''M'') and explains that this label identifies the amounts to which the KAM about material measurement uncertainty relates. This treatment then includes a ''labeled'' copy of the financial statements and footnotes, which the auditor has formally attached to its report. In this ''labeled'' copy, the auditor has clearly placed a red box around the Level 3 investment gain and labeled the amount with a red ''M'' (Dennis et al., 2019, p.225).

increased information salience could lead to an (unintended) overreaction (Khaleghi et al., 2018).

However, there is also evidence that indicates an alternative perspective. Information that is more salient, in the sense of prominent, should be easier for users of financial reports to understand and might therefore help to reduce information asymmetries (Barth & Schipper, 2008). As information asymmetries typically enhance uncertainty, they might ultimately lead to imprecise investment decisions (Zhang et al., 2022).

Moreover, the negative user's reaction to more salient financial information in prior studies, may be driven by 'warning' effects of augmented ('extra') auditor commentary (e.g., discussions of key audit matters and audit procedures performed) (Kelton & Montague, 2018). Given however that the MURGS (compared to the previous EOM) only 'highlights' an area of audit emphasis without adding additional commentary might positively impact, rather than decrease, users' confidence.

This *credibility-enhancing effect* of an audit report that clearly highlights management's uncertainty disclosures in the financial reporting, was recently shown by the experiment of Kelton and Montague (2018) that tested the effect of adding an EOM paragraph in the audit report highlighting the management's uncertainty disclosures. Their results showed that nonprofessional investors who received an EOM paragraph in the audit report were more prone to invest in the company than those who did not receive an EOM paragraph. In line with Koch and Zerback (2013), Kelton and Montague (2018) argue that (1) if individuals are exposed to a message for a second time, the message becomes more familiar and is perceived as more credible and (2) when the source that repeats the message is considered to be a trustworthy party (i.e., the auditor), there is an increase in credibility for the originator of the message (i.e., the management). Also Mercer (2004) suggests that the level of external assurance provided for a management disclosure positively affects the disclosure's

credibility. Therefore, it might also be assumed that more clearly addressing the GC matter including the reference to the adequate disclosures management has been made in the financial statements (which not only need to include the principal events or conditions that may cast significant doubt on the entity's ability to continue as a going concern (i.e., red flags like for example adverse key financial ratios or negative operating cash flow) but also the management's plans to deal with these events or conditions (i.e., the mitigating risk factors)) (ISA 570 (revised) §19), might lead to more positive perceptions of management credibility, which in turn will be positively associated with investment related judgments.

As collectively, the above views suggest rather opposite results about the way lenders might react to a more prominently disclosed material GC uncertainty in the audit report, we formulate following null-hypothesis:

> **H_0.** *There is no difference in lender reaction between a more prominently disclosed material GC uncertainty (MURGS) and a less prominently disclosed material GC uncertainty (EOM).*

DATA AND RESEARCH METHOD

The Belgian Setting

In Belgium, more than 99 percent of the companies are privately held, as is common in other Continental European countries (Willekens & Gaeremynck, 2005). Private companies are typically financed by families, holding companies, or banks (De Beelde, 2002; Van Tendeloo & Vanstraelen, 2008). This is why lenders, such as financial institutions, are the primary users of the financial statements in the private market (Karjalainen, 2011; Niemi & Sundgren, 2012). Voluntary demand for auditing is typically low in private settings. To ensure the protection of stakeholders such as lenders, Company Law regulates the demand for auditing by mandating a statutory audit for all public companies, as well as private companies that meet specific size criteria.[6] Given that these size criteria are relatively modest, many small companies are legally obligated to appoint a statutory auditor. Auditing regulations in Belgium are similar to that of other EU member states because Belgium follows all EU directives concerning the European Single Market (i.e., directives regulating the movement of capital, labor, goods, and services) (Hardies et al., 2018; Van Tendeloo & Vanstraelen, 2008).

Already before the mandatory EU-requirement, Belgium decided to formally adopt the ISAs in 2010 making them applicable to audits of financial statements of Public Interest Entities from December 15, 2012, and for all other audits from December 15, 2014. While the revised ISA 570 introduced the more salient separate MURGC section for financial statements ending December 15, 2016, in Belgium, the revised ISA 570 became only

[6] Companies are considered large if they met at least two of the following criteria during our sample period: (1) turnover (excluding VAT) > 9 million euros; (2) total assets > 4.5 million euros; and (3) number of employees (yearly average) >50.

applicable on March 22, 2019.[7] However, between December 15, 2016 and March 22, 2019, Belgian auditors were allowed to apply either ISA 570 of the revised version of the standard (IBR, 2018, par. 8).[8] Put differently, auditors were allowed to disclose material GC uncertainties by either the not prominently EoM paragraph or the prominently disclosed separate MURGC section (see Figure 1). As such, the Belgian context provides a unique setting to investigate the incremental lender reaction to prominently disclosed material GC uncertainties over not prominently disclosed material GC uncertainties in the audit report, while minimizing the threat of contemporaneous factors that could confound the results.

Sample selection

Our data selection process can be found in Table 1. We started our sample selection by using the *Bel-First* database to identify all Belgian companies that met specific size criteria andunderwent audits. This resulted in a total of 32,606 firm-year observations for the years 2017 and 2018. We eliminate 15,399 companies without financial stress, given the emphasis in the existing auditing literature on conditioning analyses of GC reporting on the presence of such stress (Carcello et al., 2009; Hardies et al., 2018). A financially stressed firm is defined according to the criteria of Mutchler (1985): companies with either (1) an operating loss, (2) a bottom-line loss, (3) negative retained earnings, or (4) a negative working capital.

Furthermore, as our study focuses on the private market where institutional debt is the primary source of financing, we exclude 205 observations from listed firms as well as 2,657 observations from financial and public administrative institutions. Finally, we eliminate 1,462 observations without debt and 3,080 observations with missing data for the empirical

[7] In Belgium, the ratification of ISA 570 by the Minister of Economy on February 26, 2019 was published in the Belgian Official Gazette on March 12, 2019. The standard enters into force for the audit of financial statements ending on or after the tenth day after its publication in the Belgian Official Gazette.
[8] In Belgium, auditors are allowed to apply revised ISAs based their professional judgment, even before those standards have been formally ratified (IBR, 2018, par. 8).

models. As reported in Table 1, this selection process results in 9,803 firm-year observations.

[Insert Table 1 around here]

Data sources

The data utilized in this study was derived from three main sources. First, financial statement data was extracted from the *Bel-First* database and the National Bank of Belgium. Second, we manually collected information regarding material GC disclosures in the audit report, which were accessible through the National Bank of Belgium. Lastly, information pertaining to audit partners and firms was obtained by manual collection of data from the public register of the professional body of Belgian auditors.

Research Method

Estimation model

To test our hypothesis, we estimate the following model based on previous research examining the effect of audit related factors on the cost of debt (Causholli & Knechel, 2012; Chen et al., 2016; Karjalainen, 2011; Knechel et al., 2015; Niemi & Sundgren, 2012; Pittman & Fortin, 2004):

$$CoD_{i,t+1} = \alpha_0 + \beta_1 PROMINENCE_{it} + \beta_2 NET\_INCOME_{it} + \beta_3 CURRENT\_RATIO_{it} + \beta_4 LOSS_{it} + \beta_5 DSCORE_{it} + \beta_6 LEV_{it,avg} + \beta_7 OPERATING\_CF_{it} + \beta_8 EQUITY\_HALF_{it} + \beta_9 WORKING\_CAPITAL_{it} + \beta_{10} LTA_{it} + \beta_{11} AGE_{it} + \beta_{12} GROWTH_{it} + \beta_{13} BIG4_{it} + year\ and\ industry\ dummies + \varepsilon_{i,t+1} \quad (1)$$

where *CoD* is the firm's cost of debt or the interest rate on the firm's debt in the year following the audit opinion (*t+1*), defined as the firm's interest expenses in year *(t+1)* scaled by the average debt at the beginning and end of year *t+1*, and multiplied by 100. *PROMINENCE* is a dummy variable equal to 1 if the material GC uncertainty is disclosed

prominently (via a separate MURGC section), and equal to 0 if the material GC uncertainty is not prominently disclosed (via an EoM paragraph).

We also control for other known determinants of the cost of debt, based on prior research (Causholli & Knechel, 2012; Chen et al., 2016; Karjalainen, 2011; Knechel et al., 2015; Niemi & Sundgren, 2012; Pittman & Fortin, 2004). Specifically, we include variables related to companies' financial health as the required risk premium is smaller for financially healthier companies. By doing so, we control for the firm's net income to total assets (*NET_INCOME*), current ratio (*CURRENT_RATIO*), prior losses (*LOSS*), bankruptcy risk (*DSCORE*), leverage (*LEV*), operating cash flow *(OPERATING_CF*), having equity falling below half of the firm's share capital *(EQUITY_HALF)* and the firm's working capital (*WORKING_CAPITAL*). Furthermore, we control for firm size (*LTA*) and age (*AGE*), as smaller and younger firms are associated with a higher risk, and growth opportunities (*GROWTH*) defined as the difference between the natural logarithm of total assets in year *t* and *t-1.* as growth opportunities reduce the risk of loans. Moreover, we control for factors in the firm's audit environment that could potentially affect the investor response to a material GC disclosure. We control for whether the audit firm is part of the Big 4 (*BIG4*), an indicator of audit quality. Higher audit quality has a positive impact on debt contracting efficiency by increasing the credibility of the financial information, thereby reducing the information uncertainty and lowering lenders' debt monitoring costs (Jensen, 1976; Kim et al., 2011). Consequently, we expect higher perceived audit quality to decrease the cost of debt. To conclude, we include industry and year dummies to our model to control for industry and time effects.[9] A detailed overview of the variables used can be found in Appendix A.

[9] Following Ceustermans et al. (2017), we divide industries in five industry groups, based on their two-digit SIC (NACEBEL) code. We opted for five industry groups as grouping on two-digit SIC (NACEBEL) categories leads to 88 (21) groups, which overfits the model. According to both the Bayesian information criterion and Akaike Information criterion, which consider the goodness of fit and the simplicity of the model (Kudo et al., 2020), only including five industry groups is the best model.

We also test our hypothesis by re-estimating Model (1) using an expanded sample that includes financially stressed firms without material GC. To account for this, we introduce *GC,* a dummy variable equal to 1 when a material GC uncertainty is disclosed in the audit report, and 0 otherwise. Specifically, we estimate the following model:

$$CoD_{i,t+1} = \alpha_0 + \beta_1 GC_{i,t} + \beta_2 PROMINENCE + controls + year\ and\ industry\ dummies + \varepsilon_{i,t+1} \quad (2)$$

Since Equation (2) includes both *GC* and *PROMINENCE*, the coefficient on *GC* captures lenders' reaction to a material GC uncertainty that is not prominently disclosed in an EoM (compared to the absence of a material GC uncertainty), while the coefficient on *PROMINENCE* measures the incremental effect of highlighting the material GC uncertainty in a MURGC (over that of a not prominently disclosed material GC uncertainty in an EoM). As evidence suggests that lenders react negatively to a GC uncertainty (Chen et al., 2016; Trpeska et al., 2017), we expect the coefficient on *GC* to be positive.

Furthermore, all independent variables are winsorized at the top and bottom 5 percent in all analyses. Our dependent variable, cost of debt, is winsorized only at the top 5 percent, as one-sided winsorization is preferable for skewed data (Cheng and Young (2023).

Identification of GC Uncertainties in the Audit Report

The information pertaining to material GC uncertainty disclosures in the audit report was gathered through the process of downloading and reading the audit reports. The identification of a separate MURGC section within an audit report was a relatively straightforward task due to its explicit visual cue in the form of a heading. Conversely, to determine whether an EoM discusses a material GC uncertainty required us to closely scrutinize the entire paragraph to ascertain the presence of any material GC uncertainty.

As a result of these procedures (see Table 1), out of 9,803 firm-year observations, 386

(3.94 percent) are identified as material GC uncertainty disclosures in the audit report.[10] This GC rate is much lower than other research in a comparable setting (Carcello et al., 2009; Hardies et al., 2018). As stated above, prior to the revision of ISA 570, a general Emphasis of Matter (EoM) paragraph was not limited to solely material GC uncertainties. If the auditor considers it necessary to draw users' attention to a matter presented or disclosed in the financial statements that, in the auditor's judgement, is of such importance that it is fundamental to users'understanding of the financial statements, ISA 706 (§8) requires the auditor to include an EoM provided this would not require the auditor to modify his opinion.

In case the auditor identifies events or conditions that may cast significant doubt on the entity's ability to continue as a GC, but based on the audit evidence obtained (this is, after evaluating management's plans for future actions in relation to its GC assessment), concludesthat no material GC uncertainty exists, the auditor might still consider it important enough to draw users' attention to the importance of specific management's plans in the firm's GC. In prior research, these "close call" situations are typically also considered as a GC (IAASB, 2022), explaining their higher GC rate.

In order to be able to measure the incremental effect of a prominently disclosed material GC, this study only considers *material* GC uncertainties as a GC. Among these 386 material GC uncertainties, 126 (32.64 percent) are not prominently disclosed (*GC* = 1 and *PROMINENCE* = 0) and 260 (67.36 percent) are prominently disclosed (*GC* = 1 and *PROMINENCE* = 1).

[10] The 386 firm-year observations where the auditor expressed a GC uncertainty come from 290 unique private companies.

III. RESULTS

Descriptive Statistics and Univariate Results

Table 2 presents the descriptive statistics on the variables used in the empirical analysis.

The average cost of debt for the entire sample is 1.32 percent, which is slightly lower than the average cost of debt for Belgian companies between 2017 and 2018 (ranging between 1.4 and 1.8 percent depending on type and period) (NBB, 2024)[11-12].

The average cost of debt of companies without a material GC uncertainty disclosure (*CoD* = 1.3 percent) is significantly lower than the average cost of debt of companies with a less prominently disclosed material GC uncertainty (EoM) (*CoD* = 1.72 percent). Notably, however, the average cost of debt of companies with a more prominently disclosed GC uncertainty (MURGC) is also significantly lower (*CoD* = 1.32 percent) than those with a less prominent GC disclosure (EoM) (1.72 percent).

To test the differences in variables across the three subsamples, a Pearson Chi-square test is used for binary variables, and an ANOVA test is used for continuous variables. To test which groups differ significantly, Pairwise comparisons are employed for binary variables and a Bonferroni post-hoc test for continuous variables. The corresponding $\chi 2$-values, F-values and p-values are reported in Table 2.

The average total assets for companies with a more prominently disclosed material GC uncertainty (*LTA* = 15.88) is significantly larger than companies with a less prominently disclosed material GC uncertainty (*LTA* = 15.67). The average company age is 28 years (*AGE*). Furthermore, companies with a less prominently disclosed material GC uncertainty are of worse financial health (*DSCORE* = -1.79), than both, companies without a material

[11] Nationale Bank van België (NBB). (2024). *Kredietverlening aan niet-financiële vennootschappen in België in het tweede kwartaal van 2024*. https://www.nbb.be/doc/dq/n/dq3/histo/tnk24ii.pdf

[12] The fact that we consider all debt, not just interest-bearing debt (as the latter is not separately listed in Belgian financial statements), when calculating the cost of debt, might explain this discrepancy.

GC uncertainty disclosure (*DSCORE* = 0.49) and companies with a more prominently disclosed material GC uncertainty (*DSCORE* = -1.10). The averages in all three groups are very low, indicating that the companies in our sample are all of poor financial health.

This poor financial health is also observable in the other variables, as the companies have, on average, a negative net income (*NITA*), show no growth (*GROWTH*), have a current ratio around one (*CR*) and more than half of the companies have a negative working capital (*WC*). Especially, companies with a material GC uncertainty disclosure, either disclosed more prominently via MURGC or disclosed less prominently via EOM, have a very fragile financial condition as more than half (60 percent, MURGC and 76 percent, EOM) have their equity falling below half of the companies' share capital versus only 19 percent of the companies without a material GC uncertainty disclosure.

[Insert Table 2 around here]

Entropy Balancing

We employ entropy balancing (EB) to address functional form misspecification.[13] As discussed above, Table 2 shows that within our sample, firms with a prominently disclosed material GC (MURGSCS) tend to be financially healthier than those with a less prominently disclosed GC disclosure (EoM). Similarly, in the expanded sample, firms without a material GC exhibit stronger financial health than those with a material GC, regardless of prominence. We, therefore, reweight observations to equalize the mean and variance of the distributions of all control variables for both samples, one comparing prominently (MURGC, treatment firms) and no prominently (EoM, control firms) disclosed material GC (Table 3, Panel A) and the other comparing material GC (regardless of prominence, treatment firms) and no material GC (control firms) (Table 3,

[13] As an alternative to EB, we use propensity score matching (PSM) to create two sets of matched firms. We obtain very similar results when we use propensity score matching as an alternative to achieve covariate balance in observable client characteristics.

Panel B)(Hainmueller, 2012; McMullin & Schonberger, 2022). Descriptive statistics (see Table 3, Panels A and B) show that for all covariates standardized differences are near 0 and variance ratios near 1, suggesting that EB successfully eliminates covariate imbalance in our sample. The maximum observational weight that EB assigned to a control observation ranges from 1.05 to 11.08, suggesting there are no observations with extreme weights in our samples.

[Insert Table 3 around here]

Table 4 reports correlations between all variables at the 0.01 level, both for the reweighted sample of firms with material GC, either prominently or not prominently disclosed (Panel A) and the sample of firms with and without material GC (Panel B). Panel A shows a weak negative correlation between *PROMINENCE* and *CoD* (r = -0.18). Panel B reveals that neither *GC*, nor *PROMINENCE* correlates significantly with *CoD*. In both Panels, *AGE*, *LTA*, *WORKING_CAPITAL*, *GROWTH*, *LEV* and *BIG4* correlate significantly with CoD. In terms of the correlations among the independent variables, there exist no substantial correlations that could potentially result in issues of multicollinearity (as all Variance Inflation Factor (VIF) values are considerably below 10).

[Insert Table 4 around here]

Multivariate Analyses

Table 5 presents the results from estimating Eq. (1) in Column (1) using a sample of firms with a material GC, either prominently (MURGC) or not prominently disclosed (EoM). The R^2 for model 1 is 27.51 percent. The estimated coefficient of *PROMINENCE* is statistically significant and negative (t-stat = -2.13). This suggests that firms experience a lower cost of debt when their auditor prominently disclosed material GC uncertainties, compared to when these GC uncertainties are not prominently disclosed.

Column (2) presents the results from estimating Eq. (2) using an expanded sample of firms with and without material GC. The R^2 for model 2 is 7.44 percent. The estimated coefficient of *GC* is statistically significant and positive (*t*-stat = 3.49), while the estimated coefficient of *PROMINENCE* is significant and negative (*t*- stat = -3.09). These results suggest that lenders react negatively to the disclosure of material GC uncertainties, but this reaction is less negative when the disclosures are prominently disclosed.

Results for most control variables are in both models as expected and in line with prior research.

[Insert Table 5 around here]

IV. DISCUSSION AND CONCLUSION

ISA 570 addresses the auditor's responsibility in the audit of financial statements relating to the GC and the implications for the auditor's report. Prior to its revision in 2016, the standard required auditors to issue an unmodified opinion and include an EoM in cases where the auditor had a material uncertainty related to the GC, but this uncertainty was adequately disclosed by management in the financial statements. However, the auditor's GC disclosure could be obscured in the EoM paragraph, that was not limited to solely material GC uncertainties, making it difficult for users to identify. In a reaction to this potential issue, the IAASB revised ISA 570 in 2016. Auditors are now required to disclose material GC uncertainties more prominently in a separate MURGC section, rather than in a more general EoM paragraph. Using a visual cue, this brings the GC uncertainty more to the front.

Previous studies have shown that when the information is disclosed more prominently and highlights uncertainty or risk, individuals are inclined to interpret it as reflecting a higher level of uncertainty or risk (Mormann & Frydman, 2016). Consequently, the salience of the GCO might result in negative economic reactions from the users of financial statements.

These adverse economic reactions compromises the standard setters' intent to add informational value (Sirois et al., 2018). Moreover, experimental research of Mormann and Frydman (2016) shows that – given the same set of information– the perceived risk increases when the salience of information highlighting risk increases.

The limited attention theory, however, suggests that visual cues, such as greater salience, can enhance users' understanding of information and improve their decision-making (Bordalo et al., 2022). Furthermore, research of Barth and Schipper (2008) suggests that information that is more prominent, could help users of financial statements to better understand what is contained therein and might limit information asymmetry. The experiment of Kelton and Montague (2018) also shows the credibility-enhancing effect of an audit report that clearly highlights management's uncertainty disclosures in the financial reporting. They found evidence that nonprofessional investors who received an EOM paragraph in the audit report were more prone to invest in the company than those who did not receive the paragraph.

Our paper adds new evidence regarding lenders economic reaction in a private market following an auditor material GC uncertainty disclosure, and studies the effect of disclosing this material GC uncertainty more prominently. To do so, we make use of a natural experiment provided by the Belgian audit landscape, where in 2017 and 2018, auditors were allowed to use either a less prominent EoM to express their uncertainty regarding the GCO, or a more salient MURGC. Using entropy balancing we find that firms that received a prominently disclosed material GC uncertainty experience a lower cost of debt compared to the ones with a less prominently disclosed material GC uncertainty. We use this proxy as lenders are the primary source of finance inthe private market, and are also the main users of the financial statements in the private market (Karjalainen, 2011; Niemi & Sundgren, 2012). Furthermore, the results of our expanded sample show that lenders react negatively

to a disclosed material GC uncertainty compared to firms with no GCO. However, this reaction is less negative when it comes to disclosures that are prominently disclosed. Our results therefore suggest that more clearly addressing the GC matter, including the reference to the disclosures management has been made in the financial statements, enhances perceptions of management credibility outweighing any potential daunting effect on users. Overall, our study supports the notion that the standard setter's goal of enhancing user awareness of material GC uncertainty disclosures through more prominent disclosures has been achieved, without any inadvertent lender economic overreaction.

Our study is subject to a number of limitations. First, it is not possible to determine from archival data whether audit reports provide lenders with information beyond financial statements or whether lenders do not use accounting information in their decision-making process. Future research can study the link between salience of the GCO and the effect on users in an experimental setting. Second, our findings are based on data obtained from a single country and may not be applicable to other settings. Although auditors in Belgium may adhere to the ISAs, it should not be assumed that audit reporting is consistent across all countries that implement ISAs. Variations in audit reporting can arise due to differences in legislation and cultural norms among nations. Finally, although several validity checks were conducted during and after data collection, it is important to acknowledge that identifying GCOs required a considerable amount of manual effort, which could lead to the possibility of some GCOs remaining unnoticed.

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Appendix A
Variable Definitions

	Definition	Data Source
Dependent variable		
CoD	Firm's *i* interest expenses in year *t+1* scaled by the average debt at the beginning and end of year *t+1,* and multiplied by 100.	Audit opinion
Independent test variables		
GC	Dummy variable: *GC* = 1, in case firm *i* receives a disclosure in the audit report regarding a material going concern uncertainty in year *t*, and 0 otherwise.	Audit opinion
PROMINENCE	Dummy variable: *PROMINENCE* = 1 in case firm's *i* GC is prominently disclosed in year *t*, and *PROMINENCE* = 0 in case firm's *i* GC is not prominently disclosed in year *t*.	Audit opinion
Control variables		
AGE	Firm's *i* age in year *t* measured in years.	Bel-first
BIG4	Dummy variable: *BIG4* = 1, in case firm *i* is audited by a Big 4 audit firm in year *t*, and 0 otherwise.	Audit opinion
CURRENT_RATIO	Firm's *i* current ratio in year *t.*	Bel-first
DSCORE	General discriminant score (D-score) of firm *i* in year *t*, measured byusing a standardized bankruptcy prediction model developed for Belgian companies (Ooghe, Joos and De Bourdeaudhuij 1995), consisting of the following ratios: accumulated profit (loss) & reserves/total liabilities; taxes and social security charges/short-term external liabilities; cash/restricted current assets; work in progress & finished goods/restricted current assets; short-term financial debts/short term external liabilities. A higher score indicates a healthier firm.	Bel-first
EQUITY_HALF	Dummy variable: *EQUITY_HALF* = 1, if firm's *i* equity capital is less than half of the share capital in year *t*, and 0 otherwise.	Bel-first
GROWTH	The natural logarithm of firm's *i* total assets in year *t* less the natural logarithm of total assets year *t*-1 .	Bel-first
LEV	Firm's *i* average debt at the beginning and end of year *t+1*, scaled by the average total assets at the beginning and end of year *t+1*.	Bel-first
LOSS	Dummy variable: *LOSS* = 1, in case firm *i* experienced a loss in year *t.*	Bel-first
LTA	The natural logarithm of firm's *i* total assets in year *t.*	Bel-first
NET_INCOME	Firm's *i* net income, scaled by total assets in year *t.*	Bel-first
OPERATING_CF	Firm's *i* operating cash flows *(*measured as *net income + non-cash expenses +/- Δ net working capital)*, scaled by total assets in year *t.*	Bel-first
TA	Firm's *i* total assets in year *t.*	Bel-first
WORKING_CAPITAL	Dummy variable: *WORKING_CAPITAL* = 1, in case firm *i* has a negative working capital in year *t*, and 0 otherwise. (FORMULE TOEVOEGEN van working capital)	Bel-first

TABLE 1
Sample Selection

Description	**Firm-Year observations**
Firm-year observations 2017-2018	32,606
Less observations from non-financially distressed companies[a]	(15,399)
Less observations from listed companies	(205)
Less observations from financial and public administrative institutions[b]	(2,657)
Less observations without debt	(1,462)
Less observations with missing data for control variables	(3,080)
Total	**9,803**
No material GC	9,417
Material GC	**386 (3.94%)**
No prominently disclosed material GC	126 (1,29%)
Prominently disclosed material GC	260 (2,65%)

This table details the sample selection process.
[a] Financially distressed companies are defined as companies with either: (1) an operating loss, (2) abottom-line loss, (3) negative retained earnings, or (4) a negative working capital (Mutchler et al. 1985).
[b] Financial institutions are excluded because of their specific accounting requirements which differ substantially from those of industrial and commercial firms. Public administrative institutions areexcluded because of their specific nature.

TABLE 2
Descriptive statistics unweighted sample
Material GC (prominently and no prominently disclosed material GCOs) and no GC sample

	Full sample (n = 9,803)	(1) Prominently disclosed GC MURGC (n = 260)			(2) No prominently disclosed GC EOM (*n* = 126)			(3) No GC (*n* = 9,417)			ANOVA or Chi-square	Bonferroni post hoc test or pairwise comparisons		
Variable	**Mean (St. Dev.)**	**Mean**	**Var.**	**Skew.**	**Mean**	**Var.**	**Skew.**	**Mean**	**Var.**	**Skew.**	**F or χ 2**	**(1) vs (2)**	**(1) vs (3)**	**(2) vs (3)**
CoD	1.32 (1.18)	1.30	1.11	1.07	1.72	1.42	0.36	1.32	1.40	1.05	7.27***	0.000***	1.000	0.000***
NET_INCOME	-0.01 (0.09)	-0.08	0.01	-0.43	-0.06	0.01	-0.54	-0.01	0.01	-1.27	80.15***	0.000***	0.000***	0.257
TA	1.25e+08 (1.07e+09)	2.18e+07	4.84e+15	10.17	1.88e+07	2.28e+15	7.18	1.29e+08	1.19e+18	27.84581	7.51***	0.828	0.001***	0.616
CURRENT_RATIO	1.32 (1.38)	1.00	0.80	3.35	1.19	1.49	2.42	1.33	1.94	2.23	1.90	0.751	0.331	1.000
LOSS	0.47 (0.50)	0.74	0.19	-1.09	0.68	0.22	-0.78	0.46	0.25	0.16	101.32***	0.000***	0.000***	0.251
DSCORE	0.41 (2.05)	-1.10	4.42	-0.64	-1.79	4.98	-0.43	0.49	4.04	-1.25	154.89***	0.000***	0.000***	0.005***
LEV	0.72 (0.34)	0.96	0.16	0.04	1.01	0.13	-0.17	0.71	0.11	0.39	117.77***	0.000***	0.000***	0.371
OPERATING_CF	0.05 (0.16)	-0.00	0.03	-0.19	-0.00	0.03	-0.13	0.05	0.02	-0.18	19.75***	0.000***	0.000***	1.000
EQUITY_HALF	0.21 (0.41)	0.60	0.24	-0.39	0.74	0.19	-1.08	0.19	0.15	1.57	465.86***	0.000***	0.000***	0.006***
WORKING_CAPITAL	0.59 (0.49)	0.68	0.22	-0.79	0.60	0.24	-0.39	0.59	0.24	-0.36	9.68***	0.879	0.002***	0.083*
LTA	16.39 (1.59)	15.88	1.65	0.04	15.65	1.97	0.28	16.41	2.55	0.05	27.70***	0.000***	0.000***	0.512
AGE	28.08 (20.87)	29.34	462.7	1.13	26.81	503.6	1.34	28.07	434.1	1.20	0.71	1.000	0.997	0.793
GROWTH	0.02 (0.21)	-0.00	0.05	0.44	-0.02	0.05	0.29	0.02	0.04	0.32	3.46**	0.107	0.314	1.000
BIG4	0.48 (0.50)	0.25	0.19	1.16	0.25	0.19	1.13	0.49	0.25	0.05	83.37***	0.000***	0.000***	0.933

Notes: This table presents summary statistics before using entropy balancing for the material GC (prominently and no prominently disclosed material GCOs) and no material GC sample. Appendix A for variable definitions.
*, **, *** p < 0.10, 0.05 and 0.01

TABLE 3
Entropy Balancing – Descriptive Statistics and Balancing tests
Panel A: Prominently (treatment firms) and no prominently (control firms) disclosed material GC sample

Variable	Prominently disclosed GC (*n* = 260)			No prominently disclosed GCs (*n* = 126)			Balance Stats.	
	Mean	Var.	Skew.	Mean	Var.	Skew.	Std. Diff.	Var. Ratio
NET_INCOME	-0.08	0.01	-0.43	-0.08	0.01	-0.43	0.00	1.00
CURRENT_RATIO	1.00	0.80	3.35	1.00	0.80	3.34	0.00	1.00
LOSS	0.74	0.19	-1.09	0.74	0.19	-1.09	0.00	1.00
DSCORE	-1.10	4.42	-0.64	-1.11	4.43	-0.64	0.00	1.00
LEV	0.96	0.12	0.04	0.96	0.12	0.04	0.00	1.00
OPERATING_CF	-0.00	0.03	-0.19	-0.00	0.03	-0.19	0.00	1.00
EQUITY_HALF	0.60	0.24	-0.39	0.60	0.24	-0.40	0.00	1.00
WORKING_CAPITAL	0.68	0.22	-0.79	0.69	0.22	-0.80	0.00	1.00
LTA	15.88	1.65	0.04	15.9	1.65	0.01	-0.01	1.00
AGE	29.34	462.7	1.13	29.37	463.1	1.13	0.00	1.00
GROWTH	-0.00	0.05	0.44	-0.00	0.05	0.44	0.00	1.00
BIG4	0.25	0.19	1.16	0.25	0.19	1.16	0.00	1.00

Notes: This table presents summary statistics and covariate distributions after using entropy balancing for the prominently (treated firms) and no prominently disclosed (control firms) material GC samples. Standardized differences (Std. Diff.) are computed as the difference in means in the treatment and control group divided by the standard deviation in the treatment group. Variance ratios (Var. Ratio) are computed as the ratio of the variance of each covariate in the sample of firm-years observations with a prominently disclosed GC scaled by variance for the control sample of firm-years observations. See Appendix A for variable definitions.

TABLE 3 (cont.)
Panel B: Material GC (treatment firms) and no material GC (control firms) sample

Variables	GC (*n* = 386)			No GC (*n* = 9,417)			Balance Stats	
	Mean	Var.	Skew.	Mean	Var.	Skew.	Std. Diff.	Var. Ratio
NET_INCOME	-0.07	0.01	-0.46	-0.07	0.01	-0.46	0.00	1.00
CURRENT_RATIO	1.06	1.03	2.99	1.06	1.03	2.99	0.00	1.00
LOSS	0.72	0.20	-0.98	0.72	0.20	-0.98	0.00	1.00
DSCORE	-1.33	4.70	-0.57	-1.33	4.69	-0.57	0.00	1.00
LEV	0.98	0.12	-0.02	0.98	0.12	-0.02	0.00	1.00
OPERATING_CF	-0.00	0.03	-0.17	-0.00	0.03	-0.17	0.00	1.00
EQUITY_HALF	0.64	0.23	-0.59	0.64	0.23	-0.590	0.00	1.00
WORKING_CAPITAL	0.66	0.23	-0.65	0.65	0.23	-0.65	0.00	1.00
LTA	15.81	1.76	0.11	15.8	1.76	0.14	0.00	1.00
AGE	28.51	476.2	1.19	28.5	475.9	1.20	0.00	1.00
GROWTH	-0.01	0.05	0.40	-0.01	0.05	0.40	0.00	1.00
BIG4	0.25	0.19	1.15	0.25	0.19	1.14	0.00	1.00

Notes: This table presents summary statistics and covariate distributions after using entropy balancing for the material GC (treated firms) and no material GC (control firms) sample. Standardized differences (Std. Diff.) are computed as the difference in means in the treatment and control group divided by the standard deviation in the treatment group. Variance ratios (Var. Ratio) are computed as the ratio of the variance of each covariate in the sample of firm-years observations of promoted partners scaled by variance for the sample of firm-years observations of control partners. See Appendix A for variable definitions.

TABLE 4
Pearson's correlation matrix
Panel A: Prominently (treatment firms) and no prominently (control firms) disclosed material GC sample

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 CoD													
2 PROMINENCE	**-0.18**												
3 NET_INCOME	-0.02	-0.07											
4 CURRENT_RATIO	0.02	-0.09	0.00										
5 LOSS	0.02	0.06	**-0.65**	**0.10**									
6 DSCORE	0.01	**0.15**	**0.41**	**0.13**	**-0.21**								
7 LEV	**0.03**	-0.08	**-0.30**	**-0.37**	**0.15**	**-0.58**							
8 OPERATING_CF	0.02	0.01	**0.41**	**-0.06**	**-0.30**	**0.24**	**-0.13**						
9 EQUITY_HALF	0.01	**-0.14**	**-0.38**	**-0.09**	**0.24**	**-0.66**	**0.57**	**-0.18**					
10 WORKING_CAPITAL	**0.05**	0.09	**0.07**	**-0.63**	**-0.24**	**-0.07**	**0.28**	**0.14**	**0.10**				
11 LTA	**0.08**	0.08	**0.21**	0.01	**-0.15**	**0.29**	**-0.29**	**0.07**	**-0.34**	0.01			
12 AGE	**-0.08**	0.05	0.02	0.02	-0.00	**0.10**	**-0.11**	-0.01	**-0.12**	**-0.05**	**0.14**		
13 GROWTH	**-0.03**	0.04	**0.23**	**-0.07**	**-0.14**	**0.09**	0.02	**-0.10**	**-0.07**	**0.08**	**0.11**	-0.02	
14 BIG4	**-0.03**	-0.00	-0.02	0.02	0.02	**-0.08**	0.02	**-0.03**	**0.07**	0.01	**0.17**	**-0.04**	0.01

Bolded values are significant at .01-level.
This table reports Pearson correlation coefficients for 386 observations with a material GC using Entropy Balancing (260 observations with a prominently disclosed material GC and 126 observations with a material GC that is not prominently disclosed).
All variables are defined in Appendix A.

TABLE 4 (cont.)
Panel B: Material GC (treatment firms) and no material GC (control firms) sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 CoD														
2 GC	0.02													
3 PROMINENCE	-0.08	**0.73**												
4 NET_INCOME	-0.02	**-0.13**	**-0.09**											
5 CURRENT_RATIO	0.02	**-0.04**	**-0.09**	0.00										
6 LOSS	0.02	**0.10**	0.05	**-0.65**	**0.10**									
7 DSCORE	0.01	**-0.17**	0.02	**0.41**	**0.13**	**-0.21**								
8 LEV	**0.03**	**0.15**	0.03	**-0.30**	**-0.37**	**0.15**	**-0.58**							
9 OPERTING_CF	0.02	**-0.06**	-0.02	**0.41**	**-0.06**	**-0.30**	**0.24**	**-0.13**						
10 EQUITY_HALF	0.01	**0.22**	0.00	**-0.38**	**-0.09**	**0.24**	**-0.66**	**0.57**	**-0.18**					
11 WORKING_CAPITAL	**0.05**	**0.03**	0.08	**0.07**	**-0.63**	**-0.24**	**-0.07**	**0.28**	**0.14**	**0.10**				
12 LTA	**0.08**	**-0.07**	0.03	**0.21**	0.01	**-0.15**	**0.29**	**-0.29**	**0.07**	**-0.34**	0.01			
13 AGE	**-0.08**	0.00	0.03	0.02	0.02	-0.00	**0.10**	**-0.11**	-0.01	**-0.12**	**-0.05**	**0.14**		
14 GROWTH	**-0.03**	-0.03	-0.00	**0.23**	**-0.07**	**-0.14**	**0.09**	0.02	**-0.10**	**-0.07**	**0.08**	**0.11**	-0.02	
15 BIG4	**-0.03**	**-0.09**	-0.05	-0.02	0.02	0.02	**-0.08**	0.02	**-0.03**	**0.07**	0.01	**0.17**	**-0.04**	0.01

Bolded values are significant at .01-level.
This table reports Pearson correlation coefficients for the 9,803 observations using Entropy Balancing (386 (9,417) with (no) material GC). Of the 368 observations with a material GC, 260 (126) are (not) prominently disclosed.
All variables are defined in Appendix A.

TABLE 5
Prominently disclosed GC and cost of debt using EB.

Variable	CoD (1)	CoD (2)
	β (*t*-stat.)	*β* (*t*-stat.)
GC		**0.42*** **
		(3.49)
PROMINENCE	**-0.28** **	**-0.42*** **
	(-2.13)	**(-3.09)**
NET_INCOME	-1.28	-0.41
	(-1.28)	(-0.93)
CURRENT_RATIO	**-0.30*** **	**-0.07***
	(-3.11)	**(-1.66)**
LOSS	-0.05	0.04
	(-0.23)	(0.50)
DSCORE	**0.09** **	0.04
	(2.42)	(1.64)
LEV	**-0.79** **	0.10
	(-2.19)	(0.70)
OPERATING_CF	0.60	**0.44** **
	(1.26)	**(2.18)**
EQUITY_HALF	**0.69*** **	0.06
	(3.62)	(0.68)
WORKING_CAPITAL	-0.21	-0.03
	(-1.27)	(-0.31)
LTA	0.01	**0.07** **
	(0.20)	**(2.38)**
AGE	-0.00	-0.00
	(-1.21)	(-0.62)
GROWTH	0.04	**-0.29** **
	(0.08)	**(-1.96)**
BIG4	-0.15	**-0.14***
	(-1.05)	**(-1.81)**
Constant	**2.40*** **	0.10
	(2.58)	(0.18)
Year FE	Yes	Yes
Industry FE	Yes	Yes
F-value	5.23***	3.97***
R^2	27.51%	7.44%
N	386	9,803
# firm-year obs. (prominently) disclosed GC	126 (260)	
# firm-year obs. (no) GC		386 (9,417)
Match Ratio	0.54	0.02
Maximum Weight	11.08	1.05
Highest order of moment constraint	3	3

Notes: This table presents the results for the association between cost of debt and prominently disclosed material GC using entropy balanced samples. The sample for the analysis in Column (1) includes firms with a prominently disclosed material GC (treatment group) and firms where the material GC is not prominently disclosed (control group). The sample for the analysis in Column (2) consists of firms that received a material GC (either prominently or not prominently disclosed) (treatment group) and those with no material GC (control group). *Match ratio* is the ratio of observations with weights >1 in the EB sample divided by the number of control observations and shows the percentage of controls that is up-weighted to achieve balance. *Maximum weight* is the maximum observational weight that EB assigns to a single control observation. Dividing the maximum weight by the number of control observations shows that a single control observation serves as the counterfactual for 0.09% (1), 0.0001% (2) of treatment observations, respectively. See Appendix A for variable definition. ***, **, and * represent $p < 0.01$, 0.05, and 0.10, respectively.

Standardization of Risk Factor Disclosures: a Curse or a Blessing for Investors?

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Abstract

Risk factor disclosures have become increasingly standardized in recent years, prompting concerns about their informational value to investors. In response, the SEC has implemented regulatory reforms aimed to counteract excessive standardization in risk factor disclosures and promote material risk information. This paper examines how investor reactions to changes in risk disclosures have evolved following the SEC 2020 mandate and explores the role standardization plays in shaping disclosure informativeness. Using textual analysis of 10-K risk factor disclosures, we find that while changes in risk disclosures are initially informative, their impact on investor reactions diminishes post-mandate. We show how less standardized disclosures – those that are shorter, more specific, and less repetitive – are driving the informativeness of RFD updates prior to the mandate, eliciting stronger market responses. However, over time, these effects weaken as investors increasingly rely on more standardized reporting structures rather than firm-specific risk signals. In particular, disclosure length, complexity, and stickiness dampen the informativeness of disclosure changes. Our findings suggest that the SEC mandate has not succeeded in enhancing the decision-usefulness of risk factor disclosures; instead, increasing standardization appears to reduce the unique, firm-specific signals investors need for effective risk assessment, highlighting a critical trade-off between comparability and informational value.

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1. Introduction

Risk factor disclosures (RFDs) in US 10-K annual reports are a critical tool for investors to assess firm-specific risks. While these disclosures are mandatory, managers retain considerable leeway in how they describe their risk factors. This discretion often leads to the inclusion of boilerplate or overly generic content, which practitioners and scholars argue can reduce disclosure usefulness for investors (Dyer et al., 2017; Johnson, 2010; Jorgensen & Kirschenheiter, 2003; Schrand & Elliott, 1998). Given persistent concerns about the increasing standardization and generic nature of RFDs, the Securities and Exchange Commission (SEC) has introduced a series of reforms aimed at enhancing readability, minimizing boilerplate language, and discouraging the inclusion of immaterial information (SEC, 2013, 2016, 2020). Despite these regulatory efforts, the actual impact on disclosure informativeness – and the evolving role of standardization in shaping investor responses – remains an empirical question. On one hand, standardization could simplify the process of comparing firms' disclosures, enabling investors to more easily evaluate and benchmark risks across firms. On the other hand, it may diminish the unique, firm-specific information that is crucial for a nuanced understanding of each firm's individual risk profile.

To investigate this relationship, we (i) examine how investors respond to year-over-year changes in RFDs, (ii) assess whether the informativeness of these changes has evolved over time following the SEC's recent mandate, and (iii) evaluate how textual attributes reflecting standardization have shapen these investor reactions over time. If RFDs convey meaningful information, risk factors with stronger changes in prevalence year-over-year should elicit stronger investor responses. However, as disclosures become more standardized, their informativeness may diminish, particularly if increased standardization reduces investors' ability to interpret changes in RFDs. We measure equity investors' market reaction using

abnormal stock returns and stock return volatility.[1] While stock return volatility captures changes in investor expectations over a longer time frame, abnormal stock returns focus on the immediate market impact of changes in RFDs. This dual approach allows us to assess both short-term market sensitivity and longer-term shifts in perceived risk, providing a more comprehensive understanding of how investors process and react to risk disclosure changes.

To test our predictions, we measure RFDs at the individual risk factor level using a structural topic model (STM). This model improves upon prior methods by incorporating both the timing of disclosure and the firm's industry directly into the topic estimation phase. It allows to more accurately track year-over-year changes in the prevalence of individual risk factors, our proxy for unexpected changes in RFDs. We assume that the prior level of prevalence reflects the expected prevalence level for the current year. Changes in prevalence should therefore reflect management's perception of shifts in the firm's risk exposure and thus represent the unexpected portion of RFD for investors. As robustness test, we additionally proxy for *residuals* from a determinant model. Given the SEC's recent efforts to improve disclosure practices, we employ interaction regressions and sample splits with disclosure attributes to assess whether the standardization of RFDs has, in fact, affected their informativeness toward investors. Specifically, we compute various disclosure measures that proxy for the level of standardization in RFDs: (1) length, (2) boilerplate language, (3) specificity, (4) readability, (5) peer imitation and (6) stickiness.

Using a sample of 58,000 risk factor disclosures (RFDs) from 2006 to 2023, our empirical findings indicate that while changes in RFDs initially deliver clear, informative signals to investors, their market impact has weakened over time – especially following the

[1] We focus on equity investors as they are the primary recipient and users of risk factor disclosures. Their reactions provide a quantifiable measure of disclosure informativeness, as stock market movements aggregate diverse perspectives on risk. Furthermore, focusing on investors allows for comparability with prior studies that assess disclosure informativeness through market reactions (e.g., Beatty et al., 2019; Campbell et al., 2014; Kravet & Muslu, 2013).

SEC's 2020 mandate. Before the mandate, increases in risk disclosures heightened investor uncertainty and decreases reduced it; post-mandate, however, these effects have substantially diminished, signaling a decline in overall informativeness.

Our analysis further reveals a dual role for standardization. First, as a direct effect, more boilerplate, imitative, and repetitive disclosures have become increasingly associated with investor responses post-mandate, while more specific disclosures have lost their ability to convey meaningful risk signals. Second, in a moderating capacity, less standardized disclosures drive stronger investor reactions, but increased uniformity over time erodes the distinctiveness of risk factor changes.

Overall, our results suggest that while standardization enhances comparability across firms, it also reduces the distinctiveness and signaling value of disclosure changes. In particular, our evidence indicates that following the SEC 2020 mandate, investors increasingly rely on standardized reporting structures rather than on unique, firm-specific signals, thereby undermining the intended benefits of the amendments.

We contribute to the current literature by bringing a contemporary view of how the standardization of RFDs over time has affected disclosure informativenes toward equity investors. Our study directly addresses the call of Heyvaert et al. (2024) to examine the causal link between changes in disclosure attributes and market reactions, offering empirical insights into how investors process RFDs as they become increasingly standardized. Secondly, we improve upon prior literature's methodologies (e.g., Beatty et al., 2019; Brown et al., 2018; Campbell et al., 2014; Kravet & Muslu, 2013) by applying a STM which allows for a more granular assessment of changes and deviations in individual risk factors across firms. Thirdly, we extend the literature on the economic consequences of disclosure regulation (e.g., Leuz & Wysocki, 2016) by assessing how investors adjust their interpretation of RFDs following the SEC's Disclosure Effectiveness Initiative and 2020 mandate. While these reforms aimed to

improve disclosure quality by discouraging boilerplate language and enhancing materiality, we find that investor reactions to risk factor changes have weakened rather than strengthened post-mandate. This suggests that despite regulatory efforts to make disclosures more informative, the persistence of standardized disclosure patterns continues to erode the informativeness of new risk information. Finally, our results have practical implications. Managers should recognize that excessive standardization can dilute the distinctiveness of RFDs, thereby reducing their value. For regulators, our findings underscore the need to strike a balance between uniformity and flexibility – ensuring that disclosures are not only comparable but also sufficiently informative to guide investor decision-making.

2. Background and Literature Review

The SEC mandated RFDs in U.S. publicly listed firms' 10-K annual reports in 2005 with the purpose of informing investors about a firm's material risks and "most significant factors that make the offering speculative or risky" (SEC, 2005, p.257). Many critics, however, have complained about a lack of specificity, informativeness and transparency of RFDs due to their oftentimes boilerplate and generic nature (Dyer et al., 2017; Johnson, 2010; Jorgensen & Kirschenheiter, 2003; Schrand & Elliott, 1998). This phenomenon is mostly attributed to (1) managers' bias against disclosing too much proprietary information to their competitors or investors and (2) managers' incentives to disclose as many (vague) risks as possible, regardless of their materiality, to reduce the likelihood of litigation should an unexpected risk event unfold (Cazier et al., 2021; Ellis et al., 2012; Hope et al., 2016; Huang et al., 2021; Israelsen & Yonker, 2017; Ke et al., 2003; Nelson & Pritchard, 2016).

Throughout the accounting literature, we notice a strong interest in the relevance of RFDs to investors and whether they are informative. Kravet & Muslu (2013) investigate annual changes in number of risk-related sentences across the 10-K report and show that aggregate risk information in disclosures influences investors' risk perceptions through stock return

volatility and trading volume. Campbell et al. (2014) are one of the first to specifically examine the number of risk-related words in RFDs and assign these words to one of five risk categories: financial, tax, legal, other-systematic, and other-idiosyncratic. Their paper finds a positive relationship with both future stock return volatility and market beta between 2005 and 2008. While both studies conclude that RFDs carry information that is represented in systematic and – to a lower degree – idiosyncratic risk that firms face, they, however, examine RFDs prior to the financial crisis. Beatty et al. (2019) find that market reactions decline significantly in the post-crisis period due to heightened litigation concerns. Nelson & Pritchard (2016) argue that mandatory RFDs have become less informative, particularly for firms with high litigation risks, as firms resort to lengthy and generic disclosures. Dyer et al. (2017) further confirm this trend, demonstrating that RFDs have become more boilerplate, less readable and more redundant over time. Cazier et al. (2021) provide insight into this phenomenon, showing that companies with more boilerplate disclosures tend to receive more favourable regulatory and judicial outcomes. Collectively, these studies contradict earlier assertions by suggesting that RFDs currently lack informational value as they become increasingly generic.

A common approach across those studies involves using predefined dictionaries and key word counting metrics to quantify an aggregate measure of risk. By counting the number of words associated to a category, researchers can quantify their presence in the disclosure (Beatty et al., 2019; Campbell et al., 2014; Kravet & Muslu, 2013). While such methods work for quantifying disclosure attributes such as the length, tone, readability, or specificity of RFDs, they are however less suited for accurately identifying existing and emerging risk types that appear in RFDs. They neglect the unpredictability of risk factors and the fact they could differ between firms and industries and change over time. Bao & Datta (2014) argue that, in such a

context, risk types need to be discovered before they can be quantified. Predefined risk categories do not fit that narrative.[2]

More recent research has turned to advanced machine learning techniques, particularly topic models, to explore the content of RFDs more comprehensively (Bao & Datta, 2014; Israelsen, 2014; Israelsen & Yonker, 2017; Lopez Lira, 2023). Bao & Datta (2014) measure the content of RFDs through an improved sent-LDA model that captures the contextual information of each sentence. Their study finds that – between 2006 and 2010 - 8 of the 30 identified risk types have a significant effect on investors' risk perceptions while the remaining 22 risk types lack informativeness. Israelsen (2014) similarly uses a topic model to assess the link between disclosed risks and factor portfolios, showing how certain risk disclosures are correlated with returns. LDA, however, has certain limitations. Firstly, topics within a document are independent of one another, meaning that the presence of one topic in a document provides no information on the potential occurrence of any other topic. Secondly, and more importantly, LDA assumes that all documents have the same topic prevalence θ_d and all topics have the same topic content β_k across documents (Bai et al., 2021; Kuhn, 2018). This means that the generated topic and word distributions are stationary; they cannot change over time, nor can they vary according to the industry or any other covariate that might influence the risks disclosed by a firm. Consequently, we approach the existing literature with caution, as it may neglect crucial details that could impact the precision of topic allocation. We remedy to these limitations by adopting a STM, developed by Roberts et al. (2014), which allows document-level covariates to influence the topic prevalence and topic content across our set of documents. By employing a STM rather than relying on keyword counting methods or LDA models, our approach enables us to capture the underlying thematic structure of RFDs and measure their

[2] Yang et al. (2018) additionally prove that methods utilizing predefined risk words lack precision and recall because of polysemy (word has different meanings) and synonymy (different words have similar meaning).

evolution over time and across industries in terms of topic prevalence. This allows us to identify nuanced changes in RFDs that may be obscured by traditional textual analysis methods.

3. Hypothesis Development

According to signaling theory (Spence, 1973), firms emphasize specific risks in their disclosures when they perceive those risks to be more material, signaling transparency and a proactive approach to risk management. Heinle & Smith (2017) further suggest that by updating risk information, firms provide investors with critical insights that reduce uncertainty around future cash flows. These disclosures equip investors to better assess the potential impact of risks on firm performance and stock price. If investors interpret such changes as informative signals, deviations from prior disclosure levels should trigger stronger market reactions. While prior research indeed suggests that RFDs have historically influenced investor reactions (Campbell et al., 2014; Kravet & Muslu, 2013), Beatty et al. (2019) show a weakening of this effect following the financial crisis. These growing concerns about declining informativeness, echoed by both practitioners and investors, prompted the SEC to launch its Disclosure Effectiveness Initiative in 2013 aiming to improve disclosure transparency and relevance (SEC, 2013). This initiative was materialized in 2020 following the SEC's modernization of Regulation S-K in 2020, providing an additional impetus for firms to adjust their RFDs (SEC, 2020). Given these regulatory changes, an open question remains: Do investors still perceive RFDs as informative? We therefore investigate whether investor reactions to changes in risk factor prevalence have evolved over time. If RFDs continue to serve as informative signals, we expect market reactions to remain stable or increase. If RFD informativeness has declined, these effects should weaken post-mandate. Thus, we propose the following hypothesis (stated in null form):

H1a**:** *The association between changes in risk factor disclosures and investor reactions does not differ post-mandate from the preceding period.*

To further explore the informativeness of RFDs, we separately analyze increases and decreases in prevalence, as prior literature suggests asymmetrical investor responses (Beatty et al., 2019). Increases in risk factor prevalence may signal heightened exposure and uncertainty, prompting stronger market reactions. Conversely, decreases in risk factor prevalence may suggest reduced risk exposure or strategic de-emphasis, potentially leading to more muted reactions. Thus, the informativeness of increases and decreases in risk factor prevalence may evolve differently post-mandate. We therefore state (in null form):

H1b**:** *The informativeness of increases in risk factor disclosure does not differ post-mandate from the preceding period.*

H1c**:** *The informativeness of decreases in risk factor disclosure does not differ post-mandate from the preceding period.*

Next, we examine whether the increasing standardization of RFDs has affected their informativeness. While greater uniformity in disclosures can improve comparability across firms, it may also dilute firm-specific insights, making it harder for investors to extract meaningful signals from RFDs. Standardization can manifest through higher similarity across firms (peer imitation), higher similarity across a firm's own disclosures over time (stickiness), increased boilerplate language, reduced specificity, or less readable and longer disclosures. We examine both the direct effect of these disclosure attributes on investor reactions and their moderating role in shaping the informativeness of changes in RFDs over time. To test the former, we posit (in null form):

H2: *The association between the degree of standardization in RFDs and investor reactions does not differ post-mandate from the preceding period.*

If investors increasingly rely on standardized disclosures, this may reduce their sensitivity to changes in RFD prevalence. Conversely, if standardization weakens

informativeness, changes in prevalence may remain important for investor reactions. Thus, we propose the following hypothesis (stated in null form):

H3: *The effect of changes in risk factor disclosure on investor reactions is not influenced by the degree of standardization in disclosures.*

4. Data and Research Design

4.1. Data Retrieval and Sample Selection

Using the Filing Query Application Programming Interface (API) provided by SEC-API.io,[3] we retrieve the metadata and URL of all 10-K filings available in the SEC Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database for the filing period spanning 2006 to 2023.[4] This study focuses on non-financial firms, as financial firms are governed by distinct regulatory frameworks and exhibit characteristics that differ significantly from those of non-financial firms. Consequently, we exclude all observations with SIC codes between 6000 and 6999, following Beatty et al. (2019). Then, we use the Extractor API to extract the risk factor sections from the US 10-K filings.[5] This API significantly reduces the occurrence of incorrectly extracted risk factor sections. We subsequently divide the risk factor sections into individual risk factors by identifying and isolating bold subheadings or paragraph breaks within the text. More specifically, we use a combination of HTML parsing and pattern matching techniques, relying on specific tags and formatting styles to identify and isolate each individual risk factor based on the appearance of new subheadings.

This gives us an initial sample of 58,237 10-K reports. For each firm-year observation, we calculate firm characteristics and financial fundamentals using the WRDS Compustat and CRSP databases. We therefore match the CIK used as identifier for each annual report with the GVKEY in Compustat and CRSP's PERMNO. Excluding observations with missing data for

[3] https://sec-api.io/docs/query-api
[4] The filing period 2006 to 2023 corresponds to the fiscal years 2005 to 2022.
[5] https://sec-api.io/docs/sec-filings-item-extraction-api

our dependent and control variables, yields a starting sample of 36,935 RFDs and 6,035 unique firms. To analyze how changes and deviations in RFDs evolve over time, we reshape the data to distribute each RFD across all its disclosed topics. This is achieved by transforming the dataset into a long format, where each observation corresponds to a specific risk factor topic.

Table 1: Sample Selection

Description	Firm-year observations
Initial sample of 10-K filings from fiscal year 2005 to 2022 (filed between 2006 and 2023)	143,111
Less: observations with:	
Primary SIC classification between 6000 and 6999 (financial firms)	(48,532)
Non-existing (smaller reporting company) or difficult-to-extract risk factor section	(28,828)
Difficult-to-extract disclosed risk factors within risk factor section	(7,514)
Total 10-K filings with available risk factor disclosures	58,237
Less: observations with missing variables	(21,302)
Total firm-year observations with available risk factor disclosures and financial data	36,935
Total firm-year observations after winsorization of variables at the top and bottom 1 percent	31,712
Total firm-year-topic observations with available risk factor disclosures and financial data	1,300,192
Total firm-year-topic observations with available risk factor disclosures and financial data, using changes in variables	1,032,298

4.2.Textual Analysis Method

To quantify the content of RFDs, we employ the structural topic model (STM) as detailed in Heyvaert et al. (2024). Applying this model to our dataset enables us to determine the prevalence of 41 distinct risk factor topics within each RFD. These topics encompass a range of themes, including supply chain dynamics, competitive landscapes, regulatory changes, and cybersecurity concerns. Topic prevalence indicates the extent to which each topic is discussed within a given document. A notable advantage of this technique is its capacity to incorporate covariates that may influence topic distribution. Specifically, our model accounts for both temporal and industrial heterogeneity within our sample during the topic generation phase, offering a more precise and dynamic representation of the discussed risk factor topics. We proxy the year-over-year change in RFD by the year-over-year change in prevalence for each topic for each firm.

4.3. Empirical Design

To test ***H1a***, we conduct a short-window market analysis in which we explore the relationship between year-over-year changes in risk factor disclosures and the absolute three-day cumulative abnormal return (|*CAR*|). Specifically, we assess how this relationship evolves over time by comparing its effects before and after the mandate.

$$
\begin{aligned}
|CAR|_{i,t} = {} & \beta_0 + \beta_1|\Delta Prevalence|_{i,j,t} + \beta_2 Initiative_t + \beta_3 Mandate_t \\
& + \beta_4|\Delta Prevalence|_{i,j,t} \times Initiative_t + \beta_5|\Delta Prevalence|_{i,j,t} \times Mandate_t \\
& + \beta_6 \Delta Size_{i,t} + \beta_7 \Delta Leverage_{i,t} + \beta_8 \Delta ROA_{i,t} + \beta_9 \Delta BTM_{i,t} + \beta_{10} \Delta InstOwnership_{i,t} \\
& + \beta_{11} \Delta Big4_{i,t} + \beta_{12} \Delta AnalystFollowing_{i,t} + \beta_{13} \Delta ReturnVolatility_{i,t} \\
& + \beta_{14} \Delta ShareTurnover_{i,t} + \beta_{15} \Delta PastLosses_{i,t} + \beta_{16} \Delta ProprietaryCost_{i,t} \\
& + \beta_{17} \Delta Segment_{i,t} + \beta_{18} \Delta ForecastDispersion_{i,t} + \beta_{19} \Delta WordCount_{i,t} \\
& + \beta_{20} \Delta Fog_{i,t} + \sum_{k=1}^{41} Topic_{i,k} + \sum_{m=1}^{11} Industry_{i,m} + \epsilon_{i,t}
\end{aligned} \tag{1}
$$

Following Campbell et al. (2014), Beatty et al. (2019) and Hope et al. (2016), we define our dependent variable (|*CAR*|) as the absolute value of three-day buy-and-hold return from one trading day before to one trading day after the 10-K filing date less the expected return.[6] Given that the prior year's level of risk factor prevalence proxies for the expected risk disclosure level for the current year *t*, changes in risk factor prevalence, |Δ*Prevalence*|, should capture the unexpected amount of risk factor disclosure. This variable measures the absolute year-over-year change in topic prevalence for each firm *i* and topic *j*. *Mandate* is an indicator variable which equals one for the post-mandate period (2020–2023) and zero otherwise. Our primary variable of interest, |Δ*Prevalence*|×*Mandate*, captures whether the relationship between unexpected changes in risk disclosures and investor reactions differs following the mandate. To account for the Disclosure Effectiveness Initiative, we also include an indicator

[6] The unsigned abnormal return reflects the magnitude of investor reactions, irrespective of their direction. This approach enables us to concentrate on the informational value conveyed by changes in RFDs, aligning with the methodologies of Beatty et al. (2019) and Hope et al. (2016).

variable, *Initiative,* which equals one for the period 2013–2020 and zero otherwise. Consistent with findings that capital markets adjust to regulatory changes even before their formal implementation (see also Leuz & Wysocki, 2016), interacting this variable with |Δ*Prevalence*| allows us to capture whether the initiative, which preceded the 2020 mandate, had already influenced the relationship between unexpected changes in risk disclosures and investor reactions. Following prior literature (e.g., Beatty et al., 2019; Campbell et al., 2014; Elshandidy & Ahmed, 2023; Filzen et al., 2023; Hope et al., 2016; Kim & Shi, 2012), we control for changes in several firm characteristics and performance measures such as firm size (*Size*), current performance *(ROA*), leverage (*Leverage*), book-to-market (*BTM*), institutional ownership (*InstOwnership*), the number of analysts following the firm (*AnalystFollowing*) and auditor quality (*Big4*). These controls are designed to ensure that stakeholders are responding to the disclosure rather than to underlying economics of the firm. To control for general levels of uncertainty and firm complexity, we include analysts' earnings forecast dispersion (*ForecastDispersion*) and the number of business segments (*BU_Segments*) respectively. We also include stock-return volatility (*ReturnVolatility*) and share turnover (*ShareTurnover*) in the year prior to the filing and past financial performance (*PastLosses*) to assess the inherent risk level of the firm. We also consider a firm's R&D intensity (*ProprietaryCost*) since proprietary information can be a deterrent for providing firm-specific risks. To account for RFD characteristics, we include their word count (*WordCount*) and Fog index (*Fog*). Finally, we include industry and topic fixed effects to account for potential heterogeneity among industries and topics. Standard errors are clustered by firm, filing month and topic.

To examine the asymmetric relation between the direction of changes in risk factor prevalence and market reactions (***H1b*** and ***H1c***), we decompose our independent variable into increases (*PrevalenceIncrease*) and decreases (*PrevalenceDecrease*) in risk factor prevalence. We define *PrevalenceIncrease* as the year-over-year change if it is positive, and zero

otherwise, while *PrevalenceDecrease* is the year-over-year change if it is negative, and zero otherwise. We interact these variables with *Mandate* to assess whether the informativeness of risk factor additions and reductions has changed following the SEC's modernization of Regulation S-K. A significant coefficient on these interaction terms would suggest that investors respond differently to risk disclosure adjustments post-mandate.

$$
\begin{aligned}
|CAR|_{i,t} = {} & \beta_0 + \beta_1\, PrevalenceIncrease_{i,j,t} + \beta_2 PrevalenceDecrease_{i,j,t} + \beta_3 Initiative_t \\
& + \beta_4 Mandate_t + \beta_5\, PrevalenceIncrease_{i,j,t} \times Initiative_t \\
& + \beta_6\, PrevalenceDecrease_{i,j,t} \times Initiative_t \\
& + \beta_7 PrevalenceIncrease_{i,j,t} \times Mandate_t \\
& + \beta_8 PrevalenceDecrease_{i,j,t} \times Mandate_t + \beta_9 \Delta Size_{i,t} + \beta_{10} \Delta Leverage_{i,t} \\
& + \beta_{11} \Delta ROA_{i,t} + \beta_{12} \Delta BTM_{i,t} + \beta_{13} \Delta InstOwnership_{i,t} + \beta_{14} \Delta Big4_{i,t} \\
& + \beta_{15} \Delta AnalystFollowing_{i,t} + \beta_{16} \Delta ReturnVolatility_{i,t} + \beta_{17} \Delta ShareTurnover_{i,t} \\
& + \beta_{18} \Delta PastLosses_{i,t} + \beta_{19} \Delta ProprietaryCost_{i,t} + \beta_{20} \Delta Segment_{i,t} \\
& + \beta_{21} \Delta ForecastDispersion_{i,t} + \beta_{22} \Delta WordCount_{i,t} + \beta_{23} \Delta Fog_{i,t} + \sum_{k=1}^{41} Topic_{i,k} \\
& + \sum_{m=1}^{11} Industry_{i,m} + \epsilon_{i,t}
\end{aligned}
\tag{2}
$$

In addition to analyzing the immediate market impact of changes in RFDs, we extend our investigation to their longer-term effects on market uncertainty by examining stock return volatility over a 30-day period following the filing date (*PostVolatility*) as the dependent variable. This approach allows us to capture the sustained effects of RFDs on investor perceptions and trading behavior, providing insights into how disclosures influence ongoing uncertainty and the persistence of market reactions beyond the immediate post-filing window. To control for the pre-existing level of market uncertainty, we include stock return volatility over the 30-day period *prior* to the filing (*PreVolatility*) as an additional control variable. This ensures that the observed changes in post-filing volatility are attributed to the content of the

disclosures rather than to baseline market conditions or firm-specific uncertainties that existed prior to the filing.

Finally, model (3) and (4) investigate the direct effect various disclosure attributes have on investor reactions (***H2***) and their moderating role on changes in risk factor prevalence (***H3***), respectively. In regression (3), we additionally control for late filers (*LateFiling*) and litigation risk (*Litigation*) (Brown & Tucker, 2011; Hope et al., 2016). *DisclosureAttribute* represents one of 6 metrics used to measure the level of standardization in RFDs. For each disclosure, we calculate (1) the *length* through its word count, (2) the level of *boilerplate* language using the approach of Lang & Stice-Lawrence (2015)[7], (3) the level of *specificity* using the approach of Hope et al. (2016)[8], (4) the level of *readability* using the Fog Index, (5) the level of industry peer imitation on both the text and topic distribution (*text imitation* and *topic imitation*)[9], and (6) the level of repetition in text and topic distribution year-over-year within the same firm using pairwise cosine similarity (*text stickiness* and *topic stickiness*). We interact these variables with *Mandate* to assess whether the informativeness of each disclosure attribute has changed following the SEC's modernization of Regulation S-K.

[7] This metric measures the degree to which language is standardized or so widely adopted by industry peers that it is unlikely to convey meaningful or distinctive information (Lang & Stice-Lawrence, 2015).
[8] This approach categorizes words into seven specific entity types, thereby measuring the degree to which language is inherently specific versus non-specific.
[9] Imitation, measured using pairwise cosine similarity, captures the degree to which a firm's topic distribution or textual content aligns with that of its industry peers. High imitation reflects greater standardization or alignment with industry norms, while low imitation signals divergence from peer practices.

$$|CAR|_{i,t} = \beta_0 + \beta_1 DisclosureAttribute_{i,t} + \beta_2 Initiative_t + \beta_3 Mandate_t \quad (3)$$
$$+ \beta_4 DisclosureAttribute_{i,t} \times Initiative_t$$
$$+ \beta_5 DisclosureAttribute_{i,t} \times Mandate_t + \beta_6 Size_{i,t} + \beta_7 Leverage_{i,t}$$
$$+ \beta_8 ROA_{i,t} + \beta_9 BTM_{i,t} + \beta_{10} InstOwnership_{i,t} + \beta_{11} Big4_{i,t}$$
$$+ \beta_{12} AnalystFollowing_{i,t} + \beta_{13} ReturnVolatility_{i,t} + \beta_{14} ShareTurnover_{i,t}$$
$$+ \beta_{15} LateFiling_{i,t} + \beta_{16} Litigation_{i,t} + \beta_{17} PastLosses_{i,t}$$
$$+ \beta_{18} ProprietaryCost_{i,t} + \beta_{19} Segment_{i,t} + \beta_{20} ForecastDispersion_{i,t}$$
$$+ \beta_{21} WordCount_{i,t} + \beta_{22} Fog_{i,t} + \sum_{m=1}^{11} Industry_{i,m} + \epsilon_{i,t}$$

Finally, in regression (4), we evaluate the moderating role of each disclosure attribute on the effect of changes in RFD on investor reactions. The coefficient of our three-way interactions captures whether standardization strengthens or weakens the informativeness of disclosure changes over time.

$$|CAR|_{i,t} = \beta_0 + \beta_1 |\Delta Prevalence|_{i,j,t} + \beta_2 DisclosureAttribute_{i,t} + \beta_3 Initiative_t \quad (4)$$
$$+ \beta_4 Mandate_t + \beta_5 |\Delta Prevalence|_{i,j,t} \times DisclosureAttribute_{i,t}$$
$$+ \beta_6 |\Delta Prevalence|_{i,j,t} \times Initiative_t + \beta_7 |\Delta Prevalence|_{i,j,t} \times Mandate_t$$
$$+ \beta_8 DisclosureAttribute_{i,t} \times Initiative_t$$
$$+ \beta_9 DisclosureAttribute_{i,t} \times Mandate_t$$
$$+ \beta_{10} |\Delta Prevalence|_{i,j,t} \times DisclosureAttribute_{i,t} \times Initiative_t$$
$$+ \beta_{11} |\Delta Prevalence|_{i,j,t} \times DisclosureAttribute_{i,t} \times Mandate_t + \beta_{12} \Delta Size_{i,t}$$
$$+ \beta_{13} \Delta Leverage_{i,t} + \beta_{14} \Delta ROA_{i,t} + \beta_{15} \Delta BTM_{i,t} + \beta_{16} \Delta InstOwnership_{i,t}$$
$$+ \beta_{17} \Delta Big4_{i,t} + \beta_{18} \Delta AnalystFollowing_{i,t} + \beta_{19} \Delta ReturnVolatility_{i,t}$$
$$+ \beta_{20} \Delta ShareTurnover_{i,t} + \beta_{21} \Delta PastLosses_{i,t} + \beta_{22} \Delta ProprietaryCost_{i,t}$$
$$+ \beta_{23} \Delta Segment_{i,t} + \beta_{24} \Delta ForecastDispersion_{i,t} + \beta_{25} \Delta WordCount_{i,t}$$
$$+ \beta_{26} \Delta Fog_{i,t} + \sum_{k=1}^{41} Topic_{i,k} + \sum_{m=1}^{11} Industry_{i,m} + \epsilon_{i,t}$$

4.4.Descriptive Statistics

Table 2 presents the descriptive statistics for our main sample, highlighting the distribution of key dependent, independent, and control variables. The average absolute cumulative abnormal return (|CAR|) is 0.052, with a wide range suggesting variability in market responses to disclosures. Post-disclosure volatility averages 0.034, indicating modest but notable investor reactions. Changes in topic prevalence, both positive and negative, are minimal on average but show significant outliers, reflecting the heterogeneity in risk factor adjustments across firms. Control variables such as firm size, leverage, and return volatility exhibit considerable variation, underscoring the diverse nature of the sample in terms of financial health, disclosure practices, and market activity. Notably, 59% of firms report past losses, and institutional ownership averages 53%, pointing to the inclusion of both distressed and widely held firms.

Table 2: Descriptive statistics

	Mean	Std	Min	p25	Median	p75	Max
Dependent Variables							
$\|CAR\|$	0.052	0.051	0.001	0.016	0.037	0.071	0.308
PostVolatility	0.034	0.019	0.009	0.020	0.028	0.042	0.128
Main Independent Variables							
$\|\Delta Prevalence\|$	0.002	0.006	0.000	0.0002	0.0006	0.002	0.302
PrevalenceIncrease	0.001	0.004	0.000	0.000	0.000	0.001	0.298
PrevalenceDecrease	-0.001	0.004	-0.302	-0.001	-0.000	0.000	0.000
Length	6.536	0.963	2.197	6.028	6.620	7.140	11.401
Fog	19.181	2.017	2.876	18.059	19.190	20.362	83.509
Boilerplate	0.363	0.162	0.000	0.267	0.363	0.463	1.000
Specificity	0.024	0.025	0.000	0.009	0.016	0.028	0.375
Text imitation	0.743	0.151	0.000	0.700	0.782	0.832	0.928
Topic imitation	0.875	0.055	0.356	0.859	0.887	0.907	0.949
Text stickiness	0.963	0.089	0.000	0.974	0.991	0.997	1.000
Topic stickiness	0.984	0.038	0.346	0.989	0.996	0.999	1.000
Control Variables							
Size	20.41	1.90	15.84	19.02	20.39	21.74	25.13
Leverage	0.221	0.206	0.000	0.024	0.187	0.352	1.082

ROA	-0.044	0.213	-1.352	-0.069	0.025	0.068	0.289
BTM	0.540	0.529	-0.519	0.215	0.406	0.697	4.283
InstOwnership	53.43	37.88	0.000	12.11	62.94	89.29	100
Big4	0.252	0.434	0.000	0.000	0.000	1.000	1.000
AnalystFollowing	1.819	0.976	0.000	1.099	1.946	2.565	3.951
ReturnVolatility	0.033	0.016	0.001	0.021	0.029	0.041	0.110
PreVolatility	0.032	0.018	0.010	0.019	0.027	0.039	0.129
ShareTurnover	0.843	0.828	0.033	0.339	0.607	1.034	6.276
PastLosses	0.590	0.492	0.000	0.000	1.000	1.000	1.000
ProprietaryCost	0.065	0.111	0.000	0.000	0.009	0.085	0.662
Segment	1.058	0.457	0.693	0.693	0.693	1.386	2.944
ForecastDispersion	0.003	0.006	0.000	0.000	0.001	0.002	0.056

5. Empirical Results

The effect of changes in RFD on investor reactions (Hypotheses 1a – 1c)

Table 3, panel A, presents the results of Hypothesis 1, which examines the effect of year-over-year changes in risk factor disclosures on two key measures of investor behavior: (1) short-window market reactions using the absolute cumulative abnormal returns (|*CAR*|) within a 3-day window surrounding the filing date, and (2) longer-term market uncertainty using the stock return volatility (*PostVolatility*) over the 30-day period following the filling. For each specificiation, we control for topic and industry fixed effects, with clustered standard errors by firm, filing month and topic.

Columns (1) and (3) confirm that, prior to regulatory changes, year-over-year changes in risk factor prevalence are positively associated with |*CAR*| and *PostVolatility*, suggesting that investors respond to deviations from prior disclosure levels. This finding is consistent with prior literature (Beatty et al., 2019; Campbell et al., 2014; Kravet & Muslu, 2013) demonstrating that changes in RFDs contain value-relevant information. However, the interaction term |Δ*Prevalence*| × *Mandate* is negative and statistically significant (β_{31} = -0.375, *t*-statistic = -7.52; β_{31} = -2.555, *t*-statistic = -5.04), indicating that the market's response to

changes in RFDs has significantly weakened in the post-mandate period. Our F-tests further confirm this pattern: investor responses remained statistically, positively significant through the Initiative period but reversed sharply post-mandate for |*CAR*|. The insignificant F-test of post-mandate effects on *PostVolatility* further suggests that changes in risk factor disclosures no longer trigger the same level of market uncertainty in the post-mandate period.

Next, we assess whether the informativeness of disclosure changes differs depending on the direction of the change. In Columns (2) and (4), we separately analyze increases and decreases in risk factor prevalence. We find that increases in prevalence elicits a significant positive market response pre-mandate. This suggests that when firms place greater emphasis on a particular risk year-over-year, investors perceive this as a signal of heightened exposure, prompting stronger market reactions and increased uncertainty. Decreases in prevalence, on the other hand, are associated with a negative market response pre-mandate, indicating that reduced emphasis on a risk factor is linked to lower investor reactions and diminished uncertainty. Investors may interpret these reductions as a sign that the risk has become less material or that the firm has effectively managed its exposure, leading to weaker market responses. Results further indicate that during the Initiative period (2013–2020), investor responses to both increases and decreases in RFDs remained stable. Post-mandate, however, the informativeness of increases in RFDs declines significantly (β_{32} = -0.378, *t*-statistic = -5.96; β_{32} = -2.568, *t*-statistic = -4.65), whereas reductions in RFDs trigger stronger investor reactions (β_{33} = 0.372, *t*-statistic = 5.87; β_{33} = 2.543, *t*-statistic = 4.76). This implies investors are less reactive to firms increasing risk disclosures post-mandate, suggesting that firms' risk signaling may have become less informative. At the same time, investors respond more strongly to firms reducing risk disclosures, indicating heightened scrutiny or skepticism towards firms downplaying risks post-mandate.

In Table 3, Panel B, we complement our relative measure of changes in disclosure prevalence with an alternative proxy for unexpected risk factor disclosures using residuals from a determinant model. Following Campbell et al. (2014) and Beatty et al. (2019), we implement a two-stage residual regression approach. We estimate the unexpected component of risk factor disclosure by calculating residuals from a generalized linear model (GLM) for each risk factor topic. The model predicts the prevalence of each topic based on the firm's prior prevalence, its industry, filing year and a set of firm-specific characteristics identified in RFD literature as determinants of risk reporting (Campbell et al., 2014; Fama & French, 2015; Lang & Lundholm, 1996):

$$\begin{aligned} TopicPrevalence_{i,j,t} \sim\ & \beta_0 + \beta_1 LaggedPrevalence_{i,j,t} + \beta_2 Size_{i,t} + \beta_3 Leverage_{i,t} + \beta_4 ROA_{i,t} \\ & + \beta_5 BTM_{i,t} + \beta_6 InstOwnership_{i,t} + \beta_7 Big4_{i,t} + \beta_8 AnalystFollowing_{i,t} \\ & + \beta_9 ReturnVolatility_{i,t} + \beta_{10} TradingVolume_{i,t} + \beta_{11} PastLosses_{i,t} \\ & + \beta_{12} ProprietaryCost_{i,t} + \beta_{13} Segment_{i,t} + \beta_{14} ForecastDispersion_{i,t} \\ & + \sum_{m=1}^{11} Industry_{i,m} + \sum_{l=1}^{16} Year_{i,l} + \epsilon_{i,t} \end{aligned} \quad (4)$$

The residuals from this model represent the unexpected component of risk factor disclosure, isolating deviations in prevalence that cannot be explained by firm characteristics, industry norms, or prior disclosure levels. The results align with those from Panel A, reinforcing the conclusion that the informativeness of RFDs has weakened post-mandate. The coefficients on *Residual* × *Mandate* are negative and highly significant in columns (1) and (3) of panel B, indicating that investor reactions to unexpected disclosures have diminished over time. When decomposing residuals into *PositiveResidual* and *NegativeResidual* in columns (2) and (4), we again observe the same asymmetry as in panel A: while unexpected increases in disclosure lose informativeness post-mandate, reductions in disclosure elicit stronger market reactions than before. Overall, using two distinct measures of unexpected risk factor disclosures, we find robust evidence rejecting Hypotheses 1a – 1c, suggesting that RFDs have become less

informative to investors in the post-mandate period (2020–2023) relative to the preceding years (2006–2019).[10]

Table 3: Market Reactions to unexpected risk factor disclosures

Dependent Variable	|*CAR*| (1)	|*CAR*| (2)	*PostVolatility* (3)	*PostVolatility* (4)
Panel A: Unexpected disclosures measured with changes in risk factor prevalence				
|Δ*Prevalence*| (β_{11})	**0.122*** (4.30)**		**0.727*** (5.62)**	
PrevalenceIncrease (β_{12})		**0.122*** (4.16)**		**0.727*** (5.00)**
PrevalenceDecrease (β_{13})		**-0.122*** (-4.47)**		**-0.728*** (-5.84)**
Initiative	0.002*** (2.45)	0.002*** (2.45)	0.058** (2.58)	0.058** (2.58)
Mandate	0.013*** (13.69)	0.013*** (13.69)	0.054*** (5.09)	0.053*** (5.09)
|Δ*Prevalence*|: *Initiative* (β_{21})	-0.020 (-0.51)		3.56 (1.56)	
|Δ*Prevalence*|: *Mandate* (β_{31})	**-0.375*** (-7.52)**		**-2.555*** (-5.04)**	
PrevalenceIncrease: Initiative (β_{22})		-0.026 (-0.65)		3.365 (1.51)
PrevalenceDecrease: Initiative (β_{23})		0.014 (0.36)		-3.783 (-1.63)
PrevalenceIncrease: Mandate (β_{32})		**-0.378*** (-5.96)**		**-2.568*** (-4.65)**
PrevalenceDecrease: Mandate (β_{33})		**0.372*** (5.87)**		**2.543*** (4.76)**
Δ*Size*	-0.002** (-2.29)	-0.002** (-2.29)	0.079 (1.80)	0.079 (1.80)
Δ*Leverage*	0.026*** (4.80)	0.026*** (4.80)	0.007 (0.11)	0.007 (0.11)
Δ*ROA*	-0.005* (-2.12)	-0.005* (-2.12)	-0.075* (-1.86)	-0.075* (-1.86)
Δ*BTM*	0.010*** (10.86)	0.010*** (10.86)	-0.016 (-0.89)	-0.016 (-0.89)
Δ*InstOwnership*	-0.004** (-3.08)	-0.004** (-3.08)	-0.105*** (-3.46)	-0.105*** (-3.46)
Δ*Big4*	-0.005* (-2.17)	-0.005* (-2.17)	0.012 (0.53)	0.012 (0.53)
Δ*AnalystFollowing*	-0.0006 (-0.83)	-0.0006 (-0.83)	-0.020** (-2.46)	-0.020** (-2.46)
Δ*ReturnVolatility*	0.224*** (14.64)	0.224*** (14.64)		
PreVolatility			0.734*** (74.22)	0.734*** (74.22)

[10] To account for potential confounding effects from the COVID-19 pandemic, we include the CBOE Volatility Index (VIX) as a proxy for COVID-induced market uncertainty. While VIX significantly influences overall investor reactions, our results (untabulated) remain robust to its inclusion, confirming that the decline in disclosure informativeness is primarily attributable to the 2020 mandate.

Δ*ShareTurnover*	0.004*** (6.82)	0.004*** (6.82)	-0.037*** (-4.27)	-0.037*** (-4.27)
Δ*PastLosses*	0.004*** (3.27)	0.004*** (3.27)	0.033*** (3.48)	0.033*** (3.48)
Δ*ProprietaryCost*	0.037*** (5.67)	0.037*** (5.67)	0.328*** (4.40)	0.328*** (4.40)
Δ*Segment*	0.001 (0.93)	0.001 (0.93)	0.051** (2.79)	0.051** (2.79)
Δ*ForecastDispersion*	0.229*** (9.23)	0.229*** (9.23)	0.466** (2.69)	0.466** (2.69)
Δ*WordCount*	-0.0003** (-2.29)	-0.0003** (-2.29)	0.003 (0.50)	0.003 (0.50)
Δ*Fog*	-0.0005 (-1.54)	-0.0005 (-1.54)	-0.007*** (-3.19)	-0.007*** (-3.19)
Industry FE	Yes	Yes	Yes	Yes
Topic FE	Yes	Yes	Yes	Yes
Observations	1,032,298	1,032,298	1,048,575	1,048,575
Adjusted R^2	0.042	0.042	0.495	0.495
p-value of *F*-test: $\beta_{11} + \beta_{21}(\beta_{12} + \beta_{22}, \beta_{13} + \beta_{23}) \neq 0$	0.021	0.046, 0.008	0.053	0.058, 0.045
p-value of *F*-test: $\beta_{11} + \beta_{21} + \beta_{31}(\beta_{12} + \beta_{22} + \beta_{32}, \beta_{13} + \beta_{23} + \beta_{33}) \neq 0$	0.000	0.001, 0.005	0.395	0.448, 0.339
Panel B: Unexpected disclosures measured with residuals from a determinant model				
Residual	**0.074**** **(2.76)**		**0.459***** **(4.22)**	
PositiveResidual		**0.083***** **(3.40)**		**0.450***** **(5.02)**
NegativeResidual		**-0.064**** **(-2.22)**		**-0.468**** **(-2.81)**
Initiative	0.003** (2.86)	0.003** (2.86)	0.064** (2.22)	0.064* (2.22)
Mandate	0.014*** (16.41)	0.014*** (16.45)	0.059*** (5.73)	0.059*** (5.74)
Residual: Initiative	-0.045 (-1.53)		0.443 (0.72)	
Residual: Mandate	**-0.139***** **(-4.99)**		**-0.710**** **(-2.879)**	
PositiveResidual: Initiative		-0.057* (-1.97)		0.507 (0.76)
NegativeResidual: Initiative		0.034 (1.01)		-0.382 (-0.66)
PositiveResidual: Mandate		**-0.136***** **(-3.10)**		**-0.892***** **(-3.76)**
NegativeResidual: Mandate		**0.137***** **(4.49)**		**0.615***** **(2.06)**
PreVolatility			0.719*** (70.88)	0.719*** (70.88)
Δ*WordCount*	-0.0001 (-0.29)	-0.0001 (-0.29)	0.008*** (3.22)	0.008*** (3.22)
Δ*Fog*	0.0003**	0.0003**	-0.008*	-0.008*

	(2.31)	(2.31)	(-1.97)	(-1.97)
Industry FE	Yes	Yes	Yes	Yes
Topic FE	Yes	Yes	Yes	Yes
Observations	1,068,706	1,068,706	1,093,593	1,093,593
Adjusted R^2	0.025	0.025	0.487	0.487
p-value of *F*-test: $\beta_{11} + \beta_{21}(\beta_{12} + \beta_{22}, \beta_{13} + \beta_{23}) \neq 0$	0.286	0.434, 0.261	0.162	0.151, 0.175
p-value of *F*-test: $\beta_{11} + \beta_{21} + \beta_{31}(\beta_{12} + \beta_{22} + \beta_{32}, \beta_{13} + \beta_{23} + \beta_{33}) \neq 0$	0.015	0.087, 0.011	0.719	0.916, 0.611

This table presents the results of regressions analyzing the relation between unexpected changes in risk factor disclosures and investor reaction. Panel A measures unexpected disclosure using changes in risk factor prevalence, while panel B employs residuals from a determinant model. Columns 1 and 3 examine the effect of the absolute changes in disclosure prior to and following the SEC 2020 mandate on absolute abnormal returns and stock return volatility, respectively. Columns 2 and 4 examine the effect of increases and decreases in disclosure prior to and following the SEC 2020 mandate on absolute abnormal returns and stock return volatility, respectively. Continuous variables are winsorized at the top and bottom 1 percent, and all specifications include industry and topic fixed effects. Standard errors are clustered by firm, filing month and topic. T-statistics are presented in parentheses. *, **, and *** indicate statistical significane at the 10%, 5%, and 1% levels, respectively. Variable definitions are provided in Appendix A.

The effect of standardization on investor reactions (Hypothesis 2)

In this section, we assess how various disclosure attributes – length, boilerplate, specificity, readability, text imitation, topic imitation, text stickiness, and topic stickiness – affect investor reactions and how their effects evolve over time, particularly following the SEC's Disclosure Effectiveness Initiative (2013–2020) and the post-mandate period (2020–2023). Column (1) in Table 4 indicates that longer disclosures initially weaken investor reactions (β_1 = -0.0002, *t*-statistic = -5.33), consistent with concerns that excessive length dilutes informativeness. However, this negative effect diminishes during the initiative (β_2 = 0.007, *t*-statistic = 14.17) and further weakens post-mandate (β_3 = 0.005, *t*-statistic = 4.38). Our F-test further confirms that the overall effect of length significantly changes post-mandate (*p*-value = 0.000), suggesting that investors find considerable value in longer disclosures over time. Similarly, Column (2) shows that *boilerplate* disclosures weaken investor reactions pre-initiative (β_1 = -0.004, *t*-statistic = -2.97), though this effect diminishes post-initiative (β_2 = 0.006, *t*-statistic = 1.82). Post-mandate, boilerplate disclosures become significantly more associated with investor reactions (β_3 = 0.010, *t*-statistic = 2.27, *p*-value = 0.049). By contrast, *specificity* in column (3) enhances investor reactions pre-mandate (β_1 = 0.034, *t*-statistic =

3.97), showing its role in improving disclosure informativeness. However, its post-mandate interaction is significantly negative (β_3 = -0.053, *t*-statistic = -2.25), indicating that as disclosures have become more standardized, specificity has lost signaling power. For *readability*, measured via the Fog Index (i.e., higher values indicate lower readability) in column (4), we observe a negative effect, meaning that less readable disclosures deter investors. This effect reverses during the *Initiative* (β_2 = 0.001, *t*-statistic = 3.76), with investors responding more positively to disclosures despite their complexity. The *Mandate* interaction is insignificant, suggesting that the initiative had a greater role in improving readability perceptions than the mandate. Both *text imitation* and *topic imitation* in columns (5) and (6) exhibit negative pre-initiative effects (β_1 = -0.025, *t*-statistic = -7.47; β_1 = -0.014, *t*-statistic = -1.98), indicating that disclosures that closely resemble peer firms were initially perceived as less informative. However, as standardization increased, investors no longer penalize imitation. Post-mandate, both text and topic imitation become significantly associated with investor reactions (β_3 = 0.027, *t*-statistic = 4.35; β_3 = 0.077, *t*-statistic = 3.09), suggesting that investors may have come to view standardized RFDs as a credible benchmark rather than redundant information. Finally, *text stickiness* and *topic stickiness* in columns (7) and (8) both initially show negative effects on investor reactions (β_1 = -0.015, *t*-statistic = -3.47; β_1 = -0.035, *t*-statistic = -2.79), indicating that repetitive disclosures were perceived as less informative. *Text stickiness* turns significantly positive post-mandate (β_3 = 0.020, *t*-statistic = 3.64), suggesting that investors may have come to view consistency in RFDs as beneficial. *Topic stickiness* remains marginally insignificant post-mandate (β_3 = 0.021, *t*-statistic = 1.64), implying that while textual consistency may have gained acceptance, consistency in topic selection does not necessarily enhance informativeness.

Overall, our results reject Hypothesis 2, indicating that the association between the degree of standardization in RFDs and investor reactions does differ post-mandate compared

to the preceding period. Specifically, while various forms of standardization (e.g., boilerplate language, imitation, and stickiness) were initially viewed negatively, they became less penalized and, in some cases, more positively associated with investor reactions, particularly after the SEC 2020 mandate. This suggests that investors have adapted to standardized disclosures rather than outright dismissing them as uninformative. At the same time, the diminished influence of specificity indicates that firm-level uniqueness in RFDs may become less important, possibly because investors increasingly prioritize comparability across firms.

Table 4: Market Reactions to standardization of risk factor disclosures

Dependent Variable	|*CAR*| (1)	|*CAR*| (2)	|*CAR*| (3)	|*CAR*| (4)	|*CAR*| (5)	|*CAR*| (6)	|*CAR*| (7)	|*CAR*| (8)
Length (β_1)	-0.002***							
	(-5.33)							
Length:Initiative (β_2)	0.007***							
	(14.17)							
Length:Mandate (β_3)	**0.005*** **							
	(4.38)							
Boilerplate (β_1)		-0.004**						
		(-2.97)						
Boilerplate:Initiative (β_2)		0.006*						
		(1.82)						
Boilerplate:Mandate (β_3)		**0.010** **						
		(2.27)						
Specificity (β_1)			0.034***					
			(3.97)					
Specificity:Initiative (β_2)			-0.031					
			(-1.21)					
Specificity:Mandate (β_3)			**-0.053** **					
			(-2.25)					
Fog (β_1)				-0.0004*				
				(-1.85)				
Fog:Initiative (β_2)				0.001***				
				(3.76)				
Fog:Mandate (β_3)				0.0008				
				(1.05)				
Text imitation (β_1)					-0.025***			
					(-7.47)			
Text imitation:Initiative (β_2)					0.037***			
					(7.25)			
Text imitation:Mandate (β_3)					**0.027*** **			
					(4.35)			
Topic imitation (β_1)						-0.014*		
						(-1.98)		
Topic imitation:Initiative (β_2)						0.041*		
						(2.17)		
Topic imitation:Mandate (β_3)						**0.077** **		
						(3.09)		
Text stickiness (β_1)							-0.015***	
							(-3.47)	
Text stickiness:Initiative (β_2)							0.009	
							(0.97)	
Text stickiness:Mandate (β_3)							**0.020*** **	
							(3.64)	

Topic stickiness (β_1)								-0.035*** (-2.79)
Topic stickiness:Initiative (β_2)								-0.015 (-0.58)
Topic stickiness:Mandate (β_3)								0.021 (1.64)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	31,712	31,712	31,712	31,712	31,712	31,712	25,851	25,851
Adjusted R^2	0.098	0.096	0.096	0.096	0.098	0.096	0.105	0.105
p-value of *F*-test: $\beta_1 + \beta_2 \neq 0$	0.000	0.594	0.874	0.075	0.012	0.050	0.328	0.006
p-value of *F*-test: $\beta_1 + \beta_2 + \beta_3 \neq 0$	0.000	0.049	0.190	0.200	0.000	0.006	0.176	0.293

This table presents the results of regressions analyzing the relation between different disclosure attributes – proxying for the degree of standardization within risk factor disclosures – and investor reaction prior to and following the SEC 2020 mandate. Continuous variables are winsorized at the top and bottom 1 percent, and all specifications include industry fixed effects. Standard errors are clustered by firm and filing month. T-statistics are presented in parentheses. *, **, and *** indicate statistical significane at the 10%, 5%, and 1% levels, respectively. Variable definitions are provided in Appendix A.

The interaction between standardization and changes in RFD (Hypothesis 3)

Given that standardization has increasingly shaped investor reactions, we next examine whether the declining informativeness of changes in RFDs is driven by the rising standardization of disclosures. We proceed by estimating the interaction between |*ΔPrevalence*| and different disclosure attributes prior to and following both the initiative and the mandate, assessing whether these interactions significantly influence investor reactions. If standardization reduces the informativeness of disclosure changes, we expect to observe a negative and significant coefficient on these interaction terms. Conversely, if standardization has no bearing on how investors interpret changes in disclosures, we would fail to reject Hypothesis 3.

Results in Table 5 indicate that the informativeness of RFDs is significantly influenced by disclosure attributes. While the overall F-test result for longer disclosures in column (1) is marginally insignificant (*p*-value = 0.104), individual coefficient estimates suggest a declining informativeness trend. Initially, longer disclosures slightly enhance the market response to risk factor updates (β_2 = 0.048, *t*-statistic = 1.96), but this effect reverses post-initiative (β_3 = -0.106, *t*-statistic = -2.74). We also find that less readable (higher Fog) disclosures initially make RFD changes more informative (β_2 = 0.027, *t*-statistic = 3.21) suggesting that investors extract meaningful insights from complex risk narratives. However, regulatory interventions

progressively weaken the informativeness of complex disclosures, with informativeness declining after the 2013 initiative and even more sharply post-mandate (β_4 = -0.071, *t*-statistic = -3.92). The significant F-test (*p*-value = 0.006) confirms that readability plays a key role in shaping investor responses to disclosure changes over time. Similarly, the interaction between |*ΔPrevalence*| and *text stickiness* in column (7) reveals that pre-mandate, changes in highly repetitive disclosures are still perceived as informative (β_2 = 0.608, *t*-statistic = 8.60), but this effect weakens significantly following the 2013 initiative (β_3 = -0.383, *t*-statistic = -3.35), and reverses after the 2020 mandate (β_4 = -1.006, *t*-statistic = -3.45). This suggests that investors initially rely on consistency to assess RFD changes, but as firms increasingly adopt repetitive language, investor reactions weaken. Post-mandate, investors actively discount changes in highly repetitive disclosures. *Topic stickiness* in column (8) exhibits a similar pattern, with persistent risk topics initially retaining informativeness but losing signaling value over time, particularly post-mandate (β_4 = -2.063, *t*-statistic = -4.70). F-tests confirm that investors have become increasingly indifferent to changes in highly persistent disclosures. Conversely, *boilerplate* language in column (3) exhibits a different trend compared to stickiness. While its interaction with |*ΔPrevalence*| is not significant pre-mandate, post-mandate results show a positive and significant coefficient (β_4 = 0.582, *t*-statistic = 2.28). In contrast, the lack of significant effects for *specificity*, *text imitation* and *topic imitation* suggest that these dimensions of standardization do not materially alter investor reactions to disclosure changes.

Given our results, we reject Hypothesis 3, indicating that the effect of changes in RFDs on investor reactions is influenced by the degree of standardization, at least for certain disclosure attributes. Our findings highlight the dual role of standardization: while it enhances comparability, excessive conformity – particularly in terms of length, readability and repetition – limits investors' ability to distinguish meaningful risk updates. Post-mandate, investors appear to discount changes in RFDs when they are embedded within standardized, persistent,

or overly complex reporting structures. This suggests that while regulatory reforms aim to improve disclosure effectiveness, they may unintentionally reduce the informativeness of risk factor updates by reinforcing standardized disclosure practices.

Table 5: The Effect of standardization on market reactions to unexpected risk factor disclosures

Dependent Variable	|*CAR*| (1)	|*CAR*| (2)	|*CAR*| (3)	|*CAR*| (4)	|*CAR*| (5)	|*CAR*| (6)	|*CAR*| (7)	|*CAR*| (8)
|Δ*Prevalence*| (β_1)	-0.132 (-1.02)	**0.142*** (3.35)**	**0.130*** (4.19)**	**-0.407** (-2.49)**	**0.203* (2.06)**	0.317 (1.32)	**-0.419*** (-7.64)**	**-0.597*** (-3.51)**
Length	0.0001 (0.25)							
|Δ*Prevalence*|:*Length* (β_2)	0.048* (1.96)							
|Δ*Prevalence*|:*Length:Initiative* (β_3)	**-0.106** (-2.74)**							
|Δ*Prevalence*|:*Length:Mandate* (β_4)	-0.072 (-1.30)							
Boilerplate		0.002 (0.89)						
|Δ*Prevalence*|:*Boilerplate* (β_2)		-0.054 (-0.54)						
|Δ*Prevalence*|:*Boilerplate:Initiative* (β_3)		-0.067 (-0.19)						
|Δ*Prevalence*|:*Boilerplate:Mandate* (β_4)		**0.582** (2.28)**						
Specificity			0.002 (0.18)					
|Δ*Prevalence*|:*Specificity* (β_2)			-0.309 (-0.57)					
|Δ*Prevalence*|:*Specificity:Initiative* (β_3)			0.719 (0.79)					
|Δ*Prevalence*|:*Specificity:Mandate* (β_4)			-1.758 (-0.88)					
Fog				-0.001*** (-4.62)				
|Δ*Prevalence*|:*Fog* (β_2)				0.027*** (3.21)				
|Δ*Prevalence*|:*Fog:Initiative* (β_3)				-0.044*** (-3.72)				
|Δ*Prevalence*|:*Fog:Mandate* (β_4)				**-0.071*** (-3.92)**				
Text imitation					-0.001 (-0.29)			
|Δ*Prevalence*|: *Text imitation* (β_2)					-0.115 (0.73)			
|Δ*Prevalence*|: *Text imitation:Initiative* (β_3)					-0.160 (-0.55)			
|Δ*Prevalence*|: *Text imitation:Mandate* (β_4)					0.009 (0.03)			
Topic imitation						0.007 (0.61)		
|Δ*Prevalence*|:*Topic imitation* (β_2)						-0.230 (-0.81)		
|Δ*Prevalence*|:*Topic imitation:Initiative* (β_3)						0.139 (0.37)		
|Δ*Prevalence*|:*Topic imitation:Mandate* (β_4)						-0.107 (-0.12)		
Text stickiness							-0.016*** (-3.76)	
|Δ*Prevalence*|:*Text stickiness* (β_2)							0.608*** (8.60)	
|Δ*Prevalence*|:*Text stickiness:Initiative* (β_3)							-0.383*** (-3.35)	

|ΔPrevalence|:Text stickiness:Mandate (β_4)							**-1.006*** **	
							(-3.45)	
Topic stickiness								-0.047***
								(-3.95)
|ΔPrevalence|:Topic stickiness (β_2)								0.702***
								(3.60)
|ΔPrevalence|:Topic stickiness:Initiative (β_3)								-0.275
								(-0.55)
|ΔPrevalence|:Topic stickiness:Mandate (β_4)								**-2.063*** **
								(-4.70)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Topic FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,032,298	1,032,298	1,032,298	1,032,298	1,032,298	1,032,298	971,413	971,413
Adjusted R2	0.050	0.042	0.042	0.043	0.047	0.045	0.042	0.042
p-value of *F*-test: $\beta_1 + \beta_2 + \beta_3 \neq 0$	0.153	0.951	0.423	0.011	0.780	0.552	0.084	0.730
p-value of *F*-test: $\beta_1 + \beta_2 + \beta_3 + \beta_4 \neq 0$	0.104	0.264	0.562	0.006	0.869	0.922	0.001	0.008

This table presents the results of regressions analyzing the effect of standardization on investor reactions to unexpected risk factor disclosures. Specifically, it examines how different disclosure attributes moderate the informativeness of year-over-year changes in risk factor prevalence before and after both the SEC's Disclosure Effectiveness Initiative (2013–2020) and the 2020 mandate. Continuous variables are winsorized at the top and bottom 1 percent, and all specifications include industry and topic fixed effects. Standard errors are clustered by firm, filing month and topic. T-statistics are presented in parentheses. *, **, and *** indicate statistical significane at the 10%, 5%, and 1% levels, respectively. Variable definitions are provided in Appendix A.

6. Additional Cross-sectional Analyses

6.1. Firm Size

In this section, we examine how the variance in specific firm characteristics influences the association between changes in risk factor prevalence and the absolute abnormal returns (|*CAR*|) across the whole sample. Larger firms are generally more exposed to systematic risk than smaller firms, which should amplify the market's reaction to a change in information (Heinle & Smith, 2017). To test this, we divide our sample into larger and smaller firms based on whether their total assets exceed or fall below the annual median. Columns (1) and (2) in Panel A of Table 6 display the results for the larger and smaller firm samples, respectively. As expected, changes in risk factor prevalence are significantly more informative for larger firms, as evidenced by a stronger association between |*CAR*| and |*ΔPrevalence*|. This suggests that investors respond more strongly to RFD updates from larger firms, reflecting their focus on these firms as key sources of market-relevant information. We also find that the informativeness of RFD changes declines more sharply for larger firms after the SEC's 2020

mandate. For smaller firms, the informativeness of risk factor changes remains significant but relatively weaker, with a less pronounced post-mandate decline.[11]

6.2. Early vs. Late filers

Second, we partition our sample based on their filing date, as early 10-K filers might reveal new information to a larger extent or be more transparent than late filers (Lyle et al., 2023). We classify firms as early or late filers based on whether the number of days between their reporting date and filing date is smaller or larger than the median. The results in Columns (3) and (4) in Panel A of Table 6 indicate that while both early and late filers experience significant investor reactions to changes in risk disclosures, the impact is stronger for early filers. This supports the idea that early filers play a more significant role in setting market expectations and that investors rely more heavily on their disclosures. We also find that the informativeness of disclosure changes declines more sharply for early filers following the 2020 mandate.

Table 6: Cross-sectional analyses on market reactions

Panel A – Firm Size and Early vs. Late Filers				
Dependent Variable: $\|CAR\|$	Larger Firms (1)	Smaller Firms (2)	Early Filers (3)	Late Filers (4)
$\|\Delta Prevalence\|$ (β_1)	**0.144*****	0.106***	**0.112****	0.095**
	(4.57)	(3.19)	**(2.58)**	(2.35)
$\|\Delta Prevalence\|$*:Initiative* (β_2)	0.051	-0.051	-0.053	0.047
	(1.02)	(-0.81)	(-0.72)	(0.57)
$\|\Delta Prevalence\|$*:Mandate* (β_3)	**-0.395*****	-0.363***	**-0.395*****	-0.32**
	(-4.52)	(3.73)	**(-4.12)**	(-2.52)
Control Variables	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Topic FE	Yes	Yes	Yes	Yes
Observations	516,313	515,985	551,163	481,135
Adjusted R2	0.041	0.037	0.095	0.102
p-value of F-test: $\beta_1 + \beta_2 + \beta_3 \neq 0$	0.021	0.001	0.005	0.251

Columns (1) and (2) discuss the effect of the year-over-year change in RFD prevalence on the absolute abnormal return on our sample of larger and smaller firms, respectively. Columns (3) and (4) analyze this effect on a sample of early and late 10-K filers, respectively.

Panel B – Length and Fog Index				
Dependent Variable: $\|CAR\|$	High	Low	High	Low

[11] We find similar (untabulated) results for changes in risk factor prevalence when dividing the sample based on its analyst following rather than its total assets (proxying for firm size).

	Length (1)	Length (2)	Fog (3)	Fog (4)
$\lvert\Delta Prevalence\rvert$ (β_1)	0.087	**0.139*****	**0.186*****	0.109**
	(1.39)	**(4.25)**	**(5.82)**	(2.53)
$\lvert\Delta Prevalence\rvert$*:Initiative* ($\beta_2$)	0.066	0.023	-0.138	0.098
	(0.57)	(0.38)	(-2.11)	(1.66)
$\lvert\Delta Prevalence\rvert$*:Mandate* ($\beta_3$)	-0.242**	**-0.363*****	**-0.432*****	-0.299***
	(-2.29)	**(-5.03)**	**(-6.17)**	(-7.28)
Control Variables	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Topic FE	Yes	Yes	Yes	Yes
Observations	515,780	516,518	516,149	516,149
Adjusted R2	0.044	0.035	0.060	0.029
p-value of *F*-test: $\beta_1 + \beta_2 + \beta_3 \neq 0$	0.360	0.010	0.000	0.2432

Columns (1) and (2) discuss the effect of the year-over-year change in RFD prevalence on the absolute abnormal return on our sample of firms with higher and lower disclosure length in their RFDs, respectively. Columns (3) and (4) analyze this effect on a sample of firms with higher and lower Fog index, respectively.

Panel C – Boilerplate and Specificity

Dependent Variable: $\lvert CAR\rvert$	High Boilerplate (1)	Low Boilerplate (2)	High Specificity (3)	Low Specificity (4)
$\lvert\Delta Prevalence\rvert$ (β_1)	0.120***	**0.135*****	0.124***	**0.130*****
	(3.86)	**(3.31)**	(3.38)	**(3.74)**
$\lvert\Delta Prevalence\rvert$*:Initiative* ($\beta_2$)	-0.023	-0.013	-0.057	0.047
	(-0.40)	(-0.22)	(-1.02)	(0.83)
$\lvert\Delta Prevalence\rvert$*:Mandate* ($\beta_3$)	-0.245***	**-0.472*****	**-0.438*****	-0.253***
	(-3.65)	**(-7.48)**	**(-8.08)**	(-3.54)
Control Variables	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Topic FE	Yes	Yes	Yes	Yes
Observations	516,149	516,149	516,149	516,149
Adjusted R2	0.040	0.047	0.047	0.040
p-value of *F*-test: $\beta_1 + \beta_2 + \beta_3 \neq 0$	0.131	0.000	0.000	0.467

Columns (1) and (2) discuss the effect of the year-over-year change in RFD prevalence on the absolute abnormal return on our sample of firms with higher and lower boilerplate in their RFDs, respectively. Columns (3) and (4) analyze this effect on a sample of firms with higher and lower specificity, respectively.

Panel D – Topic and Text Imitation

Dependent Variable: $\lvert CAR\rvert$	High Topic Imitation (1)	Low Topic Imitation (2)	High Text Imitation (3)	Low Text Imitation (4)
$\lvert\Delta Prevalence\rvert$ (β_1)	-0.048	**0.147*****	-0.063	**0.126*****
	(-0.78)	**(5.49)**	(-0.81)	**(3.55)**
$\lvert\Delta Prevalence\rvert$*:Initiative* ($\beta_2$)	0.232***	-0.032	0.148*	0.110*
	(4.53)	(-0.65)	(2.14)	(1.91)
$\lvert\Delta Prevalence\rvert$*:Mandate* ($\beta_3$)	0.101	**-0.352*****	-0.011	**-0.367*****
	(-0.71)	**(-3.26)**	(-0.05)	**(-4.44)**
Control Variables	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Topic FE	Yes	Yes	Yes	Yes
Observations	516,149	516,149	516,149	516,149

Adjusted R2	0.049	0.037	0.043	0.039
p-value of *F*-test: $\beta_1 + \beta_2 + \beta_3 \neq 0$	0.606	0.088	0.705	0.122

Columns (1) and (2) discuss the effect of the year-over-year change in RFD prevalence on the absolute abnormal return on our sample of firms with higher and lower *topic* imitation, respectively. Columns (3) and (4) analyze this effect on a sample of firms with higher and lower *text* imitation, respectively.

Panel E – Topic and Text Stickiness

Dependent Variable: |*CAR*|	High Topic Stickiness (1)	Low Topic Stickiness (2)	High Text Stickiness (3)	Low Text Stickiness (4)
|Δ*Prevalence*| (β_1)	0.199	**0.076***	0.100	**0.090****
	(0.84)	**(2.05)**	(1.13)	**(2.30)**
|Δ*Prevalence*|:*Initiative* (β_2)	0.302	0.002	0.367**	0.003
	(1.65)	(0.03)	(2.95)	(0.05)
|Δ*Prevalence*|:*Mandate* (β_3)	-0.284	**-0.160*****	-0.110	**-0.145*****
	(-1.57)	**(-3.51)**	(-1.00)	**(-5.13)**
Control Variables	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Topic FE	Yes	Yes	Yes	Yes
Observations	485,686	485,727	485,686	485,727
Adjusted R2	0.052	0.034	0.053	0.034
p-value of *F*-test: $\beta_1 + \beta_2 + \beta_3 \neq 0$	0.222	0.195	0.021	0.595

Columns (1) and (2) discuss the effect of the year-over-year change in RFD prevalence on the absolute abnormal return on our sample of firms with higher and lower *topic* stickiness, respectively. Columns (3) and (4) analyze this effect on a sample of firms with higher and lower *text* stickiness, respectively.

6.3. Standardization

To further investigate whether standardization enhances or worsens disclosure informativeness, we conduct a cross-sectional analysis by splitting the sample based on key disclosure attributes: (1) length and readability in Panel B, (2) boilerplate language and disclosure specificity in Panel C, (3) topic and text imitation in Panel D, and (4) topic and text stickiness in Panel E. Our findings in Panel B of Table 6 suggest that investors respond more strongly to shorter (β_1 = 0.139, *t*-statistic = 4.25), less readable (β_1 = 0.186, *t*-statistic = 5.82) disclosures than to lengthy, highly readable ones, implying that concise yet more complex disclosures may be more effective in conveying updated risk information. The 2020 mandate significantly reduces informativeness across all groups (β_3), with the effect being most pronounced for shorter and less readable disclosures.

Regarding Panel C, both high- and low-*boilerplate* firms see significant investor reactions to disclosure changes (β_1 = 0.120, *t*-statistic = 3.86; β_1 = 0.135, *t*-statistic = 3.31).

Similarly, high-*specificity* disclosures elicit strong market responses (β_1 = 0.124, *t*-statistic = 3.38), but low-*specificity* firms also experience significant reactions (β_1 = 0.130, *t*-statistic = 3.74), indicating that the informativeness of RFD updates is not necessarily dependent on the level of specificity, as already shown in column (3) of Table 5. The 2020 mandate significantly weakens the informativeness of risk factor updates across all groups, with the strongest decline in low-boilerplate and high-specificity disclosures. The F-test results show that informativeness of these disclosures has significantly declined over time. This implies that while firm-specific, less boilerplate disclosures were once more informative, post-mandate standardization may have reduced their distinctiveness, diminishing their impact on investor perception.

Our findings in Panel D indicate that firms with lower levels of *topic* and *text imitation* experience significantly stronger investor responses to changes in risk factor prevalence pre-initiative (β_1 = 0.147, *t*-statistic = 5.49; β_1 = 0.126, *t*-statistic = 3.55). This effect, however, declines significantly post-mandate. By contrast, firms with high imitation do not elicit significant investor responses in either period, suggesting that changes in disclosures that closely mirror industry norms are generally perceived as less informative. Finally, our split-sample analysis in Panel E reveals that only firms with low text or topic stickiness drive significant investor reactions – displaying a strong positive effect pre-initiative initiative (β_1 = 0.090, *t*-statistic = 2.30; β_1 = 0.076, *t*-statistic = 2.05) and a significant negative effect post-mandate (β_1 = -0.145, *t*-statistic = -5.13; β_1 = -0.160, *t*-statistic = -3.15) – while high-stickiness firms show no significant response in either period. Although regulatory reforms were intended to counter excessive standardization, our findings indicate that these interventions have reduced the distinctiveness of RFDs. In effect, even firms that once conveyed meaningful signals through lower repetition lose their informational edge post-mandate, underscoring that increased uniformity ultimately diminishes the value of RFD updates for investors.

Our cross-sectional analysis in Table 6 complements our interaction regressions in Table 5 by showing that mostly firms with lower levels of standardization (e.g., low length, low boilerplate, high specificity, low peer imitation, and low stickiness) drive significant investor responses – exhibiting strong positive effects pre-initiative that turn negative post-mandate – while firms with higher standardization consistently elicit muted reactions.

7. Conclusion

Our study examines the impact of increasing standardization in risk factor disclosures (RFDs) on their informativeness to investors amid recent regulatory reforms. Using a structural topic model to analyze 58,000 RFDs from 2006 to 2023, our findings suggest that, despite regulatory efforts to enhance disclosure effectiveness, investors increasingly rely on common reporting structures rather than firm-specific risk signals when interpreting RFDs. While less standardized disclosures initially trigger stronger market responses, attributes associated with high standardization – such as longer texts, greater complexity, increased imitation, and higher stickiness – decrease the informativeness of risk factor updates over time. These findings raise concerns about the effectiveness of the SEC 2020 mandate, highlighting the need for regulatory strategies that preserve the unique, firm-specific signals essential for effective risk communication in capital markets.

Appendix A: Variable definitions

Dependent Variables	
|CAR|	The absolute value of the three-day buy-and-hold abnormal return, calculated from one trading day before to one trading day after the 10-K filing date. The expected return is estimated following Campbell et al. (2014), using the firm's exposure to market returns and the returns of two hedge portfolios (HML and SMB) from the Fama-French database, based on data from the previous 250 trading days.
PostVolatility	The natural logarithm of the standard deviation of daily stock returns measured over a 30-day window following the 10-K filing date.
Independent Variables	
|ΔPrevalence|	The absolute change in topic prevalence for a risk factor between the current and previous filing.
PrevalenceIncrease	The positive component of the change in topic prevalence for a risk factor between the current and previous filing. Equals the change in prevalence if positive; otherwise, it is set to zero.
PrevalenceDecrease	The negative component of the change in topic prevalence for a risk factor between the current and previous filing. Equals the value of the change if negative; otherwise, it is set to zero.
LaggedPrevalence	The prevalence of a given topic in the previous 10-K filing (i.e., the prior year's disclosure).
Residual	The residual from a regression of topic prevalence on past disclosure prevalence, firm characteristics and fixed effects
PositiveResidual	The positive component of the residual from a regression of topic prevalence on past disclosure prevalence, firm characteristics and fixed effects. Equals the residual if positive; otherwise, it is set to zero.
NegativeResidual	The negative component of the residual from a regression of topic prevalence on past disclosure prevalence, firm characteristics and fixed effects. Equals the value of the residual if negative; otherwise, it is set to zero.
Initiative	An indicator variable equal to one if the RFD has been filed between December 2nd, 2013, and November 9th, 2020, and zero otherwise.
Mandate	An indicator variable equal to one if the RFD has been filed after November 9th, 2020, and zero otherwise.
Size	The natural logarithm of total assets.
Leverage	The ratio of long-term debt to total assets.
ROA	The ratio of income before extraordinary items to total assets.
BTM	The ratio of common shareholders' equity divided by the market value of equity.
PastLosses	An indicator variable that equals one if the firm has a negative net income over the previous five years, and zero otherwise.
ProprietaryCost	The ratio of R&D expenses to total assets. Missing data is replaced by zero.
Segment	The natural logarithm of one plus the number of business segments.
InstOwnership	The percentage of outstanding shares owned by institutional investors at the end of the fiscal year.
Big4	An indicator variable that equals one for firms with a Big 4 auditor: Ernst & Young LLP, Deloitte & Touche LLP, KPMG LLP and PricewaterhouseCoopers LLP, and zero otherwise.
Litigation	An indicator variable that equals one for firms in SIC codes 2833-2836, 3570-3577, 3600-3674, 5200-5961, 7370- 7374, and 8731-8734, zero otherwise.
LateFiling	An indicator variable that equals one when the 10-K filing date is at least 90 days after the year end, zero otherwise.
AnalystFollowing	The natural logarithm of one plus the number of analysts following the firm as reported by I/B/E/S.
ReturnVolatility	The daily standard deviation of stock returns for the 250 trading days prior to the fiscal year end.
PreVolatility	The natural logarithm of the standard deviation of daily stock returns measured over a 30-day window prior to the 10-K filing date.
ShareTurnover	The ratio of the total volume of shares traded to the total number of shares outstanding for the 250 trading days prior to the fiscal year end.

ForecastDispersion	The standard deviation of analysts' earnings forecasts from the last consensus forecast issued before the 10-K filing, scaled by the firm's share price 90 days prior to the 10-K filing date.
Length	The natural logarithm of one plus the total number of words in a document.
Fog	The Fog index is measured using the following equation: 0.4 ∗ (average number of words per sentence + percent of complex words), with complex words having more than two syllables.
Boilerplate	We flag sentences as boilerplate if they include at least one 4-word phrase that is shared by at least 30% of all firms in our corpus or occurs on average at least 5 times per document. Similar to Lang & Stice-Lawrence (2015), we exclude sentences which include common tetragrams that occur in at least 75% of our entire corpus of documents across our sample. We then divide the number of words from boilerplate sentences by the total number of sentences in a given portion of text.
Specificity	The count of specific entities (locations, people, organizations, monetary amounts, percentages, dates, or times) identified using the Stanford Named Entity Recognizer (NER) tool, normalized by the total word count in the text (see Hope et al., 2016, for further details).
Text imitation	Text imitation is measured as the cosine similarity between the textual content of a firm's RFD and that of each of its peers within the same industry. The cosine similarity scores are calculated pairwise and then averaged across all peers to obtain a single measure of how closely the firm's text aligns with industry norms.
Topic imitation	Topic imitation is measured as the cosine similarity between the topic distribution of a firm's RFD (as derived from the STM) and the topic distributions of its peers within the same industry. Similar to text imitation, these pairwise cosine similarity scores are averaged to produce a measure of how closely the firm's topic selection mirrors that of its industry peers.
Text stickiness	Text stickiness is measured as the cosine similarity between the textual content of a firm's RFD in the current year and its own disclosure from the previous year. This provides a measure of how much the firm repeats or reuses language from one year to the next.
Topic stickiness	Topic stickiness is measured as the cosine similarity between the topic distribution of a firm's RFD (derived from the STM) in the current year and its topic distribution from the previous year. This captures the extent to which a firm maintains consistency in the thematic content of its disclosures over time.

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Let's talk about ESG: The emergence of ESG-focused investor events *

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January 2025

Preliminary and incomplete - Please do not cite or circulate

Abstract

Firms regularly meet with investors to discuss corporate strategy and recent performance. More recently, firms began to host or participate in investor events that specifically focus on ESG. Using a comprehensive sample of ESG-focused investor events, we investigate the role of these meetings in capital markets. The number of ESG-focused investor events significantly increases after 2017. Firms participating in such events are likely to continue to participate in ESG-focused investor events, suggesting that these meetings are not just one-time events in response to, for example, specific economic shocks. We also document that firms participating in ESG-focused investor events show generally higher ESG metrics, but also originate from industries with higher ESG-related risks. In addition, the information environment of ESG-focused investor events is different from other events, and hosting or participating in ESG-focused investor events is associated with increases in ownership by ESG-focused funds. Overall, our results suggest that ESG-focused investor events are likely to constitute a new type of information channel in the corporate reporting ecosystem.

Keywords: Investor conferences, Investor Relations, Investor meetings, Corporate disclosure, ESG, Corporate Social Responsibility, CSR, Sustainability

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Firms regularly meet with investors to discuss corporate strategy and recent performance. More recently, firms began to host or participate in investor events that specifically focus on ESG. Using a comprehensive sample of ESG-focused investor events, we investigate the role of these meetings in capital markets. The number of ESG-focused investor events significantly increases after 2017. Firms participating in such events are likely to continue to participate in ESG-focused investor events, suggesting that these meetings are not just one-time events in response to, for example, specific economic shocks. We also document that firms participating in ESG-focused investor events show generally higher ESG metrics, but also originate from industries with higher ESG-related risks. In addition, the information environment of ESG-focused investor events is different from other events, and hosting or participating in ESG-focused investor events is associated with increases in ownership by ESG-focused funds. Overall, our results suggest that ESG-focused investor events are likely to constitute a new type of information channel in the corporate reporting ecosystem.

1 Introduction

We investigate a recent phenomenon in the corporate reporting ecosystem: ESG-focused investor events. These are dedicated investor relation events during which firms meet with mostly institutional investors to report about their ESG progress and explain how ESG is integrated into corporate strategy and performance (IR Magazine, 2022). Despite the increasing importance and awareness of ESG issues, the role of these ESG-focused investor events remains relatively unclear.

Firms regularly interact with institutional investors and information intermediaries as part of their investor relation strategy. This includes, for example, hosting quarterly earnings calls (e.g., Bushee et al., 2003; Frankel et al., 1999; Tasker, 1998), meeting analysts and investors during capital market days (e.g., Bradley et al., 2022; Kirk and Markov, 2016; Park, 2019), or participating in broker-hosted investor conferences (e.g., Brockman et al., 2017; Bushee et al., 2022, 2011; Green et al., 2014a,b). Especially capital market days and investor conferences have traditionally been a way for senior management to meet investors in a slightly less formal environment and to talk about the broader business strategy and direction (e.g., Solomon and Soltes, 2015; Zhang, 2022). While ESG may thus be a prominent agenda item these days for *existing* investor events, it is unclear why firms and brokerages would begin to organize additional *specific events* dedicated to ESG. Relatedly, it remains unclear how these events interact with other established investor events and whether participation has any economic consequences.

There are various reasons for the emergence of ESG-focussed investor events. Survey results in Amel-Zadeh and Serafeim (2018) suggest that about 54 percent of large issuers consider ESG information in investment decisions because of growing client demand. Facing an increasing demand for ESG-related information, firms respond with an increase in the supply of corresponding information. For example, there has been a significant jump recently in the discussion of ESG- and sustainability-related issues during earnings conference calls

(Dzieliński et al., 2022; NASDAQ, 2022). The increasing demand and supply of ESG-related information, however, has two important implications. For one, given restrictions on presentation and discussion time, including ESG information in traditional (earnings) conference call and capital market events increasingly crowds out other topics in favor of ESG issues. Firms that face a high demand for ESG information that they wish to satisfy may thus prefer to host or participate in separate ESG-focused investor events in addition to existing investor interactions. For another, there may also be an increasing demand of institutional investors to meet with corporate management and hear and talk about ESG issues only. ESG issues are increasingly complex and require some level of expertise to have a meaningful exchange. Investors may want to meet those managers responsible for implementing sustainable practices, probably even without the CEO or CFO being present to ascertain how well management considers ESG issues despite the corporate narrative put forward by senior executives. Organizing and hosting these events may thus also be a result of brokerages strategically (re-)positioning themselves in response to changing client preferences by providing access to corporate representatives with a specific expertise. ESG-focused investor events may thus aim at facilitating interaction between dedicated ESG experts of the firm with those from brokerages and institutional investors. In any case, ESG-focused investor meetings would complement the corporate reporting ecosystem with an information event specifically focused on ESG issues.

On the other hand, it is also possible that the emergence of ESG-focused investor events is merely a response to a short-term economic shock (such as the COVID-19 pandemic in 2020 and 2021) and a related necessity to more proactively address ESG issues. ESG-focused investor events may thus be similar in nature to other news-driven event types, such as M&A conference calls (Kimbrough and Louis, 2011) or investor conferences focusing on specific economic developments. In this case, ESG-focused investor meetings may provide useful information, but do not necessarily represent an addition to the corporate reporting ecosystem.

We investigate these questions using a comprehensive, international sample of ESG-focused investor events held between January 2017 and December 2023. We observe a substantial increase in the number of ESG-focused investor events between 2017 and 2021. In 2021, the number of events peaks, and also in 2022 and 2023 we see a substantial number of ESG-focused investor events, compared to the period before 2020. In addition, many firms that participated in an ESG-focused investor meeting for the first time in or after 2017, also do so in subsequent years, suggesting that these meetings are not just one-time events in response to, for example, specific economic shocks, such as the COVID-19 pandemic. We also document that firms participating in these events originate from industries with higher ESG-related risks, such as chemicals and manufacturing.

Examining the determinants of participating in ESG-focused investor events, we find that larger firms with more resources and richer information environments are more likely to have such events. We also find positive associations with ESG ratings (in particular for the environmental pillar) and an ESG controversies score. This is consistent with firms that already have better ESG performance and more ESG disclosure being more likely to host and participate in ESG-focused investor events.

Further, we show that the information environment of ESG-focused investor events is distinct from other, non-ESG-focused investor events. A significantly larger percentage of sentences is ESG-related and executives who possess expertise in ESG and are responsible for ESG performance are more likely to be present, while CEOs and CFOs are less likely to be present. Lastly, we find that participating in ESG-focused investor events is associated with increases in ownership by ESG-focused funds.

Overall, our results suggest that ESG-focused investor events are likely to constitute a new type of information channel in the corporate reporting ecosystem. The results are consistent with ESG-focused investor events fulfilling a specific information role. Specifically, high investor demand for ESG information could lead firms to increase the supply of such

information. Given the time restrictions in capital market events, including more ESG information in these events could crowd out other information. Therefore, firms that want to increase the supply of ESG information might host or participate in separate ESG-focused investor events, next to the traditional investor meetings.

Our contribution is twofold. First, we contribute to the literature on the demand for ESG information from investors and the supply of ESG information by firms. Amel-Zadeh and Serafeim (2018), for example, find that investor interest in ESG information has grown rapidly, and that firms have responded to this increased demand by issuing sustainability or integrated reports. Relatedly, Dzieliński et al. (2022) find that firms talk more about the climate, a typical ESG topic, on earnings conference calls, when there is greater pressure to do so from investors. We add to these studies by showing that firms have also responded to the increased demand for ESG information by organizing and participating in ESG-focused investor events.

Second, we contribute to the literature on capital market events. While prior research has documented more traditional capital market events, such as broker-hosted investor conferences (Green et al., 2014b), conference presentations (Bushee et al., 2011), analyst/investor days (Kirk and Markov, 2016) and conference calls (Frankel et al., 1999), we show that a new type of investor event has emerged in the reporting ecosystem that is distinct from traditional capital market events that focus on financial performance and strategy: ESG-focused investor events.

2 Institutional background and hypotheses development

ESG investing has substantially increased in importance over the last decade and refers to the incorporation of non-financial data related to environmental, social, and governance in investment decisions. Financial markets are an important means for investors to hedge against ESG risks. For example, to hedge against climate change, assets could be invested

in green projects or investors could avoid polluting firms in their investment portfolios. Institutional investors such as pension funds, sovereign wealth funds, investment banks, foundations, private investment capital (venture capital, growth capital, buy-out capital), hedge funds, financial or insurance institutions, invest more than $100,000 billion in listed firms globally. They act on behalf of private capital providers who want their assets to pay off over time. According to the Global Sustainable Investment Alliance (GSIA, 2020), the total of sustainable funds in which capital can be invested has grown to $35,000 billion of invested assets by 2020 in the US, Europe, Australasia, Japan, and Canada, up 15% from 2018. SRI (socially responsible investment) funds represent 36% of global invested assets. The GSIA labels a fund as 'sustainable' if it contains one or more of the following elements: ESG integration (i.e., the systematic consideration of ESG factors in financial analysis), ESG dialogue with firms, shareholder activism, ESG standards-based screening (e.g., UN SDGs, ILO, NGOs such as Transparency International), screening for negative ESG performance (e.g., weapons and tobacco), best-in-class or positive ESG performance screening, specific ESG themes (e.g., green buildings, gender equality, sustainable agriculture), and finally impact investments with specific social or environmental objectives.

According to Matos (2020), there are two structural factors that explain the increase in sustainable funds. First, among savers and investors, we see a shift from the baby boomers to the generation of millennials, who want to invest their assets in a more sustainable way. Second, since the 2009 global financial crisis, there has been increased regulation that significantly tightens prudential (i.e., sound) supervision of fund managers and exchanges. Besides these two structural factors, institutional investors also want to commit to ESG for financial reasons: do well by doing good (i.e., investing in ESG firms leads to superior stock market returns). Servaes and Tamayo (2013) and Albuquerque et al. (2019) show that better ESG performance in fact increases firm value or reduces firm risk in the long run. This is said to be due to increased trust with stakeholders, such as staff, customers, and suppliers. "High ESG firms" can develop a better long-term strategy as they have a closer relationship with

their environment. Logically, one would expect funds with investments in highly rated ESG firms to be able to show better stock market performance, resulting also in higher bonuses for fund managers.

Yet doing well by doing good is not always empirically observable in listed funds. In a recent study, Demers et al. (2021) show that a firm's ESG performance was no insurance against the massive downward stock market movement in March 2020 during the COVID-19 pandemic. They show that other factors, such as investment in firms with high innovation content, were much better "vaccines" against stock price declines and also proved a stronger stimulus during the recovery in the market from June 2020. Thus, despite initial enthusiasm that ESG leads to better stock market performance, recent academic findings are rather critical. However, a number of studies attribute the lack of a relationship between ESG and stock market performance to faulty ESG performance measurement, greenwashing (i.e., pretending to be greener than one actually is), and inadequate supervision and regulation.

The above trends and observations can lead to the emergence of ESG-focused investor events in multiple ways. First, high investor demand for ESG information could lead firms to increase the supply of such information. Given the time restrictions in capital market events, including more ESG information in these events could crowd out other information. Therefore, firms that want to increase the supply of ESG information in response to increased demand might host or participate in separate ESG-focused investor events, next to the traditional investor meetings.

Second, firms might be persuaded by brokerages to participate in such events, because their clients demand ESG information, leading these brokerages to organize ESG-focused investor events and inviting firms to participate in these events. This implies that ESG-focused investor events are not driven by firms wanting to supply ESG information to their investors, but by the brokerages organizing them.

Alternatively, ESG-focused investor events may be a response to a short-term economic

shock leading to a short-term increase in the demand for ESG information. This would mean that it is a one-time event as opposed to a new type of recurring investor event that firms have in consecutive years.

3 The rise of ESG-focused investor events

To identify ESG-focused investor events we search corporate events listed in Refinitiv Eikon Advanced Events Search. We first identify all conference calls, corporate presentations, and broker-organized conferences that include at least one ESG-related keyword in the event title.[1] To validate that an event is ESG-focused, we manually inspect the resulting list of events and exclude events that are not clearly ESG-focused, despite having an ESG-related keyword in the event title. This also includes events hosted by firms with a name that includes an ESG-related keyword. We further exclude events that solely focus on governance, since these form a distinct category of events that already existed before and is not necessarily related to sustainability or CSR issues.

Figure 1 presents the resulting number and frequency of ESG-focused investor events over time. For better comparison, we further sort the investor events into distinct categories based on keywords appearing in the event title: events focused on ESG and CSR in general (*ESG/CSR*), events related to sustainable and responsible investments (*SRI*), and events that specifically focus on sustainability (*Sustainable*), the environment (*Environmental*), or social issues (*Social*). If an event title contains keywords that relate to multiple of these categories, we assign it to *Multiple*.

It appears that the frequency of ESG-focused investor events has increased significantly, especially over the past five years. While there were hardly any ESG-focused investor events prior to 2010, we observe a wave of events related to sustainable and responsible investing (SRI) that constitutes the majority of ESG-focused investor events until 2018. Starting in

[1] Keywords include *carbon*, *climate*, *CSR*, *environmental*, *ESG*, *governance*, *humanity*, *renewable*, *responsible*, *social*, *SRI*, *sustainability*, *sustainable*, *women*.

2019, we then observe a sharp increase in investor events from a stable number of around 80 events to a peak in 2021 with more than 560 events. After 2021, the number of events declines but remains at a high level of more than 300 events annually.

To further investigate the characteristics of these events, we limit the sample to countries with a meaningful number of firms hosting or participating in ESG-focused investor events. Specifically, we focus on countries that have (1) at least 20 firms participating in or hosting an ESG-focused investor event, and (2) where these firms constitute at least one percent of the publicly listed firms domiciled in that country. We exclude Italy and Australia due to data limitations. From observation, it is mainly larger firms that participate in or host ESG-focused investor events. Hence, for better comparison, we limit the sample of firms to constituents of our sample country's main stock indices. We further exclude financial firms (SIC 6000-6999) and credit reporting services firms (SIC 7323) because of their special role in capital markets and focus on the years from 2017 until 2023 because of the observed sharp increase in the number of ESG-focused investor events during this period. The resulting sample consists of 824 ESG-focused investor events associated with 356 unique firms (674 unique firm-years) from 8 countries (Canada, France, Germany, Japan, Netherlands, Switzerland, United Kingdom, and the US). Importantly, the total number of ESG-focused investor events is higher than the number of unique firms with ESG-focused investor events, suggesting that events are not necessarily one-time reactions to changes in firms' fundamentals or their socio-economic environment.

Figure 2 presents the number of ESG-focused investor events for the resulting sample of firms separately for all 8 countries. Two observations stand out. First, the frequency of ESG-focused investor events for sample firms mirrors the one presented in Figure 1, suggesting that our selection of sample countries likely accurately reflects the general phenomenon. Second, and more importantly, while for all sample countries we observe a substantial increase in the number of ESG-focused investor events over time, the increase is not uniform across countries. For example, firms from European countries, such as France, Germany, or the Netherlands,

were relatively more likely to host or participate in ESG-focused investor events early on in 2017. In contrast, we observe a sharp increase in ESG-focused investor events from 2020 onward particularly for US firms. While the rise in ESG-focused investor events seems to be a global phenomenon, these patterns also suggest that there are country- or market-specific factors driving the demand and/or supply of these meetings.

We further investigate both the industrial origin of firms with ESG-focused investor events as well as the specific event type. As presented in Table 1 Panel A, we observe ESG-focused investor events across all 12 Fama-French industries. Events are concentrated in the chemicals, consumer durables (e.g., cars, TVs, household appliances), manufacturing (e.g., trucks, planes), and utilities industries. This is consistent with firms in industries with higher ESG-related risks being more likely to participate in ESG-focused investor events.

Not all ESG-focused investor events are of the same type. Upon inspection of event transcripts, These ESG-focused investor events can be differentiated into two main event types: firm-specific calls and presentations at broker-organized conferences. Firm-specific events can be organized by the firm itself or by a brokerage house and typically consist of a conference call with investors and/or analysts. Examples include firms like Coca-Cola or Valmont Industries hosting their own sustainability conference calls. Broker-organized conferences, on the other hand, typically include presentations with moderated Q&A sessions by multiple firms, often with the opportunity for firm and investor representatives to meet afterward. As presented in Table 1 Panel B, the majority of ESG-focused investor events are either presentations at broker-organized conferences or firm-organized calls. Only a small fraction of events are firm-specific broker-organized calls. While there is some variation over time, proportions among event types remain relatively stable. Appendix B includes some illustrative excerpts from event transcripts to provide a better understanding of what is discussed in ESG-focused investor events.

While there undoubtedly has been a sharp increase in ESG-focused investor events

over the past decade, an increase alone does not imply that these meetings are of particular relevance or lasting importance for the disclosure landscape of capital market-oriented companies. However, two observations indicate that they may do.

First, the number of ESG-focused investor events has increased much more relative to other investor event topics. Figure 3 presents the trend for the ten most popular topics of broker-organized conferences based on event titles for the years 2017 until 2023. We do so by completing our sample of ESG-focused investor events with all other broker-organized conferences, obtaining the most frequently occurring keywords in the event titles, grouping together similar keywords to form conference topics, and counting the number of unique conferences focusing on these topics. We focus on broker-organized conferences as opposed to firm-specific calls, since conferences typically revolve around specific topics, while this is not necessarily the case for firm-specific calls in general. In addition, we abstract from firm-level observations and focus on unique conference events to better assess trends in topics irrespective of the number of firms participating in these conferences. As illustrated in Figure 3, the increase in the number of ESG-focused conferences is both quicker and more pronounced than for any of the ten other most popular conference topics (i.e., Consumer, Energy, Financial, Healthcare, Industrials, Infrastructure, Media, Mining, Real Estate, and Technology). This confirms that the increase in ESG-focused investor events is not just due to a general increase in investor-oriented outreach and events.

Second, and as mentioned before, it seems that for a significant number of firms, ESG-focused investor events are not just one-time events in response to, for example, socio-economic events such as the COVID-19 pandemic. Figure 4 presents the number of sample firms that have an ESG-focused investor event by sample year, also showing in which years these firms hosted or participated in their first ESG-focused investor event. Many firms that participated in an ESG-focused investor event for the first time in 2017 continue to do so in subsequent years. Similarly, a substantial number of firms that have their first ESG-focused investor event in 2018 or later continue to host or participate in ESG-focused investor events

in the following years.

Overall, these descriptive statistics suggest that there has been a sharp increase in firms participating in ESG-focused investor events over the past years that spans across countries and industries and is unlikely to be solely driven by a general increase in investor outreach activities or one-time socio-economic events. In the following sections, we investigate the determinants, characteristics, and economic consequences of ESG-focused investor events to better understand their role in the reporting ecosystem of capital market-oriented companies.

4 Firm characteristics and ESG-focused investor events

To get a better understanding of which firms organize or participate in ESG-focused investor events, we investigate firm characteristics and conduct a determinants analysis. We focus on the constituents of the major stock indices of the 8 sample countries identified above and determine, for each firm-year, whether the firm participated in at least one ESG-focused investor event or not.

Following prior literature, we include common financial measures, measures of stock market performance, and measures of information demand as event determinants constructed using data from Refinitiv Eikon and Datastream (e.g., Kirk and Markov, 2016). Specifically, we include firm size (*Size*), return on assets (*ROA*), R&D intensity (*R&D intensity*), book-to-market ratio (*Book-to-market*), leverage (*Leverage*), a loss indicator (*Loss*), the earnings-price ratio (*Earnings-price ratio*), the age of the firm (*Firm age*), the prior year cumulative daily stock return (*Prior return*), the prior year daily stock return volatility (*Volatility*), the number of analysts following the firm (*Analyst following*), and the percentage of shares held by institutional investors (*Institutional ownership*). To measure demand for ESG information, we also include the percentage of shares held by ESG-focused funds (*ESG fund ownership*). In addition, we include key ESG metrics to control for a firm's ESG performance. Specifically, we include ratings of overall ESG performance and performance

on the individual pillars (*ESG score*, *E score*, *S score* and *G score*), as well as an ESG controversies indicator (*ESG controversies*). We match financial information based on whether there was an ESG-focused investor event in a given year or not. If a firm participated in an ESG-focused investor event in a given year, we use the latest 10-K issued before the event date to capture relevant firm characteristics (focusing on the first event if a firm participated in multiple ESG-focused investor events in a given year). If a firm did not participate in an ESG-focused investor event in a given year, we use the 10-K issued for that year. We drop firm-years with missing data and winsorize continuous variables at 1 percent and 99 percent. Please refer to Appendix A for a definition of all variables. Table 2 presents an overview of the sample selection procedure. The final sample contains 2,572 unique firms and 15,496 firm-years capturing 808 ESG-focused investor events for 350 unique firms (representing 662 firm-years with ESG-focused investor events).

Table 3 presents summary statistics at the firm level. Around 13.6 percent of the sample firms hosted or participated in an investor event focusing on ESG at least once during the sample period. In addition to the expected variation in common firm characteristics, we also observe considerable variation regarding firms' ESG performance and the occurrence of ESG controversies.

Shedding more light on the main ESG metrics included in the determinants analysis, Table 4 shows mean values for *ESG fund ownership*, *ESG score*, and *ESG controversies* for the 12 Fama-French industries as well as for all industries combined. In addition, it distinguishes between firms that do and do not have an ESG-focused investor event. Firms with an ESG-focused investor event have significantly higher ownership by ESG-focused funds, significantly higher ESG scores, and are significantly more likely to experience an ESG controversy (all $p < 0.01$). For example, firms with an ESG-focused investor event have an average ESG score of 68.07, while firms that do not have an ESG-focused investor event have an average ESG score of 52.87. These results indicate that firms that host and participate in ESG-focused investor events likely face more demand for ESG information from ESG-focused

investors and already have better ESG (disclosure) performance, but are also more likely to be involved in ESG controversies (e.g., negative media attention). For firms that do have an ESG-focused investor event, it further distinguishes between the types of investor events. Among the 350 sample firms that host or participate in at least one ESG-focused investor event, 158 only participate in ESG conferences, 132 only host firm-specific ESG calls, and 60 both participate in ESG conferences and host firm-specific ESG calls. Interestingly, firms that participate in ESG conferences have significantly higher ownership by ESG-focused funds and are significantly less likely to experience an ESG controversy, but also have significantly poorer ESG performance compared to firms that host firm-specific ESG calls (all $p < 0.01$). While 12.37 percent of firms that only participate in ESG conferences are involved in ESG controversies, 22.06 percent of firms that only host firm-specific ESG calls experience ESG controversies. These findings suggest that different types of firms (i.e., firms that are different in terms of ESG disclosure performance as captured by the ESG score as well as in terms of involvement in ESG controversies) might opt for different types of ESG-focused investor events. Therefore, in the determinants analysis, we will not only examine which firms host and participate in ESG-focused investor events in general, but also which firms choose to present at ESG conferences as opposed to hosting a firm-specific ESG call.

We estimate the determinants of ESG-focused investor events both in a static firm level and a more dynamic firm-year level specification. For the firm level analysis, where we test firms' general likelihood to participate in ESG-focused investor events, we focus on the first event-year for firms that participate in at least one ESG-focused investor event during the sample period and the last sample year for firms that never participated in an ESG-focused event over the entire 2017-2023 sample period. We estimate a linear probability model based on OLS regressions. All specifications include year fixed effects, country fixed effects as well as industry fixed effects based on the Fama-French 12 industries classification. We cluster standard errors by firm in the firm-year level analysis.

Columns 1-3 of Table 5 present the results of the firm level analysis, while columns

4-6 present the results of the firm-year level analysis. In columns 1 and 4, we include all financial measures, stock market performance measures, and information demand measures, as well as the general ESG score. In columns 2 and 5, we split the ESG score into its three components, while in columns 3 and 6, we include the ESG controversies indicator in addition to the overall ESG score.

We find that larger firms are more likely to host and participate in ESG-focused investor events, possibly because these firms operate in a more complex environment which requires the disclosure of more (ESG) information or have more resources to host and participate in investor events. Likewise, firms with more leverage, and so, fewer resources, are less likely to participate in such events. The significantly positive association with analyst following is consistent with firms with a richer information environment being more likely to participate in ESG-focused investor events. Firms facing more uncertainty as indicated by higher return volatility, on the other hand, are significantly less likely to have these events.

With respect to the ESG metrics, we find that firms that already have a higher ESG score and, therefore, more ESG disclosures, are more likely to also participate in ESG-focused investor events. This result is mainly driven by the E pillar. Moreover, the significantly positive association with ownership by ESG-focused funds indicates that firms that face more demand for ESG information by investors who care about a firm's ESG performance are more likely to have ESG-focused investor events. Lastly, we do not observe a significant association with ESG controversies, meaning that, on average, being involved in an ESG controversy is not associated with firms hosting or participating in an ESG-focused investor event.

Results based on firm-year regressions are generally consistent with the results from the firm level analysis. However, we also observe a significantly positive coefficient on R&D intensity and a significantly negative coefficient on the book-to-market ratio, consistent with innovative growth firms being more likely to host and participate in ESG-focused investor

events. Moreover, in the firm-year level analysis, the coefficient on return volatility has the opposite sign. This could be explained by the firm level analysis being more affected by firms-years from 2020, when many firms had their first ESG-focused investor event and market volatility was high due to the COVID-19 pandemic. The positive coefficient as observed in the firm-year level analysis is consistent with firms facing more uncertainty being more likely to participate in ESG-focused investor events, potentially to reduce uncertainty.

Comparing firms that only present at ESG conferences to firms that only host firm-specific ESG calls, Table 6 shows that for the financial measures, stock market performance measures, and information demand measures, there are few differences between these firms. We mainly find that larger firms are less likely to present at an ESG conference as opposed to hosting a firm-specific ESG call. Regarding the ESG metrics, we observe some interesting patterns. Ownership by ESG-focused funds is significantly positively associated with presenting at an ESG conference instead, consistent with firms facing more demand for ESG information by investors interested in ESG performance preferring presenting at an ESG conference over hosting a firm-specific ESG call. In addition, we find that firms that are involved in ESG controversies are less likely to present at ESG conferences over hosting firm-specific ESG calls. These findings are consistent with the notion that different types of firms opt for different types of ESG-focused investor events. Specifically, larger firms that experienced ESG controversies are more likely to host a firm-specific ESG call while firms that have more ESG-conscious investors, and so, face a higher demand for ESG information, are more likely to interact with these investors and present at ESG conferences.

5 Characteristics of ESG-focused investor events

While the determinants pertain to the types of firms that host and participate in ESG-focused investor events, they do not provide evidence on why these firms have such investor events. To answer this question, we will examine consequences of hosting and participating

in ESG-focused investor events. To do so, we first provide descriptive evidence on the extent to which the information environment of ESG-focused investor events is distinct from other investor events these firms host and participate in. In Panel A of 7, using transcripts, we compare, for firms that have at least one ESG-focused investor event as well as at least one other (non-ESG-focused) investor event with the transcript available, the percentage of ESG-related sentences in ESG-focused investor events to the percentage of ESG-related sentences in the other investor events these firms participate in. Further, we also compare ESG talk in ESG-focused investor events to ESG talk in the events of firms that do not have an ESG-focused investor event during the sample period. We distinguish between ESG talk in the corporate presentation part by representatives of the firm and ESG talk in the Q&A part by participants. Combining all events - both firm-specific calls and presentations at broker-organized conferences - we observe at least one ESG-related keyword in 10.7% of sentences in the corporate presentation part of ESG-focused investor events, but only in 1.5% of sentences of other investor events these firms participate in and only in 0.7% of sentences of investor events firms without any ESG-focused investor events participate in. For the participant Q&A, we find at least one ESG-related keyword in 5.7% of sentences in ESG-focused investor events, 0.5% of sentences in other investor events these firms participate in and 0.1% of sentences in investor events of firms without any ESG-focused investor events. All differences in ESG talk between ESG-focused and non-ESG-focused investor events are highly significant ($p < 0.01$), meaning representatives of the firms as well as analysts and investors participating in these events talk more about ESG in ESG-focused investor events than in other investor events. Moreover, the level of ESG talk in other, non-ESG-focused investor events is generally very low. When we analyze firm-specific calls and presentations at broker-organized conferences separately, the results are qualitatively similar.

In Panel B of Table 7, we compare the presence of particular corporate participants - Chief Executive Officer (*CEO*), Chief Financial Officer (*CFO*), Chief Operating Officer (*COO*), Chief Sustainability Officer (*CSO*), non-CSO executive responsible for ESG (*Other*

ESG), any executive responsible for ESG including CSO (*Any ESG*), as well as non-COO operations executive (*Operations*), IR executive (*IR*) or another non-financial executive not captured by any of the other categories (*Other*) - between ESG-focused investor events and non-ESG-focused investor events. We find that relative to other events, in ESG-focused investor events CEOs and CFOs are significantly less likely to be present (all $p < 0.01$), while CSOs and other executives responsible for ESG are significantly more likely to be present (all $p < 0.01$). Taking firms that have at least one ESG event for which participant data is available, we find, for example, that the CFO is present at 61.5% of non-ESG-focused investor events, but only at 26.5% of ESG-focused investor events. On the other hand, in only 4.0% of non-ESG-focused investor events, an executive responsible for ESG is present, while it is 40.0% for ESG-focused investor events. These highly significant differences are generally even bigger when comparing ESG-focused investor events to the investor events of firms that do not have such ESG-focused investor events during the sample period. The results are quantitatively similar for firm-specific calls and presentations at broker-organized conferences. For both C-level and non-C-level operations executives, who might possess relevant information about the ESG performance of the firm's own operations as well as the entire supply chain, we do not find a consistent difference in participation between ESG-focused investor events and non-ESG-focused investor events. Similarly, the results are mixed for IR executives. In contrast, we find that non-financial executives not captured by any of the other categories are significantly more likely to be present at ESG-focused investor events relative to non-ESG-focused investor events. Examples of these non-financial executives are HR executives, legal and compliance executives, and directors.

Given this evidence that the information environment of ESG-focused investor events is significantly different from other, non-ESG-focused investor events in terms of the subjects discussed by both management, investors, and analysts as well as the types of executives that represent their firms at these investor events, we will examine to what extent these ESG-focused investor events are associated with changes in the investor base.

6 Economic consequences around ESG-focused investor events

Specifically, we will analyze changes in ownership by ESG-focused funds. From Refinitiv Eikon, we obtain fund level ownership data. Using the fund name, we create a keyword-based classification approach and label a fund as ESG-focused if the name contains *ESG*, *CSR*, *sustainable*, *sustainability*, *responsible* or *SRI*, and non-ESG-focused otherwise. This approach relies on the assumption that the fund name correctly reflects a fund's efforts to integrate ESG factors into its investment process. We then examine changes in ESG fund and non-ESG fund ownership around ESG-focused investor events on the quarterly level. *ESG fund ownership change 2Q* and *ESG fund ownership change 4Q* are the changes in the percentage of shared held by ESG-focused funds from quarter t-1 to quarter t+1 and from quarter t-1 to quarter t+3 (the same quarter one year later), respectively. *Non-ESG fund ownership change 2Q* and *Non-ESG fund ownership change 4Q* are their equivalents for ownership by non-ESG-focused funds. The independent variable of interest, *ESG-focused investor event*, is coded 1 for firm-quarters with an ESG-focused investor event and 0 otherwise. Panel A of Table 8 presents results for all funds. We find significantly ($p < 0.05$) positive coefficients on the ESG-focused investor events indicator in columns 1 and 3, where the dependent variables measure changes in ownership by ESG-focused funds, consistent with ESG-focused investor events being associated with increases in ownership by ESG-focused funds. In terms of economic significance, the coefficient of 0.081 in column 3 represents a 10.6% increase relative to the sample mean reported in Table 3. In columns 2 and 4, we do not find evidence of changes in ownership by non-ESG-focused funds around ESG-focused investor events. In Panel B of Table 8, we consider only mutual funds, the main class of funds. The results are qualitatively similar.

These results can be interpreted in two ways. On the one hand, they are consistent with ESG-focused investor events fulfilling a specific information demand of ESG-focused investors. By being a platform for ESG-related discussions, often with executives who possess

specific knowledge about and are responsible for the ESG performance of the firm, these events can inform ESG-focused investors, leading them to invest in the firm. On the other hand, the results are also consistent with firms using ESG-focused investor events to target ESG-focused investors and promote the firm with them, resulting in investments by these ESG-focused investors. In both explanations, ESG-focused investor events fulfill a specific information role.

Motivated by the notion that the firms presenting at ESG conferences have different characteristics than the firms hosting firm-specific ESG calls - larger firms that experienced ESG controversies are more likely to host a firm-specific ESG call while firms that have more ESG-conscious investors, and so, face a higher demand for ESG information, are more likely to present at ESG conferences - we further explore to what extent these two different types of ESG-focused investor events are associated with changes in ownership by (non-)ESG-focused funds. Table 9 Panel A shows results for all funds. We find that firm-specific ESG calls are associated with significant increases in ownership by ESG-focused funds from quarter t-1 to both quarter t+1 and quarter t+3 (columns 1 and 3, respectively; both $p < 0.01$). For presentations at ESG conferences, we also find a significantly positive association with ownership by ESG-focused funds, but only from quarter t-1 to quarter t+3 (column 3; $p < 0.01$). In addition, in columns 2 and 4, we find that firm-specific ESG calls are also associated with significant increases in ownership by non-ESG-focused funds, while we do not find such an association for presentations at ESG conferences. In Panel B of Table 9, which focuses on mutual funds, the results are qualitatively similar concerning ownership by ESG-focused funds. However, we do not find a significantly positive coefficient on the firm-specific ESG call indicator in columns 2 and 4 on changes in ownership by non-ESG-focused funds. Overall, these results indicate that both firm-specific ESG calls and presentations at ESG conferences are associated with increases in ownership by ESG-focused investors, but that the response by these ESG-focused investors is more immediate following firm-specific ESG calls relative to presentations at ESG conferences. Further, we present some evidence

that a broader group of investors, as opposed to only ESG-focused investors, responds to firm-specific ESG calls. This finding suggests that these two types of ESG-focused investor events serve slightly different roles in capital markets.

7 Conclusion

Firms regularly meet with investors to discuss corporate strategy and recent performance. We, however, observe that, more recently, firms have also begun to organize and participate in investor events that specifically focus on ESG. Compared to 2017 and before, when there were few ESG-focused investor events per year, we see a large increase in such investor events from 2017 to 2021. In 2022 and 2023, the number of ESG-focused investor events remains high, although there is a decline relative to 2021. We do not observe such increases in the number of investor events for other popular topics, such as technology and healthcare. Moreover, the number of ESG-focused investor events has increased in many countries, and firms across industries host and participate in them. We find that firms participating in ESG-focused investor events are likely to continue to do so in subsequent years, suggesting that these investor events are not just one-time events in response to, for example, short-term economic shocks such as the COVID-19 pandemic.

To get a better understanding of which firms organize and participate in ESG-focused investor events, we conduct a determinants analysis. Focusing on events that occurred between 2017 and 2023, the period in which a relatively large number of firms started having such events compared to the pre-2017 period, we find that larger firms with more resources and richer information environments are more likely to have ESG-focused investor events. In addition, firms that host and participate in ESG-focused investor events generally already have better ESG performance and more ESG disclosures. Overall, these results suggest that ESG-focused investor events are likely to constitute a new type of investor event in the reporting ecosystem that is distinct from traditional capital market events that focus on

financial performance and strategy.

Examining why firms host and participate in ESG-focused investor events, we find that the information environment of these investor events is distinct from other, non-ESG-focused investor events. Specifically, a significantly larger percentage of sentences is ESG-related and there are significant differences in the types of executives representing the firm. There is less likely to be a CEO or CFO present at an ESG-focused investor event, while a Chief Sustainability Officer or other executive responsible for ESG is more likely to be present. Further, we find that participating in ESG-focused investor events is associated with increases in ownership by ESG-focused funds.

We posit three non-mutually exclusive explanations for the emergence of ESG-focused investor events. First, high investor demand for ESG information could lead firms to increase the supply of such information. Given the time restrictions in capital market events, including more ESG information in these events could crowd out other information. Therefore, firms that want to increase the supply of ESG information in response to increased demand might host or participate in separate ESG-focused investor events, next to the traditional investor events. Second, the increase in ESG-focused investor events could be driven by brokerages as opposed to firms wanting to supply ESG information to their investors. If their clients demand ESG information, this could lead brokerages to organize ESG-focused investor events and persuade firms to participate in them. Alternatively, ESG-focused investor events may be a response to a short-term economic shock leading to a short-term increase in the demand for ESG information. This would mean that it is a one-time event as opposed to a new type of recurring investor event that firms have in consecutive years. In light of the results presented in this paper, the first explanation seems most plausible.

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Appendix A

Variable definitions

Panel A: Determinants		
Variable	Definition	Source
ESG-focused investor event	Indicator variable equal to one if a firm participated in an ESG-focused investor event, zero otherwise.	Refinitiv Eikon
ESG conference presentation	Indicator variable equal to one if a firm participated in an ESG conference presentation, zero otherwise.	Refinitiv Eikon
Size	Natural logarithm of total assets.	Datastream
R&D intensity	R&D expense divided by sales. Assumed to be 0 if missing.	Datastream
Book-to-market	Book value of common equity divided by market value of equity.	Datastream
Leverage	Debt divided by total assets.	Datastream
Loss	Indicator variable equal to one if net income before extraordinary items is negative, zero otherwise.	Datastream
Earnings-price ratio	Net income divided by market value of equity.	Datastream
ROA	Net income divided by total assets.	Datastream
Firm age	Natural logarithm of one plus the number of years between the current year and the first year for which stock price data is available.	Datastream
Prior return	Prior year cumulative daily stock return. At least 50 tradings required.	Datastream
Volatility	Prior year daily stock return volatility. At least 50 trading days required.	Datastream
Analyst following	Natural logarithm of one plus the number of analysts following the firm. Assumed to be 0 if missing.	Refinitiv Eikon
Institutional ownership	Percentage of shares held by institutional investors. Assumed to be 0 if missing.	Refinitiv Eikon
ESG fund ownership	Percentage of shares held by funds classified as ESG-focused. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
ESG score	ESG score. Most recent available score if missing.	Refinitiv Eikon
E score	Environmental pillar score. Most recent available score if missing.	Refinitiv Eikon
S score	Social pillar score. Most recent available score if missing.	Refinitiv Eikon
G score	Governance pillar score. Most recent available score if missing.	Refinitiv Eikon
ESG controversies	Indicator variable equal to one if the firm experienced an ESG controversy, as indicated by an ESG controversies score of less than 100, zero otherwise. Most recent available score if missing.	Refinitiv Eikon

(Continued on next page)

Panel B: Changes in fund ownership		
Variable	Definition	Source
ESG-focused investor event	Indicator variable equal to one if a firm participated in an ESG-focused investor event in a given quarter, zero otherwise.	Refinitiv Eikon
Firm-specific ESG call	Indicator variable equal to one if a firm participated in a firm-specific ESG call in a given quarter, zero otherwise.	Refinitiv Eikon
ESG conference presentation	Indicator variable equal to one if a firm participated in an ESG conference presentation in a given quarter, zero otherwise.	Refinitiv Eikon
ESG fund ownership change 2Q	Change in the percentage of shares held by funds classified as ESG-focused from quarter t-1 to quarter t+1. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
Non-ESG fund ownership change 2Q	Change in the percentage of shares held by funds not classified as ESG-focused from quarter t-1 to quarter t+1. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
ESG fund ownership change 4Q	Change in the percentage of shares held by funds classified as ESG-focused from quarter t-1 to quarter t+3. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
Non-ESG fund ownership change 4Q	Change in the percentage of shares held by funds not classified as ESG-focused from quarter t-1 to quarter t+3. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
ESG mutual fund ownership change 2Q	Change in the percentage of shares held by mutual funds classified as ESG-focused from quarter t-1 to quarter t+1. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
Non-ESG mutual fund ownership change 2Q	Change in the percentage of shares held by mutual funds not classified as ESG-focused from quarter t-1 to quarter t+1. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
ESG mutual fund ownership change 4Q	Change in the percentage of shares held by mutual funds classified as ESG-focused from quarter t-1 to quarter t+3. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
Non-ESG mutual fund ownership change 4Q	Change in the percentage of shares held by mutual funds not classified as ESG-focused from quarter t-1 to quarter t+3. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon

(Continued on next page)

Variable	Definition	Source
ESG fund ownership	Percentage of shares held by funds classified as ESG-focused in quarter t-1. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
Non-ESG fund ownership	Percentage of shares held by funds not classified as ESG-focused in quarter t-1. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
ESG mutual fund ownership	Percentage of shares held by mutual funds classified as ESG-focused in quarter t-1. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
Non-ESG mutual fund ownership	Percentage of shares held by mutual funds not classified as ESG-focused in quarter t-1. A fund is labelled as ESG-focused if the name contains 'esg', 'csr', 'sustainable', 'sustainability', 'responsible' or 'sri'.	Refinitiv Eikon
Size	Natural logarithm of total assets in quarter t-1.	Datastream
Book-to-market	Book value of common equity divided by market value of equity in quarter t-1.	Datastream
Leverage	Debt divided by total assets in quarter t-1.	Datastream
Sales growth	Change in sales from quarter t-5 to quarter t-1.	Datastream
Change in net income	Change in net income from quarter t-5 to quarter t-1.	Datastream
Intangible assets	Intangible assets divided by total assets in quarter t-1.	Datastream
Earnings-price ratio	Net income divided by market value of equity in quarter t-1.	Datastream
Firm age	Natural logarithm of one plus the number of years between quarter t-1 and the first quarter for which stock price data is available.	Datastream
Prior return	Cumulative daily stock return during quarter t-1. At least 50 trading days required.	Datastream
Volatility	Daily stock return volatility during quarter t-1. At least 50 trading days required.	Datastream
Turnover	Natural logarithm of the average proportion of shares outstanding traded daily during quarter t-1. At least 50 trading days required.	Datastream

Appendix B

Examples from transcripts of ESG-focused investor meetings

Taking the *Valmont Industries Inc ESG Conference Call* which occurred on March 29, 2022, we observe that Valmont Industries Inc's Senior VP of IR & Treasurer is responsible for the presentation:

> *"Thank you, and welcome to Valmont's first Sustainability and ESG Conference Call. Our 2022 sustainability report was released last week on March 24."*

This suggest that this ESG-focused investor meeting is centered around the firm's sustainability report. One example of a question asked in the Q&A is:

> *"What hiring practices have you implemented to ensure that diversity in new hires meets your goal, our stated goal of 50% increase in people of color by 2025 and doubling by 2030?"*

This question is related to the social and governance pillars in ESG. An example of a question related to the environmental pillar is:

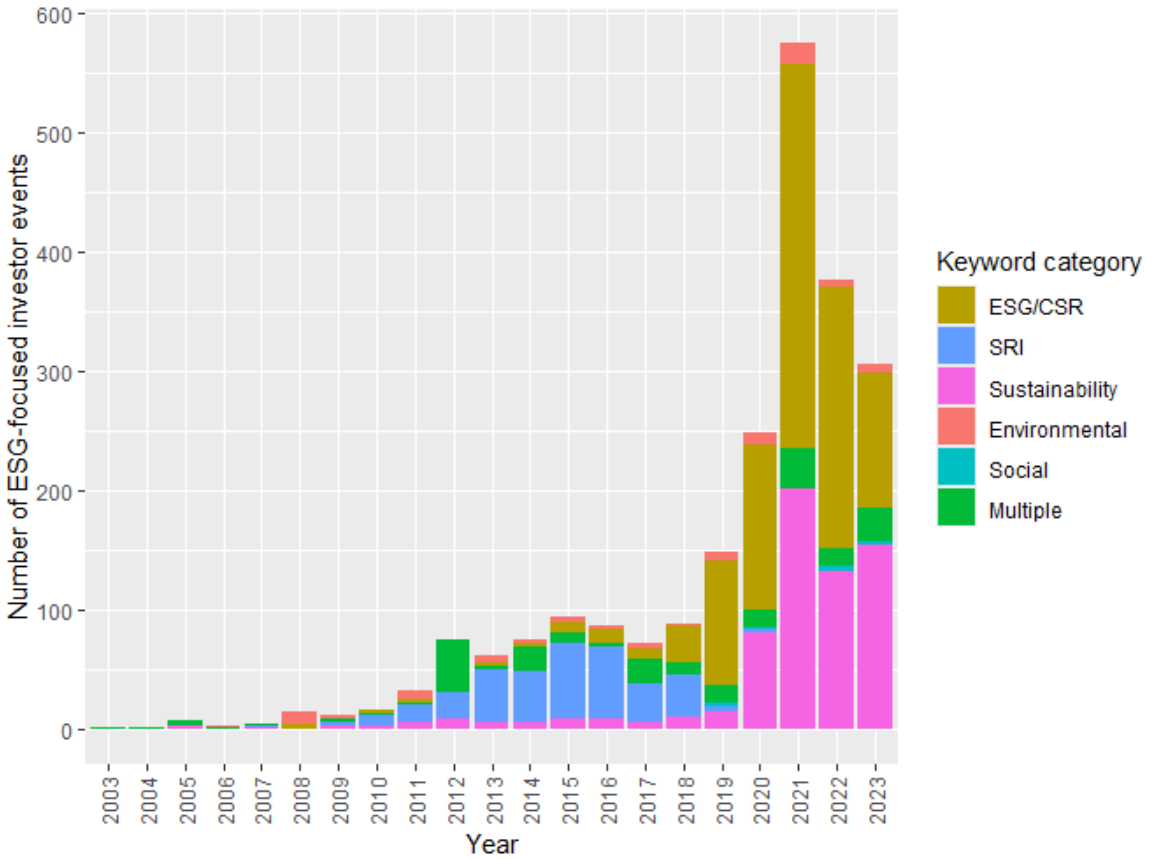
> *"How critical is government support, i.e., funding and advancing some of the infrastructure, sustainable projects or green projects?"*

A statement by the CEO and Director of Stanley Black & Decker in a presentation at a conference (*Stanley Black & Decker Inc at Robert W Baird Sustainability Conference*) on February 24, 2021, shows that an increase in demand for ESG and sustainability information is an important reason to participate in ESG-focused investor meetings:

> *"It's pretty exciting and quite an honor, I think, for Baird to be hosting this sustainability conference, and we're starting to see this tremendous wave of interest growing in ESG and sustainability. And we've been very quietly pursuing ESG for many, many years, and we've ramped it up."*

Figure 1

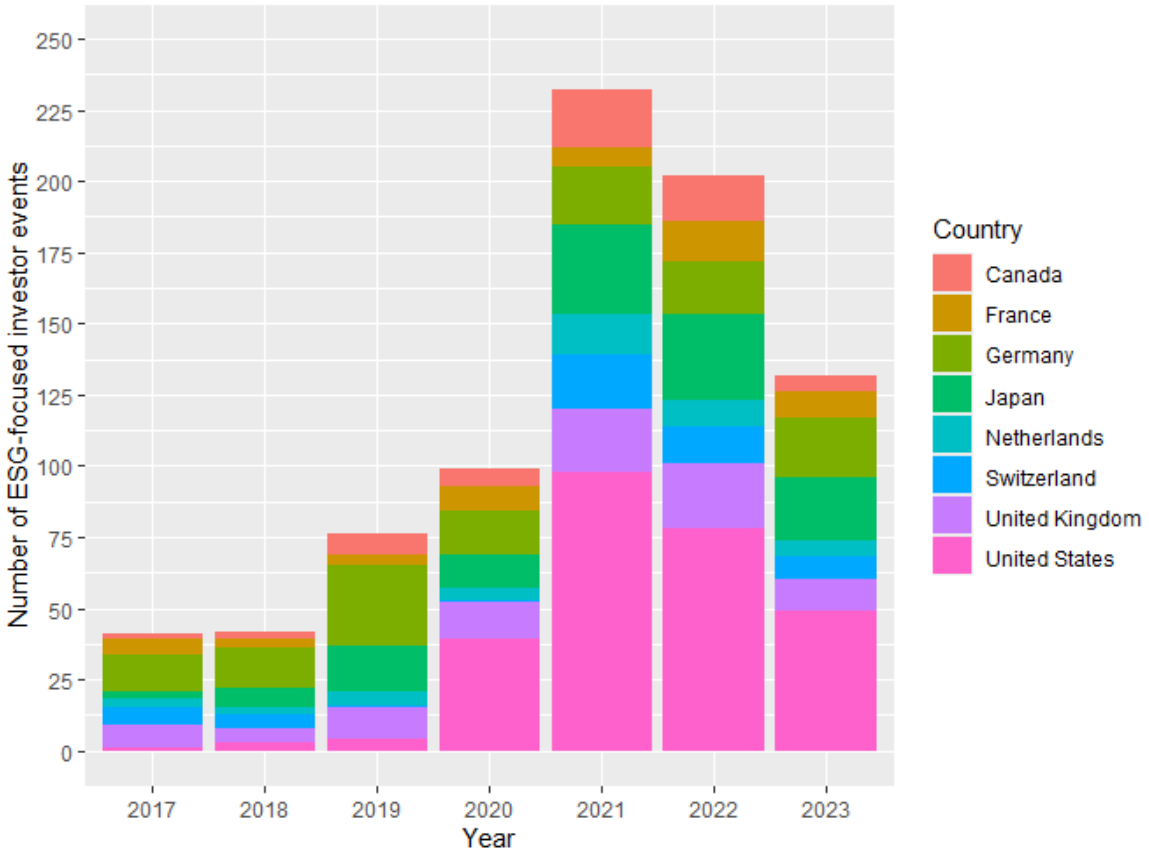
Frequency of ESG-focused investor events



Notes: Figure 1 presents the number of ESG-focused investor events by year. In addition, the investor events are sorted into categories based on keywords in the event name. The following (combinations of) keywords are used to construct these categories: *ESG/CSR*: (1) 'esg', (2) 'csr', (3) 'environmental' + 'social' + 'governance', (4) 'corporate' + 'responsibility', (5) 'social' + 'responsibility'. *SRI*: (1) 'sri', (2) 'responsible' + 'investing', (3) 'responsible' + 'investment'. *Sustainability*: (1) 'sustainability', (2) 'sustainable', (3) 'renewable'. *Environmental*: (1) 'environmental' but not 'social' nor 'governance', (2) 'environment', (3) 'carbon', (4) 'climate'. *Social*: (1) 'social' but not 'environmental' nor 'governance', (2) 'women', (3) 'humanity'. If an investor event name contains (combinations of) keywords from multiple categories, it is assigned to *Multiple*.

Figure 2

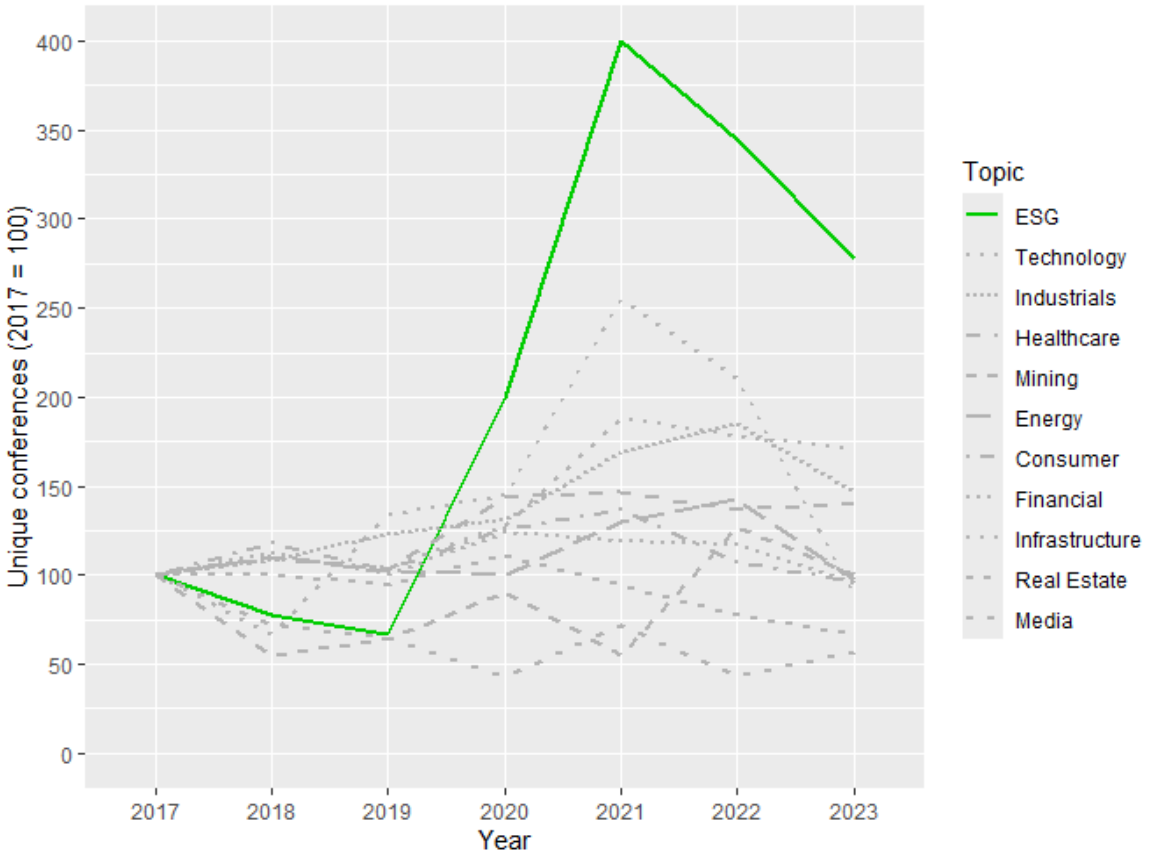
Frequency of ESG-focused investor events by sample country



Notes: Figure 2 presents the number of ESG-focused investor events for our sample firms by sample year. In addition, we distinguish between the eight sample countries.

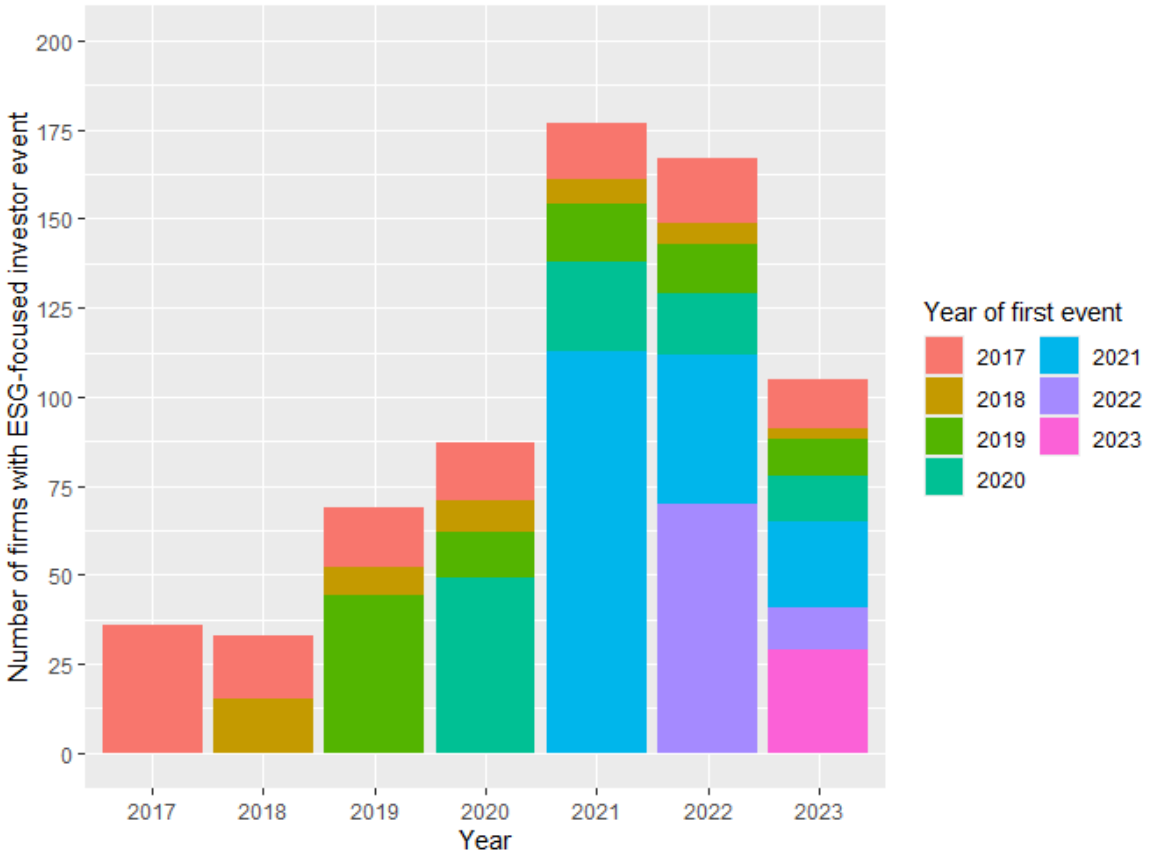
Figure 3

Trend in main conference topics



Notes: Figure 3 presents an index of the number of conferences by topic, where the number of conferences on a given topic in 2017 is set to 100. While multiple firms can present at a given conference, we count the number of unique conferences, not the number of conference presentations. Selecting all non-ESG conferences attended by the sample firms and counting the frequency of all distinct words appearing in the event names, we obtain the number of conferences for the 10 most frequently occurring topics. The topics are (1) Energy ('energy'), (2) Financial ('financial' or 'financials' but not 'national bank financial'), (3) Healthcare ('healthcare'), (4) Consumer ('consumer'), (5) Real Estate ('real estate'), (6) Technology ('technology' or 'tech'), (7) Mining ('mining'), (8) Infrastructure ('infrastructure'), (9) Industrials ('industrials') and (10) Media ('media). The number of ESG conferences is based on our classification procedure.

Figure 4
Consecutive ESG-focused investor events



Notes: Figure 4 presents the number of sample firms with at least one ESG-focused investor event by sample year. The colors indicate the first year in which a given firm had an ESG-focused investor event during the sample period.

Table 1

Frequency of ESG-focused investor events by industry and type

Panel A: Industry

Industry	Events	Firms with event	Firms	Proportion with event
Bus. Equip.	76	41	557	0.07
Chemicals	117	34	141	0.24
Cons. Dur.	57	21	122	0.17
Cons. Nondur.	66	28	196	0.14
Energy	33	15	136	0.11
Health	112	29	280	0.10
Manufacturing	123	63	402	0.16
Other	129	61	670	0.09
Shops	48	32	392	0.08
Telecom	21	9	76	0.12
Utilities	42	23	127	0.18
Total	824	356	3099	0.11

Panel B: Type

Year	Events	Firm-organized calls	% Firm-organized calls	Broker-organized calls	% Broker-organized calls	Conference presentations	% Conference presentations
2017	41	9	21.95	0	0.00	32	78.05
2018	42	17	40.48	0	0.00	25	59.52
2019	76	32	42.11	1	1.32	43	56.58
2020	99	44	44.44	5	5.05	50	50.51
2021	232	93	40.09	12	5.17	127	54.74
2022	202	76	37.62	3	1.49	123	60.89
2023	132	52	39.39	4	3.03	76	57.58
Total	824	323	39.20	25	3.03	476	57.77

Notes: Table 1 presents descriptives on the number of ESG-focused investor events for our sample firms and sample years. Panel A presents the number of ESG-focused investor events, the number of firms with at least one ESG-focused investor event, the total number of firms, and the proportion of firms with at least one ESG-focused investor event by industry. We use the Fama-French 12 industry classification. Panel B shows the number of ESG-focused investor events by type as well as the percentage of ESG-focused investor events that is of the particular type. We distinguish between firm-organized calls, broker-organized calls, and conference presentations.

Table 2

Sample selection procedure

Criteria	Firms	Firm-years
Index constituent 2017-2023	4,141	28,987
Domiciled in index country	3,928	27,496
SIC not in 6000-6999 or 7323	3,099	21,693
Data available	2,572	15,496

Notes: Table 2 presents the sample selection procedure. For each step, it shows the total number of firms and firm-years remaining.

Table 3

Summary statistics firm level

Variable	N	Mean	St. Dev.	Min	Pctl(25)	Median	Pctl(75)	Max
ESG event	2,572	0.136	0.343	0	0	0	0	1
Size	2,572	15.339	1.508	11.971	14.277	15.196	16.336	19.265
R&D intensity	2,572	0.036	0.074	0.000	0.000	0.000	0.034	0.425
Book-to-market	2,572	0.596	0.539	−0.341	0.230	0.450	0.817	2.579
Leverage	2,572	0.271	0.195	0.000	0.120	0.251	0.393	0.869
Loss	2,572	0.187	0.390	0	0	0	0	1
Earnings-price ratio	2,572	0.016	0.171	−0.916	0.014	0.042	0.074	0.295
ROA	2,572	0.043	0.092	−0.324	0.013	0.043	0.083	0.309
Firm age	2,572	3.196	0.732	0.693	2.833	3.367	3.850	4.007
Prior return	2,572	−0.003	0.373	−0.675	−0.234	−0.052	0.150	1.504
Volatility	2,572	0.026	0.011	0.009	0.018	0.023	0.031	0.068
Analyst following	2,572	2.205	0.845	0.000	1.792	2.303	2.833	3.584
Institutional ownership	2,572	65.386	28.882	6.392	41.234	71.661	91.960	100.000
ESG fund ownership	2,572	0.765	0.946	0.000	0.150	0.400	0.979	4.453
ESG score	2,572	54.937	18.349	10.030	41.418	56.506	69.369	90.366
E score	2,572	47.824	26.675	0.000	26.763	50.012	70.177	94.224
S score	2,572	56.287	21.368	5.831	40.770	57.248	73.600	95.780
G score	2,572	58.471	20.626	9.043	43.655	60.046	74.777	94.560
ESG controversies	2,572	0.255	0.436	0	0	0	1	1

Notes: Table 3 presents summary statistics for the variables used in the determinants analysis at the firm level. For firms that have at least one ESG-focused investor event, we take the first year with an ESG-focused investor event, while for firms that do not have an ESG-focused investor event during the sample period, we take the last year. The variables are defined in Appendix A.

Table 4
ESG descriptives by industry

	Firms	Without ESG-focused investor event	With ESG-focused investor event	ESG conference presentations only	Firm-specific ESG calls only	Both
	2572	2222 (86.4%)	350 (13.6%)	158 (45.1%)	132 (37.7%)	60 (17.1%)
Bus. Equip.						
ESG fund ownership	0.88	0.84	1.24	1.74	0.85	0.98
ESG score	53.69	52.03	69.96	61.71	72.30	86.35
ESG controversies	8.51	7.72	16.25	9.75	13.56	42.77
Chemicals						
ESG fund ownership	0.81	0.78	0.87	1.24	0.60	0.76
ESG score	60.23	55.71	72.02	72.19	68.17	76.94
ESG controversies	9.46	8.40	12.23	4.64	15.72	17.70
Cons. Dur.						
ESG fund ownership	0.64	0.64	0.66	0.76	0.50	0.64
ESG score	59.37	56.69	69.80	61.45	77.43	77.36
ESG controversies	13.63	10.09	27.46	14.00	45.02	33.32
Cons. Nondur.						
ESG fund ownership	0.73	0.74	0.64	0.79	0.43	0.88
ESG score	58.42	55.40	72.33	67.41	73.02	78.22
ESG controversies	16.92	15.84	21.91	22.85	19.78	25.12
Energy						
ESG fund ownership	0.25	0.25	0.23	0.08	0.41	0.21
ESG score	50.71	50.09	55.02	38.94	69.48	67.95
ESG controversies	16.67	16.20	19.95	0.00	48.80	3.24
Health						
ESG fund ownership	0.80	0.78	0.90	1.24	0.59	1.16
ESG score	53.88	50.84	75.37	67.30	72.91	86.75
ESG controversies	15.27	13.49	27.85	12.35	32.76	32.83

(Continued on next page)

Table 4
[continued]

Manufacturing						
ESG fund ownership	0.87	0.81	1.17	1.54	0.52	0.89
ESG score	58.36	56.68	66.29	66.13	67.33	64.13
ESG controversies	7.84	7.70	8.46	7.59	13.02	0.00
Other						
ESG fund ownership	0.75	0.73	0.89	0.90	0.89	0.83
ESG score	53.12	51.37	67.44	64.85	73.22	67.22
ESG controversies	12.44	12.23	14.09	15.41	15.50	6.48
Shops						
ESG fund ownership	0.71	0.70	0.87	0.93	0.79	0.92
ESG score	53.02	51.69	65.60	57.94	71.04	78.42
ESG controversies	14.00	12.89	24.48	23.23	22.50	48.12
Telecom						
ESG fund ownership	0.82	0.76	1.24	1.52	0.91	1.34
ESG score	54.19	51.97	67.99	50.93	77.72	69.22
ESG controversies	31.85	31.13	36.34	5.56	46.03	44.47
Utilities						
ESG fund ownership	0.79	0.84	0.61	0.65	0.62	0.45
ESG score	56.39	55.17	61.19	62.43	59.83	62.43
ESG controversies	16.86	15.80	21.07	16.90	22.02	30.11
All industries						
ESG fund ownership	0.76	0.74	0.90	1.12	0.66	0.87
			2.990***		-4.301***	
ESG score	54.94	52.87	68.07	63.32	70.54	75.12
			16.439***		4.067***	
ESG controversies	12.67	11.83	17.97	12.37	22.06	23.75
			3.656***		2.799***	

Notes: Table 4 presents mean values for ESG fund ownership, ESG score, and ESG controversies at the firm level by industry. For firms that have at least one ESG-focused investor event, we take the first year with an ESG-focused investor event, while for firms that do not have an ESG-focused investor event during the sample period, we take the last year. Mean values are shown for all firms, firms without an ESG-focused investor event, and firms with an ESG-focused investor event. For firms with an ESG-focused investor event, we further distinguish between those that have only ESG conference presentations, only firm-specific ESG calls (consisting of both firm-organized ESG calls and broker-organized ESG calls), and both ESG conference presentations and firm-specific ESG calls. For all industries combined, we present two-sided t-test comparing firms with an ESG-focused investor event to firms without an ESG-focused investor event as well as firms with only firm-specific ESG calls to firms with only ESG conference presentations. The variables are defined in Appendix A. *, **, and *** refer to statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 5

Determinants of ESG-focused investor events

	ESG-focused investor event (Firm level)			ESG-focused investor event (Firm-year level)		
	(1)	(2)	(3)	(4)	(5)	(6)
Size	0.024*** (0.006)	0.021*** (0.006)	0.026*** (0.006)	0.020*** (0.003)	0.020*** (0.003)	0.020*** (0.003)
R&D intensity	0.102 (0.086)	0.127 (0.086)	0.106 (0.086)	0.093*** (0.034)	0.092*** (0.034)	0.092*** (0.034)
Book-to-market	−0.006 (0.012)	−0.007 (0.012)	−0.007 (0.012)	−0.010** (0.005)	−0.010* (0.005)	−0.010* (0.005)
Leverage	−0.049 (0.030)	−0.051* (0.030)	−0.050* (0.030)	−0.039*** (0.012)	−0.039*** (0.012)	−0.039*** (0.012)
Loss	0.003 (0.020)	0.004 (0.019)	0.004 (0.020)	−0.003 (0.006)	−0.003 (0.006)	−0.004 (0.006)
Earnings-price ratio	0.013 (0.047)	0.018 (0.047)	0.012 (0.047)	0.008 (0.013)	0.008 (0.013)	0.008 (0.013)
ROA	0.052 (0.090)	0.043 (0.089)	0.054 (0.090)	−0.026 (0.030)	−0.026 (0.030)	−0.027 (0.031)
Firm age	−0.000 (0.008)	−0.002 (0.008)	−0.000 (0.008)	0.001 (0.003)	0.001 (0.003)	0.001 (0.003)
Prior return	−0.013 (0.015)	−0.014 (0.015)	−0.012 (0.015)	0.006 (0.004)	0.006 (0.004)	0.006 (0.004)
Volatility	−1.327** (0.630)	−1.412** (0.628)	−1.256** (0.633)	0.714*** (0.237)	0.711*** (0.237)	0.703*** (0.235)
Analyst following	0.029*** (0.008)	0.030*** (0.008)	0.029*** (0.008)	0.006** (0.003)	0.006** (0.003)	0.006** (0.003)
Institutional ownership	−0.001* (0.000)	−0.001 (0.000)	−0.001* (0.000)	−0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)
ESG fund ownership	0.012* (0.007)	0.011 (0.007)	0.011* (0.007)	0.012*** (0.004)	0.012*** (0.004)	0.012*** (0.004)
ESG score	0.002*** (0.000)		0.002*** (0.000)	0.001*** (0.000)		0.001*** (0.000)
E score		0.002*** (0.000)			0.000* (0.000)	
S score		−0.000 (0.000)			0.000** (0.000)	
G score		0.001* (0.000)			0.000* (0.000)	
ESG controversies			−0.016 (0.014)			0.003 (0.006)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,572	2,572	2,572	15,496	15,496	15,496
R^2	0.428	0.434	0.428	0.080	0.080	0.080
Adjusted R^2	0.420	0.425	0.420	0.077	0.077	0.077

Notes: Table 5 presents regression results for a determinants analysis with an ESG-focused investor event indicator as dependent variable. Columns 1-3 are on the firm level, where for firms that have at least one ESG-focused investor event, we take the first year with an ESG-focused investor event, while for firms that do not have an ESG-focused investor event during the sample period, we take the last year. Columns 4-6 are on the firm-year level, where we include all firm-years that are in the final sample. The variables are defined in Appendix A. Continuous variables are winsorized at the 1st and 99th percentiles. All regressions are estimated using OLS, and standard errors are clustered by firm. *, **, and *** refer to statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 6

Determinants of ESG conference presentations

	ESG conference presentation		
	(1)	(2)	(3)
Size	−0.080*** (0.027)	−0.077*** (0.027)	−0.055* (0.030)
R&D intensity	−0.569 (0.503)	−0.576 (0.503)	−0.469 (0.504)
Book-to-market	0.065 (0.060)	0.060 (0.060)	0.063 (0.060)
Leverage	0.035 (0.176)	0.049 (0.176)	0.008 (0.176)
Loss	0.093 (0.089)	0.102 (0.090)	0.093 (0.089)
Earnings-price ratio	−0.304 (0.275)	−0.275 (0.276)	−0.291 (0.274)
ROA	0.285 (0.477)	0.275 (0.477)	0.323 (0.476)
Firm age	−0.019 (0.036)	−0.012 (0.036)	−0.018 (0.036)
Prior return	0.079 (0.076)	0.083 (0.076)	0.060 (0.077)
volatility	−2.584 (3.394)	−2.407 (3.405)	−1.479 (3.441)
Analysts following	−0.019 (0.049)	−0.013 (0.049)	−0.022 (0.049)
Institutional ownership	−0.000 (0.002)	−0.001 (0.002)	0.000 (0.002)
ESG fund ownership	0.079*** (0.029)	0.080*** (0.029)	0.077*** (0.029)
ESG score	0.001 (0.002)		0.000 (0.002)
E score		−0.001 (0.002)	
S score		−0.000 (0.002)	
G score		0.002 (0.001)	
ESG controversies			−0.107* (0.062)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	290	290	290
R^2	0.502	0.505	0.508
Adjusted R^2	0.429	0.428	0.433

Notes: Table 6 presents regression results for a determinants analysis with an ESG conference presentation indicator as dependent variable. The analysis compares firms that have only ESG conference presentations to firms that have only firm-specific ESG calls. All regressions are on the firm level, where we take the first year with an ESG-focused investor event. The variables are defined in Appendix A. Continuous variables are winsorized at the 1st and 99th percentiles. All regressions are estimated using OLS, and standard errors are clustered by firm. *, **, and *** refer to statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 7

Information content and participants of ESG-focused investor events and non-ESG-focused investor events

Panel A: ESG-specific conversation in ESG-focused investor events versus non-ESG-focused investor events					
Event	ESG-focused investor event firm	Event type	N	Presentation	Q&A
All events					
	Yes	ESG-focused (a)	283	10.7	5.7
	Yes	non-ESG-focused (b)	2,107	1.5	0.5
	No	non-ESG-focused (c)	48,914	0.7	0.1
		Difference (a)-(b)		**9.2*****	**5.2*****
		Difference (a)-(c)		**10.0*****	**5.6*****
Firm-specific calls					
	Yes	ESG-focused (a)	178	12.8	5.4
	Yes	non-ESG-focused (b)	748	1.7	0.2
	No	non-ESG-focused (c)	35,527	0.8	0.1
		Difference (a)-(b)		**11.1*****	**5.2*****
		Difference (a)-(c)		**12.0*****	**5.3*****
Conference presentations					
	Yes	ESG-focused (a)	95	5.7	5.9
	Yes	non-ESG-focused (b)	624	1.0	0.8
	No	non-ESG-focused (c)	13,387	0.2	0.1
		Difference (a)-(b)		**4.7*****	**5.1*****
		Difference (a)-(c)		**5.5*****	**5.8*****

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Table 7
[continued]

Panel B: Corporate participants in ESG-focused investor events versus non-ESG-focused events

Event	ESG-focused investor event firm	Event type	N	CEO	CFO	COO	CSO	Other ESG	Any ESG	Operations	IR	Other
All events												
	Yes	ESG-focused (a)	275	56.4	26.5	7.3	11.3	31.3	40.0	12.4	41.5	49.1
	Yes	non-ESG-focused (b)	2,016	67.2	61.5	9.2	0.9	3.1	4.0	13.8	48.5	31.0
	No	non-ESG-focused (c)	48,710	82.7	82.7	11.6	0.2	0.5	0.7	8.3	43.0	25.6
		Difference (a)-(b)		**-10.8*****	**-35.0*****	**-1.9**	**10.4*****	**28.2*****	**36.0*****	**-1.4**	**-7.0****	**18.1*****
		Difference (a)-(c)		**-26.3*****	**-56.2*****	**-4.3*****	**11.1*****	**30.8*****	**39.3*****	**4.1****	**-1.5**	**23.5*****
Firm-specific calls												
	Yes	ESG-focused (a)	172	74.4	27.3	11.0	12.2	40.1	48.3	18.0	51.7	61.0
	Yes	non-ESG-focused (b)	719	84.0	69.3	10.8	1.7	3.9	5.6	20.2	68.7	44.8
	No	non-ESG-focused (c)	35,441	93.6	92.2	14.1	0.3	0.7	1.0	9.8	53.9	29.9
		Difference (a)-(b)		**-9.6*****	**-42.0*****	**0.2**	**10.5*****	**36.2*****	**42.7*****	**-2.2**	**-17.0*****	**16.2*****
		Difference (a)-(c)		**-19.2*****	**-64.9*****	**-3.1**	**11.9*****	**39.4*****	**47.3*****	**8.2*****	**-2.2**	**31.1*****
Conference presentations												
	Yes	ESG-focused (a)	93	22.6	24.7	1.1	10.8	15.1	25.8	3,2	22.6	26.9
	Yes	non-ESG-focused (b)	588	41.3	47.8	5.1	0.7	2.9	0.1	7.5	20.7	19.4
	No	non-ESG-focused (c)	13,269	53.6	57.5	5.0	0.0	0.0	0.1	4.4	14.0	14.1
		Difference (a)-(b)		**-18.7*****	**-23.1*****	**-4.0*****	**10.1*****	**12.2*****	**25.7*****	**-4.3****	**1.9**	**7.5**
		Difference (a)-(c)		**-31.0*****	**-32.8*****	**-3.9*****	**10.8*****	**15.1*****	**25.7*****	**-1.2**	**8.6***	**12.8*****

(Continued on next page)

Table 7
[continued]

Notes: Table 7 compares the information environments of ESG-focused investor events and non-ESG-focused investor events. The first column of both panels indicates whether all events, only firm-specific calls or only conference presentations are examined. The second column distinguishes between firms that do (Yes) and do not (No) have an ESG-focused investor event during the sample period. As shown in column 3, for firms that do have at least one ESG-focused investor event, we present information separately for their ESG-focused investor events and non-ESG-focused investor events. For firms without an ESG-focused investor event, we present information on their non-ESG-focused investor events. The fourth column shows the number of events included in the analyses. Panel A presents the percentage of sentences that includes at least one ESG-related keyword, both for the corporate presentation section and the participant Q&A. A sentence is labeled as ESG-related if it contains one of the following (combinations of) stemmed keywords: (1) 'esg', (2) 'environ' + 'soc' + 'govern', (3) 'csr', (4) 'soc respons', (5) 'environ' + 'impact' or 'footprint', (6) 'environ goal', (7) 'environ target', (8) 'environ protect', (9) 'environ steward', (10) 'sustain' + 'effort' or 'lead' or 'act', (11) 'sustain' + 'report', (12) 'commit' + 'sustain', (13) 'reduc' + 'carbon' or 'emit', (14) 'decarbon', (15) 'net 0 emit' or 'net zero emit', (16) 'carbon neut', (17) 'board' + 'divers', (18) 'divers' + 'includ'. Panel B shows the percentage of events where a CEO, CFO, COO, Chief Sustainability Officer (CSO), another ESG executive (Other ESG), any ESG executive (CFO and/or Other ESG; Any ESG), non-COO operations executive (Operations), IR executive or another non-financial executive not captured by any of the other categories (Other) is present. An executive is labeled as Other ESG if the job title contains one of the following (combinations of) keywords: (1) 'sustainability', (2) 'sustainable', (3) 'esg', (4) 'environment', (5) 'environmental' but not 'environmental services', (6) 'corporate responsibility', (7) 'social responsibility'. We compare ESG-focused investor events (a) to both the non-ESG-focused investor events of firms with (b) and without (c) at least one ESG-focused investor event during the sample period using two-sided t-tests. *, **, and *** refer to statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 8

Changes in (non-)ESG fund ownership following ESG-focused investor events

Panel A: All funds				
	ESG fund ownership change 2Q (1)	Non-ESG fund ownership change 2Q (2)	ESG fund ownership change 4Q (3)	Non-ESG fund ownership change 4Q (4)
ESG-focused investor event	0.032** (0.013)	0.133 (0.095)	0.081*** (0.019)	0.175 (0.122)
Control variables:				
ESG fund ownership	−0.120*** (0.008)		−0.272*** (0.014)	
Non-ESG fund ownership		−0.239*** (0.007)		−0.469*** (0.012)
Size	0.028*** (0.007)	0.612*** (0.143)	0.049*** (0.013)	1.100*** (0.266)
Book-to-market	−0.048*** (0.006)	−0.951*** (0.145)	−0.087*** (0.011)	−1.569*** (0.248)
Leverage	−0.113*** (0.024)	−0.958** (0.444)	−0.193*** (0.047)	−1.923** (0.828)
Sales growth	0.000* (0.000)	−0.000*** (0.000)	0.000 (0.000)	−0.000** (0.000)
Change in net income	0.000 (0.000)	−0.000*** (0.000)	0.000 (0.000)	−0.000** (0.000)
Intangible assets	−0.018 (0.029)	0.132 (0.573)	−0.020 (0.054)	0.610 (1.041)
Earnings-price ratio	0.028** (0.011)	3.158*** (0.289)	0.047*** (0.018)	5.115*** (0.516)
Firm age	−0.048** (0.020)	−0.888*** (0.294)	−0.112*** (0.038)	−1.393*** (0.507)
Prior return	0.018*** (0.006)	0.521*** (0.115)	0.039*** (0.008)	0.636*** (0.163)
Volatility	−0.322* (0.181)	−33.826*** (3.835)	−0.401 (0.291)	−28.606*** (6.796)
Turnover	−0.013*** (0.004)	0.589*** (0.071)	−0.024*** (0.007)	0.507*** (0.123)
Year-quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	50,556	50,556	50,554	50,554
R^2	0.193	0.255	0.324	0.383
Adjusted R^2	0.150	0.215	0.289	0.351

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Table 8
[continued]

Panel B: Mutual funds				
	ESG mutual fund ownership change 2Q (1)	Non-ESG mutual fund ownership change 2Q (2)	ESG mutual fund ownership change 4Q (3)	Non-ESG mutual fund ownership change 4Q (4)
ESG-focused investor event	0.021** (0.011)	0.090 (0.096)	0.055*** (0.016)	0.186 (0.124)
Control variables:				
ESG mutual fund ownership	−0.145*** (0.008)		−0.329*** (0.015)	
Non-ESG mutual fund ownership		−0.248*** (0.005)		−0.492*** (0.009)
Size	0.022*** (0.006)	0.509*** (0.127)	0.036*** (0.011)	0.871*** (0.228)
Book-to-market	−0.036*** (0.005)	−0.759*** (0.117)	−0.065*** (0.009)	−1.172*** (0.193)
Leverage	−0.096*** (0.021)	−0.532 (0.386)	−0.159*** (0.041)	−1.531** (0.697)
Sales growth	0.000 (0.000)	−0.000 (0.000)	0.000 (0.000)	−0.000 (0.00000)
Change in net income	0.000* (0.000)	−0.000*** (0.000)	0.000* (0.000)	−0.000 (0.000)
Intangible assets	−0.025 (0.026)	0.217 (0.497)	−0.032 (0.047)	0.788 (0.862)
Earnings-price ratio	0.021** (0.010)	2.301*** (0.229)	0.036** (0.016)	3.165*** (0.381)
Firm age	−0.033* (0.018)	−1.102*** (0.256)	−0.078** (0.034)	−1.781*** (0.431)
Prior return	0.017*** (0.005)	0.133 (0.100)	0.031*** (0.007)	0.181 (0.137)
Volatility	−0.201 (0.160)	−21.554*** (3.286)	−0.278 (0.256)	−21.628*** (5.422)
Turnover	−0.010*** (0.004)	0.353*** (0.061)	−0.018*** (0.006)	0.281*** (0.104)
Year-quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	50,556	50,556	50,554	50,554
R^2	0.185	0.233	0.320	0.365
Adjusted R^2	0.142	0.192	0.284	0.331

Notes: Table 8 presents regression results for an analysis of changes in (non-)ESG fund ownership around ESG-focused investor events. Panel A presents the results for general fund ownership, while Panel B presents results for mutual fund ownership specifically. Columns 1-2 focus on ownership changes over two consecutive quarters from quarter t-1 to quarter t+1, while columns 3-4 focus on ownership changes over four consecutive quarters from quarter t-1 to quarter t+3. The variables are defined in Appendix A. Continuous variables are winsorized at the 1st and 99th percentiles. All regressions are estimated using OLS, and standard errors are clustered by firm. *, **, and *** refer to statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 9

Changes in (non-)ESG fund ownership following firm-specific ESG calls and ESG conference presentations

Panel A: All funds				
	ESG fund ownership change 2Q (1)	Non-ESG fund ownership change 2Q (2)	ESG fund ownership change 4Q (3)	Non-ESG fund ownership change 4Q (4)
Firm-specific ESG call	0.039*** (0.013)	0.211* (0.128)	0.071*** (0.019)	0.323** (0.145)
ESG conference presentation	0.031 (0.020)	0.015 (0.138)	0.093*** (0.027)	0.031 (0.181)
Control variables:				
ESG fund ownership	−0.120*** (0.008)		−0.272*** (0.014)	
Non-ESG fund ownership		−0.239*** (0.007)		−0.469*** (0.012)
Size	0.028*** (0.007)	0.613*** (0.143)	0.049*** (0.013)	1.100*** (0.266)
Book-to-market	−0.048*** (0.006)	−0.951*** (0.145)	−0.087*** (0.011)	−1.570*** (0.248)
Leverage	−0.113*** (0.024)	−0.958** (0.444)	−0.193*** (0.047)	−1.923** (0.828)
Sales growth	0.000* (0.000)	−0.000*** (0.000)	0.000 (0.000)	−0.000** (0.000)
Change in net income	0.000 (0.000)	−0.000*** (0.000)	0.000 (0.000)	−0.000** (0.000)
Intangible assets	−0.018 (0.029)	0.132 (0.573)	−0.019 (0.054)	0.609 (1.041)
Earnings-price ratio	0.028** (0.011)	3.158*** (0.289)	0.047*** (0.018)	5.115*** (0.516)
Firm age	−0.048** (0.020)	−0.887*** (0.294)	−0.112*** (0.038)	−1.391*** (0.507)
Prior return	0.018*** (0.006)	0.522*** (0.115)	0.039*** (0.008)	0.637*** (0.163)
Volatility	−0.321* (0.181)	−33.821*** (3.835)	−0.401 (0.291)	−28.600*** (6.796)
Turnover	−0.013*** (0.004)	0.589*** (0.071)	−0.024*** (0.007)	0.507*** (0.123)
Year-quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	50,556	50,556	50,554	50,554
R^2	0.193	0.255	0.324	0.383
Adjusted R^2	0.150	0.215	0.289	0.351

(Continued on next page)

Table 9
[continued]

Panel B: Mutual funds

	ESG mutual fund ownership change 2Q (1)	Non-ESG mutual fund ownership change 2Q (2)	ESG mutual fund ownership change 4Q (3)	Non-ESG mutual fund ownership change 4Q (4)
Firm-specific ESG call	0.027*** (0.010)	0.131 (0.129)	0.049*** (0.017)	0.229 (0.161)
ESG conference presentation	0.019 (0.017)	0.017 (0.140)	0.063*** (0.024)	0.120 (0.176)
Control variables:				
ESG mutual fund ownership	−0.145*** (0.008)		−0.329*** (0.015)	
Non-ESG mutual fund ownership		−0.248*** (0.005)		−0.492*** (0.009)
Size	0.022*** (0.006)	0.509*** (0.127)	0.036*** (0.011)	0.871*** (0.228)
Book-to-market	−0.036*** (0.005)	−0.759*** (0.117)	−0.065*** (0.009)	−1.172*** (0.193)
Leverage	−0.096*** (0.021)	−0.532 (0.386)	−0.160*** (0.041)	−1.531** (0.697)
Sales growth	0.000 (0.000)	−0.000 (0.000)	0.000 (0.000)	−0.000 (0.000)
Change in net income	0.000* (0.000)	−0.000*** (0.000)	0.000* (0.000)	−0.000 (0.000)
Intangible assets	−0.025 (0.026)	0.217 (0.497)	−0.032 (0.047)	0.788 (0.862)
Earnings-price ratio	0.021** (0.010)	2.301*** (0.229)	0.036** (0.016)	3.165*** (0.381)
Firm age	−0.033* (0.018)	−1.102*** (0.256)	−0.078** (0.034)	−1.780*** (0.431)
Prior return	0.017*** (0.005)	0.133 (0.100)	0.031*** (0.007)	0.181 (0.137)
Volatility	−0.201 (0.160)	−21.550*** (3.286)	−0.278 (0.256)	−21.624*** (5.422)
Turnover	−0.010*** (0.004)	0.353*** (0.061)	−0.018*** (0.006)	0.281*** (0.104)
Year-quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	50,556	50,556	50,554	50,554
R^2	0.185	0.233	0.320	0.365
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Notes: Table 9 presents regression results for an analysis of changes in (non-)ESG fund ownership around ESG-focused investor events, distinguishing between firm-specific ESG calls and ESG conference presentations. Panel A presents the results for general fund ownership, while Panel B presents results for mutual fund ownership specifically. Columns 1-2 focus on ownership changes over two consecutive quarters from quarter t-1 to quarter t+1, while columns 3-4 focus on ownership changes over four consecutive quarters from quarter t-1 to quarter t+3. The variables are defined in Appendix A. Continuous variables are winsorized at the 1st and 99th percentiles. All regressions are estimated using OLS, and standard errors are clustered by firm. *, **, and *** refer to statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

IP Disclosure under IP Litigation

Alexander Liss*

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Version: January 2025

Abstract

Legal disputes over the ownership of intellectual property (IP) have tripled over the last three decades, costing hundreds of billion US-dollars to the US economy. In this paper, I examine how IP litigation affects the disclosure of subsequent innovation. Using the timeliness of patent pre-grant disclosures, I find that current IP litigation delays the disclosure of innovation (*delay effect*). This evidence is consistent with firms delaying the disclosure of similar technologies until IP uncertainty is resolved. In contrast, firms accelerate innovation disclosures when they have closed IP case experience (*deterrence effect*). While the delay effect leads to lower knowledge spillovers, the deterrence effect mitigates incoming industry competition. I confirm these findings using the Supreme Court decision of *eBay vs. MercExchange* within a difference-in-differences design, which lowered the potential costs of enforcement for defendants of computer patents. Patents even become more informative when firms have closed IP litigation. Finally, weak IP institutions such as more lenient courts contribute to those disclosure effects. Overall, this paper highlights both negative and positive externalities of IP litigation on IP disclosures.

Key words: voluntary disclosure, litigation, innovation, patents, regulation.
JEL Codes: D23, G38, O30, O31, O33, O34, O38
Data availability: Data are available from the public sources cited in the text.

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1. Introduction

"*Say I have lost all faith in patents, judges, and everything relating to patents.*"- Thomas Edison

The protection of intellectual property (IP) is at the core of the innovation process and a necessity for the comparative advantage of firms and an entire economy. However, rising numbers of IP litigation cases have become a burden to firms with an estimated cost of 300 billion to the US economy (Bessen et al. 2018). Thus, firms consistently innovate new technologies under the uncertainty of being sued for their technology. More importantly, many firms have to decide whether to disclose innovations which could expose them to new litigation. In this paper, I examine how IP litigation affects the disclosure of subsequent innovation.

Understanding when and why firms disclose innovation is important to policy makers and academic research (e.g., Tegernsee Experts Group 2012). Innovation is a central driver of economic growth because others can build on innovations due to knowledge spillovers (e.g., Solow 1957; Romer 1990). However, others cannot build on an innovation and no spillovers occur until the innovation is disclosed (Kim and Valentine 2021; Dyer et al. 2023). IP litigation can alter IP disclosure and therefore, the spillover of knowledge, in two directions. On the one hand, firms can increase IP disclosures. IP lawsuits introduce uncertainty about the property rights of the defending firm's technology. Potential invalidations of IP can affect the economic rents of innovations and therefore the competitive position of the defending firm. To counteract those potential forces, firms can increase innovation disclosures to deter industry competition (Glaeser and Landsman 2021), and to better define their technological space to reduce the likelihood of future IP litigation. On the other hand, IP litigation can also lead to decreasing IP disclosure. Firms might not disclose valuable information about their innovations when the information could be favorable to strategic

opponents, such as for example to the opposing party or the jury (Wagenhofer 1990). Thus, it remains an empirical question whether and how IP litigation affects innovation disclosures.

In this paper, I examine the effect of IP litigation on the disclosure of subsequent innovation. First, I investigate whether and how IP litigation affects the disclosure of IP using the timing of patent pre-grant disclosures. For that, I develop different IP litigation measures to investigate differences among the timing and severity of IP litigation. Second, I exploit the Supreme Court decision of *eBay vs. MercExchange* in 2006 in a difference-in-differences design as a shock to IP litigation risk for further identification (Mezzanotti 2021). Third, I examine how lenient IP courts moderate those disclosure effects.

The timing of patent disclosures under the American Inventor Protection Act (AIPA) provides a rich setting to study my research questions. In November 2000, Congress passed the AIPA to reform patent disclosures and to reduce the costs of duplicate inventions and to foster knowledge spillovers and faster innovation (Kim and Valentine 2021; Lück et al. 2020). The AIPA mandates patent filers to disclose non-foreign protection filed pre-grant patents *no later than* 18 months after the filing of the patent with the United States Patent and Trademark Office (USPTO) regardless of being granted. Yet, firms can request the USPTO to publicly disclose their in-process patent application at any time during the 18-month period at the USPTO website, which provides them substantial discretion (Glaeser and Landsman 2021).

The timeliness of patent disclosures under the AIPA offers several advantages to study the effects of IP litigation over other measures of IP disclosures. First, the disclosure of a patent is a credible disclosure signal on the USPTO webpage. Other innovation measures, such as textual measures of 10-K reports (Merkley 2014; Bellstam et al. 2021) might be boilerplate disclosures of firm's technology. Patent disclosures, on the other hand, must be concise and complete, so that others can replicate the disclosed innovation (35 USC § 112(a); Dyer et al. 2023). Moreover,

innovators, competitors, and investors frequently use these disclosures for their decision-making (e.g., Ouellette 2012; Glaeser et al. 2020; Martens 2023). Second, the discretion of firms in the patent disclosure timing allows me to explore a closer link to the filing of IP lawsuits. Within the patent filing process, I am able to test my predictions in a sequential disclosure framework (Wagenhofer 1990; Somaya 2003). Put differently, I examine how firms *change* their IP disclosure behavior after the filing of an IP lawsuit. Third, I am able to measure the technological proximity of each filed patent to the patents that are litigated, which provides further identification.

To examine my research question, I combine several databases on IP litigation and patent application information with accounting- and market data. My analysis starts in 2003 and ends in 2013 covering 400,725 successful patent filings. To measure IP litigation, I construct different proxies from patent litigation cases based on its timing and its severity.[1] Patent litigation cases offer the advantage that I can connect litigated patents with filed patents through their technological proximity such as the same patent class. To examine different timing effects of IP litigation, I construct two variables for current and closed IP litigation. I measure current IP litigation when an IP lawsuit is filed between the filing and disclosure date of a patent. In contrast, I measure closed IP litigation when firms have closed an IP lawsuit 365 days before the patent filing. To measure the severity of IP litigation, I construct four proxies such as the number of IP lawsuits, number of litigated patents, an indicator variable for valuable patent litigated, and a negative capital market reaction to the IP lawsuit filing.

Results on the effect of current IP litigation on the disclosure of subsequent patents show that firms delay patent disclosures when a close technology is litigated (i.e. *delay effect*). I find that

[1] While other forms of IP such as trademark or copyrights are also subject to litigation, patent lawsuits are the most common form of IP litigation in the US jurisdiction with over 97 percent of all filed IP lawsuits for public firms (Marco et al. 2017).

firms under ongoing IP litigation disclose patents with a delay of about 370 days, compared to the disclosure of similar class patents not involved in litigation. Moreover, patents under IP litigation are 29 percent more likely to be filed in the last 30 days before the disclosure deadline than a similar patent without IP litigation. This evidence is consistent with IP uncertainty delaying IP disclosures. In contrast to current IP litigation, I find a negative association between closed IP litigation and IP disclosure (i.e. *deterrence effect*). Thus, firms accelerate patent disclosures when they have closed IP litigation in comparison to non-litigated patent disclosures. This evidence is consistent with the idea that firms accelerate IP disclosures when IP uncertainty is resolved and property rights have been strengthened. Taken together, while current IP litigation delays IP disclosures, closed IP litigation has positive effects on disclosure timing. I also investigate how the severity of IP litigation moderates these effects on patent disclosures. Across all four proxies, I find additional evidence that the *delay* effect is proportional to the severity of IP litigation risk.

Next, I investigate potential real effects of different disclosure strategies under IP litigation. In particular, I investigate how *delay* and *deterrence* effect affect two important dimensions of patent disclosures, the spillover of knowledge, measured by forward citations, and future industry competition. To benchmark different disclosure strategies under litigation, I separate patent disclosures into early and late patent disclosures based on the number of days from the filing to the actual disclosure. Regarding knowledge spillovers, I find that a late patent disclosure under current IP litigation is associated with less forward citations, while early disclosures under current IP litigation is not associated with citations. These results underline that the *delay effect* results in lower knowledge spillovers, which can affect future innovation. Regarding industry competition, I find no effects of current IP litigation on future industry competition. However, I find that an early IP disclosure under closed IP litigation is significantly less negatively associated with future industry competition than a late disclosure under closed IP litigation. This evidence implies that an

early patent disclosure can mitigate potential negative effects of closed IP litigation on future competition in deterring incoming market participants.

To provide further evidence on the specific mechanisms of these effects and to alleviate potential endogeneity concerns (e.g., Schantl and Wagenhofer 2023) I exploit the Supreme Court decision of *eBay vs. MercExchange* in 2006 in a difference-in-differences design. The court decision increased the requirements for plaintiffs to file an automatic injunction for patents in the computer & communication space leaving requirements for patents from other technology classes unchanged. After the court decision, automatic injunctions have become less likely to be filed for those patents. Thus, the ruling in *eBay vs. MercExchange* reduced IP litigation risks for defendants of computer & communication patents (Bereskin et al. 2023; Mezzanotti 2021). More importantly, this unexpected court ruling might be plausibly exogenous with regard to patent disclosures, outside of its effect on IP litigation risk. Consistent with my prior findings, I find that computer-related patents have a significantly lower disclosure delay in the post period, i.e. firms accelerate disclosures timing after the court ruling. This evidence is consistent with my prior results that lower IP litigation risk likelihood, in form of a lower injunction likelihood, correlates with accelerated disclosures of pre-grant patents.

I corroborate my main findings with three additional analyses. First, I investigate whether weak IP institutions contribute to the IP disclosure effects using the court of the Eastern District of Texas (EDT) as a setting of weak IP enforcement. The EDT has been criticized for plaintiff friendly enforcement (Connors 2019). Regarding IP litigation, I find evidence that a high exposure to plaintiff-friendly IP enforcement regimes significantly delay the disclosure of patents, i.e. plaintiff-friendly courts contribute to those disclosure effects. Second, I investigate how the information content of patents changes when firms experience both current and closed IP litigation. Using the patent disclosure quality data of Dyer et al. (2023), I find evidence for more disclosure information

in the form of more pictures and words, when a firm has settled IP litigation. Yet, I find no evidence that current IP litigation affects patent information content. This evidence is consistent with accelerated and better patent disclosures after IP litigation. Third, I investigate the robustness of my results in two alternative settings: around the Leahy Smith Invents Act in 2011 and with other proxies of litigation risk from the literature (Francis et al. 1994, Kim and Skinner 2012). In total, insignificant results indicate that the distinct effect of IP litigation on IP disclosure is neither explained by changes in patent disclosure requirements nor the litigious environment of a firm.

My study's contribution is threefold. First, I extend the literature on the relationship between disclosure and litigation, where the predominant focus has been on shareholder litigation. While several papers find mixed findings in this setting (e.g., Kim and Skinner 2012; Bourveau et al. 2018; Schantl and Wagenhofer 2023), less is known about the effects of litigation on disclosures outside the shareholder litigation setting. While class action lawsuits capture misbehavior of management, IP litigation targets specific assets and therefore the potential comparative advantage of a firm (Galasso and Schankerman 2018). My paper contributes to this stream of literature by providing first evidence of how different IP litigation risks affect the IP disclosure behavior of firms.

Second, I contribute to the literature on IP enforcement, which is also of interest for legal academics and practitioners (see e.g., Bessen and Meurer 2013; Bessen et al. 2018; Mezzanotti, 2021; Bereskin et al. 2023). While many studies focus on the effects of IP litigation on investment, innovation, and competition, less is known about potential effects on information environments. Glaeser et al. (2023) find evidence that lawsuit parties collect private information to prepare of IP lawsuits. Kim et al. (2023) find evidence that judicial inefficiencies in IP enforcement can reduce innovative output. I contribute to this literature by providing the first evidence that IP litigation can

have both positive and negative effects on the disclosure of innovation. More importantly, plaintiff-friendly IP courts contribute to those effects.

Third, I contribute to the literature on IP disclosures (see Glaeser and Lang (2023) for a review). Ahci et al. (2023) find evidence that IP disclosures provide feedback effects to filing firms affecting corporate decision-making. My paper is closely related to Glaeser and Landsman (2021). They find evidence that firms time their patent disclosures to deter product market competition. In contrast, I find a countervailing effect to patent disclosures, which is current IP litigation. Moreover, I contribute to this literature by identifying IP litigation as a crucial factor in the IP disclosure process.

The paper is structured as follows: Section 2 describes the institutional background and the development of my hypothesis. Section 3 describes research design, data sources and measures of IP disclosure and litigation, while section 4 describes my main results. Section 5 provides additional analyses, while section 6 concludes.

2. Institutional background and hypothesis development

2.1 Patent litigation in the US

Innovation is a central driver of economic growth because others can build on innovations due to knowledge spillovers (e.g., Solow 1957; Romer 1990). In order to protect innovations, firms can file for intellectual protection through patents, trademarks, or copyrights. Then, potential infringements of innovation can be enforced and prosecuted. While many IP lawsuits are filed within the US jurisdiction, over 97 percent of all cases for public firms are about patent litigation (Marco et al. 2017).

The purpose of a patent is to grant a temporary monopoly over an innovation in exchange for detailed disclosure. Thus, a patent holder can extract economic rents for the innovation as a reward

for his successful investment in technology. Yet, the patent system has been critiqued recently as the enforcement of patent rights has become a large burden for both regulators and firms. The number of IP lawsuits has tripled over the last thirty years (Bessen et al. 2018). Large firms such as Apple and Google have faced over 50 IP lawsuits per year. Even smaller firms such as startups are constantly targeted by IP litigation (Lanjouw and Schankerman 2004; Appel et al. 2019). Given the strong rise in IP litigation, several scholars question whether the costs of the patenting process and enforcement have exceeded the benefits. Some even call for the abolishment of the patent system (Jaffe and Lerner 2011, Cohen et al. 2019).

In the case of legal disputes, courts are the institutions to enforce property rights. For intellectual property (IP), the court should decide on the legal claims of a patent. However, the costs of IP litigation have risen over the last thirty years due to several reasons. On the hand, the technology boundaries of patents have become unclear and unpredictable (Bessen and Meurer, 2008). Additionally, courts have been favorable in granting large monetary awards to parties, even for patents that are of small technological contribution (Government Accountability Office, 2013; Chen et al. 2023). This has led to new business ventures such as patent assertion entities.[2]

The rise in IP litigation increased the costs of innovation on several dimensions. On the macroeconomic level, Bessen et al. (2018) estimate the costs of IP litigation of over $300 billion to the US economy. Moreover, IP litigation affects cumulative innovation and productivity growth (Ryu 2022). On the firm level, the total fees per lawsuit can amount to $1-$25 million (American Intellectual Property Law Association 2013). According to a survey by RPX Corp. (2015), the

[2] Patent assertion entities are also commonly referred to as patent trolls. Usually, their business model can be described by the acquisition and monetization of patents. In particular, they do not produce or sell any products covered by the patented technology. Instead, they earn revenues through licensing agreements with patents acquired from others and legal disputes with other firms. Proponents of patent assertion entities argue that they create a market for innovation buying and selling patents. Opponents argue that they are among the reasons for rising IP litigation numbers (Cohen et al. 2019). For more information on patent assertion entities, see Cotropia et al. (2014).

mean of combined legal and settlement costs per NPE litigation is $5.6 million, even if the defendant firm wins the case. Moreover, IP lawsuits also affect the profitability of firms. When a patent is infringed, the technology cannot be used, which ultimately affects the comparative advantage of the firm.

2.2 Hypothesis development

Given the discussion above, IP litigation has become a burden for firms to consider in their overall innovation strategy. The rise of IP litigation affected the investment behavior of firms and their peers. In general, the risk of inadvertent infringement of intellectual property can reduce the economic rents of inventing (Galasso et al. 2013; Galasso and Schankerman 2015). For instance, Lemley and Feldman (2016), Cohen et al. (2019), and Mezzanotti (2021) find evidence that excess IP litigation can reduce investments in innovation at defendant firms. In particular, firms shift their innovation strategy to foster investments of more exploitative, rather than explorative innovation (Lee et al. 2021). Additionally, firms ramp up investments in defensive tools, such as a large legal department, which seems to have some effects on deterring attacks (Cohen et al. 2019). They also hire executives with legal expertise, which should reduce the threat of future litigation (Dai et al. 2023). These investments are likely to reduce the economic rents for innovating. From a macro perspective, litigation also reduces the knowledge spillover among innovators (Ryu 2022), which is crucial for fostering future innovation. While IP litigation seems to have effects on competition and the investment behavior of firms, less is known about the effects of IP litigation on information environments of firms. In particular, it is unclear how IP litigation may affect the disclosure of subsequent innovation.

Understanding when and why firms disclose innovation is important to policy makers and academic research (e.g., Tegernsee Experts Group 2012; Glaeser and Landsman 2021). Innovation is a central driver of economic growth because others can build on innovations due to knowledge

spillovers (e.g., Solow 1957; Romer 1990). However, knowledge spillovers cannot occur until the innovation is disclosed (Kim and Valentine, 2021; Dyer et al. 2023). The disclosure of innovation can also prevent costly duplication of research efforts and can affect the allocation of capital because of information asymmetry around innovations (Aboody and Lev 2000; Lück et al. 2020).

IP litigation can alter the disclosure decision of subsequent innovation and therefore, the spillover of knowledge, in two directions. On the one hand, IP litigation can increase IP disclosure. In general, the filing of an IP lawsuit introduces uncertainty about the property rights of the defending firm's technology. Unlike physical assets, IP assets can be readily copied which makes them difficult to enforce (Crouzet et al. 2022). IP lawsuits can help in redefining those property rights, again. Moreover, IP litigation presents a shock to the competitive position of a firm (Lanjouw and Schankerman 2001; Galasso and Schankerman 2018). Potential invalidations of IP rights can affect the economic rents of innovations and therefore the competitive position of the defending firm. For instance, Research in Motion (RIM), producer of the Blackberry cell phone, lost its competitive position in the cell phone market due to a long and costly IP litigation case against the patent assertion entity NTP (Mezzanotti 2021; Bereskin et al. 2023). In the end, RIM paid $ 612.5 million in settlement fees, which was about half of RIMs annual revenues at that time. To counteract those potential forces, firms can increase their innovation disclosures to deter new industry competition (Hughes and Pae 2015; Glaeser and Landsman 2021). Moreover, firms can also make their IP disclosures better to delineate their technological space, which can prevent future IP litigation.

On the other hand, IP litigation can also lead to decreasing IP disclosure. Wagenhofer (1990) underlines that firms might not disclose valuable information at first, when the information could be favorable to strategic opponents, as for example to the opposing party or the jury in a lawsuit. In the case of shareholder litigation, managers may withhold bad information to prevent a lawsuit

(Bourveau et al. 2018; Schantl and Wagenhofer 2023). In the case of IP litigation, firms can withhold IP disclosures due to the uncertainty of the litigated technology. Several technological advances might build on prior technologies that could be part of an ongoing IP lawsuit. Hou et al. (2023) finds evidence that many patents are connected with each other due to strategic patenting. Thus, firms might withhold information about new technologies until IP uncertainty is resolved.

IP litigation might also not affect innovation disclosures for two reasons. First, several IP lawsuits might not be material to the defending firm. They could rest on untenable claims, or the opposing party is relatively small, thus, the likelihood of winning is high for defendants. Consistent with this argument, Bessen (1995) finds evidence that capital markets do not react to all IP lawsuits, only to material ones. Second, the technology that is litigated, does not have many technological similarities with the technology that the firm is intending to disclose. Particularly large tech firms operate in several market segments with different and non- overlapping technologies.

In sum, it remains an empirical question whether and how IP litigation affects the disclosure of innovation. I test the following hypothesis in alternative form:

Hypothesis: IP litigation does not affect the disclosure of innovation.

3. Research design and descriptive statistics

3.1 Measures of IP disclosure

I measure IP disclosure using pre-grant patent level disclosures in the post American Inventor's Protection Act (AIPA) regime. The timing of patent disclosures under the AIPA provides a rich setting to study my research question. The setting mandates patent filers to disclose domestic pre-grant patents *no later than* 18 months after the filing of the patent with the United States Patent and Trademark Office (USPTO) regardless of being granted. Yet, firms can request

the USPTO to publicly disclose their in-process patent application at any time during the 18-months period at the USPTO website (Glaeser and Landsman 2021).

The timeliness of patent disclosures under the AIPA offers several advantages to study the effects of IP litigation over other measures of IP disclosure. First, the disclosure of a patent is a credible disclosure signal on the USPTO webpage. Other innovation measures, such as textual measures of 10-K reports (Merkley 2014; Bellstam et al. 2021) might be boilerplate disclosures of firm's technological progress. Patent disclosures must be concise and complete, so that others can replicate the disclosed innovation (35 USC § 112(a); Dyer et al. 2023). Moreover, innovators, competitors, and investors frequently use these disclosures for their decision-making (e.g. Ouellette 2012; Glaeser et al. 2020; Martens 2023). Second, text-based disclosures are sticky measures of innovation, i.e., they do not possess a lot of meaningful time variation. This makes them hard to use for empirical tests that need time series variation such as difference tests in firm's IP litigation risk. Third, the discretion of firms in the patent disclosure timing allows me to explore a closer link to the filing of IP lawsuits. Within the patent filing process, I am able to test predictions in a sequential disclosure framework (Wagenhofer 1990; Somaya 2003). Put differently, I examine how firms *change* their IP disclosure behavior after the filing of an IP lawsuit. Fourth, I am able to measure the technological proximity of each filed patent to the patents that are litigated, which provides further identification. Appendix B provides an example of a patent disclosure from a patent from Biogen Inc.

I follow Glaeser and Landsman (2021) and construct three patent disclosure measures based on the timing of pre-grant disclosures. The first measure is the logarithm of the days between the filing a patent and the actual disclosure on the USPTO website, less 14 weeks for the processing

of the patent application (Glaeser and Landsman 2021).[3] The second measure is the percentage disclosure delay measuring the ratio between days of actual disclosure divided by maximum number of days. The third measure is an indicator variable, whether the actual disclosure has been conducted 30 days before the disclosure deadline. It allows me to investigate whether firms choose to disclose right before the deadline.

3.2 Measures of IP litigation

To investigate the effect of IP litigation on IP disclosure, I construct two measures for IP litigation risk: current and closed IP litigation. Current IP litigation (*IP_litigation*) aims to capture the effect of an IP lawsuit that the firm is facing before their disclosure decision. Firms might change their IP disclosure strategy when they are litigated. I define a patent to be filed under IP litigation, i.e. *IP_litigation* equal to one when the firm faces one or more IP lawsuits between the filing and the disclosure date of patent. The advantage of this identification is that it mimics sequential disclosure models (e.g., Wagenhofer 1990; Somaya 2003) and allows me to investigate how firms *change* their IP disclosure strategy under IP litigation.

[insert Figure 1 about here]

Second, I measure closed IP litigation through closed IP lawsuits. Closed IP litigation (*Closed_IP_litigation*) aims to measure the resolving of IP uncertainty within the last year before patent filing. I define *Closed_IP_litigation* equal to one, if the firm has closed an IP lawsuit one year before the filing date of the patent, zero otherwise. Thus, while current IP litigation captures new IP uncertainty, closed IP litigation captures resolved IP uncertainty. Figure 1 summarizes my identification strategy within the patent disclosure process after the enactment of the AIPA with both current and closed IP litigation.

[3] The USPTO takes about 14 weeks to process a patent application. Thus, I exclude those 14 weeks from my timing measures (Glaeser and Landsman, 2021). Yet, inferences remain unaffected if I neglect this 14-week window.

Further, I investigate how the severity of IP litigation risk affects IP disclosure behavior. Firms with more IP litigation risk might differ in their IP disclosure strategy than lower IP litigation risk firms. Given that there is no perfect measure for IP litigation severity, I measure the severity of IP litigation using four empirical constructs: number of IP lawsuits, number of litigated patents, an indicator variable for a valuable patent litigated, and an indicator variable for an IP lawsuits with a severe negative capital market reaction. For my first measure, *Ln(1+IP Lawsuit Number)*, I follow Kiebzak et al. (2016) and take the natural logarithm of all IP lawsuits filed in the period between filing and disclosure day. While the number of IP lawsuits captures the amount of IP litigation, it does not say anything about the amount and value of the intellectual property in dispute. For instance, while some lawsuits are about one patent, other IP lawsuits are about entire patent portfolios. Therefore, I construct my second measure, *Ln(1+litigated patents)*, as the natural logarithm of the number of litigated patents. Complementary to this measure, my third measure, *Valuable_Patent_litigated*, captures the actual patent value at risk. Valuable patents can represent the most valuable technology of a firm and therefore its comparative advantage. I measure valuable patents litigated using the Kogan et al. (2017) patent value database. I denote an IP lawsuit as valuable to the firm, i.e. *Valuable_Patent_litigated* equal to one, if the litigated patent has a value above the median of all litigated patents, zero otherwise. Lastly, I construct my fourth measure based on the capital market reaction of the defendant. I follow Chen et al. (2023) and use negative cumulative abnormal returns (CAR) in a [-1, +1] three-day window around the IP lawsuit announcement using a market model.[4] *Negative_IP_Reaction* is one if the firm has a negative CAR

[4] Other studies including Bhagat et al. (1998) and Lerner (1995) have also investigated CARs around IP litigation announcements. To underline the severity, I calculate the economic significance of a material IP lawsuit in terms of dollar values. Around the announcement of a material IP lawsuit, the average firm occurs a loss in market value around $18.6 million.

of two percent around the lawsuit filing, zero otherwise.[5] Appendix A provides more details of all my variables of interest.

3.3 Baseline specification

To investigate my research question, I follow Glaeser and Landsman (2021) and estimate a baseline disclosure model on patent application level. This model compares the timing of subsequent patent pre-grant disclosures under IP litigation with patents not facing IP litigation risk. Thus, I estimate the following specification on patent level:

$$IP\ Disclosure_{i,j,t} = \beta_0 + \beta_1 IP\ Litigation_{t-1} + Controls_{i,t-d} + Patent\ Class * Year\ FE$$

$$+ Industry\ FE + \varepsilon_{i,j,t} \quad (1)$$

where i indexes patent applicants (i.e., i indexes individual firms); j indexes patent applications; and t indexes application years. *IP Disclosure* captures different measures of IP disclosure, while IP litigation captures different proxies for IP litigation risks. All firm variables are measured as of the most recent fiscal year prior to the patent application filing (the t-d). I cluster standard errors on industry level.[6]

I also include a vector of several time varying firm-, industry-, and patent specific controls. First, I include different measures for the competitive environment of a firm. Since industry competition is multidimensional and therefore hard to capture in one specific measure, I employ three established measures within the competition literature: First, I measure industry concentration

[5] This capital market measure of IP litigation is not without flaws. Bessen and Meurer (2012) note that this measure might be subject to substantial measurement error. Some IP lawsuits are not publicly disclosed by the firm (or noted in the media), and that there is sometimes a delay between the court filing date and the announcement date by the firm/media (Bereskin et al. 2023).

[6] One might argue that clustering of standard errors within this empirical design can be also appropriate on firm- and even on patent class level (Petersen 2009; Cohen et al. 2019, Mezzanotti 2021). I cluster standard errors on industry level, as many IP lawsuits are concentrated among certain industries such as the computer and the business services industry (see Table 1, Panel A). However, a different clustering of standard errors does not change statistical inferences of any of my results.

using the Herfindahl Hirschman Index (*HHI*) on industry level using sales.[7] Second, I include the product market fluidity measure (*Fluidity*) of Hoberg et al. (2014) to measure potential product competition threats of the firm. Third, I control for technological competition using the number of citations (Glaeser and Landsman 2021).

Second, firm specific controls include variables such as the size of firm (*Size*) using the natural logarithm of total assets[8], leverage (*Lev*), which is the book value of total debt divided by total assets, market-to-book ratio (*Market-to-Book*), and R&D expenditures (*R&D*). I scale R&D expenditures by total assets. I replace missing values of R&D expenditures with zeroes. Additionally, I employ an indicator variable for missing R&D (*Missing_R&D*) which equals one if data on R&D expenditures are missing; zero otherwise (Koh and Reeb 2015). I also control for the capital dependency of firms (Rajan and Zingales 1998). I measure external capital dependence (*External_Capital_Reliance*) as capital expenditures plus R&D expenditures minus the cash flow of operating activities, divided by capital expenditures plus R&D expenditures (Rajan and Zingales 1998; Plumlee et al. 2015; Glaeser and Landsman 2021). I also include variables for the firm's financial performance such as return on assets (*ROA*) and loss-making years (*Loss*). *ROA* is measured by income before extraordinary items scaled by total assets, while *Loss* is an indicator variable equal to one if the net income is negative, zero otherwise. I also include cash-to-assets ratio (*Cash*) as cash-rich firms tend to be targeted by aggressive plaintiffs such as patent assertion entities (Cohen et al. 2019). Third, I include patent specific controls such as its patent value (*Patent_Value*) measured on granting date (Kogan et al. 2017) and the technological breadth of a patent (*Breadth*) using the Bowen et al. (2023) database. Additionally, I include *ln (Days to Latest*

[7] I also test the robustness of my results by defining the HHI index by total assets instead of total sales. Results remain qualitatively the same.

[8] Results remain unchanged if I include other commonly used firm size proxies such as the natural logarithm of sales and the natural logarithm of the market value of equity (Dang et al. 2018).

Possible Disclosure) as a control when I use days until disclosure as the dependent variable. All control variables are defined in Appendix A. To mitigate the effect of outliers, I winsorize all independent variables, that are not measured in its logarithm, at the 1st and 99th percent levels.

I additionally add interacted US patent class and filing year fixed effects (*Patent Class*Year FE*) and Fama-French 48 industry fixed effects (*Industry FE*). While industry fixed effects control for unobserved differences between industries, *Patent Class*Year FE* control for unobserved regulatory differences between patent classes within each year. Thus, this fixed effect structure allows me compare patents with and without IP litigation risks filed in the same patent class in the same year.

3.4 Identification strategy

A potential concern is that IP disclosure is endogenous with respect to the disclosing firm. Schantl and Wagenhofer (2023) find theoretical evidence in the shareholder litigation setting that disclosures might also spur follow-on litigation (see also Kim and Skinner 2012; Bourveau et al. 2018). This might also be the case for IP disclosures as new patent disclosures could spur new patent lawsuits. Another potential concern is that I can only observe actual IP litigation risk in the form of filed IP lawsuits. However, plaintiffs such as patent assertion entities send out demand letters before the actual filing of a lawsuit. Defendants, then, can react to these demand letters in form of negotiating royalty agreements with the plaintiffs to prevent a lawsuit filing, which is unobservable. Taken together, the relation between IP litigation and IP disclosure might be endogenous among many dimensions.

To address these limitations, I study the effect of IP litigation on IP disclosure using a potentially exogenous variation to IP litigation risk, the *eBay vs. MercExchange* Supreme Court decision on May 30, 2006 (Bereskin et al. 2023; Mezzanotti 2021). This unexpected lawsuit outcome affected the litigation risk of defendants through the strengthening of injunction

requirements. In particular, the Supreme Court decision changed the success rate for plaintiffs to file an automatic injunction. Injunction is a remedy that can be requested by a plaintiff. If granted by a court, an injunction forces the defendant to stop using any technology covered by the contested patents, irrespective of the magnitude of the infringement. Before 2006, a plaintiff that was able to prove a violation had essentially the automatic right to obtain a permanent injunction. In other words, the norm was that "a permanent injunction should be issued when infringement was proven" (*eBay vs. MercExchange*). Exceptions to this rule were quite uncommon and mostly due to reasons of public interest. The availability of a quasi-automatic injunction grants a lot of power to plaintiffs in IP negotiations (Hall and Ziedonis 2001). Thus, the Supreme Court ruling strengthened the role of defendants.

I estimate the effect of the Supreme Court ruling in a difference- in-differences design on patent unit level:

$$IP\ Disclosure_{i,j,t} = \beta_0 + \beta_1 ICT\_Patent\ \ x\ Post_{t-1} + Controls_{i,t-d} + Fixed\ Effects + \varepsilon_{i,j,t} \qquad (2)$$

My treatment variable is *ICT_patent*, which is equal to one if a patent falls in the NBER patent category "Computers & Communications", zero otherwise. *Post* equals one if a patent is filed after May 30, 2006, zero otherwise. I also include all control variables as defined in the previous section. Further, I include different fixed effect structures, such as industry, time, patent class, and firm fixed effects, for further identification. I cluster standard errors on industry level.

3.5 Data

For my investigation, I employ and match data from different sources. I begin by retrieving the patent database from Kogan et al. (2017), which has key data on the filing dates of utility

patents.[9] Kogan et al. (2017) contain all utility patents granted to public firms from 1926 to 2016.[10] Next, I merge the patent database with the filing database of the USPTO to retrieve the disclosure dates of each patent. I follow Hall et al. (2001) and Hall et al. (2005) and remove the last three years (2014-2016) to alleviate potential concerns about truncation bias.

Next, I identify firms and patents under IP litigation. For this, I employ the patent litigation docket reports dataset published by the United States Patent and Trademark Office (USPTO).[11] This dataset combines IP lawsuits from different IP law databases such as Pacer, Lex Machina, and Lexis Nexis to provide a comprehensive dataset on IP lawsuits.[12] I only keep IP lawsuits, in which patents are the object of dispute and firms clearly marked as defendants.[13] Keeping only the lawsuits, where patent filers are defendants, allows me keep the unobserved effects between different lawsuit parties fixed. Plaintiffs and defendants have different motives in IP lawsuits and different positions in the market, which affects the likelihood of winning. I merge patent litigation data and annual accounting data using a fuzzy name-matching algorithm based on the firm name.[14] Finally, I use accounting- and financial market data from Compustat and CRSP.

For my final dataset, I require non-missing data on all my dependent and independent variables. Further, I exclude patents of firms that are in the financial and utility industry and firms with a market value of equity of less than 5 million dollars (i.e., penny stocks). I also drop

[9] I thank the authors for providing the data on their webpage.
[10] I do not investigate design patents because their disclosure requirements differ from utility patents. In particular, design patents are disclosed on the granting day, thus they are excluded from the enhanced disclosure requirements of the AIPA (Chan et al. 2022).
[11] The data is publicly available under the following link: https://www.uspto.gov/ip-policy/economic-research/research-datasets/patent-litigation-docket-reports-data.
[12] The patent litigation docket reports database of the USPTO even goes back until 2000. Yet, I start my investigation in 2003, because this database does not allow for the identification of litigated patents before 2003. For more information on this database, see Marco et al. (2017).
[13] This dataset also contains IP lawsuits, in which trademarks and copyrights are objects of disputes. Sometimes even, the object of dispute is unknown. I delete those IP lawsuits from my investigation.
[14] I manually check the accuracy of my matches to ensure proper matching between those datasets.

industries, which filed less than 50 patents.[15] I also remove singleton observations, i.e., observations that are nested within my fixed effect structure (Correia 2015). My final dataset consists of 400,725 patents from 1,667 firms filed between January 1, 2003, and December 31, 2013.

Following Glaeser and Landsman (2021), I only focus on successfully applied patents. For unsuccessful applications, it is hard to measure the effect of IP litigation on IP disclosure given that they may never disclose the pre-grant patent. Focusing on successfully applied patents also allows me to isolate the effect of IP litigation on the applicants' disclosure decision from other important factors like the underlying economics of successfully patenting (Farre-Mensa et al. 2020).

I also investigate my research question for public firms only to ensure all necessary data for all my tests. Therefore, my results might not be generalizable to private firms such as startups, which are commonly targeted by IP litigation (Lanjouw and Schankerman 2004; Appel et al. 2019). Yet, the large majority of innovation is carried out by large and publicly traded firms (Kogan et al. 2017). IP litigation is also apparent for many of those firms.

3.6 Descriptive statistics

Previous literature suggests that IP litigation is a common phenomenon for innovating firms. Figure 2 plots the frequency of filed patents under IP litigation. The plot suggests that about 30 percent of all patents are filed under litigation. Numerous patents are even filed under severe IP litigation with the number of lawsuits being higher than 25 cases. Thus, IP litigation is a significant component in the IP disclosure decisions of firms.

[insert Figure 2 about here]

[15] Results remain qualitatively the same if I include those industries in my sample.

Summary statistics reveal the same patterns. Table 1 reports descriptive statistics for my sample. Panel A reports the industry distribution of new patents filed under current and closed IP litigation. Quite strikingly, new patents are consistently filed under current IP litigation across many industries. Most patents, which are filed under current IP litigation, are located in the electronic equipment, computers, and the business services industries, which is consistent with prior evidence (Mezzanotti 2021). Those industries also have the largest severity of IP litigation, in which many patents are filed under ten or more IP lawsuits. Regarding closed IP litigation, I observe the same patterns as for current IP litigation. Taken together, high IP litigation occurrences seem to be clustered among a few industries such as business services and electronic equipment. Yet, it appears in almost every industry, not in just a few sectors.

[insert Table 1 about here]

Panel B reports my IP disclosure and my IP litigation measures. Consistent with Glaeser and Landsman (2021), the disclosure timing of pre-grant patents is clustered among the beginning and the end of the 18 months period. In general, the mean patent disclosure delay is about 325 days, and the median is about 445 days. Regarding IP litigation, I observe a large heterogeneity among my measures. Table 1, Panel C, reports summary statistics for my control variables. All control variables are in line with prior research on IP disclosure in the patent setting (Glaeser and Landsman, 2021, Kim and Valentine, 2023).

4. Main results

4.1 IP disclosure under current and closed IP litigation

First, I investigate how current and closed IP litigation affects the disclosure timing of subsequent patents. I measure IP disclosure under current IP litigation if firms face an IP lawsuit

in the time between filing and disclosure date of a patent. In contrast, closed IP litigation is measured when firms have settled an IP lawsuit 365 days before the filing of the patent.

Table 2 reports the results for the effect of current and closed IP litigation on patent disclosure delays. In particular, these tests compare patent applications filed with IP litigation against patent applications without IP litigation in the same patent class in the same year. Thus, this allows me to hold patent characteristics as well as filing regulation fixed.

[insert Table 2 about here]

Column (1) estimates the effects of current and closed IP litigation on the logarithm of the days of patent disclosures delays. Regarding current IP litigation, I find a significantly positive association to patent disclosures delays (i.e. *delay effect*). A coefficient of 0.765 suggests that being litigated is associated with a 114 percent increase in the time until patent disclosure.[16] In economic terms, IP litigation leads to an increase in patent disclosure delays of about 370 days around the mean. Thus, firms delay the disclosure of innovation because of IP uncertainty. Figure 3 displays the significant shift in patent disclosure respectively.

[insert Figure 3 about here]

In contrast to current IP litigation, I find a negative and significant coefficient for *Closed_IP_litigation*, significant on the one percent level. A coefficient of -0.408 suggests that resolved IP uncertainty leads to an acceleration of patent disclosures of about 50 percent in comparison to patents without closed IP litigation (i.e. *deterrence effect*). Figure 4 shows graphically that firms accelerate patent pre-grant disclosures after the closing of IP lawsuits. Additionally, all control variables are in line with Glaeser and Landsman (2021). In particular, I find the same significantly opposing effect of increased competition (*HHI*). Thus, while increased

[16] The increase in patent disclosure is calculated the following: $(e^{0.765}-1) *100$.

industry competition accelerates patent disclosures, current IP litigation counteracts this effect by delaying patent disclosures. Next, I estimate the interaction effect of both *IP_litigation* and *Closed_IP_litigation* to investigate whether the delay- or deterrence effect dominates the patent disclosure decision. Column (2) presents a significant and positive effect on the interaction term (0.464).

[insert Figure 4 about here]

In Column (3), I investigate the effect of current and closed IP litigation on the percentage of patent disclosure delays. Consistent with Column (1), *IP litigation* is positively associated with the percentage in patent disclosure delays. Put differently, patent disclosures are significantly delayed when the firm is under current IP litigation. In contrast, *Closed_IP_litigation* is significantly negative associated with the percentage of disclosure delays, suggesting an acceleration of patent disclosures. Additionally, the interaction term of current and closed IP litigation is again positive underlining that the *delay effect* is stronger, as reported in Column (4).

In Column (5), I examine whether patents are disclosed at the end of the disclosure deadline. Here, I estimate a linear probability model to determine the likelihood of disclosing patents before the deadline when litigated.[17] Consistent with my prior results, I find a positive and significant association between *IP_litigation* and *Disclosure 30 Days before Deadline*. In economic terms, if patent applications face IP uncertainty, firms are about 29 percent more likely to disclose the patent in the month before its deadline.

Taken together, while current IP litigation delays the disclosure of pre-grant patents, the resolution and experience of closed IP litigation fosters earlier patent disclosure. Thus, IP litigation

[17] To test the robustness of this result, I also estimate a logit model with and without fixed effects (Greene, 2019). Results remain unchanged with regard to my inferences.

does not always have negative externalities, but it can also have positive externalities in the form of faster IP disclosures when IP uncertainty has been resolved. [18]

To provide a better understanding about the mechanism of those different effects, I split my IP litigation variables into same (*Same_Tech_litigated*; *Same_Tech_closed*) and different technologies litigated (*Different_Tech_litigated*; *Different_Tech_closed*). Firms might choose to disclosure patents differently when the litigated technology is close to the filed one. Thus, this disaggregation allows me to investigate the technological proximity of litigated and filed patents. I define patents of close technological proximity, i.e., *Same_Tech_litigated* equal to one, if the filed patent and the litigated patent belong to the same US patent class.

Panel B reports results for the different effects of IP litigation on patent disclosures conditional on the technological proximity of litigated and filed patent. Again, I find the opposing effects of current and closed IP litigation, significant for both same and different technologies across all four columns. More importantly, the effect for *Same_Tech_litigated* (1.093), in Column (1), is significantly larger than for *Different_Tech_litigated* (0.679). Panel C reports differences in coefficients and their significance. This evidence is consistent with the argument that the filing of new technologies is significantly delayed when a related technology is currently litigated. Moreover, this effect remains the same across the other IP disclosure proxies as well. For closed IP litigation, *Same_Tech_closed* is also significantly different from *Different_Tech_closed*. In

[18] I do the following steps to investigate the robustness of these results: First, I estimate this specification without and within the pharmaceutical industry. Prior evidence suggests that pharmaceutical firms disclose their innovations early onwards in form of clinical trial disclosures (e.g. Cao et al. 2018, Capkun et al. 2023). Second, I estimate each specification with firm- instead of industry fixed effects. Firm fixed effects alleviate potential concerns regarding unobserved differences between firms. Moreover, it shows how firms change IP disclosure behavior when they are litigated vs. not litigated (i.e., within firm estimator). Third, I estimate this specification without and within the three major patent filing industries "Electronic equipment", "Computer", and "Business services". Results remain unchanged regarding all these robustness tests. Results are reported in Appendix C of the paper.

particular, patent disclosures are more accelerated when IP lawsuits with related technology are settled.

Additionally, I investigate the disclosure effects for different firm- and patent characteristics. Previous literature finds evidence that the existence of IP litigation depends on specific firm- and patent characteristics (e.g. Lanjouw and Schankerman 2004, Cohen et al. 2019). For firm characteristics, I examine how a different lifecycle stage of a firm (Lanjouw and Schankerman 2004; Dickinson 2011; Vorst and Yohn 2018; Appel et al. 2019) affects the disclosure decision. Results indicate that growth firms delay the disclosure of their pre-grant patents even further than mature firms do. These results are consistent as those firms usually have the highest legal costs and cannot defend their market position. Regarding patent characteristics, I examine cross-sectional differences between origination and continuation patents (Hou et al. 2023; Righi 2023). Patent applications are further delayed when a patent is continuation patent, i.e., they rely on a prior patent. Results are reported in Appendix D1 and D2 of the paper.

4.2 Severity of IP litigation

Next, I investigate if the IP disclosure delay effect differs if current IP litigation severs. Several patents are not only filed and disclosed under one IP lawsuit, but many firms face several IP lawsuits at the same time. For instance, Google Inc. had 56 IP lawsuits in 2015, in which they regularly filed new patents. Moreover, the severity and costs of IP lawsuits might differ pending on the opposing party. While some firms are targeted by other firms or patent assertion entities (Cohen et al. 2019) regularly, others might be initiated by private persons or smaller firms having lower bargaining power (Lanjouw and Schankerman 2004). Thus, the effect of IP litigation on IP disclosure might not be proportional.

The severity of litigation risk is a multidimensional construct, as one measure might not reflect the entirety of IP litigation risk. Therefore, I measure the severity of IP litigation risk using

four empirical constructs: the logarithm of the number of current IP lawsuits, the number of patents litigated, an indicator variable for a valuable patent litigated, and a material IP lawsuit with a severe negative capital market reaction. Detailed definitions of the variables can be found in Appendix A.

Table 3 reports the results for the effects of different proxies for the severity of IP litigation on IP disclosures. I report regression results for *Ln (Days to Disclosure)* only for brevity.[19] In column (1)-(4), I estimate the isolated effect of each severity proxy on the timing of patent disclosures. I find positive and significant associations between all four proxies and patent disclosure delays. Consistent with my prior evidence, I find that current IP litigation delays patent disclosures and it is proportional within the number of IP lawsuits.

[insert Table 3 about here]

Lastly, I repeat the analysis with all proxies within one specification. Column (5) reports the results. Results indicate that the number of IP lawsuits and valuable patents litigated capture the severity of IP litigation. The number of patents litigated and negative capital market reaction remain insignificant. In sum, the results of my different proxies underpin that the severity of IP litigation can even worsen the delay in patent disclosures, i.e., the effect of IP litigation on IP disclosure is proportional.

4.3 Consequences of early / late IP disclosures under IP litigation

Next, I investigate potential real consequences of both delay and deterrence effect under IP litigation. In particular, I investigate how different disclosure strategies under IP litigation affect knowledge spillover and industry competition. First, I investigate potential effects on knowledge spillovers measured by the number of citations using linear regressions.[20] I separate patent

[19] I have also investigated the effect of IP litigation severity on my other three patent disclosure proxies. Results remain qualitatively the same.

[20] Several papers argue that using count variables, as a dependent variable, can be problematic in linear regression models (Cohn et al. 2022). Thus, I also estimate the effects of IP litigation on citations using a fixed-effect Poisson model. Inferences do not change with regard to the results.

disclosure delays into early and late patent disclosures. This allows me to investigate how a late or early patent disclosure strategy maps into knowledge spillovers and industry competition. Table 4 reports results. In Column (1), I find no evidence between both current and closed IP litigation and technological spillovers. In Column (2), however, I find that a late patent disclosure under IP litigation is negatively associated with the number of citations. For an early patent disclosure, I find insignificant results.

[insert Table 4 about here]

Regarding industry competition, Column (3) confirms evidence that closed IP litigation is associated with a lower market position (e.g. Lanjouw and Schankerman, 2001). More importantly, Column (4) separates IP litigation proxies into early and late IP disclosures. I find evidence that an early IP disclosure is less associated with a loss in market position than a late patent disclosure under closed IP litigation.

4.4 *eBay vs. MercExchange* Supreme Court decision

A potential concern of my prior results is that IP disclosure could also affect the likelihood of being litigated. Schantl and Wagenhofer (2023) find theoretical evidence in the shareholder litigation setting that disclosures might also spur follow-on litigation (see also Kim and Skinner 2012; Bourveau et al. 2018). Another potential concern is that I can only observe actual IP litigation risk in the form of filed IP lawsuits. However, plaintiffs such as patent assertion entities send out demand letters before the actual filing of a lawsuit, which may never lead to actual IP litigation. Taken together, the relation between IP litigation and IP disclosure might be endogenous among many dimensions.

To address these limitations, I study the effect of IP litigation risk on IP disclosures in a difference- in-differences design. In particular, I explore the *eBay vs. MercExchange* Supreme Court decision on May 30, 2006, as a shock to IP litigation risk (Bereskin et al. 2023; Mezzanotti

2021). This unexpected lawsuit outcome affected the litigation risk of defendants through the strengthening of injunction requirements.

I restrict my sample to patent applications two years before and after the treatment (2004-2008). Additionally, I follow Bereskin et al. (2023) and exclude patents from the drugs & medical sector to form a proper control group.[21]. Column (1) estimates the effect of the reduction of an injunction likelihood on patent disclosure using industry- and semiannual fixed effects only. Column (2) adds covariates, while Column (3) adds patent class fixed effects. Column (4) estimates the specification with firm and instead of industry fixed effects, thus, it investigates within firm change in IP disclosure behavior. I predict that reduced IP litigation risk for computer patents should accelerate disclosure timing for those patents, while not affecting other patent categories.

[insert Table 5 about here]

Table 5 reports results for this prediction. First, I find a positive and significant coefficient on *ICT_patent* suggesting that computer patents are significantly disclosed at later days. More importantly, results show both negative and statistically significant coefficients on the interaction term of *ICT_patent* and *Post*. In Column (1), a coefficient of -0.098 suggests that the reduction of the injunction likelihood for computer & communication patents lead to an offset of this patent disclosure delay. In Column (2), adding control variables reduces the effect of the Supreme Court decision to about 5 percent, yet still significant on the one percent level. Moreover, column (3)

[21] The literature identifies potential difficulties in identifying pharmaceutical and biotechnology patents as an appropriately defined control group for this setting (Mezzanotti and Simcoe 2019, Bereskin et al. 2022). One reason is that the Supreme Court ruling in Mayo vs. Prometheus (2012) held that certain innovations were not patent eligible (specifically, if the innovation is based on "laws of nature"); although the Supreme Court rulings occurred outside the restricted sample period, the lawsuit was filed in 2004, and the district court held the patents invalid in 2008. Moreover, the National Research Council (2006) highlights some of the unique changes in life science patents around this time period, relating to the development of proteomics and the human genome project, including NIH policies relating to availability of data and encouragement of use of certain patented technology, and court rulings such as In re Fisher (2005), where the court ruled the patents relating to "expressed sequence tags" are not patentable (without "specific and substantial utility"). Another important legal ruling in this period is Merck KGaA vs. Integra LifeSciences I (2005), where the Supreme Court protected certain defendants from litigation when the work was related to an FDA submission.

suggests that disclosures within this patent class (i.e. within patent class estimator) are accelerated after the Supreme Court decision. Consistent with my prior evidence, I find that a reduction of IP litigation risk leads to lower patent disclosure delays. Taken together, lower injunction likelihoods for software patents reduce the threat of potential IP litigation costs for defending firms, which accelerates pre-grant disclosures of patents of the computer & communication sector.

5. Additional analyses

In the following section, I supplement my main analyses with additional results regarding the effects of IP litigation on the information content of patents (i.e., disclosure quality of patents, Dyer et al. 2023), the effect of weak enforcement regimes, and additional robustness tests.

5.1 IP enforcement regimes and IP disclosure

First, I investigate how weak IP enforcement institutions contribute to the delay of IP disclosures under IP litigation. A strong institutional enforcement regime is mandatory for the effectiveness of patent protection and follow on innovation (Lerner 2002; Kim et al. 2023). Yet, judicial inefficiencies have spurred large criticism among legal scholars about the effectiveness of current US patent protection and the wellbeing of the entire patent system (Moore 2001).

Here, I examine whether a plaintiff friendly interpretation of the patent law has effects on the disclosure timing of pre-grant patents. Plaintiff- or defendant friendly courts may have real effects on the reporting of innovation as they have in other litigation settings (Franke et al. 2023). For this, I exploit the district court of Eastern Texas as a setting of plaintiff friendly IP litigation. Legal scholars argue that this court is favorable towards plaintiffs (Moore 2001; Jacobsmeyer 2018). In fact, several scholars denote these actions as "court shopping".[22] To investigate the effect of the

[22] The US legislation recognized this problem of "court shopping" (Moore, 2001, Connors, 2019) and introduced new regulation at the end of 2016 to counteract this phenomenon. In particular, in *TC Heartland LLC v. Kraft Foods*, the

plaintiff-friendly IP enforcement, I separate current IP litigation into two variables, *EDT_Exposure* and *EDT_Non_Exposure*, based on the exposure of the firm to this court in the filing of this patent.

[insert Table 6 about here]

Table 6 reports the results for this effect. Both effects of *EDT_Exposure* and *EDT_Non_Exposure* are significantly positively associated with patent disclosure delays. This result is consistent across all three columns. More importantly, *EDT_Exposure* is significantly larger than *EDT_Non_Exposure*. Economically speaking, a large exposure to plaintiff-friendly IP courts is associated with 45 percent increase in patent disclosure delays.[23] Consistent with Franke et al. (2023), plaintiff-friendly courts in IP rulings increase disclosure delays of subsequent innovations. Particularly, they increase the IP litigation costs of firms leading to substantial IP reporting delays. Taken together, patents are later disclosed when firms have large exposure to weak IP enforcement institutions, which is consistent with a high likelihood of IP litigation costs.

5.2 Patent quality characteristics

My prior tests show that firms delay their subsequent patent disclosures under IP litigation, while accelerating when they have recently settled an IP lawsuit. Yet, IP disclosure is a multidimensional construct (Cao et al. 2018). That implies that IP litigation might not only affect the timing of patent disclosures, but also other dimensions of IP disclosures as well. One dimension could also be the disclosure quality of patents. 35 USC § 112(a) states that patent disclosures should be "full, clear, concise, and exact" enough to permit a person familiar with the technology to recreate the patented innovation. Yet, patents differ significantly in their disclosure quality they provide (Dyer et al. 2023). This discrepancy in the disclosure quality of patents might also be

Supreme Court tightened regulation to narrow venues to the state of incorporation of the defendant only, invalidating the clause "where the defendant has committed acts of infringement and has a regular and established place of business". The phenomenon of court shopping also appears in non-US jurisdictions (Jacobsmeyer 2018).

[23] The increase in patent disclosure is calculated the following: $(e^{0.262}-1)*100$.

affected by ongoing and closed IP litigation. On the one hand, IP litigation could make patent disclosures more informative as litigated firms decide to define their intellectual property rights more clearly. On the other hand, disclosure quality of patents can deteriorate.

I follow Dyer et al. (2023) and measure patent disclosure quality using five measures: file size, number of figures, number of words, the Gunning-FOG Index for patent readability, and the specificity of patents.[24] More details on the construction of the used variables can be found in Appendix A as well as in Dyer et al. (2023). I estimate the effect of IP litigation on patent disclosure quality using OLS regressions within the same regression framework as in my previous tests.

[insert Table 7 about here]

Table 7, Panel A, reports results for the effect of current and closed IP litigation on the disclosure quality of patents. While I find no evidence that current IP litigation affects the disclosure quality of patents for three out of five disclosure quality measures, I find evidence that past IP litigation increases the disclosure quality of patents for four out of five disclosure proxies. In particular, patent descriptions after closed IP litigation cases become longer (larger file sizes and more words) and provide more figures. Additionally, patents after closed IP litigation become easier to read indicated by lower FOG indices.[25] This evidence suggests that patent disclosures after settled IP lawsuits not only become faster, but also more informative.

Next, I investigate whether the effect can be explained by technologically related patents. Panel B reports the results for the disaggregation into same and different technology patents based on their patent class classification. Consistent with my previous results, the effects for same technology patents are economically larger than for unrelated technology patents. Thus, firms

[24]I thank the authors of Dyer et al. (2023) for providing the data on patent disclosure quality. The sample for patent disclosure quality proxies is limited to patents filed in the years from 2008 to 2013 due to data availability.
[25] For easier interpretation of my results, I regress the negative natural logarithm of FOG indices on IP litigation proxies.

increase patent disclosures for the same technologies rather than the unrelated technologies. In sum, IP litigation can also affect the disclosure quality of patents in form of longer texts and figures. Thus, closed IP litigation also has positive externalities on the quality of patent disclosures in the form of more detailed patent disclosures.

5.3 Robustness checks

Lastly, I investigate the robustness of my results using two different specifications. First, I split my sample in a pre- and post-period around the Leahy-Smith Invents Act (LSIA) in 2011. The Leahy-Smith America Invents Act was a recent U.S. patent reform, which altered the disclosure requirements in the patent application process.[26] In particular, the LSIA reduced the enforcement about the requirement to disclose all necessary information to be able to reproduce the patent successfully.[27]

Table 8, Panel A, reports results of a sample split among the pre- and post-LSIA period. Again, I find evidence for delayed IP disclosure under IP litigation and accelerated IP disclosure after closed IP litigation in both periods. More importantly, I find that the difference between the coefficients of both periods is statistically insignificant. Thus, the effect of IP litigation on IP disclosure has not been affected by recent changes in disclosure requirements.

[insert Table 8 about here]

Second, I investigate the relation of IP disclosure to another form of litigation risk: class action lawsuits. A potential explanation of my results might be that altered IP disclosures can be explained by a litigious environment rather than underlying IP litigation. Other forms of litigation

[26] Additionally, the Leahy-Smith Invents Act of 2011 also changed the US-patent system from a first to invent to a first to file patent system. For more information on the changes to the patent system, see Rantanen et al. (2011) and Sohi (2013).

[27] Before the LSIA, a non-disclosure of necessary information would have resulted in an invalidity of the patent. After the LSIA, a non-compliance with this rule does not automatically lead to an invalidation of the patent, which dilutes patent disclosure regulation. Thus, the LSIA might have affected the patent disclosure practices of firms.

like the appearance of class action lawsuits might explain the altered IP disclosure behavior as firms are more cautious in those environments (Kempf and Spalt 2023). Using the industry-defined litigation proxy of Francis et al. (1994), I find no associations between *Litigation_environment* and patent disclosures, as reported in Table 8, Panel B. This evidence is inconsistent with the explanation that litigious environments explain differing patent disclosures.

6. Conclusion

In this paper, I examine the effect of IP litigation on IP disclosure. Using patent disclosures as the unit of observation, I find that current IP litigation delays the disclosure of innovation, while closed IP litigation accelerates the disclosure. This evidence is consistent with firms delaying IP disclosures under IP uncertainty and accelerating IP disclosures when IP uncertainty is resolved. Patent disclosure quality even improves after the settlement of IP lawsuits. Difference-in differences estimations around the Supreme Court trial of *eBay vs. MercExchange* in 2006 provide additional evidence that when current IP litigation risks for computer & communication patents (lower injunction likelihood) are lowered, firms accelerate the timing of patent disclosures for this technology class in comparison to patents from other technological fields. Additionally, plaintiff-friendly IP courts contribute to those observed disclosure effects.

My paper contributes to the regulatory debate on potential externalities of rising IP litigation on the disclosure of innovation. Several academics have raised negative concerns about the growing concerns of IP litigation. In this paper, I document both negative and positive effects of IP litigation on the IP disclosure of firms providing a new perspective to the debate of rising IP litigation and patent enforcement.

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Figure 1: Sequence of the patent process and definition of IP litigation

This figure presents the patent protection process after the American Inventor Protection Act (AIPA) in 2000. I define current IP litigation equal to one, if the firm faces an IP lawsuit in the period between the filing and the disclosure of the patent. I define closed IP litigation when the firm closes an IP lawsuit in the period between one year before filing and the filing of the patent.

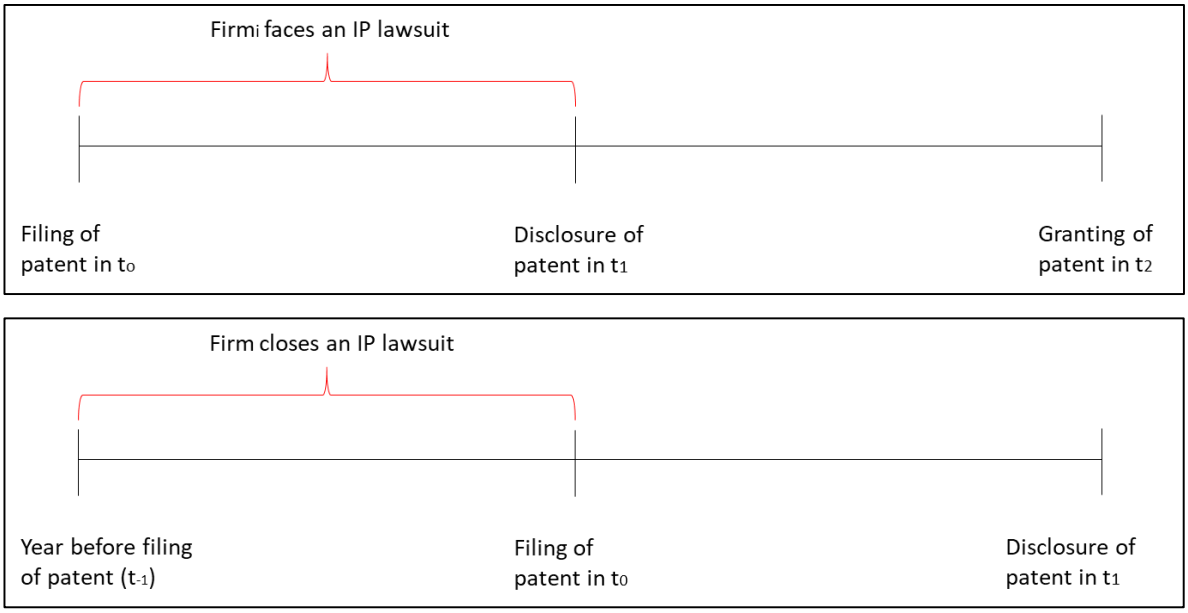

Figure 2: Occurrence of patent filings under IP litigation

This figure presents the filing of patents under current IP litigation. The different lines highlight how many lawsuits have been filed when the firm disclosed the patent. The period of observation is from 2003 until 2013.

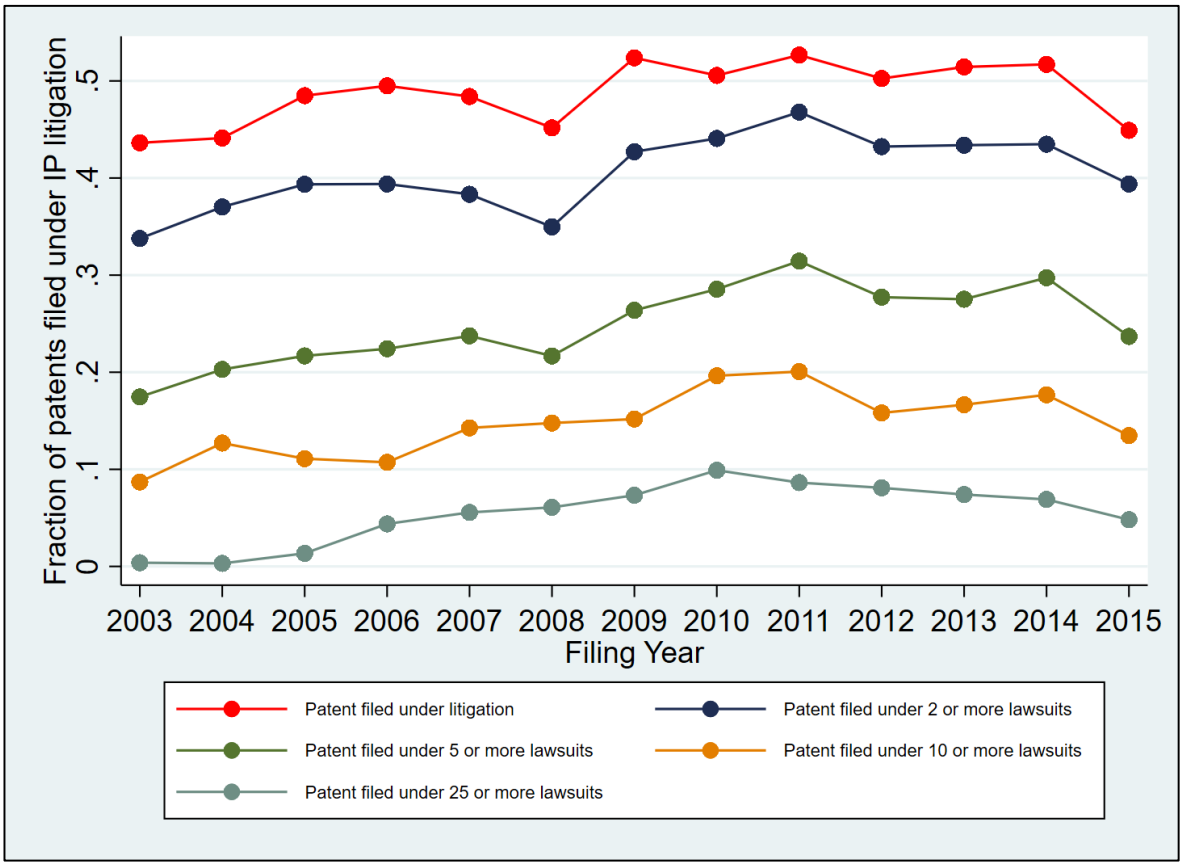

Figure 3: *Delay effect* of current IP litigation on patent disclosure delays

This figure presents histograms of the density of days to actual disclosure of a patent under current IP litigation. The left histogram presents patents disclosed without current IP litigation. The right histogram plots patents disclosed with current IP litigation. The period of observation is from 2003 until 2013.

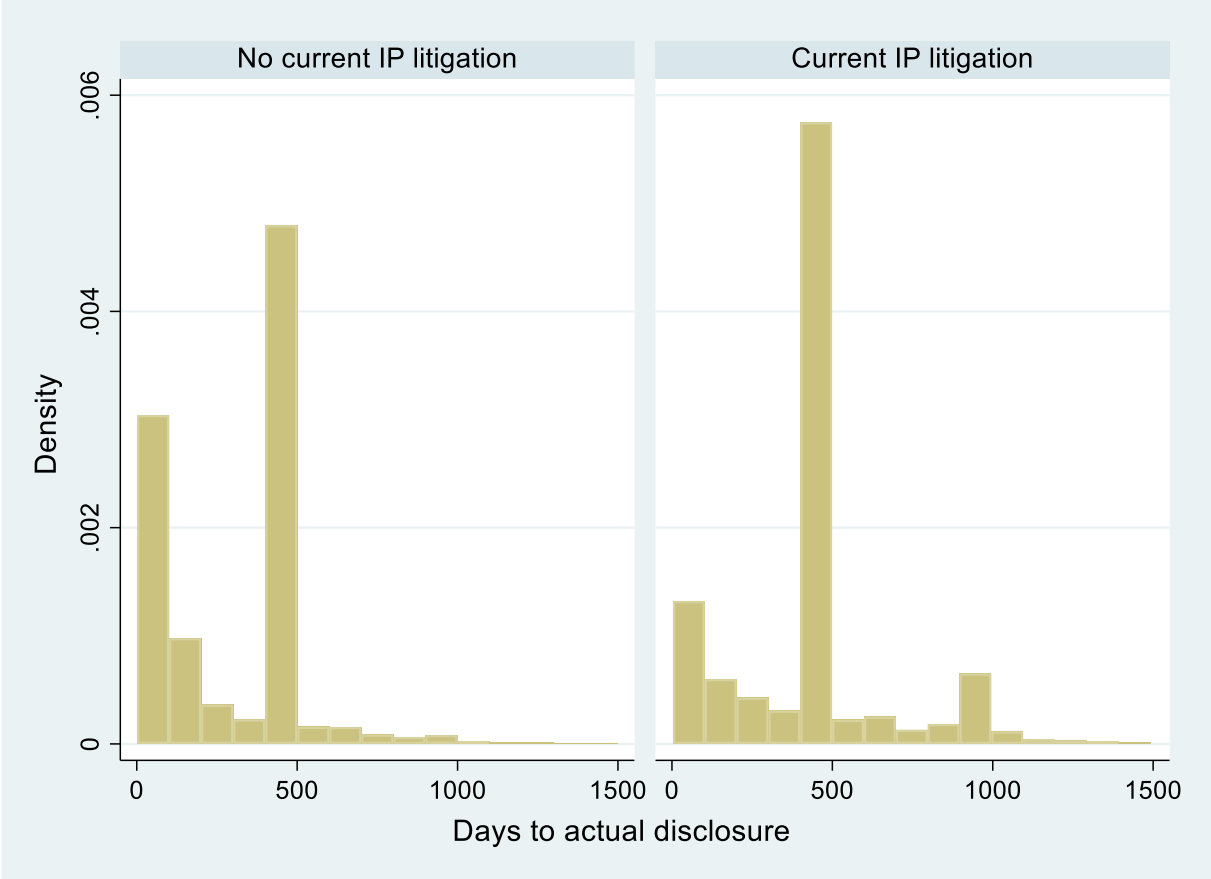

Figure 4: *Deterrence effect* of closed IP litigation on patent disclosure delays

This figure presents histograms of the density of days to actual disclosure of a patent under closed IP litigation. The left histogram presents patents disclosed without closed IP litigation. The right histogram plots patents disclosed with closed IP litigation. The period of observation is from 2003 until 2013.

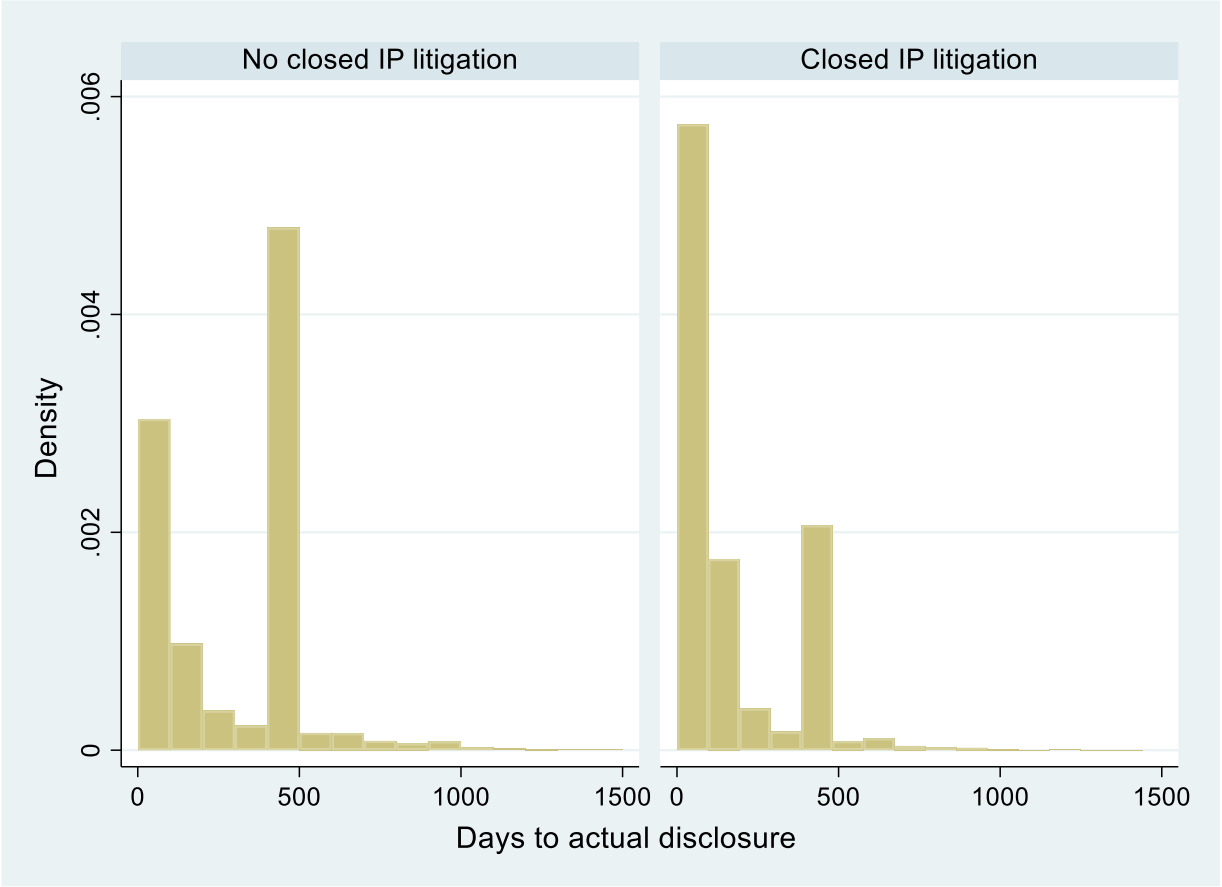

Table 1: Industry distribution of IP litigation and descriptive statistics

This table reports summary statistics for the industry distribution of IP lawsuits and the dependent and independent variables used in this study. Panel A reports industry distributions of the filing of patents and the likelihood of filing patents under current and closed IP litigation. I define industries by using the Fama-French 48 industry classifications (excluding the financial and utility industry). Panel B reports descriptive statistics on IP disclosure and IP litigation measures. Panel C reports descriptive statistics on all control variables used. The definitions of the variables can be found in Appendix A. The period of observation is from 2003 to 2013 (totaling 400,725 observations).

Panel A: Industry composition of patents filed under current and closed IP litigation.

Industry Composition	*Patents filed*	*Patents disclosed under current IP litigation*	*Patents disclosed under 10 or more IP lawsuits*	*Patents disclosed after closed IP litigation*
Agriculture	1,349	1,275	0	1,349
Food Products	375	24	0	111
Candy &Soda	102	1	0	33
Beer & Liquor	622	24	0	33
Tobacco & Products	548	0	0	0
Recreation	1,155	245	7	625
Entertainment	1,812	60	0	63
Printing & Publishing	64	23	0	23
Consumer Goods	3,874	1,371	6	2,098
Apparel	2,309	45	0	50
Healthcare	175	41	0	60
Medical Equipment	18,753	4,638	9	6,048
Pharmaceutical Products	14,715	6,395	39	7,715
Chemicals	12,426	118	0	566
Rubber & Plastic Product	106	15	0	21
Textiles	50	1	0	2
Construction Materials	1,933	850	1	1,304
Steel Works etc.	266	38	0	26
Machinery	16,635	4,551	2	6,184
Electrical Equipment	2,691	307	7	505
Automobiles & Trucks	15,812	10,644	638	9,587
Aircraft	11,051	2,400	10	2,342
Shipbuilding	136	0	0	6
Defense	1,262	387	5	359
Industrial Metal Mining	56	0	0	0
Petroleum & Gas	15,753	3,959	2	4,382
Communication	16,034	12,561	7,869	11,070
Business Services	100,121	33,245	13,151	33,484
Computers	45,504	14,579	3,933	12,980
Electronic Equipment	98,634	64,192	10,070	68,997
Measuring Equipment	7,580	2,299	2	3,146
Business Supplies	6,624	5,032	5	5,312
Shipping Containers	212	2	0	23
Transportation	255	89	0	91
Wholesale	191	29	0	44
Retail	1,540	1,177	805	1,201
Total	**400,725**	**170,617**	**25,403**	**179,840**

Panel B: Descriptive statistics on IP disclosure and IP litigation variables

Variables	*Mean*	*SD*	*Median*	*p75*	*p90*	*p99*
IP disclosure measures						
Ln (Days to Disclosure)	5.330	1.173	6.107	6.120	6.125	6.888
Days to Disclosure	325.090	231.231	449	455	457	980
Percentage Disclosure Delay	0.713	0.330	1	1	1	1
Disclosure 30 Days before Deadline	0.525	0.499	1	1	1	1
Ln (File Size)	13.843	0.565	13.794	14.144	14.528	15.534
Ln (Number Figures)	2.142	0.789	2.197	2.565	3.045	3.989
Ln (Number of words)	8.386	0.691	8.393	8.811	9.228	10.161
Ln (FOG Index)	2.977	0.124	2.979	3.056	3.127	3.273
Ln (Specificity)	1.735	0.949	1.662	2.360	3.054	4.002
IP litigation measures						
IP_litigation	0.426	0.494	0	1	1	1
Closed_IP_litigation	0.449	0.497	0	1	1	1
Same_Tech Litigated	0.096	0.294	0	0	0	1
Same_Tech_Closed	0.125	0.331	0	0	1	1
Different_Tech_Litigated	0.353	0.478	0	1	1	1
Different_Tech_Closed	0.301	0.459	0	1	1	1
Ln(1+IP Lawsuit Number)	0.639	0.912	0	1.099	1.946	3.638
Ln(1+litigated patents)	0.860	1.229	0	1.609	2.773	4.554
Valuable_Patent_litigated	0.039	0.194	0	0	0	1
Negative_IP_Reaction	0.044	0.204	0	0	0	1
EDT_Exposure	0.255	0.436	0	1	1	1
EDT_Non_Exposure	0.171	0.376	0	0	1	1

Panel C: Descriptive statistics on control variables

Variables	*Mean*	*SD*	*Median*	*p75*	*p90*	*p99*
HHI	-1.828	0.784	-1.830	-1.451	-0.656	-0.030
Fluidity	6.809	2.660	6.532	8.024	10.076	15.698
Loss	0.119	0.324	0	0	1	1
ROA	0.069	0.103	0.081	0.126	0.169	0.241
R&D	0.068	0.057	0.051	0.091	0.121	0.324
Missing R&D	0.033	0.180	0	0	0	1
Leverage	0.180	0.143	0.177	0.269	0.339	0.631
External Capital Reliance	-0.661	0.426	-0.742	-0.574	-0.294	1.484
Cash	0.329	0.217	0.272	0.467	0.633	0.959
Size	9.954	1.803	10.328	11.434	11.699	12.537
Market-to-Book	3.991	2.763	3.439	5.260	7.548	14.585
Number Cites	1.174	1.141	1.099	1.792	2.773	4.500
Patent_Value	1.759	1.169	1.757	2.516	3.271	4.662
Breadth	0.288	0.249	0.260	0.520	0.634	0.735
ln(Possible Disclosure)	6.359	0.181	6.306	6.315	6.339	7.104

Table 2: Patent disclosure delay under IP litigation

This table presents OLS regressions of patent disclosure delays as a function of closed and current IP litigation. Panel A reports results for the effect of current and closed IP litigation. Panel B disaggregates current and closed IP litigation into same and different technologies litigated. Same Technology is measured when filed and litigated patents are from the same US patent class. Panel C reports differences in coefficients between same and different technologies. All other variables are defined in Appendix A. All models include controls, as well as industry (Fama-French 48) and interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2003 to 2013 (totaling 400,725 observations).

Panel A: IP litigation on IP disclosure

Dependent Var.	*Ln (Days to Disclosure)*	*Ln (Days to Disclosure)*	*Percentage Disclosure Delay*	*Percentage Disclosure Delay*	*Disclosure 30 Days before Deadline*	*Disclosure 30 Days before Deadline*
	(1)	(2)	(3)			
IP_litigation	0.765***	0.512***	0.233***	0.168***	0.286***	0.220***
	(0.085)	(0.056)	(0.021)	(0.015)	(0.027)	(0.026)
Closed_IP_litigation	-0.408***	-0.601***	-0.122***	-0.172***	-0.150***	-0.202***
	(0.072)	(0.119)	(0.018)	(0.031)	(0.023)	(0.041)
*IP_litigation * Closed_IP_litigation*		0.464***		0.120***		0.122***
		(0.119)		(0.032)		(0.044)
HHI	0.088**	0.091***	0.031***	0.032***	0.047***	0.048***
	(0.034)	(0.029)	(0.010)	(0.009)	(0.013)	(0.012)
Fluidity	0.005	0.004	0.001	0.001	0.001	0.001
	(0.007)	(0.006)	(0.002)	(0.002)	(0.003)	(0.003)
Loss	-0.108***	-0.108***	-0.036***	-0.036***	-0.042*	-0.042*
	(0.030)	(0.030)	(0.013)	(0.012)	(0.023)	(0.023)
ROA	0.467**	0.428**	0.157**	0.148**	0.243*	0.233*
	(0.192)	(0.182)	(0.068)	(0.065)	(0.123)	(0.120)
R&D	1.057***	0.991***	0.370***	0.353***	0.609***	0.592***
	(0.250)	(0.235)	(0.092)	(0.087)	(0.163)	(0.158)
Missing R&D	0.465**	0.452**	0.116**	0.113*	0.141*	0.137*
	(0.188)	(0.190)	(0.056)	(0.056)	(0.071)	(0.072)
Leverage	0.471**	0.485**	0.166***	0.169**	0.281***	0.285***
	(0.180)	(0.196)	(0.059)	(0.062)	(0.092)	(0.096)
External Capital Reliance	-0.048**	-0.038*	-0.014**	-0.011**	-0.012	-0.009
	(0.021)	(0.019)	(0.006)	(0.005)	(0.010)	(0.009)
Cash	-0.178**	-0.177**	-0.044*	-0.044*	-0.048	-0.047
	(0.066)	(0.067)	(0.023)	(0.023)	(0.036)	(0.036)
Size	0.031**	0.026**	0.015***	0.014***	0.030***	0.029***
	(0.012)	(0.012)	(0.004)	(0.004)	(0.007)	(0.006)

Market-to-Book	0.000	-0.000	-0.001	-0.001	-0.003	-0.003
	(0.003)	(0.003)	(0.001)	(0.001)	(0.003)	(0.003)
Number Cites	0.008	0.008	-0.002	-0.002	-0.004	-0.005
	(0.009)	(0.009)	(0.003)	(0.003)	(0.003)	(0.003)
Patent_Value	-0.020	-0.021	-0.008	-0.008	-0.015	-0.015*
	(0.016)	(0.015)	(0.005)	(0.005)	(0.009)	(0.009)
Breadth	0.027	0.026	0.008	0.008	0.007	0.006
	(0.061)	(0.063)	(0.020)	(0.020)	(0.033)	(0.034)
ln(Possible Disclosure)	1.788***	1.796***				
	(0.138)	(0.132)				
Patent Class*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	400,725	400,725	400,725	400,725	400,725	400,725
Adjusted-R^2	0.224	0.228	0.173	0.177	0.173	0.174

Panel B: Same technology litigated and IP disclosure

Dependent Var.	*Ln (Days to Disclosure)*	*Percentage Disclosure Delay*	*Disclosure 30 Days before Deadline*
	(1)	(2)	(3)
Same_Tech_Litigated	1.093***	0.330***	0.409***
	(0.088)	(0.023)	(0.032)
Same_Tech_Closed	-0.624***	-0.184***	-0.231***
	(0.071)	(0.018)	(0.025)
Different_Tech_Litigated	0.679***	0.207***	0.252***
	(0.091)	(0.023)	(0.031)
Different_Tech_Closed	-0.406***	-0.122***	-0.152***
	(0.067)	(0.017)	(0.021)
Controls	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	400,725	400,725	400,725
Adjusted-R^2	0.239	0.190	0.186

Panel C: Differences between same and different technologies

Differences of coeff.			
	(1)	(2)	(3)
Same_Tech_Litigated vs. Different_Tech_Litigated	0.414***	0.123***	0.157***
Same_Tech_Closed vs. Different_Tech_Closed	-0.624***	-0.062***	-0.079***

Table 3: Severity of IP litigation

This table presents OLS regressions of patent disclosure delays as a function of the severity of current IP litigation. Column 1 reports coefficients for the number of IP lawsuits. Column 2 reports coefficients for the number of litigated patents. Column 3 reports coefficients for lawsuits if valuable patents are litigated. Column 4 reports coefficients if the firm faces a lawsuit, which led to a negative capital market reaction. Column 5 reports coefficients for all proxies together in one specification. All other variables are defined in Appendix A. All models include controls, which are not reported for brevity, as well as industry (Fama-French 48) and interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2003 to 2013 (totaling 400,725 observations).

Dependent Var.	*Ln (Days to Disclosure)*				
	(1)	(2)	(3)	(4)	(5)
Ln(1+IP lawsuit number)	0.403***				0.399***
	(0.043)				(0.086)
Ln(1+litigated patents)		0.284***			-0.003
		(0.026)			(0.055)
Valuable_Patent_litigated			0.645***		0.113*
			(0.068)		(0.059)
Negative_IP_Reaction				0.188***	-0.055
				(0.030)	(0.041)
Controls	Yes	Yes	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	400,725	400,725	400,725	400,725	400,725
Adjusted-R^2	0.234	0.229	0.192	0.184	0.234

Table 4: Consequences of early/late patent disclosure under IP litigation

This table presents OLS regressions of consequences of an early and late disclosure under IP litigation. Column 1 reports coefficients for the effect of current and closed IP litigation on the number of forward citations. Column 2 reports coefficients for an early and late disclosure strategy under current and closed IP litigation on the number of forward citations. Column 3 for the effect of current and closed IP litigation on future industry competition. Column 4 reports coefficients for an early and late disclosure strategy under current and closed IP litigation on future industry competition. All other variables are defined in Appendix A. All models include controls, which are not reported for brevity, as well as industry (Fama-French 48) and interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2003 to 2013 (totaling 400,725 observations).

Dependent Var.	*Number Cites*	*Number Cites*	*HHI*	*HHI*
	(1)	(2)	(3)	(4)
IP_litigation	0.008		-0.059*	
	(0.026)		(0.029)	
Closed_IP_litigation	0.028		-0.174***	
	(0.022)		(0.049)	
Late_Disc_IP_litigation		-0.119***		0.085
		(0.027)		(0.067)
Early_Disc_IP_litigation		0.003		0.015
		(0.026)		(0.038)
Late_Disc_closed_IP_litigation		0.018		-0.207**
		(0.045)		(0.081)
Early_Disc_closed_IP_litigation		-0.045		-0.101***
		(0.032)		(0.022)
Controls	Yes	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	400,725	400,725	400,725	400,725
Adjusted-R^2	0.253	0.254 0.684	0.684 0.676	0.676

Table 5: Patent disclosure delay after the *eBay vs. MercExchange* ruling

This table presents OLS regressions of patent disclosure delays around *the eBay vs. MercExchange* Supreme Court ruling in a difference-in-differences design. *ICT_patent* is equal to one, if the patent is NBER patent category" computers & communications", zero otherwise. *Post* is equal to one for patents filed after the July 1, 2006, zero otherwise. Column 1 estimates the effect with time (semi-annual) and industry (Fama-French-48) fixed effects. Column (2) adds control variables, while Column (3) adds patent class fixed effects. Column (4) estimates the effects with firm, patent class, and time fixed effects. All other variables are defined in Appendix A. Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2004 to 2008 (totaling 219,667 patent observations).

Dependent Var.	*Ln (Days to Disclosure)*			
	(1)	(2)	(3)	(4)
*ICT_Patent*Post*	-0.094***	-0.053***	-0.046***	-0.040**
	(0.018)	(0.015)	(0.016)	(0.018)
ICT_Patent	0.111***	0.004		
	(0.039)	(0.030)		
HHI		0.055	0.052	0.280
		(0.050)	(0.049)	(0.189)
Fluidity		0.006	0.006	-0.007
		(0.010)	(0.010)	(0.009)
Loss		-0.034	-0.035	0.051
		(0.059)	(0.059)	(0.050)
ROA		0.779***	0.768***	0.506***
		(0.219)	(0.219)	(0.155)
R&D		1.154***	1.124***	-0.220
		(0.322)	(0.322)	(1.023)
Missing R&D		0.256***	0.254**	0.199***
		(0.094)	(0.095)	(0.045)
Leverage		0.368*	0.365*	-0.407**
		(0.188)	(0.188)	(0.175)
External Capital Reliance		-0.083***	-0.084***	0.016
		(0.029)	(0.028)	(0.015)
Cash		0.008	0.002	-0.269**
		(0.037)	(0.037)	(0.125)
Size		0.062***	0.062***	0.026
		(0.012)	(0.012)	(0.048)
Market-to-Book		0.004	0.004	0.002
		(0.004)	(0.004)	(0.011)
Number Cites		0.016**	0.015**	0.025***
		(0.007)	(0.007)	(0.008)
Patent_Value		0.003	0.003	-0.090***
		(0.023)	(0.023)	(0.016)
Breadth		-0.302**	-0.177*	-0.175***
		(0.119)	(0.094)	(0.054)
ln(Possible Disclosure)		1.698***	1.697***	1.687***
		(0.118)	(0.119)	(0.123)
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	No
Patent Class FE	No	No	Yes	Yes
Firm FE	No	No	No	Yes
Observations	219,667	219,667	219,667	219,667
Adjusted-R^2	0.038	0.139	0.140	0.202

Table 6: Patent disclosure delay under weak IP enforcement regimes

This table presents OLS regressions of patent disclosure delays as a function of a weak enforcement regime. *EDT_Exposure* is an indicator variable equal to one, when firm has a high exposure to IP litigation in the Eastern district of Texas, zero otherwise. *EDT_Non_Exposure* is an indicator variable, when the firm does not have a high exposure to IP litigation in the Eastern district of Texas, zero otherwise. All other variables are defined in Appendix A. All models include controls which are not reported for brevity, as well as industry (Fama-French 48) and interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2003 to 2013 (totaling 400,725 patent observations).

Dependent Var.	*Ln (Days to Disclosure)*	*Percentage Disclosure Delay*	*Disclosure 30 Days before Deadline*
	(1)	(2)	(3)
EDT_Exposure	0.681***	0.208***	0.262***
	(0.089)	(0.028)	(0.037)
EDT_Non_Exposure	0.359***	0.112***	0.125***
	(0.092)	(0.028)	(0.037)
Controls	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	400,725	400,725	400,725
Adjusted-R^2	0.217	0.165	0.168

Table 7: Patent disclosure characteristics under IP litigation

This table presents OLS regressions of patent disclosure characteristics as a function of closed and current IP litigation. Panel A reports results for the effect of current and closed IP litigation. Panel B disaggregates IP litigation into same and different technologies litigated. Same technology is measured when filed and litigated patents are from the same US patent class. I measure patent disclosure characteristics using the patent disclosure quality database of Dyer et al. (2023). All other variables are defined in Appendix A. All models include controls which are not reported for brevity, as well as industry (Fama-French 48) and interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2008 to 2013 (totaling 94,065 patent observations).

Panel A: IP litigation on patent disclosure characteristics

Dependent Var.	*Ln (File Size)*	*Ln (Number Figures)*	*Ln (Number of words)*	*-Ln (FOG Index)*	*Ln (Specificity)*
	(1)	(2)	(3)	(4)	(5)
IP_litigation	-0.002	-0.010	0.037*	-0.003	-0.052***
	(0.015)	(0.025)	(0.020)	(0.004)	(0.014)
Closed_IP_litigation	0.043**	0.037*	0.052**	0.008*	0.016
	(0.019)	(0.019)	(0.025)	(0.004)	(0.025)
Controls	Yes	Yes	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	94,065	94,065	94,065	94,065	94,065
Adjusted-R^2	0.253	0.390	0.269	0.111	0.365

Panel B: Same technology litigated and patent disclosure characteristics

Dependent Var.	*Ln (File Size)*	*Ln (Number Figures)*	*Ln (Number of words)*	*-Ln (FOG Index)*	*Ln (Specificity)*
	(1)	(2)	(3)	(4)	(5)
Same_Tech_Litigated	-0.011	-0.022	0.041**	-0.002	-0.086***
	(0.018)	(0.019)	(0.019)	(0.006)	(0.030)
Same_Tech_Closed	0.087***	0.061*	0.092***	0.009*	0.039
	(0.024)	(0.036)	(0.022)	(0.005)	(0.047)
Different_Tech_Litigated	-0.002	-0.009	0.034	-0.004	-0.045***
	(0.016)	(0.026)	(0.021)	(0.004)	(0.011)
Different_Tech_Closed	0.035	0.034*	0.042	0.008**	0.016
	(0.021)	(0.019)	(0.027)	(0.004)	(0.019)
Controls	Yes	Yes	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	94,065	94,065	94,065	94,065	94,065
Adjusted-R^2	0.253	0.390	0.269	0.111	0.365

Table 8: Robustness Tests

This table presents OLS regressions of patent disclosures in different robustness settings. Panel A reports results of a sample split between the pre- and post-period around the Leahy-Smith Invents Acts of 2011. Panel B reports results of another litigation proxy, *Litigation_environment*. I define *Litigation_environment* using the Francis et al. (1994) industry measure. All other variables are defined in Appendix A. All models include controls, which are not reported for brevity, as well as industry (Fama-French 48) and interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2003 to 2013 (totaling 400,725 observations).

Panel A: Leahy-Smith Invents Act

Dependent Var.	*Ln (Days to Disclosure)*		
	Pre-Period	*Post-Period*	*Difference*
	(1)	(2)	
IP_litigation	0.763***	0.750***	0.012
	(0.095)	(0.088)	(0.622)
Closed_IP_litigation	-0.408***	-0.435***	0.027
	(0.072)	(0.063)	(0.418)
Controls	Yes	Yes	
Patent Class*Year FE	Yes	Yes	
Industry FE	Yes	Yes	
Observations	306,129	94,596	
Adjusted-R^2	0.226	0.213	

Panel B: Litigation environment

Dependent Var.	*Ln (Days to Disclosure)*	*Percentage Disclosure Delay*	*Disclosure 30 Days before Deadline*
	(1)	(2)	(3)
Litigation_environment	-0.061	-0.007	0.003
	(0.123)	(0.043)	(0.068)
Controls	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	400,725	400,725	400,725
Adjusted-R^2	0.183	0.125	0.141

Appendix A: Definitions of variables

Variable	Definition	Source
Dependent variables:		
Ln (Days to Disclosure)	The number of days until the USPTO publishes a patent filing, either at the request of the applicant or because the disclosure deadline passes, less 14 weeks for publication delays.	USPTO examination research database
Percentage Disclosure Delay	The number of days until the disclosure of a patent filing, divided by the number of days until the latest possible disclosure.	USPTO examination research database
Disclosure 30 Days before Deadline	Indicator variable equal to one if patent is disclosed 30 days before the deadline, zero otherwise.	USPTO examination research database
Ln (File Size)	Natural logarithm of a patent file size in bytes.	Dyer et al. (2023)
Ln (Number Figures)	Natural logarithm of the number of figures included in the patent.	Dyer et al. (2023)
Ln (Number of words)	Natural logarithm of the number of words in the written description portion of the patent.	Dyer et al. (2023)
-Ln (FOG Index)	Negative natural logarithm of the Gunning (1952) FOG Index of the patent.	Dyer et al. (2023)
Ln (Specificity)	Natural logarithm of the number of specific pieces of information (quantities, percentages, names) identified in the written description portion of the patent.	Dyer et al. (2023)
IP litigation variables:		
IP_litigation	Indicator variable equal to one if the firm faces a patent lawsuit in the disclosure process of a patent, zero otherwise.	USPTO litigation docket reports database
Closed_IP_litigation	Indicator variable equal to one if firm closed a patent lawsuit one year before the filing of the patent, zero otherwise.	USPTO litigation docket reports database
Same_Tech_Litigated	Indicator variable equal to one if the filed patent is from the same patent class than the litigated patent, zero otherwise. It is identified within current IP litigation.	USPTO examination research database
Same_Tech_Closed	Indicator variable equal to one if the filed patent is from the same patent class than the litigated patent, zero otherwise. It is identified within closed IP litigation.	USPTO examination research database
Different_Tech_Litigated	Indicator variable equal to one if the filed patent is from a different patent class than the litigated patent, zero otherwise. It is identified within current IP litigation.	USPTO examination research database
Different_Tech_Closed	Indicator variable equal to one, if the filed patent is from a different patent class than the litigated patent, zero otherwise. It is identified within closed IP litigation.	USPTO examination research database

Ln(1+IP lawsuit number)	Natural logarithm of the number of filed IP lawsuits in the disclosure process of a patent.	USPTO litigation docket reports database
Ln (1+ litigated patents)	Natural logarithm of the number of patents currently under litigation.	USPTO litigation docket reports database
Valuable_Patent_litigated	Indicator variable equal to one, if a valuable patent is litigated, zero otherwise. I measure valuable patents using the Kogan et al. (2017) database. Valuable patents is equal to one if the market value of the litigated patent is above the median of all litigated patents, zero otherwise.	USPTO litigation docket reports database / Kogan et al. (2017)
Negative_IP_Reaction	Indicator variable equal to one if the patent is filed under a lawsuit with a severe negative capital market reaction, zero otherwise. I measure a severe capital market reaction using the capital market reaction around the filing of the IP lawsuit using a market model around a three day event window [-1,+1].	USPTO litigation docket reports database/ CRSP
Late_Disc_IP_litigation	Indicator variable equal to one, if the patent is filed under current IP litigation and the patent disclosure decision is late, zero otherwise. I measure late disclosure when the disclosure delay is in 75th percentile of the distribution of the variable *Ln (Days to Disclosure)*.	USPTO litigation docket reports database
Early_Disc_IP_litigation	Indicator variable equal to one, if the patent is filed under current IP litigation and the patent disclosure decision is early, zero otherwise. I measure late disclosure when the disclosure delay is in 25th percentile of the distribution of the variable *Ln (Days to Disclosure)*.	USPTO litigation docket reports database
Late_Disc_closed_IP_litigation	Indicator variable equal to one, if the patent is filed under closed IP litigation and the patent disclosure decision is late, zero otherwise. I measure late disclosure when the disclosure delay is in 75th percentile of the distribution of the variable *Ln (Days to Disclosure)*.	USPTO litigation docket reports database
Early_Disc_closed_IP_litigation	Indicator variable equal to one, if the patent is filed under closed IP litigation and the patent disclosure decision is early, zero otherwise. I measure late disclosure when the disclosure delay is in 25th percentile of the distribution of the variable *Ln (Days to Disclosure)*.	USPTO litigation docket reports database
ICT_Patent	An indicator variable equal to one if the patent is assigned to the "computer & communications" industry category, zero otherwise. I define the computer industry category using the NBER patent classification following Hall et al. (2001).	USPTO examination research database
Post	Indicator equal to one, if a patent has been filed after the *eBay vs. MercExchange* lawsuit, zero otherwise. The case was closed in the second quarter of 2006, i.e. on May 30th, 2006.	USPTO examination research database
EDT_Exposure	Indicator variable equal to one, if firm has high exposure to IP lawsuits in the Eastern District of Texas (EDT), zero otherwise. I measure exposure by the fraction of the number IP lawsuits faced in EDT to total IP lawsuits. Exposure is high when the fraction is above the median.	USPTO litigation docket reports database

EDT_Non_Exposure	Indicator variable equal to one, if firm does not have high exposure to IP lawsuits in the Eastern District of Texas, zero otherwise.	USPTO litigation docket reports database
Litigation_environment	Indicator variable equal to one for high litigation risk industries, zero otherwise, as defined in Francis et al. (1994).	Compustat

Control variables:

HHI	The natural logarithm of the sum of the squared market share of each publicly traded firm in a particular four-digit SIC code in a given year. Market share is calculated as the sales of a particular firm divided by the total Compustat sales of the SIC code.	Compustat
Fluidity	Measure captures how rivals are changing the product words that overlap with firm i's vocabulary. Thus, it captures product market threats in a specific industry segment.	Hoberg et al. (2014)
Loss	Indicator variable equal to one if net income is negative, zero otherwise.	Compustat
ROA	Income before extraordinary items divided by total assets.	Compustat
R&D	R&D expenditures scaled by total assets. Missing values of research & development expenditures are replaced with zeroes.	Compustat
Missing R&D	Indicator variable equal to one if firm has missing research & development expenditures, zero otherwise (Koh and Reeb, 2015).	Compustat
Leverage	Sum of short-term debt and long-term debt scaled by total assets.	Compustat
External Capital Dependence	Capital expenditures plus R&D expenditures minus operating activities net cash flow, divided by capital expenditures plus R&D expenditures (Rajan and Zingales, 1998).	Compustat
Cash	Cash and cash equivalents divided by total assets.	Compustat
Size	Natural logarithm of total assets.	Compustat
Market-to-Book	Market value of equity divided by common shareholder equity.	Compustat/ CRSP
Number Cites	The natural logarithm of 1 plus the number of citations the patent receives from subsequent patents.	Kogan et al. (2017)
Patent_Value	The natural logarithm of the patent value estimated with the capital market reaction around the granting date.	Kogan et al. (2017)
Breadth	The natural logarithm of the technological breadth of a patent. It indicates whether a patent can also be used in other patent categories using the description section of a patent. For more details on the variable construction, see Bowen et al. (2023).	Bowen et al. (2023)
ln(Possible Disclosure)	The number of days until the patent application must be published (for applications seeking foreign protection, the earlier of 18 months after filing abroad and the patent decision date, and for all others, the application decision date).	USPTO examination research database

Appendix B: Patent disclosure of Biogen Inc.

This appendix presents the cover page of the patent number 9506867 filed by Biogen Inc. The patent was filed with the USPTO on December 11th, 2013 and granted on November 29th, 2016. Biogen Inc. decided to disclose the patent on July 3rd, 2014.

US009506867B2

(12) **United States Patent**
Moretto et al.

(10) **Patent No.: US 9,506,867 B2**
(45) **Date of Patent: Nov. 29, 2016**

(54) **SPECTROSCOPIC ANALYSIS OF NUTRIENT MATERIALS FOR USE IN A CELL CULTURE PROCESS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 69 days.

(21) Appl. No.: **14/103,801**

(22) Filed: **Dec. 11, 2013**

(65) **Prior Publication Data**

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(52) **U.S. Cl.**
CPC ***G01N 21/65*** (2013.01); ***G01J 3/44*** (2013.01)

(58) **Field of Classification Search**
CPC G01J 3/44; G01N 21/65
See application file for complete search history.

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(57) **ABSTRACT**

In some embodiments, aspects of the disclosure relate to methods of evaluating cell culture materials, for example, nutrient materials, or other materials that can be used in cell culture media.

14 Claims, 5 Drawing Sheets

Appendix C: Robustness tests patent disclosure delays under IP litigation

This table presents robustness tests of baseline OLS regressions of patent disclosure as a function of closed and current IP litigation presented in Table 2. Panel A estimates Table 2 without the pharmaceutical industry, while Panel B estimates Table 2 with firm- instead of industry fixed effects. Panel C estimates the effects without the two major industries "Business Services" & "Electronic Equipment", while Panel D estimates the effects within those two industries. All other variables are defined in Appendix A. All models include controls, which are not reported for brevity, as well as interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2003 to 2013 (totaling 400,725 observations).

Panel A: Pharmaceutical industry excluded

Dependent Var.	*Ln (Days to Disclosure)*	*Percentage Disclosure Delay*	*Disclosure 30 Days before Deadline*
	(1)	(2)	(3)
IP_litigation	0.768***	0.233***	0.291***
	(0.089)	(0.023)	(0.028)
Closed_IP_litigation	-0.422***	-0.126***	-0.158***
	(0.070)	(0.017)	(0.022)
Controls	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	386,010	386,010	386,010
Adjusted-R^2	0.212	0.165	0.159

Panel B: Firm fixed effects

Dependent Var.	*Ln (Days to Disclosure)*	*Percentage Disclosure Delay*	*Disclosure 30 Days before Deadline*
	(1)	(2)	(3)
IP_litigation	0.982***	0.298***	0.363***
	(0.084)	(0.020)	(0.028)
Closed _IP_litigation	-0.076**	-0.018**	-0.020**
	(0.028)	(0.007)	(0.009)
Controls	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	400,725	400,725	400,725
Adjusted-R^2	0.273	0.239	0.239

Panel C: Business Services & Electronic Equipment industries excluded

Dependent Var.	*Ln (Days to Disclosure)*	*Percentage Disclosure Delay*	*Disclosure 30 Days before Deadline*
	(1)	(2)	(3)
IP_litigation	0.636***	0.208***	0.253***
	(0.069)	(0.022)	(0.034)
Closed _IP_litigation	-0.311***	-0.100***	-0.125***
	(0.052)	(0.017)	(0.022)
Controls	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	201,970	201,970	201,970
Adjusted-R^2	0.296	0.218	0.222

Panel D: Business Services & Electronic Equipment industries only

Dependent Var.	*Ln (Days to Disclosure)*	*Percentage Disclosure Delay*	*Disclosure 30 Days before Deadline*
	(1)	(2)	(3)
IP_litigation	0.964**	0.275**	0.339**
	(0.061)	(0.019)	(0.018)
Closed _IP_litigation	-0.577**	-0.166***	-0.208**
	(0.010)	(0.001)	(0.006)
Controls	Yes	Yes	Yes
Patent Class*Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	198,755	198,755	198,755
Adjusted-R^2	0.169	0.143	0.132

Appendix D1: Growth vs. mature firms

This table presents OLS regressions of patent disclosures as a function of IP litigation risk conditional being a growth or mature firm using sample splits. I use the cash flow statement classification of Dickinson (2011) and Vorst and Yohn (2018) to separate firms into growth and mature firms. All variables are defined in Appendix A. All models include controls which are not reported for brevity, as well as industry (Fama-French 48) and interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2003 to 2013 (totaling 400,725 observations).

Dependent Var.	*Ln (Days to Disclosure)*			*Percentage Disclosure Delay*			*Disclosure 30 Days before Deadline*		
	Growth Firms	Mature Firms	Difference	Growth Firms	Mature Firms	Difference	Growth Firms	Mature Firms	Difference
	(1)	(2)		(3)	(4)		(5)	(6)	
IP_litigation	0.952***	0.742***	0.210**	0.281***	0.229***	0.051**	0.345***	0.282***	0.062**
	(0.135)	(0.068)	(0.035)	(0.035)	(0.016)	(0.043)	(0.040)	(0.024)	(0.036)
Closed_IP_litigation	-0.408***	-0.401***	0.007	-0.113***	-0.122***	-0.009	-0.135***	-0.152***	-0.017
	(0.074)	(0.057)	(0.817)	(0.017)	(0.015)	(0.383)	(0.024)	(0.021)	(0.473)
Controls	Yes	Yes		Yes	Yes		Yes	Yes	
Patent Class*Year FE	Yes	Yes		Yes	Yes		Yes	Yes	
Industry FE	Yes	Yes		Yes	Yes		Yes	Yes	
Observations	82,165	318,158		82,165	318,158		82,165	318,158	
Adjusted-R^2	0.256	0.225		0.222	0.172		0.203	0.176	

Appendix D2: Origination versus continuation patents

This table presents OLS regressions of patent disclosures as a function of IP litigation risk conditional on being an origination or continuation patent using sample splits. All variables are defined in Appendix A. All models include controls which are not reported for brevity, as well as industry (Fama-French 48) and interacted patent class with filing year fixed effects (Patent Class*Year FE). Standard errors are reported in round parentheses below each coefficient estimate, with standard errors clustered by industry. The ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. The period of observation is from 2003 to 2013 (totaling 400,725 observations).

Dependent Var.	*Ln (Days to Disclosure)*			*Percentage Disclosure Delay*			*Disclosure 30 Days before Deadline*		
	Original Patent	Contin. Patent	Difference	Original Patent	Contin. Patent	Difference	Original Patent	Contin. Patent	Difference
	(1)	(2)		(3)	(4)		(5)	(6)	
IP litigation	0.150***	0.538***	0.388***	0.060***	0.184***	0.124***	0.090***	0.128***	0.038
	(0.026)	(0.044)	(0.000)	(0.010)	(0.014)	(0.000)	(0.015)	(0.027)	(0.321)
Closed_IP_litigation	-0.081***	-0.262***	-0.181***	-0.030**	-0.092***	-0.063***	-0.046**	-0.080***	-0.034
	(0.028)	(0.054)	(0.000)	(0.013)	(0.017)	(0.000)	(0.020)	(0.027)	(0.403)
Controls	Yes	Yes		Yes	Yes		Yes	Yes	
Patent Class*Year FE	Yes	Yes		Yes	Yes		Yes	Yes	
Industry FE	Yes	Yes		Yes	Yes		Yes	Yes	
Observations	209,931	190,295		209,931	190,295		209,931	190,295	
Adjusted-R^2	0.103	0.463		0.106	0.171		0.010	0.104	

Under the Radar?
Discretionary Impairments of Finite and Indefinite Intangible Assets

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Under the Radar?
Discretionary Impairments of Finite and Indefinite Intangible Assets

Abstract

The recognition and measurement of acquired intangible assets remains controversial. While the proponents of recognition point to the economic importance of these assets, opponents are concerned that post-acquisition accounting can lead to inflated asset values and untimely impairments. Using hand-collected data on acquired intangible assets, we exploit the different accounting treatments of finite and indefinite intangible assets and goodwill to explore how impairment practices differ across these asset categories. We find that reporting incentives have a significant impact on the impairment decision for acquired intangibles. Next, internal monitoring strongly moderates the likelihood of timely impairments for indefinite intangibles for firms that face high impairment pressure, indicating the role of corporate governance in enhancing the reporting quality of intangibles. Further, we find that during conference calls, the media and analysts do not pay sufficient attention to the impairment decisions of indefinite intangibles, suggesting lesser monitoring of intangible impairments. Thus, impairments of intangible assets remain under the radar of external monitors and firms with weaker internal corporate governance exploit the discretion in the impairment testing. We contribute to the literature on post-merger accounting by providing empirical evidence that impairment indicators differ between finite and indefinite intangibles and goodwill. Our findings suggest that it is not necessary to abandon the impairment-only approach to achieve more timely impairments. However, stronger corporate governance and effective external monitoring can contribute to timely impairments. Given the growing importance of intangibles, our findings are relevant to accounting regulators, analysts, auditors, and investors in assessing the risk of impairment of intangibles.

Keywords: *Intangibles; post-acquisition accounting; impairment; goodwill; financial reporting.*

Data availability: Data are available from the public sources cited in the text.

1. Introduction

Intangible assets are important drivers of firm performance and value (Crouzet and Eberly 2023; Peters and Taylor 2017).[1] They are recognized on the balance sheets following business combinations or individual acquisitions (SFAS 141/142) and allow investors to assess the post-merger performance based on the purchased knowledge, technologies, or customer assets.[2] Despite the growing importance of intangible assets, there is limited prior research on whether and how impairments of intangible assets differ among finite and indefinite intangibles and goodwill. We argue that it is important to separately examine the finite and indefinite intangibles to shed light on the trade-offs between the two approaches currently used in accounting for intangible assets: the "impairment-only" approach used for indefinite intangibles and the combination of "amortization and impairments" approach used for finite intangibles.[3]

Our study has three objectives. First, we examine the relation between the impairment of finite and indefinite intangible assets and the firm's reporting quality and its business characteristics. Second, we examine whether internal monitoring moderates the link between impairment pressure and intangible asset impairments. Third, we examine whether external

[1] In 2018, the intangible value of all companies on the S&P 500 Index was $21.03 trillion. During the same year, the value of tangible assets of the same companies was only $4 trillion.

[2] Finite intangibles mainly cover acquired technology and patents, customer relationships- and lists, contract-related intangibles such as franchises or land- or water rights, finite trademarks, and non-compete agreements. They are amortized over the respective lifetime. Indefinite intangibles, on the other hand, mainly consist of indefinite trademarks and brands, (FCC) licenses, and in-process R&D. They are subject to an annual impairment test.

[3] There are several reasons to expect differences in firms' impairment decisions across the different types of intangibles and goodwill. First, impairment test procedures differ among different assets. While goodwill impairment tests are carried out on the level of the reporting unit, non-goodwill intangible assets are tested directly on the asset or asset group level. Therefore, managers can exercise more discretion in estimating the future cash flows for the goodwill position (Ramanna and Watts 2012) than for other intangible assets. Second, finite-lived intangibles follow the amortization and impairment approach, whereas the indefinite-lived intangibles share the impairment only approach with the goodwill. Differences between the finite and the indefinite intangibles thereby highlight differences between the impairment models and can also inform the discussion about the goodwill accounting (Ramanna and Watts 2012; Li and Sloan 2017; Beatty et al. 2024). Third, goodwill is harder to audit than non-goodwill intangibles (Ayres et al. 2019b), resulting in fewer impairment of non-goodwill intangibles. Fourth, the personal consequences of impairments to the firm's managers might vary by the type of intangible asset. We expect managers to evaluate the relative costs of recognizing an impairment versus delaying the impairment. If some impairments receive more investor attention than others, managers might prioritize these impairments of some assets over others.

monitoring affects the timeliness of impairments. To further understand the role of external monitoring, we investigate the extent to which information on an impairment of intangibles with finite and indefinite lives are featured in conference calls and the media coverage as prominent external monitoring devices. Such coverage affects both the costs and benefits of the use of discretion and are likely to influence managers' impairment decisions.

To examine our research questions, we use a hand-collected U.S. sample of acquired intangible assets for 7,090 firm-years between 2002 and 2020. This sample allows us to separate acquired intangible assets from goodwill and disaggregate the carrying values and the impairments of acquired intangible assets into different economic lifetimes. In particular, impairments of both finite and indefinite intangible assets appear almost as likely as goodwill impairments do.

We document several key findings. First, with regard to the determinants of impairments of acquired intangible assets, we find that the indicators of impairment vary by the type of intangible asset. We find a strong association between impairment and reporting quality variables for the indefinite intangible assets and goodwill, but not for the finite intangible assets. Next, we find a weaker association of many business characteristics with impairments for both finite and indefinite intangible assets relative to goodwill. In contrast, indefinite intangible assets seem to be impaired earlier than goodwill because we find a higher probability of impairment for this type of intangibles in years directly after a merger or an acquisition. Our results suggest that the impairment tests for non-goodwill intangible assets are at least as affected by managerial discretion and susceptible to reporting opportunism as is the impairment of goodwill, yet firms apply discretion differently than for goodwill.

Second, we find that the association between recognizing intangible asset impairments, and the impairment pressure is increasing in stronger internal monitoring mechanisms. Using book-to-market ratios and an indicator variable for a book-to-market ratio above one as our measures of

impairment pressure, we find increasing effects in a higher share of accounting experts on the non-executive board and after CEO turnovers and decreasing effects in the busyness of board members and executives' variable compensation. Overall, these results support the notion that internal monitoring moderates managerial discretion in impairment decisions.

Third, we find a weaker moderating effect of external monitoring as approximated by the analyst and media following and the share of institutional investors. This can be explained by how analysts, institutional investors, and the media allocate their attention. We find that intangible asset impairments receive less attention than goodwill impairments in the Q&A section of earnings conference calls and are not associated with negative tone in earnings news' coverage by the media. Moreover, we find that media tone of earnings news coverage is more negative for goodwill impairments than for impairments of finite intangibles; results for impairment of indefinite intangibles are weak or insignificant.

We make several contributions to the literature. First, we contribute to the growing literature on the measurement and reporting of acquired intangible assets. While there is a large literature on the effects of internally generated intangible capital such as R&D or advertising expenditures (Roychowdhury 2006; Dechow and Sloan 1991; Bushee 1998; Crouzet and Eberly 2023; Peters and Taylor 2017), less is known about acquired intangible assets, mostly due to data unavailability (Vitorino 2014). Yet, the accounting for acquired intangible assets is widely debated among standard setters since the introduction of SFAS 141/142 in 2001. While several papers investigate benefits of capitalizing intangible assets on the balance sheet (Wyatt 2005; Landsman et al. 2021; King et al. 2023; McInnis and Monsen 2021), little is known on the subsequent measurement of intangible assets and the discretion within those estimates. Beatty et al. (2024) compare impairments of goodwill and finite intangible assets and conclude that the impairment only approach does not cause inflated values for goodwill. We complement Beatty et al. (2023) by

focusing stronger on the indefinite intangible assets and by investigating potential ways to mitigate the use of discretion in the impairment of intangible assets only approach. Our findings inform regulators by providing first evidence on the determinants and consequences of acquired intangible impairments. Specifically, we show that internal corporate governance mechanisms are effective in increasing the timeliness of impairments, whereas external monitoring cannot fulfill this role that well. We further highlight an important trade-off between the impairment only approach and the amortization and impairment approach: while the amortization makes the impairments of finite intangible assets less susceptible for managerial discretion, these impairments show only a low association with the business characteristics, a finding that holds even for firms with strong governance. Thus, annual amortization reduces the information content of the impairment charges for investors. Our findings are relevant to standard setters in evaluating the trade-off among the different alternatives to accounting for intangibles.

Second, we contribute to a large literature in impairments of non-financial assets. While the literature only investigates (the impairment of) the loosly-related goodwill impairments (Glaum et al. 2018; Li and Sloan 2017; Kim 2023; Ramanna and Watts 2012), we are the first to study acquired intangible asset impairments with detail. A separate examination of the impairments of acquired intangibles is important because the impairment procedures and tests of intangible asset impairments substantially differ from those of goodwill. In line with these differences, Landsman et al. (2021) document differences in the value relevance of different types of intangibles. The closest study to ours is Riedl (2004). While Riedl (2004)´investigates the determinants of asset impairments, which includes finite intangible asset impairments, we are the first to investigate intangible asset impairments in detail for a larger sample of firms based on recent data. Further, we provide large sample evidence on differing motives between intangible asset impairments and goodwill.

Third, we contribute to the nascent literature on how analysts and media perceive impairments by providing evidence that impairments of non-goodwill intangible assets receive less attention from analysts compared to goodwill impairments. Similarly, we find that the media tone of earnings news coverage is less negative for the impairment of indefinite intangibles compared to an impairment of goodwill. This is in contrast to our finding that internal monitoring mechanisms work similarly for indefinite intangibles and goodwill.

2. Institutional background and accounting for acquired intangible assets

Intangible assets are non- financial assets that lack physical substance (ASC 350). Both ASC 805 (SFAS 141) and ASC 350 (SFAS 142) address the accounting for acquired intangible assets like customer lists and relationships, developed technologies, software, trademarks and tradenames, and similar assets. In particular, the standards mandate the capitalization of intangible assets if they are acquired in a business combination or as a separate acquisition. This is in contrast to internally generated intangible assets which are expensed when incurred.[4] The Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) continue to debate on whether the accounting for acquired intangibles should be updated given their rising importance to firms' balance sheets as well the ongoing criticism by many practitioners and academics (Landsman et al. 2021). Among the topics debated is the subsequent measurement of intangible assets, including the impairment of acquired intangible assets.

The subsequent measurement of intangible assets depends on their expected useful life. Indefinite acquired intangible assets can either have an indefinite economic lifetime or a clearly determined, finite economic lifetime. The economic lifetime can be assessed through their legal, regulatory, or contractual duration, or their expected uses (ASC 350-30-35-3). Acquired intangible

[4] One exception is internally generated software that can be capitalized under certain conditions. However, we do not include these capitalized costs in our variables.

assets with a finite useful life are amortized over their remaining lifetime (for a more detailed description, see Reilly and Schweihs (2014)). Only in the case of unforeseen events or circumstances (e.g., a significant decrease in market value or negative cash flows from the underlying intangible asset), finite intangibles are also tested for impairment when an impairment may be probable (ASC-360-10-35-21). Acquired intangible assets with indefinite useful life are not amortized but are subject to annual impairment testing (ASC 350-30), following the subsequent measurement method of goodwill.

The economic lifetime is also crucial for the determination of the procedure and order of the impairment test. According to the guidance laid out in ASC-350-20-35-31 and ASC 360-10-35-27, firms have to evaluate their assets for impairment in the following order:

- First, an entity should test all *individual assets* for impairment. Indefinite intangible assets fall under this category, as well as inventory and financial instruments (ASC 360).
- Second, an entity should test *asset groups* for impairment (ASC 360). Finite intangible assets like customer lists and developed technology fall under this definition.
- Third, goodwill is tested for impairment on the *reporting unit* level (ASC 350).

In the impairment test for indefinite acquired intangibles with an undetermined economic lifetime, the fair value of the underlying intangible asset is compared with the carrying amount. Firms have to recognize an impairment loss when (1) the carrying amount of an acquired indefinite intangible asset is not recoverable and (2) the carrying amount of an indefinite acquired intangible asset exceeds its fair value. The unit of accounting is usually the individual indefinite intangible asset. Therefore, indefinite intangible assets are among the first assets being evaluated for impairment. Because intangibles typically lack market benchmarks, the impairment test of their carrying amounts involves managerial discretion and a substantial amount of judgement.

For acquired intangible assets with finite useful life, the impairment steps follow the provision of ASC 360 "*Accounting for the Impairment of Long-Lived Assets and for Long-Lived Assets to Be Disposed of"*. One key distinction from indefinite intangible assets is that the reassessment of the carrying amount occurs only following certain events. In contrast to the impairment test for indefinite intangible assets, testing for impairments for finite intangibles is carried out at the asset group level. That means that this procedure appears after testing indefinite intangibles but before the goodwill impairment.

Both impairment test procedures substantially differ from the goodwill impairment test, which is carried out on the reporting unit level. Unlike an individual asset or an asset group, a reporting unit must be a business with discrete financial information available that engages in business activities from which it recognizes revenues and expenses. Since 2012, entities have the possibility to do first a qualitative approach to see whether goodwill impairments are needed to reduce the costs of expensive and time-consuming quantitative goodwill impairment tests. Before the revision of the goodwill impairment standard in 2017 (ASU 2017-04), testing for a goodwill impairment has been carried out in a two-step procedure. In 2017, the FASB eliminated the second step simplifying the accounting for the goodwill.

Over our sample period, acquired intangible asset impairments occur frequently. Impairments of indefinite intangibles are recognized in 18.4 percent of all firm-years, whereas impairments of finite intangibles are recognized in about 8 percent of all firm-years. In comparison, goodwill is impaired in about 19 percent of our firm-years. Thus, impairments of acquired intangibles appear almost as frequently as goodwill impairments do.

3. Research questions

Given the exploratory nature of our study, we seek to answer three research questions concerning the impairment of intangible assets. Our research questions focus on the determinants

of impairment, the role of internal and external monitoring in moderating impairment, and the perception and the coverage of impairments by the media and analysts. We examine these questions separately for intangibles with indefinite lives, finite lives, and goodwill. We discuss our research questions below.

RQ1: What are the determinants of recognition of impairments of intangibles with finite lives, indefinite lives, and goodwill?

The nature and procedures of the impairment tests suggest two broad categories of determinants for intangible asset impairments. The first set of determinants are reporting (accounting) quality variables. If managers use discretion to opportunistically time the impairments, we expect an association between impairments and reporting quality. The second set of determinants comprises variables that represent the business characteristics of a firm. If business characteristics deteriorate, there should be a higher likelihood of an impairment of an asset. Yet, while disaggregated estimates of the recoverable amounts for each individual acquired intangible asset is not publicly available, their aggregated amounts should still correlate with firm-level metrics of performance and risk (Crouzet et al. 2022; Crouzet and Eberly 2023).

Prior research on impairments of intangible assets focuses predominantly on goodwill impairments (Glaum et al. 2018; Kim 2023; Li and Sloan 2017). There is very little research that investigates firms' impairment decisions of finite and/or indefinite intangible assets but there are good reasons to expect substantial differences in the impairments of finite and/or indefinite intangible assets compared to goodwill. Beatty et al. (2024) is a rare exception that benchmarks the impairment of goodwill and its impairment-only approach to finite lived intangibles that follow the amortization approach. In contrast to Beatty et al. (2024) which focus mainly on the goodwill accounting, our focus is on intangible assets with finite and indefinite lives. Managers have substantial discretion in testing intangible assets for impairment (see Section 2). This is because these assets are normally not traded on active markets, so that managers have to estimate future

expected cash flows. If managers make use of this discretion to opportunistically time the impairments, we expect an association between impairments and financial reporting quality. We have no expectation for which type of intangible assets the association will be strongest. On the one hand, finite intangibles by construction have a shorter useful life than indefinite intangibles (and goodwill), so the discretion is smaller because the internal valuation model has a shorter time horizon. Moreover, a shorter useful life does not allow large variation in the timing of impairments. Finally, these intangibles are amortized, resulting in a steady decrease of the book value independent of any impairments and Li and Sloan (2017) document that goodwill impairments became more discretionary after the introduction of the impairment only approach. On the other hand, finite intangibles are tested for impairment as part of a group of assets, which increases the discretion. We expect that the discretion for both types of acquired intangibles is smaller than for goodwill, which has an indefinite useful life and is tested on the level of the reporting unit. Moreover, any cash flows from (unrecognized) internally generated goodwill will inevitably reduce the impairment pressure for goodwill, whereas it is possible to separate the identifiable intangible assets from the already existing unrecognized goodwill.

While we do not make a prediction for which type of intangibles the use of discretion will be strongest, we expect some use of managerial discretion in the timing of impairment decisions for all types of intangible assets. The literature on goodwill impairments shows an association between impairments and manager incentives, which points towards the use of managerial discretion in the timing of impairment decisions. For example, Beatty and Weber (2006) a link between impairment decisions and debt covenants, compensation contracts, and CEO tenure. Similarly, Glaum et al. (2018) document the importance of CEO compensation concerns and preferences for smooth earnings to determine goodwill impairments. Caplan et al. (2018) finds a higher impairment probability if the acquisition took place in a year with an internal control

deficiency. Because intangible asset impairment decisions share similar characteristics with the impairment of goodwill, the empirical evidence from the goodwill impairment can also inform intangible impairment decisions.

Next, we consider the role of firm attributes in recording impairment of intangibles. Firm's business characteristics determine the value of firm's acquired intellectual capital (Crouzet et al. 2022) and, in the absence of managerial discretion, should explain impairment incidences. That is, losses, low revenue growth, or a low book-to-market ratio should be associated with impairment incidences. However, we expect substantial variation in which business characteristics are associated with impairments across the types of intangibles. For example, the finite intangible assets, such as patents on the current products, closely relate to current sales growth whereas the value of indefinite intangible assets, such as in-process R&D, better relates to long-term growth opportunities that is captured by the firm's market value.

RQ2: Do internal monitoring mechanisms moderate the recognition of impairments of intangibles?

To further explore the link between managerial discretion and intangible impairments, our second research question deals with the role of internal monitoring. The objective of a firm's monitoring system is to align the incentives of the shareholders, the board, and the management (Armstrong et al. 2010). Stronger corporate governance disciplines managers in engaging in less opportunistic accounting practices (Bushman et al. 2004; García Lara et al. 2009) and lead to more frequent and timely intangible asset impairments (Kim 2023; Li and Sloan 2017). Therefore, we expect that firms with better governance will react more strongly to impairment indicators like a high book-to-market ratio, whereas firms with weak monitoring can evade impairments. In contrast, if firms do not use discretion to opportunistically time the impairments, we do not expect a moderating effect of monitoring.

For goodwill, there is strong evidence for a moderating effect for internal monitoring with impairment pressure on goodwill impairment. For example, there is evidence that auditors (Carcello et al. 2020; Lobo et al. 2017; Favere-Marchesi and Emby 2018; Stein 2019) and the board composition (Shepardson 2019) affect the probability to record a goodwill impairment. We are not aware of any research that investigates whether firms' governance system affects non-goodwill intangible assets but expect that intangible impairment decisions involve at least some degree of managerial discretion. Consequently, we expect that the literature on monitoring in the context of goodwill impairments also informs the impairments of intangible assets.

RQ3: Do external monitoring mechanisms moderate the recognition of impairments of intangibles?

Our third research question deals with the firms' incentives to recognize or forgo an impairment for acquired intangible assets stemming from external monitoring. If capital markets and other stakeholders perceive an impairment as bad news, managers benefit from delaying the impairment because it reduces capital market pressure. At the same time, using discretion creates costs for the managers, even if it does not cross the threshold to fraud (Dechow et al. 2010). Accordingly, managers will evaluate the costs and benefits in deciding whether to use discretion in an impairment decision.

Prior research documents how external monitoring affects the probability to recognize impairment losses for goodwill. For example, there is evidence that analysts (Ayres et al. 2019a), institutional shareholders (Cheng et al. 2010), the strength of a countries enforcement system (Glaum et al. 2018), PCAOB inspections (Kim 2023) and the use of external valuation experts (Gietzmann and Wang 2020) affect the impairment probability. We focus in our third research question on analysts and the media because we can directly observe how these external monitors cover the impairments of intangible assets. Additionally, we also look at institutional investors as a well-researched form of external corporate governance.

The business press is an important information intermediary that disseminates information and creates new information over and above accounting information (Bushee et al. 2010; Guest 2021; Hope et al. 2021; Bushman and Pinto 2023). Similarly, analyst participation in conference calls increases the informativeness of financial information, particularly when the firm's performance is poor (Matsumoto et al. 2011). If impairments are perceived as bad news and covered by the business press and/or in conference calls, the costs of those impairments for the manager are relatively high and also the incentives to delay impairments are high. In contrast, if the impairments do not attract coverage, managers have only low incentives to delay impairments.

At the same time, media and conference call coverages not only disseminate information, but also act as a watchdog for accounting fraud (Miller 2006; Dyck et al. 2008). If journalists and analysts realize that the asset value decreased already in previous periods, but the manager used discretion to delay an impairment, the coverage of the actual impairment will be particularly negative, and the costs of the impairment will be relatively high. Thus, if discretionary reporting decisions are actively discussed and questioned during a conference call, we expect managers to use managerial discretion in a less opportunistic way. Similarly, if discretionary impairments heavily trigger negative media coverage, we also expect a less opportunistic use of managerial discretion. Consequently, we are interested in how the impairment decision of intangible assets changes the attention on intangible assets during conference calls and how it affects the media tone of earnings-related news.

Goodwill impairments are well known for their presence in conference calls and in earnings news. Prior literature shows negative stock market reactions (Bens et al. 2011; Knauer and Wöhrmann 2016; Li et al. 2011), downward revisions of analyst forecasts (Li et al. 2011) and a higher likelihood of CEO turnover (Cowan et al. 2023) following goodwill impairments. We are not aware of similar analyses for non-goodwill intangibles. However, analysts and journalists are,

akin all market participants, attention and capacity constraint (Blankespoor et al. 2020). They cannot focus on all relevant factors during conference call questions or in their news article, but they have to focus on a few factors that are relevant to their work, e.g. making better analyst forecasts (Barron et al. 2002) or writing more interesting news articles for their readers (Gentzkow and Shapiro 2010).

Because analysts frequently exclude extraordinary items and special asset impairments, such as the impairments of acquired intangible assets, from their forecasted earnings "street" (Brown et al. 2015), we expect that analysts focus on other aspects with a more direct influence on their earnings forecast (Brown et al. 2015) if they ask a question during a conference call. Similar to analysts, we expect that also the media coverage of earnings news picks-up the information from the impairments of acquired intangible assets less prominently and thereby allow managers to use managerial discretion without intensive public discussions. Although the media might serve as a watchdog (Miller 2006), most immediate earnings news coverage is done by computer algorithms that reiterate firms' disclosures (Blankespoor et al. 2018). Additional background articles that are provided by journalists rely on the journalist's attention and experiences in discovering special topics in firms' financial statements that attract sufficient attention from their readers. Because journalists are highly attention and capacity constraint, they might focus on topics that were attention grabbing in the past, such as the more heavily debated goodwill impairments, but neglect more detailed impairments, such as those of acquired intangible assets.

4. Research design

Determinants analysis

To investigate the determinants of the impairments of intangible assets, we estimate a linear probability model, where the *Impair: Indefinite Int, Impair: Finite Int, Impair Share: Indefinite Int.* and *Impair Share: Finite Int.* in period t+1 serve as our dependent variables. The first pair of variables take the value of one when *indefinite or finite intangible* assets are impaired in the next

period, and zero otherwise. The binary specification of our dependent variables closely resembles the main approaches used by Riedl (2004) and Glaum et al. (2018) on the impairment incidences of the goodwill. The second pair of variables use a continuous specification as used by Li and Sloan (2017), Glaum et al. (2018), and Kim (2023) to capture the impairment amounts. To benchmark our findings, we also investigate the occurrence of goodwill impairments. Therefore, we define *Impair: Goodwill* as a binary variable taking the value of one when goodwill is impaired, zero otherwise and *Impair Share: Goodwill* as its continuous form.

We estimate a linear probability model in our main specifications and report probit models only in the appendix because probit and logit models can face the incidental parameter problem when using large numbers of fixed effects (deHaan et al. 2023; Greene 2019) and they do not allow to compare coefficients between our different impairment specifications and with interaction terms easily (Kuha and Mills 2020).[5]

We include several explanatory variables that we expect to be associated with future impairments of finite and indefinite intangible assets. Our first set of impairment determinants are variables that measure the firm's reporting quality and reporting incentives. If firms use discretion in their impairment decisions, we expect an association with those proxies. We construct five measures for reporting quality of firms: the financial statement divergence score, *Amiram MAD (*Amiram et al. 2015*)*, the existence of an internal control weakness, *WEAK 404* (Costello and Wittenberg-Moerman 2011; Caplan et al. 2018), and an audit opinion that is anything else than a standard unqualified opinion, *Audit Opinion* (Hribar et al. 2014). To avoid any mechanical reverse effects from the impairment on the three reporting quality measures *(Amiram MAD, WEAK 404*, *Audit Opinion*), we measure these variables in period t to explain the impairment incidences of

[5] Our inferences remain unchanged if we use a probit model instead of a linear probability model (see Table C2 in the Appendix C).

acquired intangibles in period t+1. Lastly, we capture earnings management incentives from well-known discontinuities within the earnings distribution for earnings smoothing (*Smooth*) and big bath accounting (*Earns Bath*) following Riedl (2004) and Glaum et al. (2018). Because the earnings management incentives directly apply to the impairment period and are not mechanically affected by the impairments, we measure these variables in period t+1.

Our second set of impairment determinants are variables that capture the firm's business characteristics. In the absence of managerial discretion, these characteristics indicate impairment pressure. We include variables for merger or acquisition incidences in period t *(M&A)*, the book-to-market ratio (*BTM*), the firm's current profitability (*RoA before Impairm.*), firm size using the logarithm of total sales (*Size)*[6], growth in sales (*Sales Growth)*, leverage (*Leverage)*, the number of business segments as a measure of complexity (*# Business Segments)*, the research and development spending (*R&D Spending)*, inventory and receivables (*Inventory & Receivables)*, and default risk using the *Altman's Z* score (*Altman Z*). We also control for the net amounts of indefinite and finite intangible assets (*Indefinite Int, Finite Int*) and the net amounts of goodwill (*Goodwill)*. To avoid mechanical correlations between the different financial reporting variables and the impairment incidences of acquired intangibles, we measure control variables in period t, but look at the impairment incidences one year later, i.e., in period t+1. We use the market assessment of the firm (*BTM*) and the firm's current profitability (*RoA before Impairm.*) from the same period as the impairment, i.e., period t+1, because concerns about mechanical correlations do not apply here. All variable definitions can be found in Appendix A of the paper.

[6] We diverge from prior research and do not model firm size with the logarithm of total assets, because acquired intangibles and goodwill are part of total assets, which would introduce potential multicollinearity problems (Liss et al. 2023). We do pairwise correlations of different size proxies with acquired intangible assets and goodwill and find that total sales alleviate this concern.

To sum up, we estimate the following equation for determining intangible asset impairments:

$$Impair_{t+1} = \sum_{k=1}^{K=5} \beta_k \, ReportingQuality_{i,t}^{k} + \sum_{l=1}^{L=13} \beta_{l+5} \, BusinessCharacteristic_{i,t}^{k} + Industry \times Time\ FE + \varepsilon_{t+1} \quad (1)$$

Where *Impair* is either *Impair: Indefinite Int, Impair: Finite Int, Impair: Goodwill, Impair Share: Indefinite Int., Impair Share: Finite Int., or Impair Share: Goodwill*. We follow Kim (2023) and include industry-by-time fixed effects to alleviate potential differences in the time trends between industries. To account for dependencies of the standard errors within the panel, we cluster heteroscedasticity-robust standard errors on the firm level.

Analysis of internal monitoring

In our second model, we investigate how firm's internal corporate governance moderates the influence of impairment pressure on impairment incidence. We follow prior studies and use the firm's book-to-market ratio as our main variable for measuring impairment pressure (Li and Sloan 2017; Kim 2023; Ramanna and Watts 2012). A higher book-to-market ratio indicates that the market value approaches the reported book value and that a firm might have to impair assets within the next period. We also follow Ramanna and Watts (2012), Li and Sloan (2017) and Kim (2023) and report results from a binary impairment pressure indicator *BTMG1* which takes the value of one if the book-to-market ratio increases above one, and zero otherwise. We interact our impairment pressure variable with a broad set of different corporate governance variables used in prior literature to investigate whether stronger corporate governance can mitigate opportunistic impairment decisions. Therefore, we re-estimate our model of equation (1) and include the interaction effect on the book-to-market ratio with one of five measures for the strength of corporate governance at time t. Specifically, we estimate the following regression model:

$$
\begin{aligned}
Impair: Indefinite\ Int_{t+1} &= \beta_1 BTM_{t+1}[BTMG1_{t+1}] + \beta_2 Governance_{t+1} \\
&+ \beta_3 BTM_{t+1}[BTMG1_{t+1}] \times Governance_{t+1} + Reporting\ Quality\ Variables \\
&+ Business\ Characteristics + Industry \times Time\ FE \\
&+ \varepsilon_{t+1} \qquad (2)
\end{aligned}
$$

Where the reporting quality variables and business characteristics are the same as in model (1). For the governance variables, we use: the share of non-executive board members that are accounting experts (*NED: Accounting Experts*) (Chychyla et al. 2019; Krishnan and Visvanathan 2008), the non-executive members' busyness (*NED: Distraction*) and the executive directors' busyness (*ED: Distraction*) (Fich and Shivdasani 2006), top executive turnovers (*CEO Turnover*) (Francis et al. 1996; Riedl 2004),[7] and the share of the variable payments in managerial compensation contracts[8] *(Variable Compensation)* (Glaum et al. 2018; Beatty and Weber 2006; Ramanna and Watts 2012*).*

We expect the interaction term of *BTM* × Governance to be positive for *NED: Accounting Experts* and *CEO Turnover* while negative for *NED: Distraction, ED: Distraction, and Variable Compensation*. A more detailed definition of our governance variables can be found in Appendix A of the paper.

Analysis of external monitoring and perception of intangible impairments in conference calls and media coverage

We also replicate results from equation (2) using three variables that capture external corporate governance. Specifically, we use # Analysts (Li and Sloan 2017), which is the number of analysts that issue a one-year ahead EPS forecast of the firm, the # Media Coverage, which is the number of earning-related news articles from Ravenpack, and Institutional Ownership (Glaum

[7] Results are unchanged in we use CFO turnover instead of CEO turnover.

[8] We focus on the bonus share for the interaction with the market impairment pressure but, in contrast to Glaum et al. (2018), refrain from incorporating the stock- and option-based compensation. The stock- and option-based compensation show mechanical correlations with this impairment pressure indicator which would contaminate the interaction term with multicollinearity.

et al. 2018), which measures the share of institutional owners on the shares outstanding. We expect that all these measures show positive interactions with the impairment pressure variables.

Lastly, we investigate a potential mechanism for the extensive use of managerial discretion in the impairment decisions of acquired intangible assets: weaker reactions to intangible asset impairments by analysts and the media. To investigate this potential mechanism, we investigate whether analyst's ask questions about intangibles and whether the probability of asking about intangibles increases if there is an impairment of an acquired intangible in that period. We focus in our analysis on the Q&A part of the conference call because we are interested in whether analysts actively demand information about the intangible assets and related impairments. Thereby, we provide first empirical evidence on the information demand by analysts about intangibles if they are impaired.

In our linear model, our main variables of interest are the binary variables *Impair: Indefinite Int* and *Impair: Finite Int* that take the value of one when *indefinite or finite intangible* assets are impaired in the next period, and zero otherwise (similar to Li and Sloan (2017), Glaum et al. (2018), and Kim (2023)). To benchmark our results, we also include a binary variable for the impairment of goodwill.

Our control variables and the industry-by-time FEs are similar to those used in equation (1), with some notable differences. First, we use all control variables from the same period because the conference calls happen after the financial statement gets published and, thus, reverse causality is no concern. Second, we control for the bottom-line RoA instead of the RoA after impairments to capture any incremental effect of the intangible impairments that come in addition to their mechanical effects on the bottom-line net income. Third, we also control for the impairment amounts of indefinite and finite intangibles to make sure that it is the impairment incidence and not

the impairment amount that drives the conference call sentiment. Therefore, we estimate the following linear regression model:

$$\begin{aligned} Mentions\ Intangibles_t &= \beta_1 Impair{:}\ Indefinite_t + \beta_2 Impair{:}\ Finite_t + \beta_3 Impair{:}\ Goodwill_t \\ &+ \beta_4 Impair\ Share{:}\ Indefinite_t + \beta_5 Impair\ Share{:}\ Finite_t \\ &+ \beta_6 Impair\ Share{:}\ Goodwill_t + Controls + Industry \times time\ FE + \varepsilon_t \end{aligned} \quad (3)$$

Second, we compare the sentiment in the conference calls' Q&A sections between years with and without an acquired intangible asset impairment. Our dependent variable is the average sentiment in the Q&A sections of the firm's analyst conference calls that we obtain using the pre-trained machine learning model for sentiment analysis of financial data, called FinBert (Huang et al. 2023). FinBert provides a validated, objective, and subject-specific way to extract sentiment from conference call data (Huang et al. 2023), which makes FinBert our approach of choice.[9] From FinBert, we obtain sentiment information, which is coded as one, if it has a positive sentiment, zero for a neutral sentiment and minus one, if the sentiment is negative.

$$\begin{aligned} NegativeTone_t &= \beta_1 Mentioning\ Intangible_t + \beta_2 MentioningGoodwill_t \\ &+ \beta_3 Impair{:}\ Indefinite_t + \beta_4 Impair{:}\ Definite_t + \beta_5 Impair{:}\ Goodwill_t \\ &+ \beta_6 Impair\ Share{:}\ Indefinite_t + \beta_7 Impair\ Share{:}\ Definite_t \\ &+ \beta_8 Impair\ Share{:}\ Goodwill_t + Controls + Industry \times time\ FE + \varepsilon_t \end{aligned} \quad (4)$$

Third, we investigate how intangible impairments affect the media tone of earnings news. We use Ravenpack's BEE score (*BEE*) (Bushman et al. 2017; Mohrmann and Riepe 2023; Holzman et al. 2023) as our first dependent variable. It measures the average news sentiment for each firm in a given year. A higher BEE score implies that firms are covered more positively by news articles. We predict that intangible asset impairments impact news coverage less than goodwill impairments. To disentangle differing effects of impairments on positive and negative news content, we also investigate negative news sentiment as a binary variable (*Negative*

[9] Our inferences are unchanged if we use the bag-of-words approach by Loughran and McDonald (2011).

Sentiment). Intangible asset impairments might have a greater effect on negative sentiment of the business press. All control variables and fixed-effects are the same as in our analysis of the conference call sentiment (see equation 3).

5. Sample and descriptive statistics

To investigate our research questions, we use data from several data sources. First, we construct our sample by obtaining accounting and auditing data from *Compustat* and *Audit Analytics* for the period from 2002 to 2021. Our sample begins in 2002, as SFAS 141/142 became effective that year. We require firms to have non-missing equity book values, total assets, and net income. In addition, we exclude firms with market values of less than USD one million. Additionally, we restrict our sample to nonfinancial firms because the accounting and auditing of intangible assets in banks differs significantly (Hribar et al. 2014; Ettredge et al. 2014). For our analyses of the effect of corporate governance and media on intangible asset impairments, we merge our dataset with data from *BoardEx* and *Ravenpack.*

Second, we combine these data sources with a hand-collected database on acquired intangible assets (Landsman et al. 2021; Liss et al. 2023). This database contains the net amounts of acquired intangible assets, broken down into finite and indefinite intangibles, from the notes of annual financial statements obtained from the SEC Edgar webpage.

In addition to the net amount of acquired intangible assets, we extend this database significantly by hand collecting the amounts of intangible asset impairments from the note sections of financial statements. We key search each financial statement for words like “impairment”, “intangible asset impairment”, and “intangibles impaired” to identify the relevant sections within each 10-K. Then, we collect the occurrence and particular amounts of different intangible asset impairments, which allows us to investigate finite and indefinite intangible impairments separately and in comparison, to a goodwill impairment. Goodwill impairments are collected from *Compustat*.

Appendix B provides an example of Chico's Fas Inc. (2015) providing detailed disclosures about acquired net amounts of intangibles as well as information about intangible asset impairments. Our sample comprises firms with the largest market capitalizations in each of the Fama-French 12 industries. Our main sample contains 7,107 firm-year observations of 1,049 firms. We are unaware of any paper that has collected information on impairments about intangible assets of this magnitude.

Table 1 reports descriptive statistics on both dependent and independent variables used in our study. On the one hand, indefinite intangible impairments appear in one out of five cases, when firms have indefinite intangible assets on the balance sheet. Finite intangible assets, on the other hand, only appear in about ten percent of firm years. Our variables are largely in line with previous research on goodwill impairments (e.g. Dechow and Sloan (1991) and Glaum et al. (2018)).

[Insert Table 1 about here]

6. Results

Determinants of impairments

We begin with univariate analyses of the impairments of intangibles with indefinite and finite useful life. Thereby, we are not only interested in the share of firm-years with impairments, but also in the share of impairments conditional on a goodwill impairment. This provides initial evidence on whether impairments of intangibles are isolated events or occur jointly with goodwill impairments.

In Panel A of Table 2 we report the number of firm-years with and without an impairment of indefinite intangible assets. In total, there are 1,302 firm-years with an impairment, a share of 18.36 percent. Next, we look at the share of impairments conditionally on whether the firm records a goodwill impairment in the same year. If there is a goodwill impairment, the share of an impairment of indefinite intangibles increases to 61.67 percent. In contrast, the share is only 8.14

percent for firm-years without goodwill impairments. That is, in several cases firms record both goodwill and an indefinite intangible impairment in the same year. However, there are still many cases where only one asset type is impaired, but not both. We interpret this finding as early evidence that the determinants of impairments are different. Next, we look at impairments of indefinite intangibles conditionally on impairments of finite intangibles. The number of instances where both types of intangibles are impaired simultaneously is notably smaller. Only 43.22 percent of the firm-years with impaired finite intangibles also record an impairment of indefinite intangibles.

[Insert Table 2 about here]

In Panel B of Table 2, we report the number of impairments of finite intangible assets. The results are strikingly different. First, the unconditional mean is much lower at 8.22 percent. Second, the existence of goodwill impairment only increases this share to 18.91 percent. That is, the relation between the two types of impairments is much lower than between indefinite intangibles and goodwill.

After having established a significant but far from perfect correlation between impairments of indefinite intangibles and goodwill and a much lower relation between finite intangibles and goodwill, we turn to investigating the determinants of such impairments in a multivariate setting. We report the regression results in Table 3. Panel A of Table 3 reports the results using a binary dependent variable (Glaum et al. 2018; Riedl 2004) and Panel B of Table 3 reports the results using a continuous impairment variable (Kim 2023; Li and Sloan 2017). In Column 1 (Column 2) of both panels of Table 3, we investigate the determinants of impairments of indefinite (finite) intangible assets. In Column 3 we repeat the analysis with goodwill impairments as a benchmark. We begin with a set of reporting quality variables. These variables are expected to be significant if managers use discretion in their impairment decisions. In Panel A of Table 3, we find that the lower reporting quality as approximated by the Amiram et al. (2015) MAD measure is associated with fewer

impairments in the subsequent period. In contrast, adverse audit opinions on the internal control system or a non-standard audit opinion for the financial statements increases the likelihood of subsequent impairments, indicating an impairment backlog that has to be corrected to remedy the auditor's concerns. Finally, we find a positive association with indicators for big bath accounting and earnings smoothing. In Panel B of Table 3, we find very similar results when using the continuous dependent variable. Only for the Amiram MAD measure, we do not find a statistically significant link to the impairment amount anymore. The diverging results from both panels of Table 3 on the Amiram MAD measures suggest many small impairments for firms with higher Amiram MAD scores. For the impairments of finite intangibles in Column 2 the results are much weaker, both in statistical significance and in the size of the coefficients. Only the Amiram MAD measure and the big bath indicator turn significant on the 0.05 level and the smoothing indicator is marginally significant. Results are very similar between Panel A and B of Table 3. When comparing our results with goodwill impairments, we find very similar results to the indefinite intangibles regression in Panel A. The only statistically significant difference is for the big bath indicator (see Column 4). When comparing the impairment amounts of indefinite intangibles and goodwill in Panel B, we find significant and negative differences for WEAK 404, Audit Opinion, and Earnings Bath. We interpret these differences between Panel A and B as evidence that managers use similar amounts of discretion when deciding whether to impair indefinite intangibles and goodwill or not. However, once they decide to impair, they recognize larger impairment amounts for goodwill than for indefinite intangibles. In contrast, the difference between finite intangibles and goodwill is significant for all variables except the Amiram MAD in both Panel A and B. This is in line with our expectations, there is less evidence for discretion in impairments of finite intangibles, whose book values decrease due to the amortization charges anyway.

[Insert Table 3 about here]

Our next set of variables of the firms' business characteristics should explain impairments in the absence of managerial discretion. We find some notable differences between indefinite intangibles and goodwill. Prior literature used primarily the book-to-market ratio and the return on asset as economic indicators for an impairment (e.g., Li and Sloan (2017) and Kim (2023)). While we find a significant association of impairments with both indefinite and finite intangibles, the coefficients are significantly smaller than for goodwill. That is, impairments of intangibles react less to business characteristics than goodwill impairments. At the same time, we find a significant association with the M&A indicator, which is insignificant for goodwill. That is, firms are more likely to impair indefinite intangibles – but not goodwill or finite intangibles – in the year after a merger or acquisition. This implies that managers use their discretion differently, i.e., rather than delaying impairments like for goodwill, managers impair indefinite intangibles early. Because goodwill is tested for impairment on the reporting unit level, an intangible impairment reduces the goodwill's impairment pressure in that reporting unit. We will return to the question of why managers follow this strategy when we investigate the reactions of stakeholders like analysts and the media in our third research question. For the remaining variables, we find no notable differences between intangibles and goodwill.

The role of internal monitoring

In our next set of analyses, we investigate whether better corporate governance can increase the association between economic indications for impairments and the actual recognition of an impairment. We would expect such an effect if (1) firms use discretion in their impairment decisions and (2) better monitoring through governance mechanisms can moderate managerial discretion. In our main analysis, we conduct these tests for the impairment of intangible assets with indefinite useful life because we expect only limited managerial discretion for finite intangible assets due to the amortization. However, we also test for the effect of better monitoring of

impairments of finite intangibles and goodwill in additional analyses reported in section 7. For our tests we use the book-to-market ratio as our economic indicator for an impairment in its continuous form in Panels A (with the binary impairment indicator as dependent variable) and Panel B (with the continuous impairment variable as dependent variable), and the binary indicator for book-to-market ratios above one in Panel C.

First, we use two variables related to the firms' non-executive directors. We find in Panel A that firms with a higher share of accounting experts among their non-executive directors have a higher association between BTM (BTMG1 in Panel C) and impairments (Column 1), whereas the busyness of the non-executive directors reduce the association between BTM (BTMG1 in Panel C) and impairments (Column 2). Second, we use characteristics of the executive directors and find that their number of board appointments in other firms result in a negative interaction effect (Column 3). In contrast, newly appointed CEOs that are not responsible for the acquisition of the intangibles increase the association between BTM (BTMG1 in Panel C) and impairments (Column 4). Interestingly, our results show that the main effect of CEO turnover is negative and marginal significant, so that big bath accounting seems unlikely. Finally, the importance of managers' variable compensation relative to the base salary decreases the association between BTM (BTMG1 in Panel C) and impairments (Column 5).

[Insert Table 4 about here]

In summary, for all of our five governance variables we find interaction effects with the expected sign that are statistically significant in all specifications in Panel A. The statistical significance levels are a bit weaker in Panels B and C, but remain significant at conventional levels for most internal corporate governance variables even in Panel C. This strengthens our interpretation of the reporting quality variables from Table 3 as evidence for discretionary choices in the impairment decisions of indefinite intangible assets. At the same time, it shows that better

monitoring is successful in reducing the use of managerial discretion. Different empirical specifications appear to influence our results only marginally.

Conference Call and Media Sentiment

To answer our third research question, we rerun our governance interactions from equation (2) with three proxies for external monitoring. In Columns 6 through 8 of Table 4, we find inconclusive empirical evidence on the role of external monitoring on the timeliness of indefinite intangible impairments. In Panel A of Table 4, all external corporate governance variables show positive but statistically non-significant interaction effects, and through the different specification in Panels B and C, we see that the interaction terms remain far below the effects that we observe for the internal corporate governance variables in Columns (1) through (5). These results suggest that the high level of complexity and details in intangible impairments appear better suited to be addressed by good internal corporate governance.

To shed further light on why external monitoring is less efficient in restricting the use of discretion in the impairment testing of intangibles, we estimate models (3) and (4) and investigate the perception of participants in conference calls and the media to impairments of intangibles and goodwill. We start by analyzing how often the word “intangible” is used in the Q&A part of the conference call. The Q&A part is arguably more important than the presentation part because it shows whether analysts actively request information about the impairments. Only the impairment of goodwill significantly increases the use of the word “intangible”, but not the impairment of indefinite or finite intangibles. That is, it seems that impairments of intangibles do not generate the same level of scrutiny by analysts as goodwill impairments. We report the regression results in Table 5 and illustrate the different effects of intangible impairments and goodwill impairments in Figure 1.

[Insert Table 5 & Figure 1 about here]

Next, we analyze the overall tone of the conference call using a tone measure that relies on the FinBert machine learning algorithm by Huang et al. (2023). We again focus on the Q&A part of the conference call because the managers' incentives to avoid impairments are larger if they negatively affect the analysts' perception. We report in Column 2 that neither mentioning the term "intangibles", the presence of an intangible impairment, nor the size of the intangible impairment significantly affect the tone of the conference call. In contrast, mentioning the term "goodwill" results in a more negative tone and the tone becomes further negative if the size of the goodwill impairment is larger.

Next, we use a similar analysis but use the sentiment in firms' media coverage as dependent variable. In Column 3 we use *Ravenpack*'s standardized BEE index and find no significant effect of impairments of intangibles. In contrast, a goodwill impairment is associated with a more negative media sentiment. In Column 4, we investigate whether an impairment increases the likelihood that the sentiment is negative (i.e., that the standardized BEE is below zero). We find a positive association with the size of indefinite intangible impairments, whereas goodwill impairments are associated with a negative sentiment independent from their size. Importantly, the effect for goodwill is much larger than for intangibles. While a goodwill impairment increases the probability of a negative sentiment by around 7 percent, even the extreme case of a total impairment of all indefinite intangible assets would increase the probability by only 3.2 percent.

In summary, we find that impairments of intangibles create less scrutiny in conference calls and affect the tone in these calls less negatively than impairments of goodwill. The same holds for the sentiment of the media coverage. This implies that impairments of intangibles are less costly for the managers and can explain why they seem to impair intangibles earlier than goodwill.

7. Robustness checks and additional analyses

In our main tests for the determinants of impairments we use OLS regressions to avoid the incidental parameter problem that can occur in logit or probit regressions with a large number of fixed effects. In Table C2 in Appendix C we replicate our Table 3 using a probit model instead. We find that all inferences are qualitatively unchanged from the OLS results.

In Table C3 Panel A in Appendix C, we rerun our monitoring analyses for intangibles with finite useful life. We find that only one out of five governance variables has a significant interaction effect with BTM. That is, in contrast to indefinite intangible assets, better monitoring does not improve the association between the book-to-market ratio as an economic indicator of impairments and actual impairments. This implies that the low association between BTM and impairments in Table 3 for finite intangibles is most likely not the result of the use of managerial discretion. This is in line with the mostly insignificant reporting quality indicators in Table 3 and our theoretical reasoning in Section 3: due to the annual amortization charges the finite intangible assets are not overvalued and therefore no impairments are necessary even if the book-to-market ratio is high. In Table C3 Panel B in Appendix C, we replicate the analyses for goodwill impairments. For four of the five monitoring proxies we find significant interaction effects, so that our findings are in line with prior research.

8. Conclusion

In this study, we investigate firms' impairment strategies separately for finite and indefinite intangible assets and goodwill. Intangible assets are a major asset class whose importance increased in the last year and is expected to become even more important in the future. Our results imply that firms use discretion in their impairment decisions for intangibles with indefinite useful life just as in the case of goodwill impairments. Interestingly, they use their discretion in a different way than for goodwill. While impairments of goodwill are delayed as shown in previous research, we find

early impairments for intangibles with indefinite useful life. In contrast, we find no evidence for discretion in the impairments of finite intangible assets. These assets are amortized and, hence, are less likely to be impaired. In further analyses, we document that better corporate governance can mitigate discretionary choices.

We also document a potential reason for why the strategies are different for intangibles and goodwill. By analyzing conference calls, we find that analysts demand less information about the impairments of intangibles relative to goodwill impairments. In line with this finding, also the media coverage is less negative after an intangible impairment than after a goodwill impairment. Thus, intangible impairments are under the radar and create less costs for the firms. At the same time, they decrease the impairment pressure for goodwill. For this reason, more vigilant analysts and journalists could lead to more timely impairments of intangibles and goodwill.

We acknowledge that our study is subject to certain limitations. First, our study is exploratory in nature and provides evidence of associations, not causation. We further note that some associations that we document, such as firm attributes, also reflect broader management decisions or management styles. Nevertheless, we argue that the associations are still informative to many stakeholders because they allow outsiders to better assess the quality of a firm's acquired intellectual capital. Furthermore, the balance sheet information on the acquired intangible assets only include the carrying values and the impairments on the assets but does not allow us to assign each asset to a previous takeover transaction (see Ashby et al. (2023) for goodwill).

Accounting for intangible assets is a timely topic for both standard setters and academics. Our study is an important first step to understand how and why firms choose to use discretion in their impairment decisions. Our results suggest that it is not the impairment only approach in itself that leads to delayed impairments, but rather the incentives of the management.

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Figure 1: Conference calls and analysts' attention toward intangibles around impairment
Figure 1 shows the relative frequencies of mentioning the words "intangible" and "goodwill" during the Q&A session of firm's earnings conference calls and how it is affected by the impairments of intangibles and goodwill.

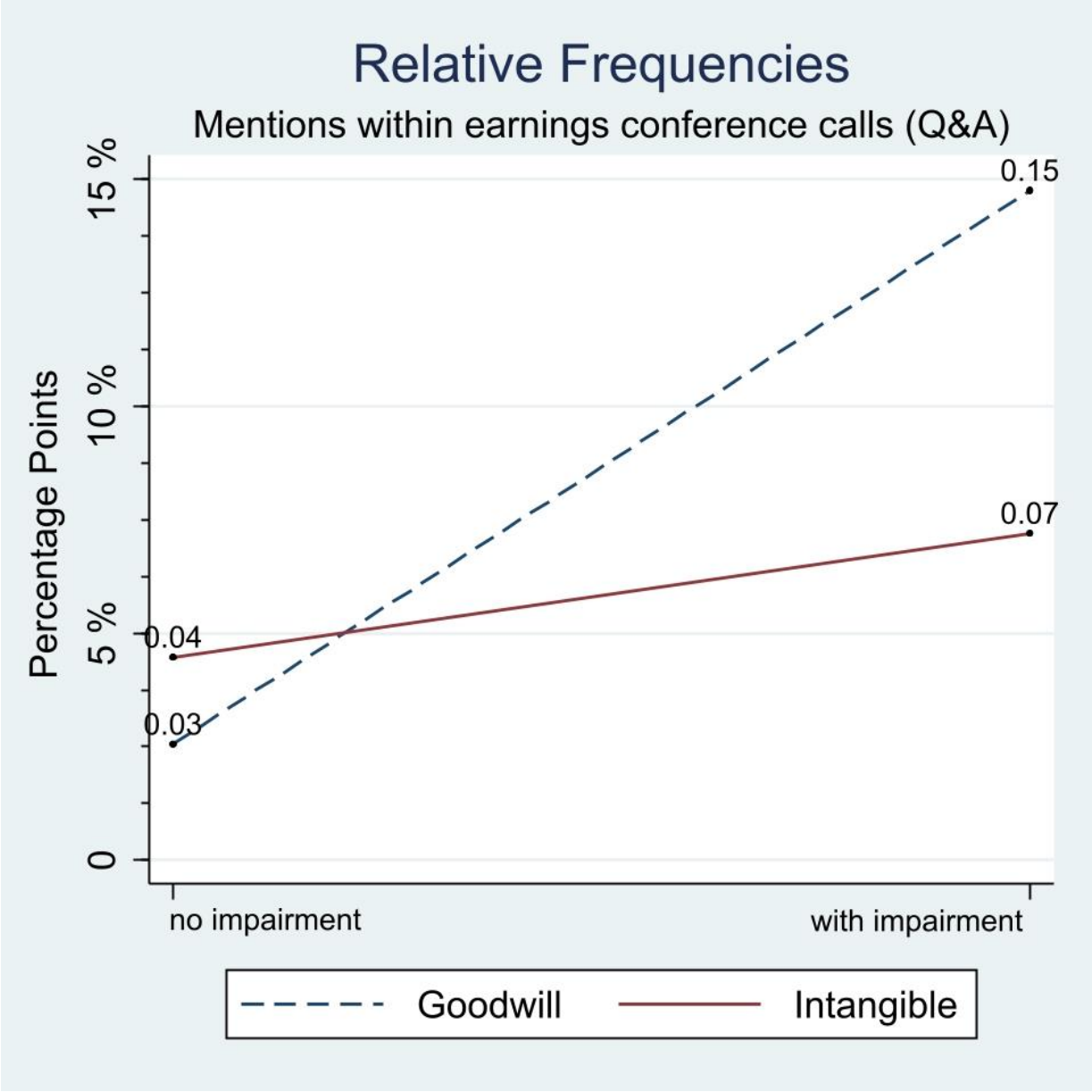


Table 1: Descriptive statistics

This table presents the descriptive statistics for the sample. Data are for years 2002 through 2021. See Appendix A for variable definitions.

Variables	N	Mean	SD	p5	p25	p50	p75	p95
Intangible Assets and Goodwill								
Impair: Indefinite Int. $_{(t+1)}$	7,090	0.1836	0.3872	0	0	0	0	1
Impair: Finite Int. $_{(t+1)}$	7,090	0.0822	0.2747	0	0	0	0	1
Impair: Goodwill $_{(t+1)}$	7,090	0.1910	0.3931	0	0	0	0	1
Impair Share: Indefinite Int. $_{(t+1)}$	7,090	0.0275	0.1011	0	0	0	0	0.1875
Impair Share: Finite Int. $_{(t+1)}$	7,090	0.0083	0.0451	0	0	0	0	0.0231
Impair Share: Goodwill$_{(t+1)}$	7,090	0.0406	0.1531	0	0	0	0	0.2880
Indefinite Int	7,090	0.0718	0.1169	0.0010	0.0071	0.0253	0.0826	0.2987
Finite Int	7,090	0.0555	0.0685	0	0.0062	0.0295	0.0788	0.2031
Goodwill	7,090	0.1871	0.1480	0	0.0622	0.1608	0.2871	0.4753
Reporting Quality Indicators								
Amiram MAD	7,090	0.0227	0.0066	0.0128	0.0178	0.0220	0.0269	0.0347
WEAK 404	7,090	0.0450	0.2073	0	0	0	0	0
Audit Opinion	7,090	0.3111	0.4630	0	0	0	1	1
Earns Bath. $_{(t+1)}$	7,090	0.0415	0.1994	0	0	0	0	0
SMOOTH. $_{(t+1)}$	7,090	0.2030	0.4022	0	0	0	0	1
Business Model Indicators								
M&A	7,090	0.4111	0.4921	0	0	0	1	1
BTM $_{(t+1)}$	7,090	0.4683	0.5030	-0.0357	0.2123	0.3908	0.6524	1.3175
ROA before Impair. $_{(t+1)}$	7,090	0.1164	0.1412	-0.0606	0.0429	0.0911	0.1669	0.3629
Size	7,090	7.4903	1.6153	4.7709	6.4223	7.5224	8.5849	10.1325
Sales Growth	7,090	0.0632	0.1663	-0.1877	-0.0179	0.0489	0.1304	0.3713
Leverage	7,090	0.4770	0.2238	0.1397	0.3217	0.4582	0.5993	0.8836
Business Segment	7,090	6.8986	5.0993	1	3	6	11	16
R&D Spending	7,090	0.0224	0.0444	0.0000	0.0000	0.0000	0.0230	0.1159
Altman's Z	7,090	1.9532	0.9466	0.6871	1.2893	1.8170	2.4684	3.7363
Inventory & Receivables	7,090	0.2414	0.1596	0.0324	0.1103	0.2198	0.3389	0.5416
Governance Variables								
NED: Accounting Experts	6,180	0.1412	0.1404	0.0000	0.0000	0.1250	0.2222	0.4000
NED: Distraction	6,179	3.4293	1.4060	1.4286	2.3846	3.2308	4.2857	6.1538
ED: Distraction (# Boards)	6,050	2.2232	1.4832	1	1	2	3	5
CEO Turnover	5,285	0.0047	0.0686	0	0	0	0	0
Variable Compensation	5,307	0.0787	0.1426	0	0	0	0.0973	0.4276
# Analyst Coverage	7,090	9.1158	8.7422	0	1	7	15	26
Above Median Analyst Coverage	7,090	0.5179	0.4997	0	0	1	1	1
Benchmark Beating	5,474	0.0216	0.1452	0	0	0	0	0
Auditor Industry Leader	7,090	0.3240	0.4680	0	0	0	1	1

Table 1: Descriptive statistics (continued)

Variables	N	Mean	SD	p5	p25	p50	p75	p95
Media Tone								
Mentioning "Intangible": Q&A	5,441	0.0506	0.2891					
Mentioning: "Goodwill": Q&A	5,441	0.0467	0.3160					
FinBert Negative Tone: Present.	5,407	0.2156	0.1380	0.0372	0.1079	0.1919	0.2962	0.4794
FinBert Negative Tone: Q&A	5,407	0.0911	0.0524	0.0293	0.0530	0.0799	0.1158	0.1923
BEE	5,239	0.0000	1.0008	-1.8179	-0.3914	0.2363	0.2363	1.4757
Negative Sentiment	7,090	0.3030	0.4596	0	0	0	1	1
LM Negative Tone: Present.	5,361	0.3668	0.0877	0.2027	0.3209	0.3790	0.4271	0.4851
LM Negative Tone: Q&A	5,361	0.2955	0.0843	0.1179	0.2526	0.3083	0.3523	0.4085

Table 2: Impairment incidences of Goodwill and Indefinite acquired intangible assets by Firm-Year

This table presents the mean values of the impairment incidences of indefinite intangibles, finite intangibles and goodwill.

Panel A: Indefinite intangible assets

Indefinite Intangible Assets			Impair: Goodwill $_{(t+1)}$				Impair: Finite Int. $_{(t+1)}$			
Impair:	Total		No (=0)		Yes (=1)		No (=0)		Yes (=1)	
Indefinite Int. $_{(t+1)}$	N	%	N	%	N	%	N	%	N	%
No (=0)	5,788	**81.64**	5,269	**91.86**	519	**38.33**	5,457	**83.86**	331	**56.78**
Yes (=1)	1,302	**18.36**	467	**8.14**	835	**61.67**	1,050	**16.14**	252	**43.22**
N	7,090		5,736		1,354		6,507		583	

Panel B: Finite intangible assets

Finite Intangibles Assets			Impair: Goodwill $_{(t+1)}$			
Impair:	Total		No (=0)		Yes (=1)	
Finite Int. $_{(t+1)}$	N	%	%	%	N	%
No (=0)	6,507	**91.18**	5,409	**94.30**	1,098	**81.09**
Yes (=1)	583	**8.22**	327	**5.70**	256	**18.91**
N	7,090		5,736		1,354	

Table 3: Indicators of Impairment of Acquired Intangible Assets and Goodwill

This table presents the results of a linear probability model of the determinants of impairment of indefinite intangibles (Column 1), finite intangibles (Column 2), and goodwill (Column 3). Columns (4) and (5) report Wald-test results on differences in the coefficients between the indicators for acquired intangible assets with indefinite (finite) useful economic lifetimes and Goodwill. In Panel A, we report results, where indicator variables serve as our dependent variables which take the value of one if there is an impairment, and zero otherwise. In Panel B, we use the impairment shares as our dependent variables. Control variables capture portfolio-level indicators, impairment indicators from firms' business models, and impairment indicators that refer to firms' reporting quality and reporting incentives. Industry and time trends are captured in all specifications by including industry-by-time fixed effects. Constant term is not reported to enhance the readability of the table. Robust standard errors are clustered on the firm level. Robust t-statistics are reported in round brackets. Prob > chi2 is displayed in squared brackets. ***, **, and * indicate, respectively, significance levels at the 0.01, 0.05, and 0.10 levels. See Appendix A for variable definitions.

Panel A: Binary Indicators of Impairment

Dep. Var.: Impair:	(1) Indefinite Int. (t+1)	(2) Finite Int. (t+1)	(3) Goodwill (t+1)	(4) (1) vs. (3)	(5) (2) vs. (3)
Reporting Quality Indicators					
Amiram MAD	-1.8137**	-1.0526**	-1.5975**	-0.2163	0.5448
	(-2.3765)	(-2.0378)	(-2.1071)	[0.7572]	[0.5225]
WEAK 404	0.0949***	0.0246	0.1251***	-0.0302	-0.1006 ***
	(3.2090)	(1.3782)	(4.4124)	[0.2224]	[0.0008]
Audit Opinion	0.0279***	0.0025	0.0342***	-0.0062	-0.0317 ***
	(2.7130)	(0.3136)	(3.2183)	[0.5387]	[0.0064]
Earns Bath. (t+1)	0.1136***	0.0635**	0.1827***	-0.0691 **	-0.1191 ***
	(3.5430)	(2.4416)	(5.5802)	[0.0385]	[0.0026]
SMOOTH. (t+1)	0.0496***	0.0160*	0.0512***	-0.0016	-0.0352 ***
	(3.7892)	(1.8086)	(4.1265)	[0.8842]	[0.0081]
Business characteristics					
M&A	0.0300**	0.0031	0.0066	0.0233 **	-0.0035
	(2.3997)	(0.3834)	(0.5684)	[0.0272]	[0.7863]
BTM (t+1)	0.0365**	0.0216**	0.0904***	-0.0539 ***	-0.0688 ***
	(2.3896)	(2.1326)	(5.4547)	[0.0000]	[0.0000]
ROA before Impair. (t+1)	-0.3641***	-0.2537***	-0.4981***	0.1339 *	0.2444 **
	(-4.0237)	(-4.3560)	(-5.6841)	[0.0923]	[0.0116]
Size	0.0235***	0.0173***	0.0234***	0.0001	-0.0061
	(4.4733)	(4.6102)	(5.3916)	[0.9836]	[0.2261]
Sales Growth	-0.0907***	-0.0167	-0.0791***	-0.0116	0.0624 *
	(-3.0029)	(-0.8321)	(-2.7300)	[0.6787]	[0.0543]
Leverage	-0.0066	0.0320	0.0398	-0.0464 *	-0.0078
	(-0.1967)	(1.3368)	(1.2246)	[0.0809]	[0.8305]
Business Segment	0.0005	-0.0004	0.0024	-0.0019	-0.0028 *
	(0.3312)	(-0.3688)	(1.6345)	[0.1185]	[0.0843]
R&D Spending	0.2084	0.3715**	-0.4458***	0.6542 ***	0.8173 ***
	(1.1577)	(2.3427)	(-2.7145)	[0.0000]	[0.0002]
Altman's Z	-0.0047	0.0042	0.0012	-0.0059	0.0030
	(-0.4376)	(0.6330)	(0.1152)	[0.4650]	[0.7872]
Inventory & Receivables	0.0599	-0.0457	0.1353*	-0.0754	-0.1810 **
	(0.9314)	(-1.0902)	(1.9514)	[0.1575]	[0.0156]
Indefinite Int	0.8235***	0.2843***	0.8191***	0.0044	-0.5348 ***
	(6.8518)	(4.2493)	(6.8045)	[0.9628]	[0.0000]
Finite Int	0.1836	0.6248***	0.0006	0.1830	0.6241 ***
	(1.4843)	(5.5915)	(0.0054)	[0.1136]	[0.0000]
Goodwill	0.0958	-0.0039	0.1975***	-0.1017 **	-0.2015 ***
	(1.5456)	(-0.1077)	(3.3728)	[0.0353]	[0.0015]
Industry×Year FEs	Yes	Yes	Yes		
Observations	7,090	7,090	7,090		
R-squared	0.0808	0.0794	0.0986		

Panel B: Indicators of Impairment Amounts

Dep. Var.: SHARE OF	(1) Indefinite Int. $_{(t+1)}$	(2) Finite Int. $_{(t+1)}$	(3) Goodwill $_{(t+1)}$	(4) (1) vs. (3)	(5) (2) vs. (3)
Reporting Quality Indicators					
Amiram MAD	0.0877	-0.1794*	0.0801	0.0077	-0.2595
	(0.4156)	(-1.9060)	(0.2334)	[0.9811]	[0.4257]
WEAK 404	0.0124*	0.0034	0.0340**	-0.0217*	-0.0306**
	(1.6947)	(1.0220)	(2.5247)	[0.0809]	[0.017]
Audit Opinion	0.0090***	0.0022	0.0251***	-0.0161***	-0.023***
	(2.9229)	(1.5493)	(4.7295)	[0.0014]	[0.000]
Earns Bath. $_{(t+1)}$	0.0334**	0.0197***	0.1384***	-0.1051***	-0.1188***
	(2.3268)	(2.5971)	(4.9820)	[0.0003]	[0.000]
SMOOTH. $_{(t+1)}$	0.0132***	0.0015	0.0163***	-0.0031	-0.0148***
	(3.1487)	(1.1399)	(2.8836)	[0.587]	[0.0078]
Business Model Indicators					
M&A	0.0031	-0.0000	-0.0058	0.0089*	0.0058
	(0.9974)	(-0.0136)	(-1.2908)	[0.0519]	[0.1916]
BTM $_{(t+1)}$	0.0159***	0.0016	0.0448***	-0.0289***	-0.0433***
	(3.3178)	(0.6510)	(3.7023)	[0.004]	[0.0001]
ROA before Impairment $_{(t+1)}$	-0.0827***	-0.0316**	-0.0798	-0.0029	0.0482
	(-2.6124)	(-2.1741)	(-1.4016)	[0.9568]	[0.3851]
Size	0.0039***	0.0006	0.0012	0.0027	-0.0006
	(3.3187)	(1.0627)	(0.6513)	[0.1333]	[0.7261]
Sales Growth	-0.0116	-0.0007	-0.0212	0.0095	0.0205
	(-1.2632)	(-0.1743)	(-1.4538)	[0.4853]	[0.1527]
Leverage	0.0005	0.0040	0.0222	-0.0217*	-0.0182
	(0.0626)	(1.0580)	(1.6103)	[0.0825]	[0.1625]
Business Segment	-0.0000	0.0001	0.0001	-0.0002	0.0000
	(-0.1213)	(0.6295)	(0.2566)	[0.7158]	[0.9444]
R&D Spending	0.1955***	0.0730**	-0.0131	0.2087***	0.0861
	(2.9986)	(1.9679)	(-0.1856)	[0.0075]	[0.2599]
Altman's Z	0.0027	0.0007	-0.0014	0.004	0.0021
	(0.8803)	(0.6703)	(-0.3111)	[0.3313]	[0.6283]
Inventory & Receivables	0.0137	-0.0113	0.0528*	-0.039	-0.0641**
	(0.6850)	(-1.4965)	(1.8613)	[0.1493]	[0.0195]
Indefinite Int	0.0997***	0.0333**	0.2030***	-0.1033*	-0.1697***
	(2.9909)	(2.0434)	(3.0106)	[0.0926]	[0.0088]
Finite Int	0.0582	-0.0011	-0.0072	0.0655	0.0061
	(1.6174)	(-0.0857)	(-0.2113)	[0.1397]	[0.8639]
Goodwill	-0.0003	-0.0060	0.0245	-0.0248	-0.0305*
	(-0.0246)	(-1.1058)	(1.3810)	[0.1744]	[0.0839]
Industry×Year FEs	Yes	Yes	Yes		
Observations	5,854	5,854	5,854		
R-squared	0.0461	0.0333	0.0916		

Table 4: Impairment Pressure, Governance and the Impairments of Indefinite Intangibles

This table shows regression results from a linear probability model, where Impair: Indefinite Int. (t+1) serves as our dependent variable in Panel A, and Impair Share: Indefinite Int. (t+1) serves as the dependent variable in Panels B and C. Our main variable of interest is the interaction term of BTM (BTM G1), which serves as a market indicator for impairment pressure in Panels A and B (Panel C), and different governance variables that are displayed above each column. Additional control variables as in Table 3 are included in all specifications but are not displayed to ease the reading of the table. Industry and time trends are captured in all specifications by including industry-by-time fixed effects. Robust standard errors are clustered on the firm level. Robust t-statistics are reported in round brackets. ***, **, and * indicate, respectively, significance levels at the 0.01, 0.05, and 0.10 levels. See Appendix A for variable definitions.

Panel A: Binary Impairment Indicator, Impairment Pressure, and Corporate Governance

	INTERNAL CORPORATE GOVERNANCE					EXTERNAL MONITORING		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Governance Variables:	*NED: Accounting Expert (%)*	*NED: Distraction (# Boards)*	*ED: Distraction (# Boards)*	*CEO Turnover*	*Variable Compensation*	# Analyst Coverage	# Media Coverage	Institutional Ownership (%)
Impairment Pressure Indicators for Impairments								
BTM $_{(t+1)}$	0.0194	0.1233***	0.0999***	0.0435**	0.0652***	0.0290*	0.0315	0.0376**
	(0.8740)	(3.3924)	(3.9567)	(2.1261)	(2.9011)	(1.7430)	(0.9498)	(1.9922)
Impairment Pressure Indicators for Impairments								
GOVERNANCE VARIABLE	-0.0462	0.0055	0.0082	-0.1135*	0.0232	-0.0015	-0.0012	0.0004
(As indicated by column header)	(-0.6432)	(0.6873)	(1.3297)	(-1.6555)	(0.4354)	(-0.8533)	(-1.3317)	(0.8095)
Interaction Term: Governance × Impairment Pressure Indicators for Impairments								
BTM $_{(t+1)}$×	0.2108**	-0.0238**	-0.0224***	0.2435***	-0.1841**	0.0036	0.0018	-0.0001
GOVERNANCE VARIABLE	(2.2164)	(-2.1821)	(-2.7605)	(3.2517)	(-2.1154)	(0.9032)	(1.2724)	(-0.1045)
Reporting Quality Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business Model Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,180	6,179	6,050	5,285	5,307	7,090	5,239	7,090
R-squared	0.0815	0.0813	0.0787	0.0931	0.0937	0.0810	0.0877	0.0810

Panel B: Impair **Share**: Indefinite Int, Impairment Pressure, and Corporate Governance

	INTERNAL CORPORATE GOVERNANCE					EXTERNAL MONITORING		
Governance Variables:	(1) *NED: Accounting Expert (%)*	(2) *NED: Distraction (# Boards)*	(3) *ED: Distraction (# Boards)*	(4) *CEO Turnover*	(5) *Variable Compensation*	(6) # Analyst Coverage	(7) # Media Coverage	(8) Institutional Ownership (%)
Impairment Pressure Indicators for Impairments								
BTM $_{(t+1)}$	0.0113*	0.0407***	0.0309***	0.0159***	0.0301***	0.0129**	0.0104	0.0155***
	(1.6587)	(3.6063)	(3.8699)	(3.3047)	(4.4204)	(2.4043)	(1.3015)	(2.7703)
Impairment Pressure Indicators for Impairments								
GOVERNANCE VARIABLE	-0.0258	0.0033	0.0033*	-0.0161**	0.0404**	-0.0004	-0.0003	0.0001
(As indicated by column header)	(-1.5167)	(1.4824)	(1.8405)	(-2.1059)	(2.2839)	(-0.8506)	(-1.5400)	(0.9315)
Interaction Term: Governance × Impairment Pressure Indicators for Impairments								
BTM $_{(t+1)}$×	0.0670**	-0.0065*	-0.0045**	0.0034	-0.1206***	0.0016	0.0007*	0.0000
GOVERNANCE VARIABLE	(2.2405)	(-1.7887)	(-1.9685)	(0.4142)	(-3.5196)	(1.5654)	(1.8676)	(0.1070)
Reporting Quality Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business Model Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,180	6,179	6,050	5,285	5,307	5,854	4,630	5,854
R-squared	0.0815	0.0813	0.0787	0.0931	0.0937	0.0467	0.0563	0.0465

Panel C: Binary Impairment Pressure Indicator (BTM G1), Impair Share: Indefinite Int, and Corporate Governance

	INTERNAL CORPORATE GOVERNANCE					EXTERNAL MONITORING		
Governance Variables:	(1) *NED: Accounting Expert (%)*	(2) *NED: Distraction (# Boards)*	(3) *ED: Distraction (# Boards)*	(4) *CEO Turnover*	(5) *Variable Compensation*	(6) # Analyst Coverage	(7) # Media Coverage	(8) Institutional Ownership (%)
Impairment Pressure Indicators for Impairments								
BTM $G1_{(t+1)}$×	0.0270***	0.0398**	0.0462***	0.0327***	0.0509***	0.0228***	0.0094	0.0262***
	(2.9404)	(2.3994)	(4.3666)	(5.0878)	(4.4509)	(3.3407)	(0.6194)	(3.2522)
Impairment Pressure Indicators for Impairments								
GOVERNANCE VARIABLE	-0.0029	0.0004	0.0015	-0.0075	0.0027	-0.0001	-0.0001	0.0001
(As indicated by column header)	(-0.2437)	(0.2687)	(1.0893)	(-0.7231)	(0.2850)	(-0.1663)	(-0.7931)	(1.2110)
Interaction Term: Governance × Impairment Pressure Indicators for Impairments								
BTM $G1_{(t+1)}$×	0.0781*	0.0002	-0.0033	-0.0350**	-0.1723***	0.0050**	0.0018**	0.0003
GOVERNANCE VARIABLE	(1.8927)	(0.0391)	(-0.9408)	(-2.0257)	(-3.3266)	(2.1211)	(2.3509)	(1.1550)
Reporting Quality Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business Model Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,184	5,183	5,072	5,854	4,438	5,854	4,630	5,854
R-squared	0.0571	0.0558	0.0540	0.0500	0.0668	0.0514	0.0632	0.0507

Table 5: Content of Conference Calls, Media Sentiment and Intangible Impairments

Table 5 shows the results from OLS regressions of Equations 3 and 4. In Column 1, the relative frequency of parts in the Q&A part of the conference call that include the word "intangible" to the total number of parts serves as the dependent variable. In Column 2, the negative sentiment of the Q&A part of the conference call estimated by FinBert (Huang et al. 2023) is the dependent variable. The dependent variable in Column 3 is the standardized BEE score that represents the news sentiment of the given story about earnings evaluations. The raw scores can take values of 0 through 100 indicating negative (0) through positive (100) sentiment, respectively. This sentiment score is based on RavenPack's Traditional Methodology (Bushman et al. 2017). We standardize the BEE score with a mean of zero and a standard deviation of one to ease the interpretation of the coefficients. In Column 4, Negative Sentiment is the dependent variable, an indicator variable which takes the value of one if the BEE score is negative, indicating a negative tone in the earnings news coverage, and zero otherwise. The indicator variables for impairments of indefinite and finite acquired intangibles and goodwill as well as all business model control variables and additional reporting quality measures from Table 3 are included in all specifications. Because we are interested in the direct media tone to the reported financial statement information, we only use contemporaneous control variables. In addition, we control for the operating RoA instead of the RoA before impairments because we want to see whether the impairments of acquired intangibles and goodwill correlated with the media tone in addition to its effect on the bottom-line net income. We also include the impairment shares in all even columns to capture any additional effects of the impairment magnitude. Industry and time trends are captured in all specifications by including industry-by-time fixed effects. Robust standard errors are clustered on the firm level. Robust t-statistics are reported in round brackets. We report the Prob > F in squared brackets. ***, **, and * indicate, respectively, significance levels at the 0.01, 0.05, and 0.10 levels. See Appendix A for variable definitions.

	(1)	(2)	(3)	(4)
	Q&A Part of Conference Calls		**Media Sentiment**	
	Relative Frequency of Mentioning "Intangible"	FinBert Negative Tone (Huang et al. 2023)	BEE (standardized)	Negative Sentiment
Mentioning "Intangible"		0.0001		
		(0.0310)		
Mentioning: "Goodwill"		0.0137***		
		(4.3968)		
Impair: Indefinite Int.	0.0182	0.0022	-0.0380	0.0163
	(1.0533)	(0.7778)	(-0.8896)	(0.7557)
Impair: Finite Int.	-0.0157	-0.0029	-0.0825	0.0454
	(-0.8539)	(-0.7281)	(-1.4884)	(1.5855)
Impair: Goodwill	0.0419**	0.0015	-0.1395***	0.0736***
	(2.5670)	(0.5605)	(-2.6789)	(2.9566)
Impair Share: Indefinite Int.	-0.0370	0.0016	0.0073	0.0324**
	(-0.7634)	(0.1782)	(0.2549)	(2.3989)
Impair Share: Finite Int.	0.1321	0.0093	0.0357	-0.0347***
	(0.9844)	(0.4277)	(1.4552)	(-3.0532)
Impair Share: Goodwill	-0.0094	0.0175**	0.0146	-0.0111
	(-0.2638)	(2.2239)	(0.6767)	(-1.0957)
Controls	Yes	Yes	Yes	Yes
Industry×Year FEs	Yes	Yes	Yes	Yes
Observations	5,427	5,407	5,243	5,243
R-squared	0.0253	0.2317	0.2474	0.2014

Appendix A. Variable definitions

Variable	Description	Data source
Dependent variables:		
Impair: Indefinite Int.	Indicator variable equal to one if there is an impairment of Indefinite Acquired Intangibles, and zero otherwise	Hand-collected
Impair: Finite Int.	Indicator variable equal to one if there is an impairment of Finite Acquired Intangibles, and zero otherwise	
Impair: Goodwill	Indicator variable equal to one if there is an impairment of Goodwill, and zero otherwise	
Impair Share: Indefinite Int.	Impairment scaled by beginning balance of indefinite intangible assets similar to Li and Sloan (2017)	
Impair Share: Finite Int.	Impairment scaled by beginning balance of finite intangible assets similar to Li and Sloan (2017)	
Impair Share: Goodwill	Impairment scaled by beginning balance of goodwill as in Li and Sloan (2017)	
Business Model Indicators		
M&A	Indicator variable equal to one if the firm engaged in an M&A transaction in period t, and zero otherwise	Compustat
BTM	Book value of equity divided by market value of equity.	
BTM G1	Indicator variable equal to one if the book value of equity divided by market value of equity is above one, and zero otherwise.	
ROA before Impairm.	Operating income before the Impairment of Goodwill and Acquired Intangibles to lagged total assets.	
ROA as reported	Operating income as reported to lagged total assets	
Size	Log of total sales.	
Sales Growth	Change in total sales from prior to current period.	
Leverage	Sum of short-term debt and long-term debt to lagged total assets.	
Business Segment	Square root of the number of business segments of the firm	
R&D Spending	Research and development spending (xrd) to lagged total assets.	
Altman's Z	Altman's (1968) Z Score measures firm default risk: 1.2*(working capital to TA)+1.4*(retained earnings TA)+3.3*(EBIT to TA)+0.6*(MV to TA)+1.0*(Sales to TA)	
Inventory & Receivables	Inventory and Receivables to lagged total assets.	
Indefinite Int	Net amount of acquired indefinite intangible assets to lagged total assets.	Hand-collected
Finite Int	Net amount of acquired finite intangible assets to lagged total assets.	
Goodwill	Net amount of goodwill to lagged total assets.	

Reporting Quality Indicators

Amiram MAD	Measure on the Mean Absolute Deviation of financial reporting numbers and the theoretical digit distribution following Amiram et al. (2015). Higher values of Amiram MAD correlate with lower reporting quality.	Own Calculation
WEAK 404	Indicator variable that is equal to one if firm received an internal control weakness by the auditor.	Audit Analytics
Audit Opinion	Indicator variable equal to one if the firm receives a modified audit opinion and zero otherwise, where a modified opinion is defined as anything other than a standard unqualified audit opinion coded as one by Compustat (Hribar et al. 2014)	
Earns Bath	Indicator variable following Riedl (2004) and Glaum et al. (2018). It equals to one if the firm's change in operation RoA is below the average firm observation with a reporting loss in that year, and zero otherwise (Riedl 2004; Glaum et al. 2018)	Compustat
SMOOTH	Indicator variable following Riedl (2004) and Glaum et al. (2018). It equals to one if the firm's change in operation RoA is above the average firm observation with a reporting gain in that year, and zero otherwise.	

Corporate Governance Variables

# Analyst Coverage	Number of Analysts that have made an EPS forecast on the firm.	
Above Median Analyst Coverage	Indicator variable which takes the value of one for company-years where the number of analysts that made an EPS forecast on the firm is above the median value for all firms in the sample, and zero otherwise.	
Benchmark Beating	Indicator variable which takes the value of one for company-years where the reported earnings-per-share exceeds the consensus analyst EPS forecast by only one cent, and zero otherwise (Bhojraj, Hribar, Picconi, and McInnis 2009)	IBES
Auditor Industry Leader	Indicator variable which takes the value of one for company-years that are audited by the audit firm that is the industry leader in this industry in terms of aggregated audit fees, and zero otherwise.	Audit Analytics
NED: Accounting Experts	Share of non-executive board members who are accounting experts.	
NED: Distraction	Average number of other current boards that the non-executive board members are holding while simultaneously supervising the current firm.	
ED: Distraction	Average number of other current boards that the executive board members are holding while simultaneously working in the firm.	BoardEx
CEO Turnover	Turnover of the firm's Chief Executive Officer between period t-1 and t	
Variable Compensation	Variable Compensation measures the average share of bonus scaled by base salary plus bonus of the firm's executives. We refrain from incorporating the stock- and option-based compensation because they show mechanical correlations with the market impairment pressure indicator which would contaminate the interaction term with multicollinearity	Execu Comp

Media Variables

BEE	A score that represents the average news sentiment by firm-year according to RavenPack's BEE classifier, which specializes in news stories about earnings evaluations. The initial scores can take values of 0, 50, or 100 indicating negative, neutral, or positive sentiment, respectively. We standardized the score to have a mean of zero and a standard deviation on one to ease its interpretation	RavenPack
Negative Sentiment	Indicator variable equal to one if the average BEE score indicates a negative sentiment of the earnings news coverage, and zero otherwise.	
Mentions "Intangible" Presentation Parts	The number of presentation parts that include the word "intangible" scaled by the total number of presentation parts of the annual (Q4) conference call	Own Calculation
Mentions "Intangible" Q&A Parts	The number of analysts' Q&A parts that include the word "intangible" scaled by the total number of analysts' Q&A parts of the annual (Q4) conference call	
Conference Call Sentiment: Pres.	Sentiment indicator estimated by FinBert (Huang et al. 2023) which takes the value of one for a positive sentiment, zero for a neutral sentiment and minus one for a negative sentiment in the presentation part of the annual (Q4) conference call.	
Conference Call Sentiment: QnA.	Sentiment indicator estimated by FinBert (Huang et al. 2023) which takes the value of one for a positive sentiment, zero for a neutral sentiment and minus one for a negative sentiment in the Q&A part of the annual (Q4) conference call.	

Appendix B: Example of How Intangible Impairments are Displayed in Firms' Balance Sheets from Chicos Fas Inc. (2015)

	January 30, 2016	January 31, 2015
	(in thousands)	
Goodwill:		
Total Goodwill	$ 96,774	$ 145,627
Indefinite-Lived Intangibles:		
WHBM trade name	$ 34,000	$ 34,000
Minnesota territorial franchise rights	4,930	4,930
Boston Proper trade name	—	41,700
Total indefinite-lived intangibles	$ 38,930	$ 80,630
Definite-Lived Intangibles:		
Boston Proper customer relationships	$ 43,580	$ 43,580
Accumulated amortization expense recorded	(16,851)	(14,672)
Impairment expense recorded	(24,166)	—
Sale of Boston Proper customer relationships	(2,563)	—
Total definite-lived intangibles	—	28,908
Total other intangible assets, net	$ 38,930	$ 109,538

"…In fiscal 2015, based on market indications of value and a decline in sales, we recorded a pre-tax goodwill impairment charge of $48.9 million related to Boston Proper goodwill, reducing the carrying value of goodwill to zero, pre-tax impairment charges related to the Boston Proper trade name of $39.4 million, reducing the carrying value of the trade name to $2.3 million, and a pre-tax impairment charge related to Boston Proper customer relationships of $24.2 million, reducing the carrying value of the customer relationships to $2.6 million. All impairment charges were recorded within Goodwill and intangible impairment charges in the accompanying consolidated statements of income. There were no changes or cumulative impairment charges for other outstanding goodwill and intangible balances during fiscal 2015." (Chico's Fas Inc, page 47)

Appendix C: Additional Results

Table C1: Correlations

This table displays correlation coefficients of the variables used in the analyses. Pearson correlations are below the diagonal and spearman correlations above the diagonal.

Pearson/Spearman correlations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15=	(16)	(17)	(18)	(19)	(20)	(21)
(1) Impair: Indefinite Int. $_{(t+1)}$	1.0000	0.1922	0.5434	-0.0579	0.0552	0.0511	0.0804	0.0170	0.0694	0.0702	0.0199	-0.0684	0.0700	-0.0654	0.0325	-0.0023	0.0237	-0.0757	-0.0289	0.1764	0.0550
(2) Impair: Finite Int. $_{(t+1)}$	0.1922	1.0000	0.1890	-0.0605	0.0242	0.0162	0.0820	-0.0094	0.0890	0.0002	-0.0808	-0.0918	0.0639	-0.0039	0.0187	-0.0057	0.1090	-0.0866	-0.0521	-0.0138	0.1796
(3) Impair: Goodwill. $_{(t+1)}$	0.5434	0.1890	1.0000	-0.0378	0.0763	0.0587	0.1221	0.0020	0.0126	0.1550	-0.0460	-0.0180	0.0505	-0.0911	0.0467	0.0246	-0.0815	-0.0544	0.0051	0.1170	0.0212
(4) Amiram MAD	-0.0580	-0.0612	-0.0393	1.0000	0.0185	-0.0141	0.0541	-0.0048	-0.1150	0.0565	-0.0275	0.1253	-0.2310	0.0212	-0.0691	-0.0492	-0.1090	0.0037	-0.0271	0.0249	-0.1315
(5) WEAK 404	0.0552	0.0242	0.0763	0.0225	1.0000	0.0364	0.0368	0.0089	0.0440	0.0325	-0.0714	-0.0382	-0.0966	-0.0139	0.0344	0.0028	-0.0013	-0.0770	-0.0037	0.0021	0.0555
(6) Audit Opinion	0.0511	0.0162	0.0587	-0.0205	0.0364	1.0000	0.0191	-0.0028	-0.0421	0.0131	-0.0026	0.0752	0.0545	-0.0324	0.0571	-0.0071	0.0306	-0.0922	-0.0847	0.0182	0.0031
(7) Earns Bath. $_{(t+1)}$	0.0804	0.0820	0.1221	0.0533	0.0368	0.0191	1.0000	-0.1050	-0.0257	0.0488	-0.3328	0.0264	-0.1196	-0.0587	-0.0268	-0.0430	0.0316	-0.0660	-0.0082	-0.0514	-0.0197
(8) SMOOTH. $_{(t+1)}$	0.0170	-0.0094	0.0020	-0.0060	0.0089	-0.0028	-0.1050	1.0000	-0.0425	-0.0494	0.2484	0.0393	-0.0504	-0.0491	0.0421	0.0053	0.0250	-0.0273	-0.0158	0.0385	-0.0185
(9) Merger	0.0694	0.0890	0.0126	-0.1163	0.0440	-0.0421	-0.0257	-0.0425	1.0000	-0.0211	-0.0661	-0.9082	0.0985	0.1682	0.0014	0.0562	0.2175	-0.2236	-0.1020	-0.0089	0.3952
(10) BTM $_{(t+1)}$	0.0503	0.0085	0.1268	0.0482	0.0123	0.0053	0.0476	-0.0451	-0.0183	1.0000	-0.2290	0.0183	-0.1672	-0.0900	-0.3411	0.0912	-0.1470	-0.1372	0.1305	-0.0040	-0.0517
(11) ROA before Impairm. $_{(t+1)}$	0.0257	-0.0772	-0.0148	-0.0097	-0.0500	0.0065	-0.3594	0.2308	-0.0520	-0.1031	1.0000	0.0706	0.0868	0.0673	0.0005	-0.0472	-0.1019	0.1643	-0.0932	0.5806	-0.0651
(12) Size	-0.0691	-0.0915	-0.0199	0.1271	-0.0398	0.0767	0.0273	0.0388	-0.8895	0.0106	0.0568	1.0000	-0.1370	-0.1329	-0.0149	-0.0622	-0.2157	0.2345	0.1107	0.0020	-0.4295
(13) Sales Growth	0.0652	0.0634	0.0505	-0.2463	-0.0970	0.0579	-0.1321	-0.0432	0.1009	-0.1407	0.0431	-0.1352	1.0000	-0.0349	0.3000	0.0510	-0.0139	0.1620	0.0744	-0.0796	0.0621
(14) Leverage	-0.0405	0.0086	-0.0633	0.0189	0.0013	-0.0231	-0.0357	-0.0504	0.1688	-0.0509	0.0190	-0.1341	-0.0318	1.0000	-0.0898	-0.0040	0.0919	0.0314	-0.0311	-0.0362	0.1049
(15) Business Segment	0.0244	0.0152	0.0393	-0.0585	0.0327	0.0594	-0.0240	0.0507	-0.0202	-0.3545	0.0855	0.0093	0.2512	-0.0858	1.0000	-0.0611	-0.2063	0.0752	-0.0181	0.1201	0.0333
(16) R&D Spending	0.0018	-0.0020	0.0396	-0.0684	-0.0041	-0.0001	-0.0547	0.0047	0.0580	0.0515	-0.0248	-0.0692	0.1299	-0.0132	-0.0505	1.0000	0.0723	-0.0019	0.1261	-0.0555	0.1171
(17) Altman's Z	0.0184	0.0884	-0.0923	-0.0075	0.0018	0.0077	0.0864	0.0107	0.1644	-0.0855	-0.1706	-0.1568	-0.1551	0.1606	-0.2336	-0.0779	1.0000	-0.1707	0.0042	-0.1676	0.3263
(18) Inventory & Receivables	-0.0848	-0.0839	-0.0590	0.0202	-0.0720	-0.0958	-0.0688	-0.0282	-0.2170	-0.1006	0.0620	0.2355	0.1887	0.0065	0.1241	-0.0176	-0.2040	1.0000	0.6365	-0.1473	-0.3118
(19) Indefinite Int	-0.0337	-0.0570	0.0028	-0.0026	-0.0061	-0.0950	-0.0004	-0.0235	-0.1168	0.1294	-0.1769	0.1238	0.0568	-0.0381	-0.0076	0.0925	-0.1217	0.5951	1.0000	-0.1843	-0.1072
(20) Finite Int	0.1104	-0.0224	0.0907	0.0379	0.0163	0.0325	-0.0596	0.0485	-0.0253	0.0102	0.7758	0.0285	-0.1383	-0.0213	0.1276	-0.0559	-0.1184	-0.2170	-0.2712	1.0000	0.0416
(21) Goodwill	0.0713	0.1955	0.0140	-0.0926	0.0503	0.0162	0.0064	-0.0029	0.3464	-0.0543	-0.1006	-0.3556	0.0279	0.1315	0.0214	0.0477	0.1511	-0.3316	-0.2061	-0.0674	1.0000

Table C2: Results from Table 3 using Probit Regressions

Table C2 uses a Probit regression model to show the explanatory power of different indicators on the probability to impair acquired intangible assets with indefinite (Column (1)), finite (Column (2)) useful economic lifetimes, and the goodwill (Column (3)) in the period t+1. Industry and time trends are captured in all specifications by including industry-by-time fixed effects. Standard errors are clustered on the firm level. Robust t-statistics are reported in round brackets. ***, **, and * indicate, respectively, significance levels at the 0.01, 0.05, and 0.10 levels. See Appendix A for variable definitions.

Dep. Var.: Impair:	(1) Indefinite Int. $_{(t+1)}$	(2) Finite Int. $_{(t+1)}$	(3) Goodwill $_{(t+1)}$
Reporting Quality Indicators			
Amiram MAD	-8.1675**	-9.8135**	-7.2463**
	(-2.5139)	(-2.5200)	(-2.3370)
WEAK 404	0.3452***	0.1671	0.4161***
	(3.5250)	(1.5787)	(4.6507)
Audit Opinion	0.1163***	0.0367	0.1382***
	(2.9098)	(0.6721)	(3.4043)
Earns Bath. $_{(t+1)}$	0.3723***	0.2280*	0.5369***
	(3.5053)	(1.8193)	(5.0222)
SMOOTH. $_{(t+1)}$	0.2008***	0.1049	0.2170***
	(3.9375)	(1.6264)	(4.4478)
Business Model Indicators			
M&A	0.1176**	0.0342	0.0261
	(2.3733)	(0.6004)	(0.5553)
BTM $_{(t+1)}$	0.1358***	0.1463**	0.3028***
	(2.6225)	(2.0050)	(5.6792)
ROA before Impairment $_{(t+1)}$	-1.5254***	-1.9305***	-2.2274***
	(-4.0495)	(-4.5783)	(-5.9368)
Size	0.0995***	0.1263***	0.0987***
	(4.6636)	(5.1345)	(5.3902)
Sales Growth	-0.3809***	-0.1482	-0.3594***
	(-3.1072)	(-1.1124)	(-2.9997)
Leverage	0.0111	0.3158*	0.1672
	(0.0760)	(1.7369)	(1.1976)
Business Segment	0.0027	-0.0017	0.0108*
	(0.4536)	(-0.2645)	(1.9293)
R&D Spending	0.7780	2.3351***	-2.6899***
	(1.1009)	(2.8662)	(-2.8875)
Altman's Z	-0.0378	0.0286	-0.0210
	(-0.7903)	(0.5157)	(-0.4856)
Inventory & Receivables	0.3778	-0.2691	0.7589***
	(1.3606)	(-0.7919)	(2.6232)
Indefinite Int	3.3103***	2.0639***	3.5026***
	(7.0676)	(4.0093)	(7.6128)
Finite Int	0.5776	2.9684***	0.0559
	(1.3185)	(6.4189)	(0.1224)
Goodwill	0.4434*	0.0685	0.8811***
	(1.7935)	(0.2583)	(3.7780)
Industry×Year FEs	Yes	Yes	Yes
Observations	7,075	6,868	7,080

Table C3: Impairment Pressure, Governance and the Impairments of Finite Acquired Intangibles and Goodwill

This table shows a different version of Table 4 Panel A from the main table on regression results from a linear probability model, where Impair: Finite Int. (t+1) in Panel A and Impair: Goodwill in Panel B servs as our dependent variables. Our main variable of interest is the interaction term of BTM, which serves as a market indicator for impairment pressure, and different governance variables that are displayed above each column. Additional control variables as in Table 3 are included in all specifications but are not displayed to ease the reading of the table. Industry and time trends are captured in all specifications by including industry-by-time fixed effects. Robust standard errors are clustered on the firm level. Robust t-statistics are reported in round brackets. ***, **, and * indicate, respectively, significance levels at the 0.01, 0.05, and 0.10 levels. See Appendix A for variable definitions.

Panel A: Impairments of finite intangible assets

	INTERNAL CORPORATE GOVERNANCE					EXTERNAL MONITORING		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Governance Variables:	*NED: Accounting Expert (%)*	*NED: Distraction (# Boards)*	*ED: Distraction (# Boards)*	*CEO Turnover*	*Variable Compensation*	*# Analyst Coverage*	*# Media Coverage*	*Institutional Ownership (%)*
Impairment Pressure Indicators for Impairments								
BTM $_{(t+1)}$	0.0066	0.0560**	0.0115	0.0085	0.0231	0.0261**	0.0284	0.0351**
	(0.4235)	(2.4554)	(0.7112)	(0.5825)	(1.5833)	(2.1365)	(1.5530)	(2.5491)
Impairment Pressure Indicators for Impairments								
GOVERNANCE VARIABLE	0.0440	0.0114*	-0.0001	0.0030	0.0383	0.0009	0.0021***	0.0003
(As indicated by column header)	(0.8447)	(1.8277)	(-0.0290)	(0.0434)	(0.8582)	(0.5546)	(3.1413)	(0.8595)
Interaction Term: Governance × Impairment Pressure Indicators for Impairments								
BTM $_{(t+1)}$×	0.0494	-0.0133	0.0015	0.0678	-0.1286**	-0.0022	-0.0003	-0.0007*
GOVERNANCE VARIABLE	(0.6862)	(-1.6254)	(0.2834)	(0.7425)	(-2.0826)	(-0.7514)	(-0.2923)	(-1.7896)
Reporting Quality Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business Model Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,180	6,179	6,050	5,285	5,307	7,090	5,239	7,090
R-squared	0.0774	0.0772	0.0740	0.0805	0.0813	0.0796	0.0836	0.0800

Panel B: Impairments of goodwill

	INTERNAL CORPORATE GOVERNANCE					EXTERNAL MONITORING		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Governance Variables:	*NED: Accounting Expert (%)*	*NED: Distraction (# Boards)*	*ED: Distraction (# Boards)*	*CEO Turnover*	*Variable Compensation*	*# Analyst Coverage*	*# Media Coverage*	*Institutional Ownership (%)*
Impairment Pressure Indicators for Impairments								
BTM $_{(t+1)}$	0.0731***	0.1412***	0.1662***	0.0889***	0.1434***	0.0721***	0.0469	0.0986***
	(2.9200)	(3.7626)	(5.5015)	(5.3727)	(6.8802)	(4.0580)	(1.3404)	(4.8414)
Impairment Pressure Indicators for Impairments								
GOVERNANCE VARIABLE	-0.0995	0.0039	0.0110	-0.1994***	0.1349**	-0.0061***	-0.0020**	0.0006
(As indicated by column header)	(-1.3351)	(0.4800)	(1.3023)	(-3.3332)	(2.3138)	(-3.3393)	(-2.0395)	(1.2674)
Interaction Term: Governance × Impairment Pressure Indicators for Impairments								
BTM $_{(t+1)}$×	0.2267**	-0.0112	-0.0280**	0.2665***	-0.2984***	0.0067	0.0038**	-0.0004
GOVERNANCE VARIABLE	(2.1552)	(-0.9010)	(-2.4652)	(3.3601)	(-3.1745)	(1.5404)	(2.4484)	(-0.6597)
Reporting Quality Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business Model Indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry×Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,179	6,178	6,050	7,090	5,307	7,090	5,239	7,090
R-squared	0.1065	0.1051	0.1080	0.0994	0.1142	0.1011	0.1179	0.0990

tax accounting

Discursive legitimation of tax practices in the electric utilities sector in the European Union: a critical discourse analysis approach

Abstract

Corporations are increasingly disclosing voluntary tax reports that include both quantitative data and accompanying narratives. Some researchers argue that these reports serve to meet corporations' legitimacy needs. However, analyses of such reports often focus on the documents themselves, overlooking the broader socio-political context and ideological dimensions of corporate legitimation efforts. Using critical discourse analysis, this study elucidates how corporations discursively construct legitimacy for their tax practices in tax transparency publications. The findings reveal that corporations justify their tax behavior by appealing to various authorities, rationalities, values, and exemplifications of 'good' behavior, framing themselves as socially responsible tax actors. Additionally, the articulation of taxation, sustainability, and CSR discourses plays a central role in this legitimation process, subtly reflecting deeper ideological assumptions. Overall, the study raises concerns that tax disclosures may create an illusion of transparency without contributing to corporate accountability.

1. Introduction

In recent years, there has been a growing interest among corporations in disclosing reports that encompass both quantitative tax information and accompanying narratives complementing these figures. Prior research indicates that such reports have proven ineffective in mitigating tax avoidance (Bilicka et al., 2022; Xia, 2023). Moreover, tax disclosures may be utilized to build reputational capital (Hardeck, Inger, et al., 2024), or serve as instruments to signal legitimacy (Blaufus et al., 2023; Holland et al., 2016; Kao & Liao, 2021a).

Organizational legitimacy implies that perceived organization' values system is aligned with the norms and values of the social system in which it operates (J. Dowling & Pfeffer, 1975). When an organization is perceived as deviating from these values, its legitimacy is threatened (Deegan, 2002). The rise in tax disclosures in recent years aligns with the concerns that tax avoidance and

profit shifting may undermine the legitimacy of multinational companies (Aliprandi & Borders, 2023; Holland et al., 2016).

Voluntary tax disclosures serve not only as a strategic response to public scrutiny and media pressure but also as a means to provide a comprehensive narrative that explains the reported tax figures (Jonkman et al., 2023). This dual function shapes both the nature of the information disclosed and the dynamics between information providers and recipients (Oats & Tuck, 2019).

Previous analyses of tax reports predominantly focus on standalone documents, often neglecting the socio-political context and ideological dimensions inherent in corporate legitimation efforts. Additionally, limited attention has been given to how corporations construct legitimacy within their tax reports. Since legitimation efforts are largely discursive, it is essential to examine the linguistic and communicative aspects that underpin the process of legitimation (Rojo & Van Dijk, 1997).

To address this gap in the taxation literature, this study aims to analyze the process of discursive legitimation of corporate taxation practices. From a discursive perspective, legitimation involves constructing a sense of positive, beneficial, ethical, necessary, or acceptable action, whereas delegitimation entails the portrayal of actions as negative, morally reprehensible or unacceptable (Rojo & Van Dijk, 1997; Vaara, 2014; Van Leeuwen & Wodak, 1999). Legitimation also relies on and involves broader discourses and ideologies (Vaara, 2014; van Dijk, 1998). Consequently, the study is guided by the following research questions:

- *Which taxation practices are the focus of (de)legitimation, and which authorities, values, rationalities, and narratives are employed to (de)legitimize these taxation practices?*
- *How are sustainability and corporate social responsibility discourses articulated into the legitimation of taxation practices?*
- *How is ideology embedded in the discourse legitimating corporate taxation practices?*

Addressing these questions is crucial for several reasons. First, examining the tax practices that are legitimized or delegitimized in public reports provides insights into how companies justify or condemn tax-related actions, thus informing future regulatory frameworks. Second, the analysis

of textual strategies allows to understand how particular voices and interest are reproduced and how others are silenced (Vaara & Tienar, 2008). Third, analyzing how CSR and sustainability discourses are articulated to the taxation discourse sheds lights on the ethical perceptions of corporations about taxation and contributes to the debate on the limits and responsibilities of corporations as societal actors. Fourth, ideologies influence how tax practices are perceived and debated, shaping policy decisions and public opinion. Understanding these ideologies deepens our comprehension of power dynamics in corporate taxation debates. Overall, addressing these three questions contributes to a more holistic comprehension of tax regulation and challenges assumptions about transparency as the ideal policy solution (Sonnerfeldt, 2020).

To explore these research questions, we analyze the tax transparency reports of two large European utility companies, Enel and Iberdrola, which are published on their websites. These companies were selected because they are the largest utilities in the EU, and they are pioneers in tax reporting. Several reasons motivated our choice of utilities sector as the focus of this analysis. First, major companies in the energy sector are leaders in voluntary tax disclosures (Aliprandi & Borders, 2023). Unlike mining, extractive, and banking sectors, companies in the utilities energy sector are only required to disclose publicly their tax payments on a country basis as of 2024. Second, as providers of public services, and as companies subject to various reforms, such as privatization, regulation, and restructuring, face increasing public pressure to contribute to sustainable development and to demonstrate the legitimacy of their operations (Branco et al., 2023). Third, with the surge in energy prices in 2022, various European governments imposed temporary windfall taxes on energy companies (Nicolay et al., 2023). This temporary windfall tax offers a critical test for these companies to demonstrate their tax and social responsibility claims.

We draw upon two complementary approaches within the critical discourse analysis (CDA) to shed light on our research questions. CDA is a qualitative systematic linguistic approach to analyzing discourse within its social context (Joye & Maeseele, 2022). It seeks to deconstruct ideologies and power through the analysis of written, spoken or visual data (Wodak & Meyer, 2016). Specifically, we adopt Norman Fairclough's dialectical relational approach (2016) which posits a dynamic relation between discourse and society, in which one shapes the other. This analysis in

conducted at three simultaneous levels, the text or microlevel textual elements, the context of production and interpretation of that text, and the situational and institutional context (Vaara & Tienar, 2008).

We complement this with an analysis of the of microlevel discursive strategies of taxation practices following Theo Van Leeuwen's (2007) framework, which examines how language is used to construct legitimacy through references to authority, utility, morality and storytelling. Analyzing micro-level discursive elements provides a nuanced understanding of the complexities, ambiguities, and contradictions inherent in legitimation processes (Vaara et al., 2006). Together, Fairclough's and Van Leeuwen's approaches allow us to scrutinize how specific discursive practices are deployed to secure or maintain legitimacy in tax reports (Vaara & Tienar, 2008), and to question established assumptions (Tregidga et al., 2014). Furthermore, CDA facilitates the understanding of the discursive-ideological foundations of legitimation and the dynamics of power in corporate legitimation processes (Joutsenvirta & Vaara, 2015).

This work responds to the call for research into taxation as a field of critical enquiry relevant to our understanding of globalization, social justice and power (Boden et al., 2010). It addresses the need for accounting research to delve into the study of public relations, rhetorical, strategies, propaganda, and political aspects of corporate messages conveyed through stand-alone reports (Tregidga et al., 2012). Furthermore, it contributes to in-depth studies on how corporations explain their taxes, providing a deeper understanding of the processes behind tax disclosures (Sonnerfeldt, 2020).

Our work offers theoretical and practical contributions. Academically, it advances a critical understanding of taxation as a social practice and enriches the literature on tax transparency by integrating qualitative methods like critical discourse analysis into the investigation of the reports. The research provides valuable insights into the discursive construction of legitimacy and the influence of neoliberal ideology on corporate taxation discourse. These findings can help stakeholders better interpret tax reports and support policymakers in designing regulatory frameworks that better balance market forces with oversight, ensuring that transparency serves the public interest rather than simply advancing corporate goals.

The paper is structured as follows: Section two introduces the study of taxation as a social practice and situates the research within the academic literature on transparency and tax disclosures. Section 3 describes the discursive perspective on legitimation, including Fairclough's discursive approach and Theo van Leeuwen's grammar of legitimation. Section 4 details the sample and method of analysis. Section 5 presents the results. Finally, Section 6 discusses the findings, highlights limitations, and offers suggestions for future research.

2. Positioning in the accounting literature

2.1. Taxation as a social practice

A significant strand of taxation literature has been informed by positivists approaches characterized by the pursuit of causal explanations, measurement, and value-free science (Boden et al., 2010; Gracia & Oats, 2015; Oats, 2012). Although this body of work has significantly advanced our knowledge of taxation, it has frequently neglected critical dimensions such as social conflict, power dynamics, class structures, state capture, ideology, and issues of social justice and fairness in the analysis of taxation (Sikka, 2013). To develop a more comprehensive and reflective understanding of taxation practices, it is essential to conceptualize taxation as a historical, social and institutional phenomenon (Gracia & Oats, 2015).

Understanding taxation as a social practice implies viewing it as a relatively stable configuration of diverse social elements that are dialectically related. These elements include activities, subjects and their social relations, instruments, objects, time and place, values, and discourse (Chiapello & Fairclough, 2002). This perspective allows social research and analysis to oscillate between the perspectives of social structure and social action and agency, providing a more holistic understanding of taxation.

The importance of taxation is undeniable, but its social role is very contested. Taxation performs four key functions in social life. First, it has a revenue function, financing public spending and government operations. Second, it serves a redistributive function by helping to combat wealth and income inequality. Third, it has a repricing or regulatory function, influencing social behavior through taxes on items such as cigarettes, alcohol, and environmental pollutants. Finally, taxation

has a representation function, acting as a cornerstone in the social contract between citizens and the state, aligning the state's interest in the well-being of its citizens with the citizens' interest in the state (Ylönen & Finér, 2023).

The effectiveness of these functions is severely affected, both directly and indirectly, by tax base erosion and profit shifting. The ownership of multinationals and financial assets is mostly concentrated among the wealthy, which can corrode the treasury's revenue and hinder redistribution. Tax aggressiveness and evasion, particularly by the affluent, facilitate the reduction of their tax burden, which is transferred to other members of society, and decrease the transparency of their investments (Ylönen & Finér, 2023). Consequently, taxation becomes a site of inherent social conflict, necessitating critical analysis to understand social antagonisms and advance towards social change.

2.2. Transparency and tax disclosures

Transparency has emerged as an important element for policy-making and organizational accountability, involving both public and private sectors. In most areas the social domain, transparency refers to objects and activities that are made visible through acts and instruments of disclosure (Hansen et al., 2015). It is widely believed that transparency can address information asymmetries, fostering visibility, clarity, trust, and accountability. However, transparency initiatives also involve hidden dimensions such as the selective presentation, framing or structuring of information. These aspects can introduce uncertainty, provoke suspicion, increase opacity, and divert attention from the core issues (Hansen et al., 2015; Oats & Tuck, 2019). Thus, transparency is marked by complexity and ambiguity and is not necessarily a panacea for addressing organizational misconduct (Oats & Tuck, 2019).

In the tax context, tax transparency has been proposed as a solution to address aggressive tax behavior (Oats & Tuck, 2019). One approach to enhancing transparency for multinationals is through disclosure initiatives. For example, the European Union mandates country-by-country reporting (CbCR) of tax payments, while the United Kingdom requires the disclosure of tax strategies. In other European countries, the publication of reports detailing tax strategies and

approaches to taxation is discretionary. These reports, referred to as qualitative tax disclosures or tax reports, may be published as standalone documents or included within integrated company reports or corporate social responsibility (CSR) reports.

In their examination of companies' tax strategies reports required by United Kingdom tax authorities, Bilicka, Casi, Seregni, and Stage (2022) and Xia (2023) find no evidence that this regulation curbs tax avoidance. Instead, they demonstrate how these reports may serve to enhance companies' public image as responsible taxpayers. In contrast, Hardeck, Hechtner, Seebeck, and Weiss (2024) document an increase of the effective tax rates of the companies adopting the standard report on taxation recommended by the Global Reporting Initiative (GRI) 207. This reporting standard requires the disclosure of qualitative tax information (e.g. tax strategies) and quantitative tax information (CbCR). Their finding suggests that tax reports that include both, quantitative tax information and narratives on taxation are more effective to address tax avoidance than solely qualitative tax disclosures. In a related study, Göttsche, Habermann, and Sieber (2024) find that tax strategy reports are not considered material by investors, whereas country-by-country reports are deemed more significant.

A plausible explanation for the ineffectiveness of qualitative tax disclosures in curbing tax-aggressive behavior may lie in the content and presentation of these disclosures. Kopetzki et al. (2023) observe that publications from Italian, French, and German corporations are often not highly comprehensible, making it challenging for readers to access relevant information. Furthermore, Belnap (2022) presents evidence of plagiarism in the tax strategy reports of United States companies operating in the United Kingdom, raising doubts about the accuracy and credibility of the information provided in these disclosures.

Furthermore, Hardeck, Inger, Moore, and Schneider (2024) find that firms often use disclosures to frame tax payments as beneficial to society, rather than outlining strategies for socially responsible tax behavior. The authors document a negative association between environmental performance and responsible tax disclosures, suggesting that such reports may be used to repair reputational capital harmed by environmental poor performance. In a similar study of public UK companies, Kao and Liao (2021a) find that firms with higher tax avoidance are more likely to

include tax disclosures in their CSR reports. These reports are typically longer and contain more soft information, supporting legitimacy theory, which suggests firms use voluntary disclosures to manage stakeholders' perceptions when violating the social contract.

Furthermore, Blaufus et al. (2023), through the analysis of tax strategy reports of UK companies, find that firms generally portray themselves as 'responsible taxpayers' rather than 'tax planners'. They also note that the tone of strategy disclosures reflects firms' actual tax policies only when firms are subject to external oversight, such as financial analysts or government regulators.

Specifically in the utilities energy sector, Branco et al. (2023), observe that tax-related sustainability reporting is influenced by coercive (regulations), mimetic (past similar reporting experiences), and normative (strength of the accounting profession) isomorphism. Although not specifically concerning tax reporting, Talbot and Boiral (2018) find that energy companies use impression management strategies in their GRI climate change reports to disclose opaque and concealed information, hindering stakeholders' ability to effectively assess climate performance. Similarly, Rossi and Nicolo (2022) document that energy sector companies make symbolic rather than substantive changes concerning the SDGs, a practice termed "SDG-washing."

Overall, these cited studies are consistent with the observation that tax and sustainability reports are typically used as tools for gaining, repairing, or maintaining legitimacy. Legitimation efforts are mostly realized through communication and discourse, therefore a more comprehensive understanding of legitimacy may be achieved considering the linguistic, communicative, or interactional aspects of legitimation (Rojo & Van Dijk, 1997).

3. Discursive perspective on legitimation

Legitimacy is commonly defined as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574). This definition implies that legitimacy is more closely associated with societal perceptions than with the actual conduct of the organization (Peda & Vinnari, 2020).

According to Dowling and Pfeffer (1975), organizations undertake three actions to achieve legitimacy. First, they may adapt their processes, goals, and practices to align with the prevailing definition of legitimacy. Second, they may attempt to redefine social legitimacy to align with their own practices and values. Third, they may seek to associate themselves with symbols, values, or institutions that possess strong social legitimacy. These latter two actions are primarily carried out through communication, underscoring the discursive nature of legitimation acts. Therefore, discussions on legitimation must encompass linguistic, discursive, communicative, and interactional characteristics (Rojo & Van Dijk, 1997).

Given that the process of legitimation heavily relies on discursive acts, we propose to address our research enquiry using critical discourse analysis (CDA). This approach is particularly suitable for our analysis as it facilitates the understanding of the socio-political and ideological aspects of legitimacy (Joutsenvirta & Vaara, 2015). From a CDA perspective, the legitimation of specific actions is intertwined with broader social practices and power dynamics (Peda & Vinnari, 2020; Rojo & Van Dijk, 1997; Vaara & Tienar, 2008). In multinational corporations, the process of legitimation generally involves complex interdiscursive dynamics where ideologies and discourses are employed to (de)legitimize certain practices (Vaara & Tienar, 2008). CDA focuses on legitimizing discourses which frame certain actions as beneficial, morally or politically justifiable, while depicting others as reprehensible or unacceptable (Peda & Vinnari, 2020; Rojo & Van Dijk, 1997).

To investigate how legitimacy is constructed through micro level textual strategies, discourses and ideologies, we rely on the Fairclough's framework (Fairclough, 2016) and the grammar of legitimation proposed by Theo van Leeuwen (Van Leeuwen, 2007). These two frameworks will be explained below.

3.1.Fairclough's critical discourse analysis

CDA is a form of critical social analysis (Fairclough, 2018). It seeks to elucidate the relations between discourse and various components of social reality, including power dynamics, ideologies,

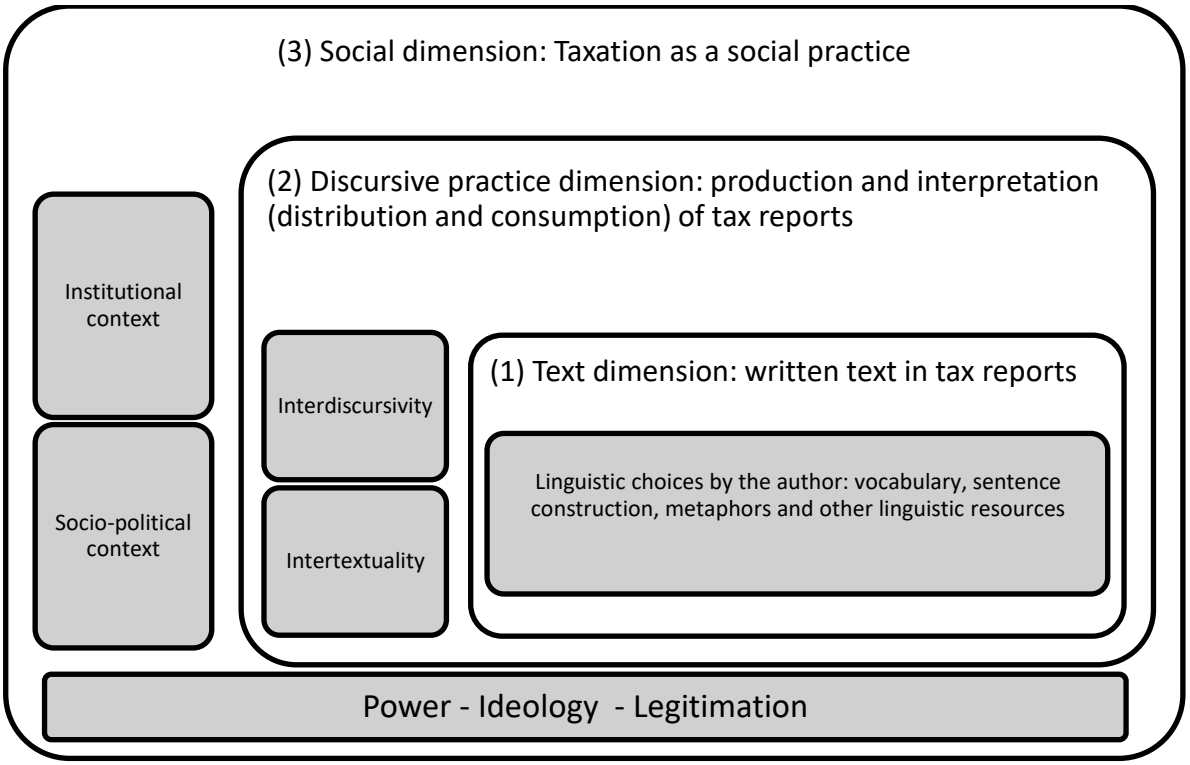
and institutions, with the aim of addressing aspects of social systems that undermine human well-being such as discrimination, inequality, and lack of freedom (Fairclough, 2016).

Discourse can be understood in three distinct ways within the context of this approach. Firstly, it is viewed as meaning-making, constituting an element of a social process that is dialectically related to other elements of social life. This perspective regards discourse as language use, functioning as a form of social practice (Fairclough, 1993). Secondly, discourse is associated with specific social practices, such as political discourse or taxation discourse. Thirdly, discourse serves as a means of representing aspects of the world, as seen in examples like the neoliberal discourse of globalization (Fairclough, 2016).

Viewing language use as a social practice entails situating it within a historical and social context. Because language is dialectically related to other elements of social life, it is both socially shaped and socially constitutive. Fairclough's CDA aims to systematically analyze the opaque relationships of causality and determination between discursive practices (which encompass different discourses mobilized, and genres), events, texts, and wider social and cultural structures. This analysis seeks to explain how such practices, events, and texts emerge from and are ideologically shaped by power relations and struggles over power (Fairclough, 1993, p. 135). Fairclough proposes a three-dimensional framework for analyzing discursive events: (i) the text dimension, (ii) the discursive practice dimension, and (iii) the social practice dimension (Fairclough, 1993). Fairclough's framework of analysis is depicted in Figure 1.

The first dimension involves analyzing the choices made by the author within the text. This includes the choice of vocabulary, sentence construction and other linguistic resources. The second dimension focuses on the properties of the production, dissemination and consumption process that inform the author's textual choices. This dimension encompasses interdiscursivity and intertextuality (Joye & Maeseele, 2022). Interdiscursivity is the articulation of different discourses in the text. Intertextuality is the presence of other texts within the analyzed text. The third dimension, the social practice, delves into the broader social context surrounding the other two dimensions, the situational and institutional context, including the economy, politics, and ideology (Joye & Maeseele, 2022).

Figure 1. Fairclough's three-dimensional model



It is within this third dimension that the connection between ideology, discourse, legitimation, and power becomes most evident, as illustrated in Figure 1. Discourses are inherently shaped by ideologies, and consequently, legitimation often involves the reinforcement of these ideologies (Vaara & Tienar, 2008; van Dijk, 1998). In the context of Fairclough's CDA approach, ideology is defined as "representations of aspects of the world which can be shown to contribute to establishing, maintaining and changing social relations of power, domination and exploitation" (Fairclough, 2003, p. 9). Thus, analyzing ideology within texts is closely tied to understanding their effects on power relations. The ideological function of a text often involves imposing assumptions on both readers and producers, typically unconsciously. In this sense, ideology operates as an implicit philosophy, a form of common sense and a set of ideas taken for granted (Fairclough, 2015).

In the context of multinational corporations discussions around controversial actions, such as privatization or organizational transformations are linked to ideologies like neoliberalism, global capitalism, and nationalism, as well as Marxism or radical humanism to resist neoliberalism (Lupu & Sandu, 2017; Vaara & Tienar, 2008). Certain organizational practices are deemed legitimate or illegitimate depending on the ideological perspective. For example, industrial restructuring is under

neoliberal ideology if it creates shareholder value, from a nationalist perspective, it may be considered illegitimate for undermining national heritage or being perceived as surrendering to foreign powers (Vaara et al., 2006).

3.2.The grammar of legitimation by Theo van Leeuwen

Van Leeuwen (2007) offers a framework for analyzing how discourses construct legitimation of social practices. He identifies four key forms of legitimation, each realized through specific linguistic resources and configurations: authorization, rationalization, moral evaluation, and mythopoesis or narrativization (Fairclough, 2003; Leeuwen Van & Wodak, 1999).

Authorization refers to legitimation through the invocation of either personal or impersonal authority. Personal authorities may include individuals such as doctors, professors, well-known intellectuals, experts, or anyone vested with authority. Impersonal authorities, in contrast, encompass traditions, customs, laws, and regulations (Van Leeuwen & Wodak, 1999). A further form of authority arises from conformity, where the justification for an action is that “everyone does it” or “it is what most people do” (Van Leeuwen, 2007).

Rationalization can be categorized into two types: instrumental rationalization and theoretical rationalization. Instrumental rationalization justifies actions based on their utility, consequences, or necessity. Theoretical rationalization, on the other hand, is grounded in a perceived truth, presenting actions as "the way things are," closely related to the naturalization of actions. This form of legitimation may also appeal to a system of knowledge, whether scientific or not, such as religion (Van Leeuwen, 2007). Moral evaluation legitimizes actions by aligning them with a widely accepted moral order. References to values are employed to justify actions and practices, either implicitly or explicitly (Van Leeuwen, 2007).

Finally, mythopoesis, or narrativization, legitimizes through storytelling, often using normative narratives to highlight acceptable or unacceptable behavior. Stories or events serve as examples of either proper conduct or behavior to be avoided (Vaara & Tienar, 2008; Van Leeuwen, 2007; Van Leeuwen & Wodak, 1999).

These strategies are often intertwined, such as in the combination of moral and rational legitimation strategies. Moreover, actors may employ these discursive strategies consciously or unconsciously. However, it is beyond the scope of this study to determine the extent to which these legitimation strategies are consciously mobilized.

4. Research design

4.1.Sample -selection

Our empirical study is based on the qualitative content analysis of taxation reports published on their websites by two EU headquarters electric companies: Enel and Iberdrola, covering the period from 2018 to 2022. The year 2018 marks the first publication of separate taxation reports by these companies, including quantitative tax information such as tax contributions per country, and details about their tax strategies and approach to taxation. We analyzed a total of 10 reports.

Our selection of the sector electric utilities is based on several reasons. First, organizations providing public services face significant institutional, technical and public pressures (Branco et al., 2023) likely making them pioneers in voluntary tax disclosures. Second, the electricity sector has undergone substantial transformations in recent decades, including changes to business models, privatization, and market-based reforms aimed at enhancing competitiveness and efficiency (Dubash, 2003), which requires ongoing legitimation efforts. Third, the sector faces increasing public pressure to demonstrate their contribution to sustainable development, and to ensure the legitimacy of their operations (Branco et al., 2023). Lastly, with the surge in energy prices in 2022, various European governments imposed temporary windfall taxes on energy companies (Nicolay et al., 2023). These temporary windfall taxes serve as a test of the companies' claims to socially responsible behavior in connection with taxes, as it assesses their willingness to transfer profits or revenue from the shareholders to the government and community as a whole through taxes paid.

We selected Enel and Iberdrola from the electric utilities sector for two key reasons. First, Iberdrola holds the largest market capitalization among European electric utilities, while Enel ranks as the second largest. Market capitalization, generally defined as the product of a company's closing

stock price and outstanding shares (on average US 73 billion the latest years for both companies), serves as a critical indicator company's size, perceived overall market value, and stability. This metric reflects investor sentiment and expectations regarding investment risk and volatility, which can influence corporate tax strategies[1]. Second, both companies are pioneers in tax transparency initiatives. Furthermore, Enel presents a unique case as a partially state-owned enterprise, in contrast to the privately owned Iberdrola. This distinction may influence their respective tax strategies, and the discourse employed in their reports. Henceforth, when referring to both Iberdrola and Enel, we will use the term "the companies."

Enel, headquartered in Italy, was founded in 1989 and went public in 1999[2]. As a multinational corporation with over 1,200 subsidiaries worldwide, Enel is engaged in the production, distribution, and transmission of electricity, as well as supplying gas to households and businesses. The company is also active in the renewable energy sector, providing wind, solar, geothermal, and hydropower energy. Over the past decade, Enel has maintained an average operating profit of €0.12 for every euro of revenue. The Italian government is the major shareholder, holding 23.59% of the outstanding shares. Other significant shareholders include hedge funds such as BlackRock Institutional Trust Company (US), The Vanguard Group, Inc. (US), and the sovereign wealth fund Norges Bank Investment Management (NO).[3]

Iberdrola, headquartered in Spain, was founded in 1901 and went public in 1989. The company operates worldwide through more than 650 subsidiaries and is structured into various business segments in the wholesale and retail markets. The network business segment includes energy transmission and distribution activities. The deregulated business segment comprises electricity generation and sales, gas trading and storage. The renewable business segment focuses on renewable energy activities. Other businesses segment includes engineering, construction, and non-power businesses. The major shareholders include the Qatar Investment Authority (QA),

[1] Globally, Contemporary Amperex Technology Co. Ltd. (CATL), a leading Chinese company, demonstrates one of the highest market capitalizations in the electricity sector, at approximately $140 billion USD

[2] https://www.enel.com/

[3] LSEG Data and Analytics as of August 20, 2024.

BlackRock Institutional Trust Company (US), Norges Bank Investment Management (NO), and The Vanguard Group, Inc (US). Over the past decade, the company has maintained an average operating margin of 15%.[4] The presence of common shareholders suggests a form of concentrated power in the European utilities sector. While not identical, similarities in legitimating discourse are to be expected.

4.2.Method of analysis

We conducted a qualitative content analysis of the tax reports of Enel and Iberdrola, using Fairclough's CDA approach and Van Leeuwen's grammar of legitimation as guiding frameworks. Fairclough's CDA approach involves analyzing the text considering three levels: the text level, focusing on the author's choice regarding content, vocabulary, sentences structure, and metaphors; the discursive practice level, which examines the context of the text's production, consumption and interpretation, including references to other texts and coexisting discourses within the reports; and the macro level, which considers the broader institutional, socio-economic and political context surrounding the text.

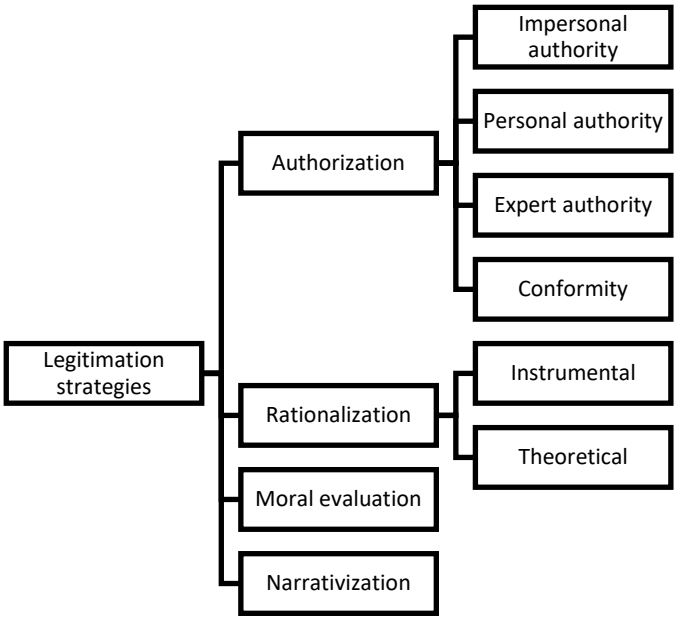
Fairclough's three-dimensional model does not imply separate analysis at each level; rather, our analysis was conducted simultaneously across all three dimensions. This integrated approach allowed us to scrutinize the reports in detail, considering not only the linguistic devices employed but also the institutional and socio-historical context, as well as the intertextuality of the reports.

Specifically, for the analysis of the tax reports, we followed several steps. The reports, publicly available on the companies' websites, were first read generally to gain an overview of their content, writing style, and length. Next, we conducted a more detailed reading and uploaded the reports into NVivo, the software used for coding and analysis. Finally, we analyzed the results in light of the theoretical framework and the relevant context of tax reporting. Given the inherently abductive nature of the CDA methodology, we constantly iterated between the empirical material and the theoretical elements guiding the study (Wodak & Meyer, 2016).

[4] LSEG Data and Analytics as of August 20, 2024.

From the detailed reading, we identified specific actions that are crucial constituents of Enel and Iberdrola's tax behavior. Elements such as tax advocacy, cooperation with tax authorities, and tax transparency were used to create a set of codes under the label "tax practices". In parallel, we applied predetermined codes based on Van Leeuwen's legitimation strategies, as outlined in Figure 2. These codes include legitimation by authority (expert, impersonal, personal and conformity), legitimation by instrumental or theoretical rationalization, legitimation by moral evaluation, and legitimation by narrativization.

Figure 2. Coding of legitimation strategies guided by Van Leeuwen's framework



Additional predetermined codes included lexical choice, metaphors, and intertextual allusions. Lexical choice refers to the specific vocabulary used in the reports, which signals particular discourses. Metaphors were analyzed to identify underlying discourses, while intertextual allusions captured references to other texts, both from within the company and external sources, cited in the reports. These intertextual references provided insights into which actors were given a voice in the legitimation of taxation practices and which were excluded.

We acknowledge critiques of the CDA approach, such as the lack of longitudinal studies, the overemphasis on texts at the expense of understanding how they are consumed and interpreted by the public, and the potential for subjective bias on the part of the analyst (Joye & Maeseele, 2022).

To address these concerns, we employed several strategies. First, we analyzed reports from different years to capture the dynamics of the tax discourse over time[5]. Second, we provided a transparent and detailed explanation of our methodology. Third, we emphasized reflexivity by acknowledging how our own perspectives influence our interpretations. As consumers of these reports, our views are shaped by our perceptions of business organizations. Furthermore, we approached the reports from the standpoint of taxation scholars, with the goal of contributing to solutions for issues arising from the harmful taxation practices of multinational corporations (Tregidga et al., 2014).

5. Results

In this section, we present the findings of the study. First, we provide an overview of the electric utilities sector and the regulatory framework for tax transparency, which aids in understanding the institutional context surrounding the production of tax reports by Enel and Iberdrola. Second, we examine the tax practices most commonly legitimized and delegitimized in the reports, along with the discursive strategies used for (de)legitimation. Third, we analyze how CSR and sustainability discourses are articulated into the legitimation of tax practices. Finally, we explore the ideological underpinnings of the legitimating taxation discourse within the tax reports.

5.1.The electric utilities sector in Europe and the tax transparency landscape

The electricity sector is an intensive capital sector requiring huge amounts of financing for the construction of infrastructure of power plants, transmission lines and distribution networks. The high start-up costs and high barriers to entry facilitate companies to operate as natural monopolies, meaning that the operation of one big company ends up being more efficient than multiple providers. This explains why most of electric utilities companies started as state-owned companies. The sector is characterized by positive and negative externalities in production and consumption and extensive vertical and horizontal integration (Glachant & Perez, 2011).

[5] It is important to note that we used reports from the years 2018 to 2022 to capture elements that may appear in one year but not in another. However, we did not consider time as a key variable in our analysis. A longitudinal analysis of the tax discourse in the reports is not the focus of this study.

A general model for the electricity utilities sector began to emerge in the early 1990s (Dubash, 2003), characterized by a shift in management practices from commercialization to privatization and restructuring aimed at increasing competition and deregulation. The advantages and disadvantages of a market-based system leading the sector have been widely debated. Given that electricity is a public service, there is ongoing contention over whether it should be driven purely by market mechanisms or guided by broader public objectives (Dubash, 2003).

In Europe, the electricity utilities sector is characterized by a complex regulatory framework. Directive 2009/72/EC laid ground for the market liberalization and integration of the electricity sector and has been expanded in its provisions more recently by the Directive 2019/944 to enhance competition, consumers' rights and supporting EU's climate goals as reflected in the European Green Deal, the Fit for 55 Package, and the REPowerEU plan.

EU-headquartered utility companies have been required to file Country-by-Country Reports (CbCR) with their tax authorities since 2017 and voluntarily disclose their CbCR since 2018. However, beginning with fiscal year 2024, the publication of these reports is mandatory. In contrast, qualitative tax reports, such as those analyzed in this study, remain voluntary and unregulated within the European Union. Nevertheless, such reports are increasingly common, either authored directly by companies or prepared with the assistance of accounting firms, which may also audit the disclosed information.

Regarding CSR, companies have been required to publish a non-financial report since 2017 as mandated in the EU Directive 2014/95. This directive mandates disclosures related to environmental performance, social responsibility, human rights, and anti-corruption measures. The reporting framework has been further expanded by the EU Regulation 2020/852, also known as the EU Taxonomy. This regulation introduces a framework to facilitate sustainable investment by defining which economic activities can be classified as environmentally sustainable, requiring companies to report on their alignment with these criteria.[6]

[6] https://finance.ec.europa.eu/regulation-and-supervision/financial-services-legislation/implementing-and-delegated-acts/taxonomy-regulation_en

5.2.Tax practices and discursive legitimation strategies

The taxation behavior of large multinational corporations has been the subject of both justified and unjustified public criticism. In this context, what tax practices do Enel and Iberdrola discursively legitimize? and which do they delegitimize? On what grounds do these corporations legitimize or delegitimize these practices? Table 1. provides examples of these tax practices in column 1, the respective legitimation strategies in column 2, and examples from the reports in column 3. The analysis of discursive legitimation of tax practices mobilized by Enel and Iberdrola is elaborated below.

Table 1. (De)legitimation strategies in taxation discourse in Enel and Iberdrola tax reports

Tax practice	Strategy	Example from the tax reports
Tax strategizing: management and compliance	Personal authority	Legitimation by reference to a group of individuals in which the authority is vested: "*The Board of Directors of Enel SpA defines the tax strategy of the entire Group, with the objective of ensuring uniform management of taxation for all entities*" (Enel, 2021) "*…the Board of Directors of Iberdrola coordinates the general management strategies and guidelines of the Iberdrola Group within legal limits, acting in furtherance of the interests of each and every one of the companies forming part thereof."*(Iberdrola, 2019)
Tax strategizing: management and compliance	Expert authority	Legitimation by reference to expertise: "*It should be noted that all the group's tax decisions have been analysed by its internal and external advisors, both for this and for previous financial years, and they have determined that said actions have been in accordance with law and based on reasonable interpretations of tax regulations." (*Iberdrola, 2018*)* *"Leading international transfer pricing advisors assist the Group in transfer pricing issues and check that the policies applied follow the criteria set by the OECD and are properly implemented and up to date."* (Iberdrola, 2022)
Tax strategizing: compliance	Impersonal authority Moral evaluation Theoretical rationalization	Legitimation by reference to the law and regulations, values and rationalizations associated with the law "*The Group pursues behaviour geared towards compliance with the applicable tax rules and is committed to interpreting them in a way that respects both the substance and form*" (Enel, 2019) "*The Iberdrola group is governed by strict compliance with tax laws and regulations in each of the countries and territories in which it operates, by paying all taxes due in accordance with the legal system. Furthermore, all decisions on tax matters are made based on a reasonable interpretation of applicable legal provisions*" (Iberdrola, 2018)
Tax strategizing: tax management	Conformity	"*As can be seen, the ETR of Enel Group lies within the higher end of the market range of ETR. Also, the ETR of Enel Group in 2018, which is 22,6%, was significantly higher than the median ETR of the industry players."* (Enel, 2018)
Tax strategizing: approach to taxation	Moral evaluation	Legitimation based on integer, honest, ethic, transparent and responsible behavior "*The Enel Group, in the spirit of its sustainability strategy, manages its tax related activities in accordance with values of honesty and integrity*." (Enel, 2018) "*Act with integrity in all tax-related decisions, following the recommendations of the good tax practices codes implemented in the various countries in which the group does business*" (Iberdrola, 2018) "*Iberdrola's tax practices are inspired by its Purpose and Values, and are based on a commitment to ethical principles, good corporate governance and transparency*" (Iberdrola, 2018) "*Good tax governance requires responsible tax practices with commitment to society and transparency, elements that inspire our day-to-day activities in this area, showing that it is possible to maintain an optimal balance among the various legitimate expectations of our stakeholders*." (Iberdrola, 2018)

Tax practice	Strategy	Example from the tax reports
Tax strategizing: Tax minimization	Instrumental rationalization	Legitimation by reference to shareholders' interests (value creation) *"The Iberdrola group has a legitimate obligation to maximise financial return for its shareholders, which leads us, always on a strictly legal basis, to ensure the maximum possible profit and increase the profitability of our investors,"* (Iberdrola 2018) *"The Group considers taxes as a business cost and, as such, believes that it must be managed in compliance with the principle of legality, with the aim of safeguarding the Group's assets and pursuing the primary interest of creating value for shareholders in the medium to long term."* (Enel, 2019)
Tax strategizing: Tax minimization	Instrumental rationalization	Legitimation by reference to energy transition: *"The group therefore applies those rules that permit tax incentives in line with applicable law in each case, but this should not lead to the mistaken opinion that there is any avoidance of our tax obligations; rather, entirely to the contrary, we are contributing to investment and business development for the creation of wealth and employment in accordance with the legal parameters established in each case. Moreover, in our case this investment is fundamentally directed at generating clean energy and smart grids, both essential elements in the active fight against climate change."* (Iberdrola, 2018) *"A significant share (approximately 74%) of the total tax incentives used by Enel in 2021 was due to investments in renewable energies in those countries(2) that support the energy transition through these economic policy instruments."*(Enel, 2021)
Tax strategizing	Instrumental rationalization	Legitimation based on the public interest "*Tax policy should also encourage behaviour that is most beneficial to society as a whole, like promoting conservation of the natural environment*" (Iberdrola, 2021)
Tax transparency	Conformity	Legitimation by reference to universalization: "*The TTC Framework is universal and aims to provide a concise and immediate overview of the taxes paid by the Group in the jurisdictions where it operates*." (Enel, 2020)
Tax transparency	Expert authority	Legitimacy by reference to expert authorities: "*TTC methodology adheres to the approach adopted by the OECD, which highlights the relevance of the role played by business groups in the taxation system, both as contributors of taxes which imply a cost ("Legal Tax Liability") and as "collectors" of taxes on behalf of the others ("Legal Remittance Responsibility")*" (Enel, 2018)
Tax transparency	Theoretical rationalization	Legitimation by reference to the necessary of the activity performed "*These figures reflect the importance of the taxes withheld or passed on to third parties and the role played by the Iberdrola Group as a driving force behind the activity that generates such taxes and ensures that the amounts thereof are paid into the public coffers, so much so that if Iberdrola did not exist, this volume of taxes would cease to be collected*." (Iberdrola, 2020)

Tax practice	Strategy	Example from the tax reports
Tax transparency	Theoretical rationalization	Legitimation by reference to nature of the economic activity "*These taxes derive from the Group's own economic activity, such as taxes associated with the employment that Iberdrola generates directly and indirectly or financial transaction taxes and other taxes (group employees, suppliers, purchases of products and services, etc.).*" (Iberdrola, 2021)
Tax strategizing: management and compliance	Expert authority	Legitimation by reference to expertise "*Where applicable, the tax control system is subject to external certification, as in the case of Spain. In this regard, the subsidiary Endesa obtained certification by AENOR*" (Enel, 2022) "*In 2019 Iberdrola was the first Spanish company to obtain the AENOR certificate for a tax compliance management system in accordance with the requirements of UNE Standard 19602*" (Iberdrola, 2021)
Tax strategizing	Instrumental rationalization	Legitimation by reference to the sustainable development *"Iberdrola believes that taxation is also a significant factor for the Group's sustainable strategy, to the extent that tax governance, best practices, cooperative compliance, and transparency in reporting tax information, as a significant contribution to sustainable development"* (Iberdrola, 2022) *"We firmly believe that the principles of fiscal responsibility contribute to the sustainability goals which the Group is committed to achieving."* (Enel, 2022)
Tax transparency	Expert authority	Legitimation by expert authority: *"This Report has been prepared by the Enel Group with the support of PwC TLS Avvocati e Commercialisti, part of the PwC Network, which over the years has developed specific expertise in the area of governance and tax transparency*." (Enel, 2018)
Tax transparency	Instrumental rationalization	Legitimation by reference to stakeholders' interests and expectations *"Enel has decided to publish this Total Tax Contribution Report to show the importance the Group attaches to tax matters and the extent of its commitment to its main stakeholders"* (Enel, 2018) *"Stakeholders' growing demand for tax information from multinational companies requires the maintenance of maximum standards of tax transparency. This report is proof thereof, showing the Iberdrola group's commitment to the pursuit of excellence, continuous improvement in transparency, and commitment to good tax practices."* (Iberdrola, 2018)
Tax transparency	Instrumental rationalization	Legitimation by reference to reputational value: "*Information available in this report renders it possible to identify measure and communicate the business asset, which is Enel's tax contribution, so that it can have a significant impact on its reputational value*" (Enel, 2018)
Tax transparency	Moral evaluation	Legitimation by the importance of transparency and reporting:

Tax practice	Strategy	Example from the tax reports
		"…*tax transparency and the commitment by companies in reporting their impacts on the economic conditions of stakeholders and on economic systems at national and global level are becoming increasingly important*" (Enel, 2020)
Tax transparency	Instrumental rationalization	Legitimation based on the company's need to persuade stakeholders' perceptions "*It is therefore more necessary than ever to provide society in general with the information needed for it to be able to assess the actual contribution that the Iberdrola Group makes to public finances. It is only in this way that its stakeholders can have an accurate view of reality, preventing biased information from distorting the extraordinary role that Iberdrola plays through its tax contribution*." (Iberdrola, 2019)
Tax transparency	Moral evaluation Instrumental rationalization	Legitimation based on values of trust, confidence and credibility "*Public reporting on tax matters increases transparency by promoting trust and credibility in tax practices adopted by organizations and tax systems*" (Enel, 2020) "*Iberdrola believes that transparency is fundamental for generating confidence and credibility, both in the markets and in investors, as well as in the workforce and the rest of the Stakeholders*" (Iberdrola, 2022)
Tax transparency	Moral evaluation Instrumental rationalization	Legitimation by reference to justice and sustainability *"The acknowledged role of the fiscal variable, in particular fiscal transparency, within ESG (Environmental, Social and Corporate Governance) is becoming increasingly important in view of a transition towards a more just and sustainable future."* (Enel, 2021)
Tax transparency	Moral evaluation	Legitimation by reference to effectiveness and simplicity: "…*our fourth Tax Transparency Report takes on even more relevance, because it is crucial that tax contributions and its evidences and findings are represented in a simple and effective way to all*" (Enel, 2021) "*Total Tax Framework provides information on all the taxes companies pay. The framework is straightforward in concept, not tax technical and therefore relatively easy for those who have limited knowledge of tax complexities to understand*." (Enel, 2018)
Tax transparency	Expert authority	Legitimation by reference to recognized institutions' recommended practices "*In this respect, PwC's TTC methodology adheres to the approach adopted by the OECD, which highlights the relevance of the role played by business groups in the taxation system, both as contributors of taxes which imply a cost ("Legal Tax Liability") and as "collectors" of taxes on behalf of the others ("Legal Remittance Responsibility"), as reflected in working paper no.32. "Legal tax liability, remittance responsibility and tax incidence*" (Enel, 2018) "*This model is aligned with the Global Reporting Initiative (GRI) Standard 207 and also contains the metrics on income taxes paid provided by the World Economic Forum (WEF)"* (Enel, 2021)
Tax transparency	Conformity	Legitimation by reference to standards

Tax practice	Strategy	Example from the tax reports
	Expert authority Narrativization	"*Enel is compliant with the highest international reporting standards:* *• of the Global Reporting Initiative: GRI Standard 207; • the World Economic Forum's ("WEF") metrics on taxes paid in the document "Measuring Stakeholder Capitalism: Towards Common Metrics and Consistent Reporting of Sustainable Value Creation"; • B-Team's Responsible Tax Principles*." (Enel, 2022) "*Endesa has once again topped the best practice ranking for transparency and tax responsibility according to the Contribution and Transparency Report 2021 published by the Haz Foundation*" (Iberdrola, 2020) "*The content of the report is prepared following the reporting requirements and recommendations of both the consolidated set of GRI Sustainability Reporting Standards 2016 (Comprehensive option) and the Electric Utilities Sector Supplement, both of the Global Reporting Initiative (GRI)."* (Iberdrola, 2020) *"Iberdrola thus ratifies its leading position in the Corporate Transparency Index on Integrity, Compliance and Human Rights of IBEX-35 Companies published by Transparency International in March 2022"* (Iberdrola, 2022) *"One of the top IBEX-35 companies in terms of tax transparency, according to the Fundación Haz ranking."* (Iberdrola, 2022)
Relationship with tax authorities	Moral evaluation	Legitimation by reference to values of transparency, collaboration "*the Group maintains collaborative and transparent relations with tax authorities*" (Enel, 2021)
Relationship with tax authorities	Moral evaluation	Legitimation by reference to values of fidelity, trust, professionalism, collaboration, reciprocity and good faith "*The principles of the Corporate Tax Policy include strengthening the relationship with regulatory entities on tax matters based on respect for the law, loyalty, trust, professionalism, collaboration, reciprocity and good faith, without prejudice to the legitimate disputes with such bodies that might arise with respect to the interpretation of applicable legal provisions, all while observing the aforementioned principles and in the defence of the corporate interest*." (Iberdrola, 2020)
Relationship with tax authorities	Moral evaluation	Legitimation based on legality "*It should also be taken into account that it is lawful to have disputes with regulatory entities regarding interpretation. The open audits at financial year-end 2020 vary depending on the tax laws of each country*" (Iberdrola, 2019)
Tax advocacy	Moral evaluation Instrumental rationalization	Legitimation by reference to market values: "*This report reaffirms Iberdrola's defence of a fair and appropriate tax framework that maintains the necessary levels of sufficiency, promotes economic activity and competitiveness…"* (Iberdrola, 2021) "*Enel supports fair, effective and stable tax systems in order to reduce uncertainty for both governments and companies"* (Enel, 2022)

Tax practice	Strategy	Example from the tax reports
Tax advocacy	Instrumental rationalization	Legitimation by reference to consensus in policy making *"…it supports a consensual approach to regulatory choices. To this end, it contributes by supporting governments and international organizations through active participation in public consultation phases on new regulatory processes, where they exist, either directly or through participation in various national and international associations*." (Enel, 2022)
Tax advocacy	Instrumental rationalization	Legitimation based on the goal of influencing the public debate on taxation: "*In 2019, Enel joined the European Business Tax Forum (EBTF – https://ebtforum.org), an association that aims to open up a public debate on taxation by providing a balanced and comprehensive perspective of the tax paid by companies*" (Enel, 2021)
Base erosion and profit-shifting	Theoretical rationalization	Delegitimation by reference to the nature of the business: "*Due to the structure of their main business, the results and taxable bases of the entities that own the electricity production and transmission facilities cannot be shifted from the place in which said facilities are located*" (Iberdrola, 2019) *"… due to the nature of our business, there is a close link between our activities, investments in plants, local areas and communities and tax payments*" (Enel, 2022)
Operating in tax havens	Impersonal authority	Delegitimization by reference to laws and regulations: "*The group does not include any company residing in tax havens according to Spanish law, or in territories included on the European Union's blacklist of non-cooperative tax jurisdictions, among the companies in which it has a controlling interest*" (Iberdrola, 2018)
Operating in tax havens	Narrativization	Delegitimation by reference to an exemplary behavior *"that it is prohibited to organise or acquire companies residing in tax havens or in territories or countries included on the black list of non-cooperative jurisdictions, with the sole exception of those cases in which the group is forced to do so because it is an indirect acquisition as part of a larger group that is being acquired. This happened, for example, in the case of Neoenergia S.A., the takeover of which entailed the indirect acquisition of the company Garter Properties Inc. (a dormant company residing in the British Virgin Islands), although said company has been liquidated*." (Iberdrola, 2018) *"By way of example of its responsible tax practices, in 2020 the Group made a takeover bid for the shares of the Australian entity Infigen Energy, reaching a 50% stake on 5 August, a percentage that has been increasing to reach the current 100%. At the time of the takeover bid, Infigen Energy's corporate structure included two inactive legal entities domiciled in the tax haven of Bermuda. The Group accelerated the liquidation of these two companies, called Infigen Energy (Bermuda) Limited and BBWP Holdings (Bermuda) Limited, which was completed on 4 September 2020*." (Iberdrola, 2022)

5.2.1. Tax strategizing

We grouped under the concept of tax strategizing all practices related to minimization or legal reduction of tax liabilities, management of taxes, tax planning, and general approach to taxation. In these companies, the taxation function is highly centralized and complex, with the board of directors responsible for approving the corporate tax strategy. Additionally, tax advisors also hold a degree of authority in this process.

Multinational corporations can legally reduce their tax payments. However, being perceived as not paying their fair share of taxes can jeopardize their legitimacy (Elbra & Mikler, 2017). Therefore, tax reports serve as an ideal means for these companies to demonstrate that they not only comply with their tax obligations but also that any tax reductions are legally, rationally and morally justified.

"The companies" appeal to the impersonal authority vested in tax laws and regulations to legitimize their tax payments. They affirm their compliance with the tax law and various rules in the jurisdictions where they operate. However, their respect for the law goes beyond literal interpretation. Enel and Iberdrola emphasize their consideration of the law's spirit and intention, implying a morally and rationally grounded legitimation of their actions. This approach involves acting based on 'ethical' values respecting the law's purpose and adopting a 'reasonable' interpretation. Unlike strict legal compliance, ethical and reasonable actions are not clear-cut. For instance, Iberdrola summarizes their ongoing audits and disputes with tax authorities in Spain, United Kingdom, Brazil and United States which indicates the existence of a dispute in terms of interpretation of law between the company and tax authorities.

"The companies" claim that their approach to taxation is guided by the values of honesty, integrity, transparency, responsibility and ethics. These values serve as the foundation for 'good' tax governance, emphasizing responsible tax practices owed to society. Iberdrola states that this values based approach to taxation allows it to reconcile all 'legitimate expectations' of stakeholders:

"…elements that inspire our day-to-day activities in this area, showing that it is possible to maintain an optimal balance among the various legitimate expectations of our stakeholders" (Iberdrola, 2018).

However, this stance overlooks the inherent conflict between returns to capital (financial dividends as mentioned by Iberdrola) and returns to society. Iberdrola and Enel elude this conflict by mobilizing two concepts: *social dividend* and *sustainable value creation,* respectively. Iberdrola defines the *social dividend* as "the sum of the economic, social, and environmental impacts" (Iberdrola, 2018), emphasizing that "the group's strategy is far broader than the mere achievement of financial profitability, as the financial dividend is only one component of the social dividend… and whose maximisation is a priority aim of the group. " (Iberdrola, 2018). Enel employs the concept of *sustainable value creation*, derived from *stakeholder capitalism*, which involves "the quality of the company's actions and the effects of its activity on the sustainable development of communities, society, the planet, people, suppliers, customers, lenders, and investors" (Enel, 2021).

The apparent resolution of the conflict between *shareholder value (financial dividend)* and *sustainable value creation (social dividend)* falters in the case of the profit windfall tax. In October 2022, the EU enacted a regulation 2022/1854 to address high energy prices by imposing a solidarity contribution on excess profits of energy and fossil fuel companies. This tax has been widely contested by energy companies in Spain including Iberdrola and Endesa (Spanish subsidiary of Enel) on the grounds of being discriminatory, arbitrary and contrary to the Spanish constitution and European law. The defense of *sustainable value creation* and *social dividend* persists until the shareholders' interest are at risk: "Ignacio Galán, Iberdrola chair, said its "legal department is already taking action to defend the interests of shareholders" (Jopson & Kelly, 2023). This suggests that the defense of a value beyond shareholders' interests is more rhetorical than factual.

It is uncertain whether the values of honesty and integrity claimed in relation to taxation practices extend to other organizational activities. Since 2018, Enel has been involved in anti-

competition controversies related to alleged abuse of market power [7][8] and suspected illegitimate conduct in price setting for electricity and natural gas[9]. Similarly, Iberdrola has faced a business ethics controversy in Mexico and consumer controversies for overcharging customers.[10]

Acting with responsibility can be interpreted as "the companies" fulfilling their legal obligation to maximize investors' returns. Since tax is a cost on the companies' financial statements (rephrased by Enel in their 2021 and 2022 reports as 'economic component of business' to be managed), it is rational for companies to seek to reduce it in the interest of creating shareholder value. In this sense the minimization of tax payments is justified under the pretension of maximizing shareholders' returns.

Another facet of taxes reduction involves tax incentives, which are a crucial component of the regulatory or repricing function of taxation. Tax incentives are presented as a legitimate way to reduce or defer tax burdens for businesses. In sense, "the companies" justify their use of tax incentives by emphasizing their commitment to environmental protection, particularly the transition towards clean energy sources.

Tax incentives are not only justified on the grounds of the energy transition but are also deemed desirable in the public interest: "Tax policy should also encourage behaviour that is most beneficial to society as a whole, like promoting conservation of the natural environment" (Iberdrola, 2021). This statement reflects, first, a strong deontic modality[11] by prescribing actions for legislative and governmental authorities: "tax policy should…", and second, an strong evaluative character: "…behaviour that is the most beneficial…" by asserting that promoting conservation benefits

[7] https://www.reuters.com/article/world/europe/italys-top-administrative-court-refers-enel-competition-fine-to-eu-idUSL5N2ER4CB/ .
[8] https://www.reuters.com/article/markets/us/iberdrola-accuses-enel-of-unfair-competition-in-letter-to-eu-idUSS8N1PA069/
[9] https://www.reuters.com/business/energy/italys-antitrust-probes-7-energy-firms-over-illegitimate-price-setting-2022-12-13/
[10] https://www.tradingview.com/news/reuters.com,2024:newsml_L2N3GP0IP:0-scottishpower-to-pay-out-1-5-million-pounds-after-overcharging-customers/

[11] By deontic modality we refer to the use of modal verbs to indicate author's commitment to an obligation or necessity (Fairclough, 2003).

society as a whole, thereby ignoring potential adverse effects on specific societal groups. Notably, the primary beneficiaries of such tax policies are the companies promoting conservation. In general, “The companies” emphasize the importance of their fiscal contributions to the achievement of sustainable development goals.

Furthermore, to reinforce the idea that its tax behavior aligns with industry standards, Enel employs a conformity legitimation strategy, highlighting that its effective tax rate is not only above the median but suggests that it pays more corporate income tax than its peers in the electric utilities sector. In contrast, Iberdrola does not compare its effective tax rate to that of its peers. Instead, it argues that too much public emphasis is placed on corporate income tax, overlooking the many other taxes businesses are required to pay: “Iberdrola is affected by more than 100 different taxes worldwide. Therefore, taking Corporate Income Tax as the sole reference point to measure the group’s taxation and tax responsibility would provide a very partial and biased view, as well as being clearly erroneous” (Iberdrola, 2018). This raises the question of why corporate income tax is often the focal point of public criticism and controversy.

The corporate discourse on taxation increasingly frames tax as a risk to be managed and controlled, reflecting the shift in many tax departments from compliance units to risk management centers (Brühne & Schanz, 2022; Donohoe et al., 2014). Enel clarifies the tax risk is “understood as the risk of violating the tax rules or abusing the principles and purposes of the tax system” (Enel, 2022). Both Enel and Iberdrola emphasize that they have implemented control management frameworks to mitigate tax risks. Their tax management practices are validated by expert authorities, such as certification from AENOR (Asociación Española de Normalización y Certificación[12]), a private non-profit organization that certifies 'good' business practices.

[12] In English, Spanish Association for Standardization and Certification.

5.2.2. Tax transparency

Tax transparency is not explicitly defined by “the companies”, but it frequently appears in their reports, often linked to concepts such as reporting, standards, exercise, sustainable development, and sustainable finance. Both Enel and Iberdrola emphasize the growing importance of tax transparency. However, although they do not openly oppose it, some of their major shareholders, including BlackRock and Vanguard, have voted against tax transparency proposals in other companies, such as Cisco, Amazon, and Microsoft. These shareholders argue that country-by-country reporting could expose companies to scrutiny, potentially damaging their reputation (Foley & Temple-West, 2023).

Tax transparency can be understood as having a dual nature. For "the companies," it serves both to legitimize their tax behavior and as a strategic tool achieving specific objectives. First, Enel and Iberdrola justify tax transparency as a way to meet stakeholders' expectations and information needs. For example, Iberdrola claims that tax transparency provides stakeholders with "an accurate view of reality, preventing biased information from distorting the extraordinary role that Iberdrola plays through its tax contribution" (Iberdrola, 2019). However, this statement carries two implicit assumptions: in first place, that the interpreter of information is a passive recipient, despite the fact that social actors can interpret reality differently; and in the second place, that the company's self-perception of its "extraordinary role" in tax contribution should be universally acknowledged.

Second, both companies suggest that reporting on taxation helps to build trust, confidence, and credibility among various stakeholders, not only regarding the companies' activities but also the tax system as a whole. Third, Enel argues that transparency in tax contributions enhances reputational value. Fourth, Enel portrays tax transparency as a means for advancing a sustainable and just future.

In addition, Iberdrola implicitly delegitimizes the role of the media and the European Commission’s investigations into multinationals’ tax misconduct, attributing them indirectly to the public perception that multinational companies do not pay their fair share of taxes. The company

states: “…cases such as the “Panama papers” and negative news and investigations commenced by the European Commission in relation to the taxation of a very small group of companies have placed the whole business sector in the global spotlight in relation to the payment of taxes. This has given rise to the persistent spread of the erroneous idea that multinational companies generally pay little tax, calling into question the lawfulness of their actions and affecting companies that comply with all their tax obligations” (Iberdrola, 2018).

In terms of tax transparency, particularly disclosing, actors with vested authority are the tax advisors, which in some cases are the authors of the reports such as the Enel tax reports of 2018 to 2020, and then provided support to their elaboration of reports in 2021 and 2022.

Iberdrola describes the voluntary publication of tax reports as its highest expression of tax transparency with stakeholders, stating: “Through the voluntary publication of this Report, the Iberdrola Group is exercising the maximum expression of tax transparency with its Stakeholders" (Iberdrola, 2022). However, this claim raises questions about what remains undisclosed. Key tax information, such as transfer pricing arrangements filed in master and local files, is often omitted from public reports. Thus, it is not entirely accurate to claim "maximum transparency"; rather, what is shared represents the maximum the company is willing to disclose. Notably, no explanation is provided for the nondisclosure of certain information.

An important element in the discussion of tax transparency and the associated reporting is how the information is presented. The way in which taxes paid by the companies are communicated is crucial for legitimation purposes. Both Iberdrola and Enel emphasize their active role in the revenue function of taxation, not only as payers of direct taxes but also as collectors and facilitators of taxes paid by third parties. Iberdrola, in particular, portrays itself as indispensable to tax authorities, highlighting its contribution as both a taxpayer and an intermediary in the broader tax collection process: “These figures reflect the importance of the taxes withheld or passed on to third parties and the role played by the Iberdrola group as a driving force behind the activity that generates

such taxes and ensures that the amounts thereof are paid into the public coffers, so much so that if Iberdrola did not exist, this volume of taxes would cease to be collected" (Iberdrola, 2021).

Enel justifies framing both taxes borne and taxes collected as contributions through a conformity strategy. The company argues that a framework encompassing both direct costs and taxes collected from third parties on behalf of the government is universally accepted. Taxes borne are direct costs for the company, such as corporate income taxes, social contributions, and property taxes. Taxes collected include payroll taxes, withholding taxes, and VAT, which the company collects and remits to the government. Both types of taxes are framed as resulting from the company's economic activities. The legitimacy of this approach is reinforced by referencing the expertise and authority of organizations like the Organization for Economic Cooperation and Development (OECD) and the World Economic Forum. For instance, Enel's total tax contribution to society in 2021 was EUR 11,514 million, with 64% from taxes collected and 36% from taxes borne. Iberdrola employs a similar framework in its reporting.

Enel further justifies the format of its tax reports by emphasizing the simplicity and effectiveness of the information presented, aiming to minimize the complexities often associated with technical tax matters. This argument illustrates a normalization strategy, reflected in the application of widely recognized standards proposed by authoritative institutions such as the Global Reporting Initiative (GRI), B-Team, and the World Economic Forum (WEF). The role of standardization in this context serves to mitigate the risk of non-conformity and align with the consensus expectations of stakeholders. By adhering to these global standards, Enel positions its reporting practices as transparent, accessible, and compliant with widely accepted norms.

Companies employ narrativization strategies to highlight their high standards of transparency. Both Iberdrola and Enel showcase awards and recognitions they have received for voluntarily engaging in public reporting on taxation, implicitly suggesting that positive outcomes result from acting in accordance with acceptable standards. For instance, both companies have been ranked as top performers in transparency by the Haz Foundation, a non-profit accreditation

organization. The growing presence of private actors certifying or labeling corporate tax behavior as "appropriate" contributes to a dichotomization of good and bad practices, which, as Garsten & Jacobsson (2013) argue, diminishes the space for conflict and critical debate.

5.2.3. Relationship with tax authorities

Iberdrola and Enel claim that their relationship with tax authorities is built on the principles of transparency, collaboration, fidelity, reciprocity, and good faith. Both companies participate in cooperative compliance programs with tax authorities in Italy, Spain, and Brazil. These programs stem from the International Compliance Assurance Programme (ICAP), an initiative proposed by the OECD. ICAP is a voluntary risk assessment and assurance program designed to streamline the cooperation between multinational enterprises and tax administration across jurisdictions, with the aim to improve multilateral tax certainty (OECD, 2021).

Enel omits information about tax audits and litigations, suggesting either an absence of audits or a deliberate choice to withhold this information. In contrast, Iberdrola reports major tax audits and litigations, attributing these to the company's large size and evaluating them as lawful. Iberdrola also suggests that such litigations may arise from the inherent complexity of tax systems and the typical practices of tax authorities. For instance, the company notes: “Brazil is a highly litigious jurisdiction, and there are a several pending audits in that country, which is due to the country’s tax and administrative structure and the customary actions of the tax authorities” (Iberdrola, 2020).

Additionally, Iberdrola disputes some actions of the tax authorities in the countries where it operates. For instance, Iberdrola criticizes various forms of taxation on electricity production in Spain, arguing that these taxes neither aim to reduce CO2 emissions nor incentivize behavioral change, and that the revenues are not used for environmental purposes or aligned with the specific issues the taxes address: “…the structure of these taxes is not directed towards reducing CO2 emissions or to changing the activities of the taxpayer. These taxes are not even collected for environmental purposes, and when they are, those purposes do not tend to coincide with the taxable

event giving rise to the tax" (Iberdrola, 2020). In contrast, Enel adopts a less contentious tone in its dealings with tax authorities, likely influenced by the fact that the Italian government is one of its shareholders.

5.2.4. Base erosion and profit shifting, tax havens, and aggressive tax planning

Despite various efforts by global tax governance and local authorities to reduce tax avoidance and evasion through initiatives like the Base Erosion and Profit Shifting (BEPS) OECD's Plan, these practices continue to cause significant tax revenue losses. Profit shifting shows little sign of decline with a stagnant 10% of global revenue loss over the last decade (Alstadsaeter et al., 2024). Both, Enel and Iberdrola openly delegitimize profit shifting and the use of tax havens in their tax reports.

"The companies" appeal to the authority of regulations and expertise of the OECD to delegitimize profit shifting and, in general, aggressive tax planning. To reinforce the idea that they do not engage in this type of practices, they employ a theoretical rationalization based on the nature of their business. The highly vertically integrated nature of their operations makes it difficult to shift profits from one jurisdiction to another. For example, Enel's cross-border transaction revenue is lower than 10%. Furthermore, to justify that their intercompany transactions are not leading to tax advantages they claim their related party transactions are consistent with the arm's length principle. Arm's length principle is a market value in which buyer and seller act independently and on equal footing in a given transaction.

Investment in tax havens with the sole intention of reducing taxes is also delegitimized. Enel does not mention its criteria for classifying a jurisdiction as a tax haven. In contrast, Iberdrola delegitimizes the establishment of subsidiaries in tax havens by invoking laws and regulations, specifically identifying jurisdictions considered tax havens under Spanish law or included in the EU list of non-cooperative jurisdictions[13]. Although some indicators may help distinguish whether tax

[13] As of 2017 this list included American Samoa, Bahrain, Barbados, Grenada, Guam, Republic of Korea, Macao SAR, Marshall Islands, Mongolia, Namibia, Palau, Panama, Saint Lucia, Samoa, Trinidad and Tobago, Tunisia, United Arab Emirates.

purposes drive investments in tax havens, disentangling economic from tax reasons is not straightforward, as tax motivations are ultimately driven by economic motives.

The EU list of non-cooperative jurisdictions is not the only systematic list of tax havens jurisdictions publicly available. In 2021, the Tax Justice Network published a Corporate Tax Haven Index[14], resulting from a thorough evaluation of jurisdictions' tax and financial systems. According to this index, the top ten jurisdictions facilitating corporate tax abuse included the British Virgin Islands, Cayman Islands, Bermuda, the Netherlands, Switzerland, Luxembourg, Hong Kong, Jersey, Singapore, and the United Arab Emirates. Notably, some of these jurisdictions are not included in the EU list of non-cooperative jurisdictions.

"The companies" use narrativization strategies to highlight exemplary actions when dealing with acquisitions in tax havens. As of 2022, both Enel and Iberdrola do not hold subsidiaries in commonly recognized tax havens, such as those on the EU list or jurisdictions like the British Virgin Islands or Cayman Islands. However, they maintain subsidiaries performing head offices and holding functions in countries such as Ireland, Luxembourg and the Netherlands which are controversial due to their unacknowledged role as tax havens. Determining whether these subsidiaries are used for profit shifting requires a detailed analysis, which is beyond the scope of this study.

5.2.5. Tax advocacy and tax lobbying

The role of multinationals extends beyond paying and collecting taxes on behalf of third parties. In a democratic society, all members of society are theoretically entitled to participate in the policymaking, though this participation is often unequal footing. Multinationals wield political influence, particularly in shaping tax legislation through political activities and tax lobbying. When

[14] For the complete list and methodology employed to classify tax haven, see here https://cthi.taxjustice.net/en/#:~:text=A%20jurisdiction's%20Haven%20Score%20is,multinational%20corporations%20the%20jurisdiction%20hosts.

these efforts result in disproportionate benefits for corporations, they can threaten the legitimacy of tax legislation and undermine public trust in the tax system (Van de Vijver, 2022).

Enel mobilizes a strategy of instrumental rationalization to justify its tax advocacy, arguing that such efforts reduce uncertainty in tax systems for both companies and governments. The company emphasizes its role in regulatory processes, aspiring to fairness, effectiveness and stability of the tax systems. Enel does not define what constitutes fairness, effectiveness, or stability in this context. Additionally, achieving consensus in regulatory decisions is presented as a key goal of its tax advocacy. Enel advances in its tax advocacy by participating in business's association, like the European Business Tax Forum (EBTF), contributing to public debates on corporate tax contributions.

Iberdrola's tax advocacy practices are not explicitly detailed in the reports. However, it can be inferred that Iberdrola supports a tax framework that is fair, sufficient, promotes economic activity, and ensures competitiveness, values central to a market economy. Certainly, a crucial market value, is also emphasized as essential for business operating in a competitive environment.

Notably, the term 'lobbying' is absent from both companies' reports. While tax lobbying is legal, it often carries negative connotations, likely prompting its avoidance in order to distance the companies from concerns about regulatory capture. Regulatory capture occurs when corporations manipulate policy outcomes to extract rents or reduce regulatory costs, ultimately undermining the public interest (Finér, 2022).

The companies' anticipation of voluntary disclosures can be seen as a strategy to minimize the regulatory costs of tax transparency and set limits on the scope of information disclosed. For instance, the WEF report on the measurement of stakeholder capitalism, cited by Enel, states: "This project offers companies the chance not only to get ahead of that regulation, but also to influence its

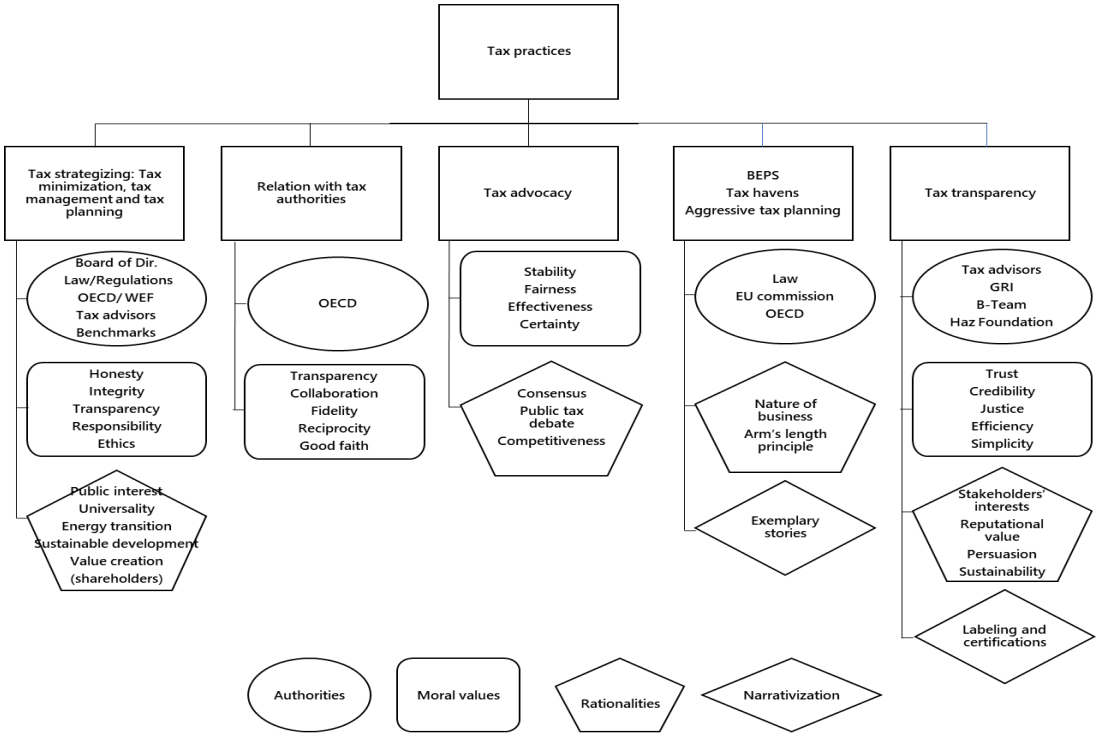
development" (World Economic Forum, 2020, p. 42). This suggests that early disclosure is used not only for compliance but also as a means to shape future regulatory landscapes.

The Figure 3. illustrates how Enel and Iberdrola legitimize their tax behavior by connecting specific tax practices with authorities, values, rationales, and narratives. The tax practices claimed in the reports are represented in rectangular figures and include activities such as tax strategizing (encompassing tax minimization, tax management, and tax planning), relations with tax authorities, tax advocacy, and tax transparency. Practices such as base erosion, profit shifting, and aggressive tax planning are delegitimized.

Authorities (de)legitimizing these practices are shown in oval shapes. The companies cite both government-based authorities (e.g., tax laws and regulations) and non-governmental organizations (e.g., OECD, WEF, B-Team, Haz Foundation, and benchmarks). The claimed values guiding corporate tax behavior, represented in rounded rectangles, include honesty, integrity, transparency, responsibility, ethics, good faith, fairness, credibility, efficiency, and effectiveness.

The goals and effects of the tax practices, as articulated by the companies, are shown in pentagon shapes. These include contributions to the energy transition and sustainable development, value creation for shareholders, serving the public interest, achieving consensus in public tax debates, addressing stakeholders' interests, and enhancing reputational value. Finally, the rhombus shapes illustrate narrativization strategies, where the companies use stories in their reports to demonstrate exemplary behavior regarding tax havens and highlight distinctions or awards received for tax transparency efforts.

Figure 3.Tax practices and (de)legitimation strategies in tax reports based on Van Leeuwen's framework



5.3. Sustainability and CSR meet taxation

In their longitudinal interpretive analysis of the taxation discourse of a Swedish state-owned company, Hilling, Sandell, Sonnerferldt and Vilhelmsson (2023), demonstrated that contemporary corporate taxation discourse may be seen as a blend of various discourses. These include the accounting and financial discourses, which define taxes as an expense or burden; the regulatory discourse, which frames tax as a societal issue; the risk management and corporate governance discourse, which views tax as something to be managed and controlled; and the sustainability discourse, which recontextualizes taxes as a meaningful corporate responsibility to society (Hilling et al., 2023).

These representations of taxes are evident in the reports of Enel and Iberdrola, as demonstrated by the common collocations of the stemmed word "tax" on both the left and right sides such as *good, responsible, contribution, transparency, strategy, governance, risks*. Table 1 shows the most common words that precede and follow the stemmed word tax, highlighting the language used to frame tax-related practices[15].

[15] To analyze collocations of the stemmed word '-tax-'we used the AntConc software version 4.2.4.

Table 1. Collocations of -tax- words

*_tax	Tax_*
Total	contribution
income	rate
corporate	transparency
nominal	policy
minimum	practices
cash	authorities
current	strategy
good	havens
tax	burden
responsible	governance
effective	administration
average	incentives
distributed	litigation
before	risks
Spanish	jurisdiction
direct	credits
deferred	obligations
country	planning
international	division
competent	accrued

Table prepared using AntConc version 4.2.4 (Released on September 25,2023)

The term Corporate social responsibility (CSR) is used less frequently than sustainability in Enel and Iberdrola's tax reports. The growing popularity of the term sustainability reflects a broader trend where companies increasingly favor its use over CSR in their disclosures (H. B. Christensen et al., 2021). However, collocations of the term "tax" such as responsible, transparency, and contribution, suggest a shift in how taxes are framed by the companies. This shift indicates that taxation is increasingly being represented as a CSR and a sustainability issue, integrating tax practices into broader discussions of corporate responsibility and sustainable development.

In this sense, we can observe an interdiscursivity between taxation, CSR and sustainability discourses. This interdiscursivity, a notable feature of the tax reports is evident both through direct references connecting taxation practices to CSR and sustainability, and through elements in the taxation discourse that mirror those found in CSR and sustainability literature.

Enel and Iberdrola regard tax transparency as an extension of their corporate social responsibility. For example, Enel (2018) states, "The purpose of this report is to enlarge the

concept of Corporate Social Responsibility and to reveal the value of the social function deriving from Enel's tax contribution." Similarly, Iberdrola (2019) emphasizes that "Tax transparency is thus inextricably linked with Iberdrola's comprehensive focus on corporate social responsibility…." These statements illustrate how both companies position tax transparency as part of their CSR commitments.

Additionally, Enel emphasizes the importance of tax transparency as a key component of sustainable *finance* and *sustainable development.* For example, Enel (2019) states*, "*We strongly believe that tax transparency is another important dimension of sustainable finance", and reiterates in 2020, "We firmly believe that tax transparency favors sustainable development" (Enel, 2020). Iberdrola echoes this sentiment, asserting that taxation, which plays a significant role in the Group's sustainable strategy through tax governance, best practices, cooperative compliance, and transparency in reporting tax information, all of which benefits sustainable development.

Another connection between sustainable and taxation is made through intertextual references to a document published by the Global Sustainability Standards Board (GSSB) which links tax reporting guidelines (GRI-207) with the United Nations' Sustainable Development Goals (SDGs) as outline in Agenda 2030[16]. This GSSB document associates tax reporting with the SDGs of "no poverty", "reduced inequality" and "partnership for goals". While Enel replicates this linkage in its reports, it does not provide detailed explanations of how its taxation practices align with these goals.

In contrast, Iberdrola explicitly emphasizes the connection between tax transparency and the SDGs, stating: "Tax transparency is thus inextricably linked with Iberdrola's focus on corporate social responsibility and its alignment with the achievement of the Sustainable

[16] A critical discourse analysis performed by Machin and Liu (2023) highlights that Agenda 2030 and its Sustainable Development Goals (SDGs) are characterized by a blurred definition of sustainability, filled with buzzwords and weakly defined concepts that disregard tensions and contradictions. The "one size fits all" approach results in the oversimplification and fragmentation of problems and solutions, guided by ethnocentric notions. Geopolitical issues that threaten the environment and human well-being, competition for resources, and problems stemming from the global spread of neoliberal economics are notably absent from the agenda (Machin & Liu, 2023).

Development Goals (SDGs) approved by the United Nations*"*(Iberdrola, 2019). Both companies exhibit strong epistemic modality[17] when discussing tax transparency and sustainable development, using adverbs such as *strongly, firmly, inextricably* to convey certainty and to influence the readers of the reports more effectively. This rhetorical strategy underscores their commitment to aligning tax practices with broader sustainability and development objectives.

Interdiscursivity between taxation and sustainability is evident in the *topos of value,* a prominent element in sustainability disclosures (Zappettini & Unerman, 2016). This argumentative strategy emphasizes the benefits of specific actions. In tax reports, companies present a taxation framework where the taxes paid and collected by the company are portrayed as value created and distributed to society, mirroring the value creation for shareholders and stakeholders in sustainability discourse. Consequently, it is common to see references to terms like tax *value, sustainable value, creation of value in a sustainable manner, shared value for stakeholders* in the tax reports, reflecting the convergence of taxation and sustainability narratives.

A common measure of sustainability impact popular in the business world today is the Environmental, Social and Governance Scores (ESG scores). Both, Enel and Iberdrola emphasize the role of taxation as a key component of this sustainability measure, justifying its integration as a c. ition for a more sustainable future. Enel states: "The acknowledged role of the fiscal variable, in particular fiscal transparency, within ESG (Environmental, Social and Corporate Governance) is becoming increasingly important in view of a transition towards a more just and sustainable future" (Enel, 2021). Iberdrola similarly underscores this connection with strong certainty: "Taxation has an important role to play in ESG, particularly with regard to tax governance" (Iberdrola, 2022). ESG is connected to taxation especially through the governance dimension.

Another example of the interdiscursivity between CSR, sustainability and taxation is the self-construction of identity as a trustworthy, honest, transparent and responsible organization common in sustainability discourse (Tregidga et al., 2014). This self-representation is frequent in

[17] Epistemic modality refers to the level of commitment of the author with the truth of a statement.

the tax reports: “The Enel Group, in the spirit of its sustainability strategy, manages its tax-related activities in accordance with values of honesty and integrity” (Enel, 2018). Additionally, membership in associations influencing public discourses on taxation and sustainability, as well as various certifications, are similar ways to communicate legitimacy and influence (Tregidga et al., 2014).

Furthermore, CSR involves adopting internal and external procedures to mitigate potential misinterpretations of the normative aspects of corporate actions (Garsten & Jacobsson, 2013). In the context of taxation, this is evident in the reports where the companies emphasize the implementation of tax control frameworks to manage taxes effectively and mitigate tax risks. Thus, the practice of tax management can be viewed as a direct extension of governance and self-regulation common in the CSR literature.

5.4. Ideological underpinnings

Corporate reports are neither neutral nor merely informational texts (Bhatia, 2010; Tinker & Neimark, 1988). They play a critical role in shaping the meaning of social and economic events of their time and in constructing identities of various stakeholders, including businesses, governments, employees, consumers, civil society, and other social actors. As such, they function as ideological tools shaping and legitimizing particular world-views (Tinker & Neimark, 1988; Tregidga et al., 2014).

Discourses are grounded in ideologies and simultaneously advance them (Vaara & Tienar, 2008; van Dijk, 1998). In our analysis of Enel and Iberdrola’s tax reports, we explore how implicit assumptions underpin the legitimizing discourse around their taxation practices, and how this discourse seeks to naturalize or universalize a particular worldview. Generally, multinational corporations’ controversial actions are legitimized through neoliberal discourses, while nationalism or humanism-based discourses are typically counter-hegemonic (Vaara et al., 2006; Vaara & Tienar, 2008).

We propose two key ideas regarding the ideological underpinnings in these tax reports. First, both companies exhibit a blend of embedded liberalism and neoliberalism in their discourses. Second, we observe a post-political form of regulation, where traditional coercive power is gradually replaced by soft power, rendering unequal power relations invisible or irrelevant (Garsten & Jacobsson, 2013).

Embedded liberalism refers to a form of liberalism where economic liberalization is embedded in social values, reconciling market efficiency with social community principles, typically negotiated at the nation-state level (Vallentin & Murillo, 2022). The participation in cooperative frameworks with the tax-authorities of the jurisdictions where companies operate and how companies build their relationship with tax authorities can be framed under the embedded liberalism ideology. For instance, Enel (2021) states that "the Group maintains collaborative and transparent relations with tax authorities". Likewise, Iberdrola (2021) asserts its relations with tax authorities are based built on "Respect for the law, fidelity, trust, professionalism, collaboration, reciprocity and good faith". This is consistent with the government's role as a democratic provider and enforcer of norms and rules grounded in embedded liberalism (Vallentin & Murillo, 2022). Moreover, the stakeholder-oriented thinking reflected in the reports aligns with the ideals of social embeddedness inherent in embedded liberalism.

Neoliberalism can be understood as a political project aimed at reshaping social relations to meet the demands of global capitalism (Bourdieu, 1998; Fairclough, 2000). It extends market principles, such as supply and demand, to all areas of society, including non-economic ones (Foucault, 2008). Neoliberalism also reframes the role of the national state as facilitator of the market's operations (Fairclough, 2006) and redefines governments as enablers of business driven corporate responsibility (Vallentin & Murillo, 2022). An example of this view is expressed by Iberdrola in its tax reports (2021): "This report reaffirms Iberdrola's defence of a fair and appropriate tax framework that maintains the necessary levels of sufficiency, promotes economic activity and competitiveness…"

A central theme in the tax reports of Enel and Iberdrola is the notion of paid and collected taxes as value distributed to society. Both companies stress that they generate value not only for shareholders but also for a broad range of stakeholders. Iberdrola (2021) emphasizes, "the Group's strategy is far broader than the mere achievement of its own financial profitability, as the financial dividend is only one component of the social dividend, which is understood as the *direct, indirect or induced value* of its activities for the Stakeholders. Enel (2019) similarly states, "The concept of value distributed refers to the contribution that the company makes to society in general. Value is distributed to the government in taxes, to employees in wages and salaries, to creditors in interest payments, and in profits retained for reinvestment or distributed to shareholders" (Enel, 2019). This concept of value creation originates from Porter and Kramer's shared value framework (2011) which posits that societal benefits and economic success can be pursued simultaneously. This approach can be viewed as a hallmark of neoliberal thinking as it frames CSR as a source of competitive advantage through the creation of shared value (Vallentin & Murillo, 2019).

Despite claims of social value creation in the reports, it is evident that shareholders' interests are prioritized. Iberdrola (2022) states, "… in December 2022 the Spanish government approved a new temporary energy tax on the turnover of energy companies, including electricity companies, and not just on "windfall profits… Iberdrola…has brought the necessary legal actions to legitimately defend its shareholders' interests, seeking the repeal of that tax and recovery of the amounts paid to the tax authorities." This reveals that while taxes are framed as contributing to societal value, shareholder interests come first when the transfer of wealth is at stake. Similarly, Enel (2021) emphasizes its goal of "…safeguarding the Group's assets and pursuing the primary interest of creating value for shareholders in the medium to long term." This aligns with a neoliberal discourse of managerial accountability, prioritizing shareholders' financial interests and dominant position (Peda & Vinnari, 2020).

The globalization of markets has been accompanied by a post-political form of regulation, which assumes consensus and harmonious social relationships rather than conflict (Garsten &

Jacobsson, 2013). This global market expansion has intensified economic competition and fragmented political authority. Multinational corporations are unique in that they are subject to national laws and regulations but operate transnational value chains that often escape binding regulatory frameworks.

Corporate social responsibility (CSR) and transparency initiatives, including tax transparency, address this regulatory gap through soft global governance (Garsten & Jacobsson, 2013). Transparency is closely linked to the neoliberal approach to governance, emphasizing individual responsibility and voluntary self-regulation (Garsten & Lindh de Montoya, 2008). Both Enel and Iberdrola highlight their commitment to transparency through voluntary disclosures and adherence to non-governmental standards. For instance, Enel (2021) asserts that "…has a clear and public tax strategy, a solid risk management and control system, and demonstrates its transparency vis-à-vis the tax authorities and all stakeholders by applying the best international standards." Similarly, Iberdrola (2022) emphasizes that "To demonstrate its absolute commitment to responsibility in tax matters, the disclosure of information to all of its Stakeholders and good practices, and in the pursuit of excellence and ongoing improvement in transparency, Iberdrola voluntarily prepares and publishes this Tax Transparency Report".

Their preference for self-regulation is reaffirmed through internal control frameworks, stakeholder engagement, and whistleblower systems. Iberdrola, for example, has "established an ethics mailbox to promote compliance with legal provisions and the Code of Ethics, enabling reports of improper activities" (Iberdrola, 2020). Likewise, Enel notes that "breaches related to tax can also be reported through the Company's internal channels" (Enel, 2021). All these statements taken together reflect the neoliberal belief that markets can produce fair societal outcomes with minimal government intervention (Peda & Vinnari, 2020).

6. Discussion and conclusions

In recent decades, there has been a growing trend toward corporate transparency. While regulatory measures in Europe require companies to disclose tax payments on a country basis, there has also been an increase in voluntary disclosures accompanying these quantitative reports. Previous research on taxation shows no reduction in tax aggressiveness as a result of the public tax strategy disclosures (Bilicka et al., 2022; Xia, 2023) and suggests that these reports may be used to signal legitimacy and build reputational capital (Blaufus et al., 2023; Hardeck, Inger, et al., 2024; Holland et al., 2016; Kao & Liao, 2021b). However, most studies employ positivist methodologies, limiting more interpretative analysis of these reports.

To complement this literature, our study aims to understand how multinational corporations discursively legitimize their tax practices in their tax standalone reports. We analyzed the tax reports of two prominent European energy companies using Fairclough's critical discourse analysis framework (Fairclough, 2016) and Van Leeuwen's grammar of legitimation (Van Leeuwen, 2007), challenging taken-for-granted assumptions about corporate taxation.

Our analysis of the reports indicates that the most commonly explained and legitimized taxation practices in the Enel and Iberdrola reports include the minimization of tax payments, the approach to tax compliance and planning, tax transparency initiatives, cooperative relationship with tax authorities and influence on taxation policies. In addition, both companies clearly delegitimize publicly condemned practices, such as profit shifting and operating in tax havens solely to reduce tax liabilities.

Overall, their discursive legitimation efforts aim to portray themselves as tax-responsible, moral, conciliatory, and transparent organizations acting for the broader good of society. These findings align with those of Ashour, Rogers and Merkl-Davis (2024), in a concurrent unpublished paper on discursive legitimation in public tax disclosures of UK companies. Their research shows that companies employ three overarching legitimation strategies to construct a coherent and legitimate tax image for stakeholders. These strategies are based on discourses that polish the

company's self-image or discredit critics, discourses that frame opponents as partners, and discourses in which the companies express their commitment to societal norms and values.

Authorization, rationalization, moral evaluation and narrativization play key roles in the discursive construction of legitimation in the reports. Regarding authorization, tax decision-making within the companies is vested in the authority of the Board of Directors. However, this authority is ultimately subject national governments, represented by the impersonal figure of law and regulations, which are the primary authorities invoked to legitimize corporate tax behavior. In addition, we observe that other actors in the private realm are increasingly becoming authorities in legitimizing tax practices. In the context of globalized markets, regulatory gaps are filled by non-state actors (Sonnerfeldt, 2020). One prominent example is the Organisation for Economic Co-operation and Development (OECD), which is the most respected expert authority on taxation mentioned in the reports. Following the OECD is the Global Reporting Initiative (GRI), an international standards organization widely recognized for its authority in CSR and sustainability and most recently tax reporting.

Tax advisors also emerge as expert authorities, assisting with tax management decisions and transparency reporting initiatives. Additionally, non-profit organizations, such as B-Corp, AENOR, and the Haz Foundation, provide certifications for good corporate responsibility and tax transparency. This trend reflects the increasing distribution of power from governmental authorities to local and supranational private entities in global tax governance.

However, certain actors within the international tax ecosystem, such as NGOs and academics, are notably absent in the reports despite their significant work on making public tax issues across countries like secrecy jurisdictions (Laage-Thomsen & Seabrooke, 2021). It is also noteworthy that, although the UN has had a Tax Committee since 1977, international tax governance is typically negotiated at the OECD that is a more limited group of countries (Laage-Thomsen & Seabrooke, 2021). The UN is not regarded as a major taxation authority by companies,

even though it is currently working to develop a supposedly more inclusive taxation framework than that of the OECD.

Companies justify their tax behavior by highlighting the benefits they provide to both shareholders and non-shareholder stakeholders. These benefits include serving the public interest, fulfilling stakeholder expectations, creating value for both shareholders and society, and supporting sustainable development. Reputational value is mentioned as a reason to engage in tax transparency. Instrumental rationalization is employed to legitimize contested practices like tax minimization, framing it as a means to achieve energy transition and sustainable development by taking advantage of tax incentives.

Furthermore, a moral perspective on taxation is evident in the reports, where corporate practices are evaluated based on virtues such as honesty, transparency, responsibility, trust, justice, fairness, and integrity. Additionally, the reports appeal to market values like stability, efficiency, and competitiveness. To emphasize the delegitimation of practices such as operating subsidiaries in tax havens, both companies illustrate examples of “good behavior” through narrativization strategies.

The interdiscursivity of CSR, sustainability, and taxation discourse is a prominent feature of the tax reports. The moralization and rationalization strategies used closely mirror those found in CSR and sustainability discussions. Tax transparency is frequently referenced as a key component of CSR, underscoring its role as a driver of sustainability initiatives and a vital source of funding for sustainability projects. Overall, we observe a blended discourse of "win-win" scenarios, where companies highlight mutually beneficial relationships between corporate and societal goals. In this framing, potential conflicts among different actors are minimized or downplayed, creating an image of consensus and cooperation (Hansen et al., 2015).

This interdiscursivity between sustainability, CSR and taxation introduces a significant debate about corporate tax behavior and the extent to which CSR’s normative prescriptions can influence corporate tax practices. This discussion echoes concepts of Foucauldian self-discipline

and governmentality, where corporations, through the concept of responsibility, are encouraged to self-regulate and align their tax behavior with broader societal expectations (Freedman, 2004; James, 2010).

Both companies' legitimation efforts are grounded in liberal ideologies, particularly neoliberalism. This is reflected in their prioritization of shareholders' interests, the emphasis on shared value creation, the view of a tax system as serving competitiveness, alongside the promotion of self-regulation and governance mechanisms. By presenting taxes as value redistributed to society and by emphasizing the effectiveness and competitiveness of the tax system, the companies depoliticize (remove from the political sphere) the discussion about taxation. This echoes the neoliberal ideology, which prioritizes economic considerations, portraying them as neutral and technical matters beyond the political debate and democratic control (Peda & Vinnari, 2020; Teivanen & Wallerstein, 2002).

This study has some limitations. CDA emphasizes the quality rather than the quantity of texts analyzed posing difficulties to generalize the results. In addition, we only focused on the corporations' discourse. Future research could incorporate media and NGOs discourses to explore social antagonisms and conflicting narratives around taxation and tax transparency. Other forms of communication, such as press releases, CEO speeches, and earnings calls, could also be included in the analysis. Further studies should examine how stakeholders and civil society interpret tax reports and whether these reports confirm or obscure perceptions of corporate legitimacy.

Our study has several contributions and implications. At the academic level, our work enhances the analysis of taxation as a social practice and contributes to the literature on tax transparency by incorporating qualitative research methods such as Critical Discourse Analysis (CDA). At the practical level, our insights into the discursive construction of legitimacy and the

influence of neoliberal ideology on corporate tax reports can help stakeholders in their interpretation of the messages in these tax disclosures.

For investors, particularly those focused on socially responsible investing, it provides tools to critically assess corporate tax reports. By distinguishing between data-supported claims, such as tax reductions due to credits from green energy investments, and more general claims of values like "integrity" and "honesty" that may conflict with ongoing controversies, investors can better evaluate the substance behind corporate tax statements. Such a critical approach helps investors discern whether claims are rhetorical or genuinely derived from specific actions. Similarly, civil society organizations and advocacy groups can use these insights to engage more effectively with corporate tax disclosures, scrutinizing both what is disclosed and what is omitted to hold companies accountable for substantive transparency. For corporate communication and reporting teams, this study highlights the importance of critically evaluating claims made in reports, providing an opportunity to refine communication strategies. By focusing on more effective and relevant reporting practices, these teams can avoid projecting an inflated or overly self-promotional image.

In addition, these findings serve as input for policymakers to develop regulatory frameworks that better balance market mechanisms with regulatory oversight, ensuring that transparency serves the public interest rather than merely advancing corporate agendas. Particularly, the results indicate that companies often prefer self-regulation mechanisms, such as private certifications, tax control frameworks, cooperative compliance programs, and internal channels for reporting ethical breaches.

These outcomes suggest that policymakers might consider strategies to incentivize and enhance the effectiveness of these self-regulatory behaviors, while also advancing binding

regulations and enforcement mechanisms to address corporate tax practices. Additionally, as discursive strategies are shown to construct an image of self-regulation, policymakers could develop tax reporting guidelines that promote genuine transparency, complementing private initiatives and preventing companies from selectively disclosing information for their own convenience. Public CbCR, which mandates the disclosure of specific information, serves as an effective example of this approach.

Overall, we aim to challenge the notion of transparency as merely the provision of information that offers direct insight into corporate actions. We have demonstrated that tax reports are tools through which companies selectively frame and present a specific worldview. In this way, tax reports, like other corporate reports, can function as ideological instruments (Tinker & Neimark, 1988; Tregidga et al., 2014). These reports shape and reinforce a particular interpretation of reality that justifies and upholds the status quo, ultimately privileging corporate interests. Simultaneously, they marginalize important discussions, such as defining what constitutes an effective or fair tax system: “the terrain of social scrutiny and reflection which existing reports displace -the agendas they preclude- constitutes their most effective censoring function” (Tinker & Neimark, 1988, p. 59).

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The impact of the CEO's perceived exchange-equity on their SME's tax aggressiveness and the moderating role of the owners' personal entrepreneurial network

Abstract

This conceptual paper focuses on the relationship between SME owner-managers' perceptions of exchange equity fairness - the value they perceive in public goods and services relative to taxes paid - and their firms' tax behaviour. While exchange equity has been explored extensively for individual taxpayers, its impact on corporate tax behaviour, especially among SMEs, remains under-researched. Moreover, as tax decisions are likely not made in isolation, we argue that personal entrepreneurial networks, composed of peers with shared tax positions, moderate this relationship. Through personal networks, SME owner-managers gain insights into peers' tax behaviours, audit risks, and enforcement outcomes, which may shape their compliance decisions. We hypothesize that perceived exchange equity unfairness leads to more tax-aggressive behaviour among SMEs, particularly when entrepreneurial peers signal low audit risk or high non-compliance themselves. Our study emphasizes how subjective perceptions of audit risk and compliance norms, shaped by social interactions within entrepreneurial networks, drive tax aggressiveness. It responds to gaps in the literature by integrating personal executive traits and social contextual factors into corporate tax research, particularly in the SME context. While this paper is conceptual, empirical data will be collected in the near future to validate our hypotheses. By examining these dynamics, we offer new insights into SME tax compliance and contribute to understanding the interplay of fairness perceptions and peer influences in shaping tax behaviour.

1 Introduction

Foregone tax revenues pose a significant challenge on public budgets in many countries (Batrancea, Nichita et al. 2019). This issue caught considerably more public attention since the global financial crisis of 2008, which compelled governments to prioritize fiscal policy (Cooper and Nguyen 2020). The current tax gap, defined as the difference between taxes expected to be paid and those actually paid, is substantial. Raczkowski and Mróz (2018) estimated the mean tax gap for the 35 developed countries studied, including the EU member states, to be around 10 % of GDP. For the US, the IRS estimated a tax gap of 13 % for the 2014-2016 tax years (IRS publication 1415, 2022). The European Commission estimated that the VAT gap was 11 % in 2018 (Grzegorz, Durán-Cabré et al. 2021).

The loss of taxes and social security contributions not only reduces the funds available for public goods or serve debt obligations, but also undermines the fairness of the tax system (Kirchler 2007). It furthermore affects the accuracy of macroeconomic statistics, potentially resulting in a misallocation of resources (Alm 2012). This compels governments to allocate resources to enhance voluntary compliance by boosting tax morale — defined as the internalized obligation to pay taxes (Braithwaite and Ahmed 2005) —, or to enforce tax compliance through audits (Kirchler, Hoelzl et al. 2008, Alm 2019).

Companies significantly contribute to the tax gap by strategically managing their tax liabilities to reduce costs and maximize shareholder value (Dyreng, Hanlon et al. 2008). Understanding the drivers of corporate tax compliance is essential for authorities to effectively address the issue of non-compliance, narrow the tax gap, and improve the budgetary balance. With their A*ction Plan on Base Erosion and Profit Shifting* (OECD 2013), the OECD took up the glove against tax avoidance policies of *multinational enterprises* (MNEs). In the light of the increased public attention for the issue, and corporate social responsibility in general, enforced by their higher public visibility, the tax behaviours of several multinational companies attracted negative media scrutiny in recent years. Notable examples are those of Starbucks (Campbell and Helleloid 2016), and Amazon (Baugh, Ben- David et al. 2018), but also other giants like Pfizer, Hewlett-Packard, Ikea, Facebook, Alphabet and Apple, caught the attention of media, activist groups or non-governmental organisations (Bird and Davis-Nozemack 2018, Riedel 2018). Tax behaviour of MNEs has, therefore, garnered considerable interest in corporate tax research (Cooper and Nguyen 2019, Cooper and Nguyen 2020). However, small and medium sized enterprises (SMEs) should not be neglected in the debate.

SMEs can be considered the backbone of the EU-27 economy. In 2022, they represented over 99 % of all European businesses, accounted for nearly two-thirds of employment, and generated just over half of the value added (Di Bella 2023). Despite their importance, and the magnitude of their tax contributions, the tax behaviour of SMEs is relatively understudied in corporate tax compliance research. However, SMEs are not just the scaled-down versions of larger firms (Sen and Cowley 2013). Due to their distinct firm-level characteristics, as well as the stronger impact of the owner-manager on corporate behaviour, the findings from research on larger firms may not directly apply to SMEs. Executive characteristics have already been shown to drive corporate tax behaviour (Dyreng, Hanlon et al. 2010). Yet, because decision-making power is highly concentrated within a narrow upper echelon (Hambrick and Mason 1984), and typically rests with non-tax specialist owner-managers (Kamleitner, Korunka et al. 2012), this influence is likely even more pronounced in SMEs. This suggests that the involvement of SME owner-managers in non-compliance might be considerable. Hence, given the pivotal role of SMEs in the economy, the same might apply for their contribution to the overall tax gap. Therefore, it is particularly important to examine the influence of the owner-managers' personal traits in this context.

Nowadays, personal traits, along with psychological and social factors, are recognised as crucial for explaining tax behaviour. Initially however, these factors were bluntly ignored. The standard theoretical model for describing and predicting tax compliance was the rational choice model developed by Allingham and Sandmo (1972), which is based on Becker's (1968) economics-of-crime model. This model assumed a representative, entirely rational taxpayer with infinite willpower and reasoning ability, making decisions in complete social isolation. Despite its major influence on tax

research, it is broadly recognised that the model is too restricted to comprehensively explain tax compliance behaviour (Alm 2019).

The typical taxpayer envisioned by the model does not actually exist. Real taxpayers are not the assumed profit-maximizing *econs* (Thaler and Sunstein 2008) with unlimited willpower and capacity for reasoning (Alm 2019) that make their decisions in social isolation. Instead, they are a heterogeneous group of individuals (Braithwaite 2003, Alm, Enami et al. 2020), living in a highly interactive social environment (Pickhardt and Prinz 2014). Richardson (2006) found in his study, based on the analysis of country-level variables and tax evasion rates from 45 countries, that non-economic determinants of tax evasion exert a stronger influence on tax evasion than economic ones. Indeed, beyond personal economic and psychological motives, people consider a range of social factors in their taxpaying decisions (Wenzel 2004, Torgler, Demir et al. 2008, Kirchler, Muehlbacher et al. 2010, Alm 2019).

Similarly, small business taxpayers, including SME owner-managers, do not make their decisions in social isolation (Alm, Bloomquist et al. 2017, Alm, Enami et al. 2020), and just like any taxpayer disregard feelings nor emotions (Olsen, Kasper et al. 2018, Enachescu, Olsen et al. 2019). Their personal characteristics, beliefs and attitudes are even likely to have a high impact on the tax behaviour of their companies, surpassing the influence of executive characteristics in larger firms. One such personal characteristic is the owner-manager's perception of the fairness of *exchange equity*, which refers to the value of public goods and services received in return for tax contributions (Mason and Calvin 1978, Kirchler 2007). Although exchange equity has been quite frequently studied as an individual taxpayers' characteristic, this research has predominantly focussed on personal income taxes (Farrar 2011). We examine how perceived exchange equity fairness affects corporate tax behaviour, by analysing the impact of the owner-managers' perceptions in this respect on their SME's tax practices. In doing so, we recognise the heterogeneity among taxpayers (Ahmed and Braithwaite 2005, Alm, Enami et al. 2020) and the varied factors driving corporate tax behaviour (Cooper and Nguyen 2019), divert from the classical standard tax decision-maker model (Kirchler 2007, Alm 2019), and consider corporate tax compliance motives beyond purely rational ones.

Moreover, we further challenge the unrealistic assumption of decision-making in social isolation, and acknowledge that owner-managers make tax decisions within a social context. In this regard, we focus on how his *personal entrepreneurial network* of fellow-entrepreneurs, formed through business operations as well as (in)formal (inter)professional social networking, may moderate the main relationship between the perceived exchange equity unfairness of the owner-manager and the SME's tax behaviour. Namely, SME owner-managers gain insights in the tax behaviour of others in similar tax positions through their entrepreneurial network, regardless of whether they share the same profession. Research on the influence of peer networks indicates that as individuals observe more tax

evasion among friends, colleagues, or the wider community, they tend to become more accepting of non-compliance, have less fear of sanctions against it and are more likely to engage in tax evasion themselves (Grasmick and Bursik Jr 1990, Hasseldine, Kaplan et al. 1994, Welch, Xu et al. 2005, Fortin, Lacroix et al. 2007, Kirchler 2007, Chau and Leung 2009). Alm, Bloomquist et al. (2017) experimentally demonstrated that knowing one's neighbours' (or by extension individuals they know, or regularly interact with) tax filing and reporting decisions, affects their own tax decisions. Likewise, SME owner-managers who are dissatisfied with their exchange equity may be more likely to act more overtly tax-aggressive if they observe similar behaviour among fellow entrepreneurs.

Secondly, SME owner-managers will also learn about audit probabilities and the consequences, through the experiences of other entrepreneurs with tax authorities. Hashimzade, Myles et al. (2014) state that taxpayers' decisions are led more by subjective, rather than objective perceptions of audit probabilities, with social interactions shaping a subjective probability that differs from the objective one. Consequently, SME owner-managers who experience high unfairness in exchange equity will become more overtly tax-aggressive if talking to the peers in their entrepreneurial network leads them to believe that audit risk is low. Conversely, even SME owner-managers perceiving high *Exchange Equity Unfairness (EEU)* may reconsider being tax aggressive if their network signals a high audit risk.

Our research complements the existing literature in several ways. First, it contributes to the broader field of empirical corporate tax research, and to the relatively understudied subarea of SME tax compliance in particular. Second, it adds a personal executive characteristic, the perceived level of exchange equity unfairness, to the realm of corporate tax research. To date, the influence of personal traits of SME owner-managers on their firms' tax behaviour still remains scarcely addressed in the literature. Thirdly, we answer the call of Slemrod (2019), who suggested to investigate the role of networks on tax behaviour and enforcement, by examining the impact of the entrepreneurial network of the owner-manager on the SME's behaviour.

The already limited number of prior empirical studies have either examined the direct effect of exchange equity fairness on tax behaviour, whether in the context of personal income tax or corporate tax, or explored the direct influence of a largely non-specific group of peers. We address this gap by examining the role of a specific group of peers, — namely the personal entrepreneurial network of SME owner-managers — as a moderator in the relationship between their perceived levels of exchange equity fairness and their firm's tax aggressiveness. In doing so, we respond to the call by Farrar, Massey et al. (2020) to evaluate factors that moderate and mediate perceptions of tax fairness to provide further insights into taxpayer's perceptions, and additionally, aim to determine whether the interaction effect between *horizontal equity* — the belief that other taxpayers in similar tax situations

pay a comparable amount of taxes (Kirchler 2007, Farrar, Kaplan et al. 2019) — and exchange equity, experimentally observed by Moser, Evans III et al. (1995), holds when empirically tested in the field.

2 Literature review and hypotheses development

2.1 SMEs and larger firms

The tax behaviour of SMEs remains relatively understudied in corporate tax compliance research. Most research tends to concentrate on larger MNEs, rather than on SMEs. However, significant differences exist between SMEs and their larger counterparts with regards to the opportunities for non-compliance, its organisational structure and the impact of the management.

First, SMEs are less likely to face intense media scrutiny (Dyreng, Hoopes et al. 2016, Chen, Schuchard et al. 2019), have fewer stakeholders (Sen and Cowley 2013) and are subject to lower public disclosure obligations (Hall, Hutchinson et al. 2004, Hanlon and Heitzman 2010). For these reasons, they are expected to have more leeway to engage in tax avoidance, and even evasion, compared to larger public companies. With tax avoidance we refer to all attempts to reduce tax liability within the boundaries of the law. However legal, tax avoidance could be against the spirit of the law and does have a chance to be challenged by tax authorities. Tax evasion entails all deliberate illegal and fraudulent actions that reduce tax liability, like underreporting of income or claiming unallowable deductions (Kirchler 2007).

Additionally, because their shares are not publicly traded, minority stakeholders also have less leverage to affect stock prices if they disagree with the firms' tax policies (Chen, Chen et al. 2010). On the other hand, SMEs lack the extensive accounting opportunities available to large multinational enterprises, which can exploit different tax regimes across countries through profit shifting and tax sheltering (Graham and Tucker 2006, Dharmapala 2014, Loretz, Sellner et al. 2017, Cooper and Nguyen 2020). Given these significant differences in firm-level characteristics, which affect the opportunities to avoid taxes, while opportunities are a most important driver for non-compliance (Robben, Webley et al. 1990, Kirchler 2007), the findings for larger MNEs may not apply to SMEs.

Initially, research on corporate tax behaviour largely focussed on firm level drivers of tax behaviour (Shackelford and Shevlin 2001, Graham 2003), such as size and profitability (Cooper and Nguyen 2020); agency conflicts (Crocker and Slemrod 2005, Bergmann 2023) stemming from (family) ownership structure (Chen, Chen et al. 2010) and the degree of capital market exposure in public versus private companies (Mills and Newberry 2001, Brune, Thomsen et al. 2019). Other aspects analysed included governance and executive compensation (Desai and Dharmapala 2006); the impact of external stakeholders like labour unions (Chyz, Leung et al. 2013) or activist groups (Cheng, Huang et al. 2012) and customer concentration (Huang, Lobo et al. 2016).

However, following Dyreng et al.'s (2010) findings that firm executives play a significant role in shaping a firm's tax avoidance behaviour, corporate compliance research embraced the upper echelon theory proposed by Hambrick and Mason (1984), which suggests that organisational outcomes often

reflect managerial background characteristics. Consequently, an entire strand of corporate tax research emerged, exploring the influence of a myriad of personal characteristics of CEOs and CFOs on their firms' tax aggressiveness. More specifically, studies examined characteristics such as personal tax aggressiveness (Chyz 2010); male gender (Francis, Hasan et al. 2014); narcissism (Olsen and Stekelberg 2016); overseas experience and accounting expertise (Chen, Chang et al. 2020, Chen, Chen et al. 2023); strength of future time preference in executives' native tongue (Na and Yan 2022) and risk-taking behaviour, sometimes proxied by unconventional measures like whether the CEO holds a pilot licence (Baghdadi, Podolski et al. 2022) or the riskiness of the CEO's sports hobby (Luo, Shevlin et al. 2022). All of these characteristics were found to be positively linked to tax aggressiveness in the quoted studies. A negative association was observed with (Republican) political affiliation (Christensen, Dhaliwal et al. 2015); and military experience (Law and Mills 2017).

However, smaller companies typically have smaller management teams that are strongly influenced by the SME owners (Sen and Cowley 2013). Therefore, personal characteristics of SME owner-managers are likely to have a considerably stronger impact on corporate tax behaviour compared to larger firms, where decision-making power is spread across a broader group of executives. Moreover, another common feature of SMEs is the lack of trained staff (Sen and Cowley 2013). In larger companies, tax matters are more often handled by inhouse experts, while small business owners typically deal with all managerial and operative decisions themselves, including day-to-day tax administration (DeLuca, Greenland et al. 2005, Kamleitner, Korunka et al. 2012). The experts in larger firms also generally experience a less direct connection between firm revenues and their personal financial situation. In contrast, SME owner-managers face a more direct link due to a more concentrated ownership structure (Hanlon and Heitzman 2010, Steijvers and Niskanen 2014). Furthermore, taxation is often not the core of their expertise (Kamleitner, Korunka et al. 2012, De Bruyckere, Verplancke et al. 2020).

Additionally, small business owners report more frequent conflicts with tax authorities compared to other taxpayers (Ahmed and Braithwaite 2005). These conflicts erode mutual understanding and the legitimacy of the authorities, decreasing taxpayers' perceptions of procedural fairness, and ultimately negatively affecting tax compliance (Verboon and van Dijke 2011). Procedures are regarded as fair if the partners involved are treated in a way they think is appropriate (Kirchler 2007). Furthermore, administrative tasks, including tax-related matters, are often handled after all other daily work and responsibilities have been addressed (Antonides and de Groot 2022). This tendency alone can be expected to influence compliance behaviour, as experimental studies have shown that people are more prone to cheating when their emotional resources for self-control are depleted (Mead, Baumeister et al. 2009). Ultimately, given their focus on operational rather than strategic concerns, SME owners more often rely on personal values and intuitions rather than long term planning and rational analysis, acting as 'strategically myopic' decision makers (Mazzarol 2004 in: Sen and Cowley 2013, p. 417). Consequently, the tax behaviour of SMEs is likely to be significantly shaped by the emotional

perceptions and intuitions of the owner-manager (Kamleitner, Korunka et al. 2012). As Fogarty and A. Jones (2014, p. 299) stated more frankly: *"smaller businesses are notorious for hating to pay any tax that could be avoided, whereas larger and more profitable ones have more discretion"*.

Given the aforementioned factors, in combination with the notably narrow upper echelon in SMEs, it is especially relevant to examine the influence of personal characteristics of the owner-manager on SME corporate tax behaviour. Indeed, in SMEs, the owner-manager makes decisions both as a manager and as an individual (Abdixhiku, Pugh et al. 2018). Nevertheless, research on the impact of personal traits of SME owner-managers on corporate tax behaviour is scant, and often intersects with personal income tax, due to the inclusion of self-employed taxpayers in their samples.

More specifically, in an exploratory study, Woodward and Tan (2015) investigated the attitudes of small business owners towards taxes and their understanding of the tax system. They mapped various factors, including mental accounting abilities, perceived compliance cost burdens, deterrence perceptions, personal experiences with and trust in tax authorities, and intrinsic motivation regarding proper tax behaviour, for general sales tax (GST) and income tax. However, they did not investigate the influence of the examined factors on small business owners' attitudes towards tax behaviour, actual tax behaviour, or behavioural intentions. In a similar vein, Tan and Braithwaite (2018) investigated how trust and small business owners' general fairness perceptions determine the type of their motivational posture (Braithwaite 2003) towards taxes.

Studies that did investigate the influence of personal traits of owner-managers on SME tax behaviour found that general fairness perceptions (Al-Rahamneh and Bidin 2022), alongside with moral obligation (Alshira'h and Abdul-Jabbar 2019), positively impact sales tax compliance, while the influence of non-specific peers (Al-Rahamneh and Bidin 2022) and industy- and geographical peers (Liang, Li et al. 2021) encourages, respectively, evasion and avoidance. Sikayu, Rahmat et al. (2022) on the other hand, found no impact of general fairness and information transparency perceptions, whereas distributive fairness and fiscal transparency negatively affected attitudes toward tax evasion. In the study of Bani-Khalid, Alshira'h et al. (2022), the three core components of the *Theory of Planned Behaviour* (Ajzen 1991) — attitudes, subjective norms, and perceived behavioural control — , as well as patriotism, positively impacted compliance intentions. Additionally, distributive justice and personal norms seem to interact in their effect on tax compliance attitudes (Verboon and Goslinga 2009). The studies referenced, predominantly explored the direct effects of various, general, fairness perceptions on tax behavior alongside other SME owner-manager characteristics. Our research adds to the literature by focussing on how exchange equity, perceived by the owner-manager, as a specific dimension of fairness, influences corporate tax behaviour, for SMEs in particular.

2.2 Exchange equity and its impact on compliance

Exchange equity pertains to how taxpayers perceive the balance between the taxes they pay and the benefits they receive from public services (Mason and Calvin 1978, Kirchler 2007), such as roads, schools and healthcare. It has been identified as the most important dimension of tax fairness (Farrar, Massey et al. 2020). The terms *exchange equity* and *fiscal exchange* are used interchangeably in literature (Alm, Jackson et al. 1993, Leder, Mannetti et al. 2010), although *exchange equity* is the more commonly used term. Another related concept is *distributive justice (or distributive fairness)*, which is sometimes used synonymously with exchange equity. Depending on how the construct under examination is conceptualised, exchange equity is sometimes combined with other fairness dimensions, such as horizontal and vertical fairness, to build a broader construct measuring distributive justice. The differing conceptualisations of fairness in literature lead to seemingly divergent results, complicating the comparison of outcomes across studies. This issue is particularly true when it is not explicitly stated which aspect or form of fairness is being examined (Kirchler 2007, Verboon and Goslinga 2009).

Taxpayers who view the tax system as unequal are more likely to behave tax-aggressive (Cowell and P.F. Gordon 1988, Cowell 1992, Bordignon 1993, Moser, Evans III et al. 1995, Kirchler 1997, Kirchler 2007), and may try to avoid taxes by shifting income in time, to more tax favourable income categories or subsidiaries (Stiglitz 1985), or might resort to evasion, claiming disputable deductions or underreporting their income, to re-establish the balance. Conversely, the better the provision of public goods and services recompenses the taxes paid, the higher the level of compliance (Verboon and Goslinga 2009), which is in line with the predictions of equity theory (Adams 1965). An experiment of Alm, McClelland et al. (1992) provided empirical evidence that the value of the public goods they receive, motivates people to comply. In the literature, exchange equity fairness perceptions are generally considered to be positively correlated with tax compliance. Only a small number of studies found no relationship between perceived exchange equity fairness and tax compliance behaviour (Keenan & Dean, 1980; Mason & Calvin, 1978; Saad, 2010; Wallschutzky, 1984, in: Verboon and Van Dijke 2007, Farrar 2011).

The perception of the benefits side of the exchange equity equation, i.e. the valuation of the public goods and services received in return for their tax money paid, is highly subjective. Individuals are more likely to view exchange equity as fair, when taxes fund public goods they approve of (and consequently value higher), or when they believe they have influence over government spending decisions (Alm, Jackson et al. 1993, Falkinger 1995, Pommerehne and Weck-Hannemann 1996, Kirchler 2007, Sussman and Olivola 2011). In the latter scenario, taxpayers anticipate to receive valuable public goods and services in the future as a return for their tax contributions. Given the inherently subjective nature of valuing public benefits, significant variability among exchange equity fairness perceptions can be expected. This variability persists even among subgroups of taxpayers who

share many common characteristics and face similar tax rates and systems, such as SME owner-managers.

Kirchler (1998) compared the exchange equity among the self-employed to that of four other taxpayer groups. The self-employed reported a slightly higher subjective tax burden and felt they received much less in government benefits compared the other groups. Interestingly, Ahmed and Braithwaite (2005) found that small business owners had a rather low intrinsic motivation to pay taxes, and admitted paying less than their fair share, compared to other taxpayers. The small business owners, as well as the self-employed, share characteristics (Kamleitner, Korunka et al. 2012) that may contribute to a lower perception of exchange equity. Firstly, they have to deal with (multiple) tax situations more regularly, compared to private taxpayers. The reason is that companies not only have to manage their income tax administration, but also the administration related to VAT or sales tax, and the withholding of taxes and social security contributions on the wages of employees (Christensen, Cline et al. 2001, Webley 2004). This more frequent involvement with tax matters make them particularly salient (Chetty, Looney et al. 2009) for SME owner-managers, highlighting the cost side of the exchange equity equation.

Secondly, small business owners often find themselves in a tax due situation when dealing with tax administration and filing. This leads them to pay taxes out-of-pocket, causing them to view the taxes paid more as a financial loss (Kirchler 2007). Taxpayers who are in a tax due situation when filing, tend to accept more risk, and therefore be less compliant, than those expecting a refund. This observation, known as the *income tax withholding phenomenon* (Schepanski and Shearer 1995), stems from *loss aversion* (Kahneman and Tversky 1979). These two factors intuitively suggest that business entrepreneurs should perceive their tax rate as being higher than the actual, objective rate, more often than other income groups. This assumption was indeed corroborated by Schmölders (1960) who found that a high proportion of business entrepreneurs overestimated their tax burden when they were asked to estimate the percentage of taxes they paid, while other groups of taxpayers estimated their tax rate more accurately (Schmölders 1960, in: Blaufus, Bob et al. 2015). However, 55 years later, this difference in tax perception between self-employed and employed people seemed to have disappeared (Blaufus, Bob et al. 2015).

Thirdly, when accounting for tax compliance costs, the picture gets even worse for SMEs. Compliance costs, which are incurred to fulfil tax law requirements and administrative duties beyond the tax liability itself (D'Andria and Heinemann 2023), tend to be higher for smaller companies compared to their larger counterparts (DeLuca, Greenland et al. 2005, Schoonjans, Van Cauwenberge et al. 2011, Hansford and Hasseldine 2012, Eichfelder and Vaillancourt 2014, Evans, Hansford et al. 2014).

Although the commonly shared characteristics of SME owner-managers suggest a rather uniform low fairness perception for this group of taxpayers as a whole, due to the cost side of the exchange equity

balance, there will be substantial individual differences in how they personally value the public benefits received. After all, people value the public benefits they receive for their tax euros in very diverse ways. Consequently, we expect substantial heterogeneity among individual SME owner-managers regarding their perceived exchange equity fairness.

Maroney, Rupert et al. (1998) demonstrated furthermore that peoples' fairness perceptions impact their tax behaviour across all types of taxes they have to pay. They identified an indirect effect of fairness perceptions, noting that the perceived fairness of taxes on one type of income influenced the decision about reporting other types of income. This finding supports the idea that the personal exchange equity fairness perception of SME owner-managers will affect their company's overall tax behaviour, including not just income taxes, but also sales tax or VAT, employee-related taxes and social security contributions. Therefore, it is crucial to investigate the extent to which the perceptions of exchange equity unfairness (EEU) among individual SME owner-managers materialises in the tax behaviour of their companies. The higher the EEU they perceive, the more aggressive the tax behaviour of their SME's is likely to be.

So far, empirical research on the impact of exchange equity fairness perceptions on tax compliance has predominantly focussed on private taxpayers (Verboon and Goslinga 2009, Farrar 2011). Farrar's (2011) review of 22 studies conducted before 2011 did not include any studies on SMEs. Despite the growing focus on executives' personal characteristics in corporate tax behaviour research since the work of Dyreng et al. (2010), the effect of exchange equity fairness perception as a personal trait of SME owner-managers on their company's tax behaviour, has been examined only by Sikayu, Rahmat et al. (2022) and Verboon and Goslinga (2009) with respect to income taxes, and Al-Rahamneh and Bidin (2022) regarding sales tax evasion. This is quite surprising since exchange equity might at least be equally important for corporate tax behaviour, especially when executives can be expected to have a huge impact on corporate decision making, like this is the case for SME owner-managers. Moreover, Sikayu, Rahmat et al. (2022) and Al-Rahamneh and Bidin (2022) report a negative effect of exchange equity perception on tax evasion, while Verboon and Goslinga (2009) found no significant main relationship between distributive justice and tax compliance attitudes, but did find a significant interaction effect of distributive justice and personal norms on tax compliance attitudes. The lack of (consistent) results, therefore, leads to a need for more research on this topic.

Building on the findings discussed, we present our first hypothesis concerning the main effect of the exchange equity perceived by the SME owner-manager, on their firms' tax behaviour. While most researchers have framed their hypotheses and results in terms of a negative relationship between fairness perceptions and tax compliance, we opt to express our hypothesis in terms of a positive relationship between perceived exchange equity unfairness and firms' tax aggressiveness. This approach aims to enhance the clarity and interpretability of our analysis and results.

H1: The level of exchange equity unfairness (EEU) perceived by the owner-manager is positively associated with the tax aggressiveness of their SME.

2.3 Moderating role of the owner-managers' personal entrepreneurial network

As hypothesised, individual SME owner-managers — and consequently their firms — are likely to be more tax aggressive when they experience higher levels of EEU. However, several factors may interact with this main relationship. Taxpayers do not make their tax decisions in social isolation. Beyond individual characteristics, social interactions and social integration play a crucial role in the dynamics of tax behaviour (Pickhardt and Prinz 2014). Theoretical literature on social norms, as well as distributive and horizontal justice, recognises the influence of "significant others" such as neighbours, co-workers, members of occupational groups, people in similar tax situations and family members, on taxpayer compliance (Grasmick and Bursik Jr 1990, Kirchler 2007, Hashimzade, Myles et al. 2014, Onu and Oats 2015, Di Gioacchino and Fichera 2020). This influence has been corroborated by numerous studies, both experimental and empirical, which are further detailed below.

Al-Rahamneh and Bidin (2022) studied the direct impact of peer influence on SME sales tax evasion behaviour and found a positive relationship. In their study, they adopted the broad definition of Jackson and Milliron (1986) and did not differentiate between the various subgroups of peers such as family, relatives, co-workers, and other acquaintances. According to Stalans, Kinsey et al. (1991), while both family members and co-workers are important sources of tax information, individuals typically receive more tax information from co-workers. Moreover, those with opportunities for tax evasion generally gather significantly more information from peers in similar tax situations. This information is shared among like-minded individuals through their social networks (Stalans, Kinsey et al. 1991).

For SME owner-managers, their personal entrepreneurial network of fellow-entrepreneurs serves as an ideal environment to connect with people in similar tax situations. We define the personal entrepreneurial network as the group of diverse fellow-entrepreneurs the owner-manager regularly interacts with, whether during business operations, in social networking settings or in their private life. In our conceptualisation, the personal entrepreneurial network encompasses more formal environments, like professional associations and interprofessional associations such as chambers of commerce, alongside informal ones, like sports or hobby clubs. We deliberately aim to include the aspects of interprofessionality and informality into the equation. Given the opportunities, the complexity and the interconnectedness of social interactions, it would be unrealistic to ignore social influences that extend beyond geographical boundaries, or business contacts within a single industry or profession.

In this personal network, fellow entrepreneurs play a role similar to that of co-workers for salaried personal income taxpayers. Hence, SME owner-managers seeking tax-related information are highly

likely to find it in their personal peer network of fellow entrepreneurs. As a result, this network is expected to significantly influence the extent to which the perceived level of EEU, as a personal trait of the owner-manager, translates into the actual tax aggressiveness of their SME. To date, and to the best of our knowledge, no prior research has examined the moderating role of a personal entrepreneurial network within this context. Previous empirical studies have either examined the direct effect of exchange equity fairness, or explored the direct influence of a non-specific group of peers (Al-Rahamneh and Bidin 2022), or the industrial and geographical peers, (Liang, Li et al. 2021) on tax behaviour. Our research aims to address this gap and explores the role of a specific peer group, the personal entrepreneurial network of SME owner-managers, as a potential moderator in the relationship between perceived EEU and a firm's tax aggressiveness. We concentrate on two proposed mechanisms through which the personal peer network might interact with the EEU perception of SME owner-managers: first, the observed tax behaviour among peers within the personal network, and second the perceived subjective audit risk shaped by interactions with fellow entrepreneurs.

2.3.1 Observed peer behaviour

Torgler, Demir et al. (2008) argue that dissatisfaction with the government, or a negative attitude towards the tax system, might stimulate taxpayers to seek advice from others to better understand evasion opportunities and the probability of getting caught. Following this assumption it is not difficult, for example, to envision an SME owner-manager experiencing EEU to attend a network event with the intention to learn from his fellow entrepreneurs about how to lower his tax duties. The more these owner-managers perceive EEU, the more their conversations are likely to be biased towards tax-related topics. Given this bias in their interactions, we expect that the personal entrepreneurial network's tax aggressiveness specifically amplifies the tax aggressiveness of SME owner-managers who perceive higher levels of exchange equity unfairness. Therefore, we anticipate an interaction effect between the tax aggressiveness of the entrepreneurial network and individual owner-manager perceptions of EEU, rather than a direct effect of the networks' tax aggressiveness as such.

More specifically, for EEU perceiving SME owner-managers, the degree of aggressiveness of their entrepreneurial peers' tax behaviour is decisive. When SME owner-managers talk more often and in greater detail about successful past tax aggressive strategies with fellow entrepreneurs, they gain valuable insights into opportunities for similar behaviour. Given that opportunity is a key driver of tax aggressiveness (Robben, Webley et al. 1990, Kirchler 2007), the implications are straightforward.

Secondly, beyond learning about opportunities, research indicates that the intensity of discussing about taxes, tax authorities or political matters with peers has a negative effect on the intrinsic motivation to pay taxes, because people perceive lower *horizontal equity* when they observe others in similar tax

situations cheating taxes (Horodnic 2018). Horizontal equity refers to the belief that other taxpayers in similar tax situations pay a comparable amount of taxes (Kirchler 2007, Farrar, Kaplan et al. 2019). Exactly this increased intensity of discussing about taxes is what we expect to see from a EEU perceiving SME owner-manager. Therefore it is likely that, for this group in particular, their intrinsic motivation to pay taxes will further decline under the influence of a more tax aggressive personal entrepreneurial network. In a tax aggressive personal entrepreneurial network, higher EEU perceiving SME owner-managers are more likely to talk with peers that are more aggressive than they themselves are, in similar tax situations. Hence, these owner-managers will perceive lower horizontal equity. Moser, Evans III et al. (1995) found an interaction effect between horizontal equity and exchange equity in their tax experiment, showing that exchange equity only had a significant influence on tax compliance if taxpayers simultaneously perceived horizontal inequity. This suggests that, particularly for SME owner-managers perceiving higher EEU in an aggressive personal entrepreneurial network, peer information sets the stage for more pronounced tax aggressiveness.

Thirdly, frequently discussing opportunities for tax aggressiveness, can distort one's perception of the prevailing social norm. Due to the aforementioned bias, this effect is more pronounced for SME owner-managers perceiving higher EEU. Increased exposure to stories about tax aggressiveness naturally increases their awareness of such practices, thereby influencing the descriptive social norm. Furthermore, they might also develop the perception that tax aggressiveness is more socially acceptable, which leads to a lower injunctive social norm. In conclusion, for SME-owner managers perceiving higher EEU, a tax aggressive entrepreneurial network leads to a lower perception of the social norm, more than it does for others. Regardless of their interrelationship, lower social and personal norms, however defined, negatively impact tax compliance. For a thorough discussion on social norms, their mutual interaction and influence on tax behaviour, see Bobek, Hageman et al. (2013); Jimenez and Iyer (2016); Onu and Oats (2015) and Wenzel (2004)

One explanation of this negative effect is that as taxpayers increasingly believe that tax evasion is widespread, the easier it may become to rationalize evasion (Pommerehne, Hart et al. 1993). Another explanation focusses on the cost of tax aggressive behaviour, and is based on an extension of the classical economic rational choice model of Allingham and Sandmo (1972). Grasmick and Bursik Jr (1990) introduced the concept of an additional psychological self-imposed, and a socially-imposed cost. They propose that psychological self-imposed costs such as shame and guilt, alongside socially-imposed costs of violating the social norms in case of tax evasion (e.g. embarrassment or loss of respect), serve as deterrents to tax evasion. Similar to the state-imposed legal sanctions outlined in the classical rational choice model, these costs lower the expected utility of tax aggressiveness. Consequently, when personal and social norms regarding taxes weaken, the potential self-imposed and socially-imposed costs also diminish (Grasmick and Bursik Jr 1990, Alm, Bloomquist et al. 2017). Hence, weaker personal and social norms decrease the potential cost of tax aggressiveness, resulting in

lower compliance. In this respect, it is interesting to note that SMEs often rely on a rather limited customer base within their local community (Sen and Cowley 2013). This makes them more vulnerable than companies with a broader and more diversified customer base to an additional potential economic cost of losing business, in case their actions are seen as violating social norms.

Ultimately, SME owner-managers that perceive high EEU, in particular, are more likely to view their peers as more tax-aggressive than themselves. SME owner-managers seeking information to lower their tax duties within a tax-aggressive personal entrepreneurial network are likely to have more conversations with fellow entrepreneurs who are more tax aggressive than they are. This is not only because of their fellow entrepreneurs being inherently more aggressive, but just as much because these owner-managers are biased to specifically seek out discussions about tax-aggressive behaviour. Conversely, owner-managers who are content with their current level of exchange equity are less likely to discuss aggressive tax strategies, even if their peers are rather aggressive. Bazart and Bonein (2014) found in a laboratory experiment that when taxpayers are informed about the average reported income of other group members, they tend to adjust their own reported income to align more closely with the group mean, depending on their relative position. This finding relates with *social conformity theory* (Myles and Naylor 1996) which suggests that individuals can experience psychological benefits by aligning with the typical reporting behaviour of their reference group. According to social conformity theory, and as confirmed by Bazart and Bonein (2014), we expect owner-managers perceiving high EEU to be more likely to increase their own tax aggressiveness when part of a tax-aggressive personal entrepreneurial network compared to the average SME owner-manager.

Thus, for this type of SME owner-manager, the aforementioned mentioned learning effects, the influence of horizontal equity, as well as social and personal norms, and social conformity theory, collectively suggest a consistent moderation effect. The extent of perceived tax aggressiveness within the personal entrepreneurial network can be expected to amplify tax aggressiveness more profoundly among SME owner-managers who perceive exchange equity as unfair. Consequently, we present the following first hypothesis regarding the moderating effect:

H2a: The level of tax aggressiveness observed within their personal entrepreneurial network amplifies the positive association between the EEU perception of the owner-managers and the tax aggressiveness of their SMEs.

2.3.2 Subjective audit risk perception

Most of all empirical studies and laboratory experiments affirm that an increase in the audit rate enhances tax compliance, in line with Allingham and Sandmo's standard theoretical model of individual compliance decisions (Kirchler, Muehlbacher et al. 2010, Alm, Enami et al. 2020).

However, contemporary tax researchers acknowledge that observed levels of tax compliance in advanced economies exceed those that would be predicted by the rational choice model, given the low actual audit probabilities and relatively modest penalties (Andreoni, Erard et al. 1998, Kirchler 2007, Alm 2019). It appears that subjective, rather than objective, audit probabilities seem to drive tax behaviour (Hashimzade, Myles et al. 2014).

Ostensibly, most taxpayers overestimate the chances of being audited due to a significant misperception of the actual audit probability. This observation can be attributed to various psychological biases. The first of these, *probability misperception*, does not even require social interaction. It is widely recognised that people tend to systematically overweigh small probabilities (Kahneman and Tversky 1979), including the probability of being subject to a tax audit (Alm, McClelland et al. 1992, Kirchler, Muehlbacher et al. 2010, Hashimzade, Myles et al. 2013).

Secondly, *availability bias* can influence individuals' perceptions of audit risk (Kirchler, Muehlbacher et al. 2010). This bias suggests that the deterrent effect of audit regimes heavily depends on the salience of audit risk. Availability bias leads people to give disproportionate weight to information that is more readily available in their memory (Tversky and Kahneman 1974). *"The human mind is built to think in terms of narratives,…"* (Akerlof and Shiller 2010, p. 51). Consequently, stories about audits circulating within the peer network, particularly their frequency, vividness and recency, can profoundly impact taxpayers' subjective perceptions of audit risk. Audit information may be disseminated either officially by the tax authority, or informally through communication among taxpayers (Alm, Jackson et al. 2009). People seem to develop a subjective belief of their likelihood of experiencing a negative audit, based on the informal audit-related information they receive from peers. Surveys and field experiments confirmed the existence of such a spill-over effect, in both directions.

Stalans, Kinsey et al. (1991) reported that communication with co-workers lowered the perceived likelihood of detection of overstated deductions. In a study on household compliance with TV licences in Austria, Rincke and Traxler (2011) found that one additional household complied for every three detections of non-compliance. Drago, Mengel et al. (2020) sent a deterrence letter, announcing additional monitoring or an imminent audit, to selected neighbours in an Austrian neighbourhood network. They found the spill-over effect to equal the magnitude of the direct effect. The letter increased the perceived audit probability about equally, in both the experimental group that received the letter and the control group of neighbours that did not. Positive spill-over effects were also noted by Pomeranz (2015), who found that a deterrence letter sent to Chilean firms suspected of VAT evasion led to a median increase of about 12 % of VAT income declared by their suppliers, with the effect fading away over a period of 18 months. Alm, Jackson et al. (2009) discovered in their experiment that when audit probabilities are either not communicated by tax authorities, or not

credible, taxpayer-to-taxpayer peer communication reduces compliance, unless the occurrence of audits is mentioned sufficiently often. These observations catch availability bias in the act.

The third psychological bias that may help explain the high observed compliance rates is *probability neglect* (Sunstein 2002), as a result of risk-as-feelings (Loewenstein, Weber et al. 2001). Bergolo, Ceni et al. (2023) concluded from their experiment that taxpayers are motivated to comply primarily out of fear, overreacting to the threat of audits and foregoing rational assessments of probabilities. Emotions play an important role in tax behaviour and have been subject of research (Braithwaite 2003, Kirchler 2007, Olsen, Kasper et al. 2018, Enachescu, Olsen et al. 2019, Privitera, Enachescu et al. 2021). Anticipation of future audits and listening to audit-related stories, can evoke strong emotions such as fear and anxiety. Consequently, taxpayers may become preoccupied with their emotional responses to a potential negative outcome, leading them to ignore the actual low probability of detection (Bergolo, Ceni et al. 2023).

While a positive impact of detection probability on tax compliance is generally observed, along with spill-over effects, the empirical evidence is not entirely conclusive (Kirchler, Muehlbacher et al. 2010, Alm, Enami et al. 2020). Farrar, Kaplan et al. (2019), building on Alm, Kirchler et al. (2012), argue that the traditional research paradigm, which assumes that an increased audit risk directly enhances tax compliance, is recognised as incomplete by economists and psychologists. Alm, Jackson et al. (2009) proposed that the effect of detection probability on tax compliance may be indirect, be moderated by, or moderate other variables (Farrar, Kaplan et al. 2019). This proposition was supported by Verboon and van Dijke (2012) who found that procedural justice and deterrence instruments (such as audit rates and fines) interact to amplify each other's effects. Similarly, Farrar, Kaplan et al. (2019) demonstrated experimentally that the impact of interactional fairness — referring to individuals' perceptions of how they are treated by authority figures, such as representatives of the tax authorities (Farrar, Kaplan et al. 2019) — on compliance was more pronounced when detection probability was lower.

As described in Wenzel (2004), Scott and Grasmick's survey findings suggested as early as in 1981 that deterrence might function as a moderating factor. Their research indicated that legal sanctions had a greater deterrent effect on tax evasion among respondents who viewed the tax system as unjust and were therefore presumably more motivated to evade taxes (Wenzel 2004). Our study aims to contribute to the existing literature, by investigating how the perception of audit risk within the personal entrepreneurial network moderates the relationship between the perceived EEU of the owner-manager and their SMEs' tax aggressiveness.

Building on the premise of Torgler, Demir et al. (2008), we propose that a higher EEU perceiving SME owner-manager is more biased to seeking information about audit risks related to tax-aggressive practices. Therefore we expect that, specifically these owner-managers, will be particularly affected by their personal entrepreneurial network's perception of audit risk. If their personal entrepreneurial

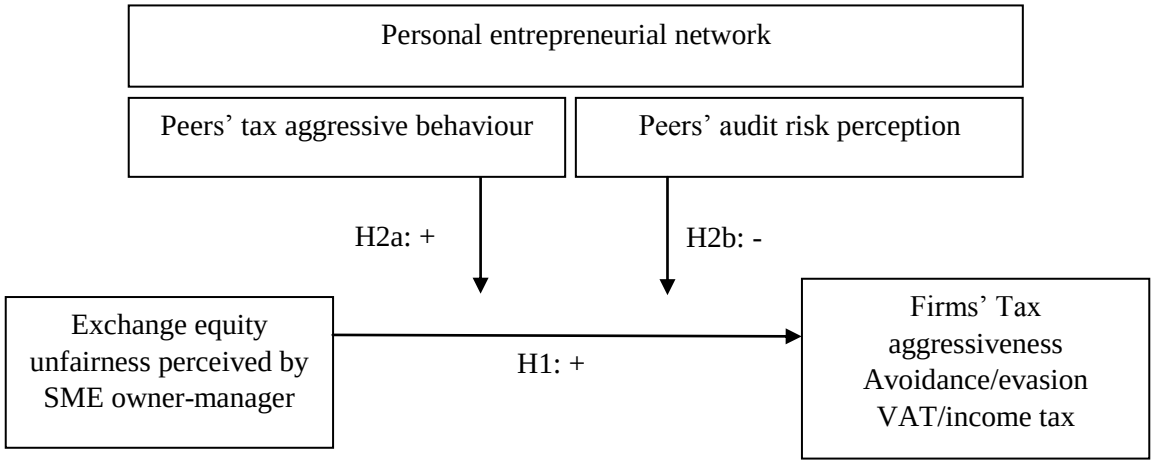
network, by experience, perceives the audit risk to be low, the owner-manager is likely to witness less stories of audits that turned out unfavourable. Conversely, if their peers experienced the audit risk to be high, instances of contrasting stories will appear more frequently.

As a result of availability bias, potentially magnified by probability neglect, the SME owner-manager may overestimate the likelihood of experiencing outcomes similar to the stories recounted by fellow entrepreneurs. Accordingly, the audit risk perceived within the network will significantly impact the owner-manager's subjective assessment of the likelihood of being caught. Consequently, SME owner-managers are expected to act more overtly tax-aggressive if they believe, based on the experiences shared by their fellow entrepreneurs, that the audit risk is low. Instead, if shared audit experience within the network suggests that the audit risk is high, they may reconsider being tax aggressive, even if they remain highly dissatisfied with their exchange equity.

We present our second moderator hypothesis as follows:

H2b: The level of audit risk perceived by the members of their personal entrepreneurial network, mitigates the positive association between the EEU perception of the owner-managers and the tax aggressiveness of their SMEs.

Figure 1: Conceptual research model with moderating effects of the personal entrepreneurial network



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Turning off the lights: Newspaper closures and corporate tax avoidance

ABSTRACT

This paper investigates the impact of local newspaper closures on corporate tax avoidance behavior of U.S. listed firms between 1991 and 2015. Using a difference-in-difference analysis of 2,155 firm-years, we find that firms faced with local newspaper closures increase their tax avoidance levels, resulting in a five percent decrease in effective tax rates. Upon closer examination, we show that financially constrained and locally embedded firms exhibit stronger responses. Higher overall media presence and stronger informal institutions mitigate this effect. Our findings underscore the critical role of local newspapers in monitoring corporate behavior and safeguarding public revenue.

"Ever wonder what's in the back of all those Ryder trucks? Your tax dollars, apparently."

The Miami New Times, November 4, 2011

I. INTRODUCTION

From a firms' perspective, tax avoidance is often considered to be a double edged sword. On the one hand, increased cash tax savings generally constitute a cheaper alternative to raising money on the capital market or borrowing from creditors (Edwards, Schwab, and Shevlin 2016; Richardson, Lanis, and Taylor 2015). On the other hand, tax avoidance strategies may be accompanied by set-up costs, potential audit costs and reputational costs (Radcliffe, Spence, Stein, and Wilkinson 2018). Ultimately, tax avoidance strategies therefore often boil down to a comparison of benefits and costs that determines if and to which extent these strategies are implemented (Scholes, Wolfson, Erickson, Maydew, and Shevlin 2014). In this paper, we focus on an intuitively compelling, yet under researched, aspect that may influence this trade-off when determining corporate tax planning strategies, namely local newspaper coverage.

Local newspapers are essential corporate monitors, shaping firms' information environments through which they can be held accountable. As such, positive reporting in local newspapers has been shown to enhance firm equity values (e.g., Gurun and Butler 2012), while declines in local newspaper coverage increase volatility of stock returns, spreads, and illiquidity, underscoring local newspapers' value as information sources for investors and stakeholders (Allee, Cating, and Rawson 2023). Resulting from this monitoring role, local newspapers also play a critical role in shaping firms' reputations within their communities. Byun and Oh (2018), for instance, show that media coverage of CSR activities with local community impact are positively associated with shareholder value. In this work, we focus on local newspapers coverage as a factor increasing reputational costs of tax avoidance by exposing firms for not contributing their 'fair share' to society. *The Miami New Times*, for example, reported that Ryder System, a transportation company headquartered in Miami-Dade

County, had not paid federal income tax for three consecutive years.[1] Similarly, *The San Francisco Chronicle* highlighted that Salesforce, a cloud-based software company based in San Francisco, paid no federal income tax in 2020 despite obtaining $2.6 billion in profit.[2] Meanwhile, *The Seattle Times* documented how Microsoft, headquartered in the same county, shifts profits offshore to reduce its tax liability.[3] The resulting increase in public pressure is aimed at urging firms to reduce these practices in order to maintain their legitimacy in the public eye. Indeed, firms with higher reputational risks tend to reduce tax avoidance to minimize scrutiny and protect their public image (Austin and Wilson 2017). Several studies provide evidence of potential consumer backlash resulting from disclosed tax avoidance (e.g., Hardeck and Hertl 2014; Antonetti and Anesa 2017; Hoopes, Robinson, and Slemrod 2018; Hardeck, Harden, and Upton 2021), while tax avoidance news also negatively affects employee perceptions of managers and firms (e.g., Lee, Ng, Shevlin, and Venkat 2021). Evidence of media attention exerting similar pressure has also been provided with regard to corporate misconduct (Heese, Pérez-Cavazos, and Peter 2022), pollution (Jiang & Kong 2023), and sexual harassment (Billings, Klein, and Shi 2022), with survey evidence also indicating managers' concerns about negative media coverage on corporate taxes (Graham, Hanlon, Shevlin, and Shroff 2014). Nevertheless, local newspapers may be reluctant to critically cover firms' activities given the employment benefits they provide to the area, especially as tax avoidance is not an illegal practice in itself. Indeed, even when covered by local media, tax avoidance may be perceived as less of an issue by the general public relative to its illegal counterpart of tax evasion (Kirchler, Maciejovsky, and Schneider 2003). If either of the latter arguments is true, we would not expect local newspaper coverage to be associated with tax avoidance.

[1] https://www.miaminewtimes.com/news/ryder-miami-based-fortune-500-company-paid-no-federal-income-tax-the-past-3-years-6541942
[2] https://www.sfchronicle.com/business/article/Salesforce-paid-no-federal-income-tax-in-2020-16078479.php
[3] https://www.seattletimes.com/business/microsoft/how-microsoft-parks-profits-offshore-to-pare-its-tax-bill/

To empirically investigate the potential relation between local newspaper coverage and corporate tax avoidance, we refrain from using newspaper coverage levels given the endogenous nature of media attention which may have been triggered by tax avoidance strategies. Instead, we use newspaper closures as an exogenous shock alleviating media pressure (Gao, Lee, and Murphy 2020; Kim, Stice, Stice, and White 2021; Heese et al. 2022; Jiang & Kong 2023). Specifically, we use difference-in-difference analyses to exploit the staggered closure of US-based *local* newspapers between 1991 and 2015. We retrieve data on publicly listed enterprises headquartered in counties facing such closures from Compustat and match this dataset with an untreated control group (i.e. listed entities from counties without newspaper closures). Leveraging our sample of 2,155 firm-years, we uncover that local newspapers are effective in their monitoring activities, as listed enterprises increase their tax avoidance activities after local newspaper closures. This effect is economically sizeable, reflecting a nearly 5 percent relative decrease in effective corporate taxes paid.

To deepen our understanding of this tax avoidance response, we explore agency and investment incentives, financing incentives, local embeddedness, and external monitoring as potential moderators. We first provide evidence that our findings cannot be explained by investment, nor agency-conflict incentives. We do find, however, that financially constrained enterprises are more likely to resort to tax avoidance after the local newspaper closures, in line with financing incentives driving this response. This is consistent with the idea that tax avoidance is not always actively pursued, but can be a byproduct of financing choices and needs (Lei, Wang, Yu, and Chan 2022). Additionally, we highlight the importance of local embeddedness of the corporations, with tax avoidance being concentrated in the more strongly locally embedded subgroup. This can be explained by more embedded enterprises having a greater exposure to the local market and as a result also higher ex-ante social and reputational costs of tax avoidance due to the more significant monitoring role of the local newspapers.

Conversely, as local monitoring mechanisms decline, the potential reputational costs of engaging in corporate tax avoidance diminish, facilitating these firms to adjust their tax planning strategies. Finally, we find support for the importance of external governance mechanisms. First, we focus on overall media attention to this end and find that treated firms with more newspapers per capita in their respective states are less likely to resort to tax avoidance after a local newspaper closes, indicating that the closure of a local newspaper is particularly relevant when its role as a local media monitor is significant. Second, we focus on the widely documented role of informal institutions in tax monitoring (see e.g., Lei et al. (2022)). These informal institutions come to the forefront as they shape individual and collective perspectives on social norms. Religiosity is one such crucial informal institution that can influence corporate tax avoidance (e.g., Boone, Khurana, and Raman 2013) and, more broadly, corporate and financial misconduct (Dyreng, Maydew, and Williams 2012; McGuire, Omer, and Sharp 2012; Amin, Kim, and Lee 2021; Cowan, Gao, Han, and Pan 2024). Specifically, our results align with the interpretation that, after a newspaper closure, firms in more religious counties are less likely to increase tax avoidance. This is because failing to contribute a "fair share" to society is less likely to be accepted in more religious counties, increasing the reputational costs of tax avoidance.

We ensure robustness of our results in various ways. As such, one might argue that our results could be driven by worsening economic conditions, causing both newspaper closures as well as tax avoidance. Yet, we address this concern in two ways. First, we control for local economic conditions such as the county GDP per capita in our regression models, as well as county population as a proxy for the size of the local economy. Second, we use state-year fixed effects in our regressions, accounting for all time-varying changes that have occurred in a certain state in a certain year, including changes in all state-level macroeconomic conditions. Additionally, we use alternative definitions of tax avoidance. Specifically, we consider the

three-year GAAP effective tax rate (ETR) as a proxy for tax avoidance, similar to Schwab, Stomberg, and Xia (2022); industry-size-adjusted tax avoidance, as defined in Balakrishnan, Blouin, and Guay (2019); and a binary indicator to identify firms that are particularly aggressive in their tax planning based on their GAAP ETR and cash effective tax rate (CASH ETR), similar to Chyz and Gaertner (2018). We also consider alternative definitions of newspaper closures. Our findings are robust across all these tests.

With this research, we contribute to the academic literature in various ways. First, we add to the corporate governance literature and address calls from Miller and Skinner (2015) and Kim et al. (2021) for further research on the monitoring role of the media on corporate strategies. Media attention has already been shown to lead to increased corporate social responsibility (El Ghoul, Guedhami, Nash, and Patel 2019), environmental (Jiang & Kong, 2023) and social performance (Billings et al. 2022, Heese et al. 2022). With this work, we provide evidence of a novel positive outcome of media coverage, namely reduced tax avoidance. As such, our findings also contribute to the literature investigating corporate misconduct following the closures of local newspapers. Specifically, this includes increased legal violations by local facilities of publicly listed firms (Heese et al. 2022), an increase in toxic chemical emissions (Jiang and Kong 2023), and an increase in insider trading (Kyung and Nam 2023). Our results provide further evidence on the importance of local newspapers as corporate monitors. Additionally, we contribute to the research strand on corporate tax avoidance within the accounting literature. A plethora of features such as corporate monitoring (Armstrong, Blouin, Jagolinzer, and Larcker 2015), compensation incentives (Gaertner 2014), and even climate policies (Compagnie, Struyfs, and Torsin 2023) have been examined that can help explain tax avoidance. More relevant to the scope of this paper, Chen, Schuchard, and Stomberg (2019) focus on negative media coverage as a mitigating factor of tax avoidance but find no evidence of firms reducing their tax avoidance as a result. Through the use of local

newspaper closures as an exogenous shock, we now provide evidence that, after a local newspaper closes, firms headquartered in that county increase their tax avoidance compared to untreated firms.

These results might also be of interest to governments and tax authorities. In the past two decades, the US has experienced a nearly 50 percent decrease in the circulation of local newspapers[4]. This trend is concerning, as our results highlight the strong monitoring capabilities of local newspaper coverage in safeguarding government revenues, which is particularly crucial in the current times of very high public deficits[5] and debt.[6] In that sense, our implications for public finances complement those of Gao et al. (2020), who found that, after a local newspaper closure, municipal borrowing costs increase by 5–11 basis points as local newspapers were no longer around to hold their governments accountable. In a similar vein, we demonstrate in our work that local newspapers, through their monitoring role, limit tax avoidance by firms headquartered in their respective areas and improve public finances.

The remainder of this paper is organized as follows. Section 2 provides our theoretical framework and defines our hypotheses. Sections 3 and 4 respectively present the data and provide our results. Section 5 concludes through a discussion of our findings and the limitations of the study.

II. THEORETICAL FRAMEWORK

Tax Avoidance

Income taxes constitute a major expense for profitable corporations, often encompassing around 25 percent of their pre-tax income (Hu et al. 2023). From a shareholder perspective and

[4] https: //www.journalism.org/fact-sheet/newspapers/

[5] https://www.brookings.edu/articles/why-did-the-budget-deficit-grow-so-much-in-fy-2023-and-what-does-this-imply-about-the-future-debt-trajectory/

[6] https://www.imf.org/en/Blogs/Articles/2024/03/28/the-fiscal-and-financial-risks-of-a-high-debt-slow-growth-world

with the aim of maximizing firm value, corporations may be tempted to resort to tax avoidance and use the resulting cash tax savings to finance investment projects or distribute as dividends. Tax avoidance encompasses all transactions that reduce companies' tax obligations (Dyreng, Hanlon, and Maydew 2008), and entails keeping cash resources within the organization that would otherwise be paid to the government (Wang, Xu, Sun, and Cullinan 2019). Bird and Davis-Nozemack (2018) show that even firms that position themselves as more morally oriented are not above the practice of tax avoidance. While intuitively appealing and even considered by some as managers' fiduciary duty to give shareholders the best return they are legally allowed (see e.g., Payne and Raibon 2018), it is not clear ex ante whether firms will actively engage in tax avoidance. Tax avoidance strategies are often discouraged by set-up costs, reporting costs, agency costs, and the risk of reputational damage and financial penalties in case of detection (Wilson 2009; Rego and Wilson 2012; Compagnie et al. 2023). Furthermore, tax avoidance is further complicated by improvements in tax enforcement mechanisms worldwide such as the OECD's Base Erosion and Profit Shifting (BEPS) initiative, U.K. Finance Act, 2015, and Australian Tax Laws Amendment (Combating Multinational Tax Avoidance) Act, 2015 (OECD 2013; McClure, Lanis, Wells, and Govendir 2018).

Over the last decade, this trade-off between the respective benefits and costs of tax avoidance has attracted significant academic interest (for reviews, see Hanlon and Heitzman, 2010; Kovermann and Velte 2019; Wang et al. 2019). As such, Compagnie et al. (2023) illustrate that highly polluting firms increase their tax avoidance levels when faced with an unexpected carbon price shock. However, reputational concerns moderate this response with greater exposure to stakeholder scrutiny mitigating the levels of tax avoidance. Relatedly, Armstrong et al. (2015) show the impact of corporate governance in reducing tax avoidance, but only under more extreme levels of tax avoidance.

As tax professionals identify various drawbacks of tax avoidance strategies which may be magnified by media attention (e.g., erosion of brand equity and introducing strains on government ties, see EY (2014)), we direct our attention towards media coverage in this paper.

Media Coverage and Tax Avoidance

Corporate monitoring is well acknowledged within the tax avoidance literature as a critical boundary condition with regards to corporate tax avoidance (Desai and Dharmapala 2006; Li, Maydew, Willis, and Xu 2022). In this work, we focus on newspaper coverage as a monitoring mechanism increasing public pressure with mass media known to alleviate informational frictions (Miller 2006; Fang & Peress 2009). Both the academic literature and anecdotal evidence also indicate that firms indeed adjust their business models in response to increased scrutiny. Dyck, Volchkova, and Zingales (2008) show that coverage by the Anglo-American press leads to reduced corporate governance violations in Russia. In terms of tax behavior, Dyreng et al. (2016) show that U.K. firms targeted by ActionAid International, a nonprofit activist group, increased their tax expense to this end. In a similar vein, Dwenger and Treber (2022) find that naming-and-shaming policies for tax debt enforcement in Slovenia lead to significant reductions in tax debts of corporations at risk of being shamed. Anecdotally, Starbucks responded to public backlash on their low tax payments through “voluntary” tax payments (Bergin 2014; Chen et al. 2019).

Numerous studies have shown a rise in corporate misconduct following the shutdown of local newspapers, suggesting that these newspapers serve as corporate monitors. Particularly, this includes an increase in legal violations of local facilities from publicly traded companies (Heese et al. 2022), a rise in toxic chemical emissions (Jiang and Kong 2023), and a growth in insider trading (Kyung and Nam 2023). This is not surprising as both Dyck, Morse, and Zingales (2010) and Heese et al. (2022) provide various instances where local newspapers exposed fraud in nearby companies.

Local newspapers are nevertheless often replaced by online news outlets nowadays that reach a broader audience, even though their business models do not fully coincide. As argued by Kim et al. (2021), local newspapers have a geographically limited audience and focus their resources on content relevant to this local user base. In contrast, online news outlets, much less constrained by geography, divide their resources between local news and broadly appealing news for online consumers. Consequently, we follow Allee et al. (2023) in their argument that the closure of local print newspapers weakens local firms' information environment.

If the expected reputational costs from resorting to tax avoidance are reduced following the local newspaper closures, we expect the level of tax avoidance to increase. Hence, we formulate the following main testable hypothesis:

Main hypothesis: *Corporate tax avoidance increases following local newspaper closures.*

III. DATA AND SAMPLE DESCRIPTION

In this section, we detail the data collection procedure and elaborate on the model that we use to investigate our main hypothesis. Additionally, we provide descriptive statistics for the explanatory variables. Appendix A provides detailed variable descriptions.

Data Collection

To investigate our main hypothesis, we treat the closures of daily newspapers as quasi-exogenous shocks that affect the monitoring and information environment of nearby firms. We hand-collect a sample of newspaper closures by drawing from several sources. We start with the list provided by Kim et al. (2021) of newspaper closures that occurred between 1991 and 2015 in US counties. We then cross-check this list with several online searches and publicly

available resources (such as Usnewsdesert)[7], adding newspaper closures that were missing and removing those that were not proper closures (e.g., if newspapers remained in existence but moved online or merged with other newspapers). In total, we identified 35 newspaper closures (Table A.2).

To construct our treatment sample, we followed a procedure similar to Heese et al. (2022) and Jiang and Kong (2023) and extracted US-based publicly listed companies from Compustat with headquarters in counties where local newspapers closed. We then match these treatment firms to control firms, also retrieved from Compustat, that are not headquartered in affected counties. We perform this match through a propensity score match by year, industry, state and all controls included in our empirical specification. Throughout our analyses, we kept observations for treated and control firms for three years before up until three years after the event. After this matching procedure, we end up with 2,155 firm-year observations.

.3.2 Model and variables

To test our main hypothesis, we estimate the following difference-in-difference (DiD) regression:

$$GAAP\_ETR_{it} = \beta_0 + \beta_1 \times Treated_i \times Post_t + \beta_2 \times Treated_i + \beta_3 \times Post_t + \sum Controls_{it} + \varepsilon_{it} \quad (1)$$

where the dependent variable, *GAAP_ETR*, defined as total income tax expense scaled by pre-tax book income less special items, is a common proxy used to measure corporate tax avoidance (e.g., Hanlon and Heitzman 2010; Wang et al. 2019).[8] TREATED is a dummy variable taking the value of '1' if the headquarter county faces a newspaper closure, while POST is a dummy variable taking the value of '1' if the observation takes place in the post-closure period. Our coefficient of interest, β_1, captures how the tax avoidance levels of firms located in counties where a local newspaper closes differ from those of a control group of non-treated firms. The

[7] https://www.usnewsdeserts.com/

[8] In the robustness section, we show that our results do not change when using other proxies of tax avoidance.

control variables used at the firm-level are consistent with those employed by previous studies on tax avoidance (see among others, Rego 2003; Atwood, Drake, Myers, and Myers 2012; Dyreng et al. 2008; Huang and Rios 2016; Kanagaretnam, Lee, Lim, and Lobo 2016; Compagnie et al. 2023) and are defined in Appendix A.1.

In addition to firm-specific controls, we also include macro-economic variables in our model as newspaper closure shocks might simply reflect underlying poor local economic conditions. To this end, we retrieved data on county income per capita (*COUNTYINCOME*) and county population (*COUNTYPOPULATION*) from the U.S. Bureau of Economic Analysis (BEA). The inclusion of both measures ensures that our results are not driven by county economic conditions or the size of the economy. Finally, we also include state-year fixed effects to control for all time- and industry-varying characteristics in the state in which the company resides.

Table 1 shows the descriptive statistics of the main variables used in this study. We find that the average effective tax rate is about 28 percent, with a relatively high standard deviation, indicating a heterogeneity with regards to tax behavior in our sample. Furthermore, we find that the average sample firm has a size of 1.76 billion dollars in total assets, of which 11.4 percent captured in intangible assets, 36.8 percent in property, plant and equipment, and 9 percent in cash. We also note an average positive value of firms' capital expenditure (mean: 0.083), changes in working capital (mean: 0.072), and non-operating assets (mean: 0.032). With regards to financial performance, the mean return on assets in our sample equals 15.7 percent, with 43.7 percent of our sample distributing dividends. Finally, we classify 38.2 percent of our sample as a multinational corporation.

Pairwise correlations between the variables, as reported in Table 2, do not raise concerns of multicollinearity.[9]

[9] The mean Variance Inflation Factor (VIF) value in our main regression equals 1.51, with a maximum value of 2.14. This is well below the traditionally accepted threshold of 5.

IV. EMPIRICAL RESULTS

Baseline Results

First, we present evidence on the impact of newspaper closures on tax avoidance in Table 3. The results of our estimation of equation (1) are reported in Table 3 Model (1), where the interaction term of *TREATED x POST* captures the differential tax avoidance strategy of enterprises operating in a county where a newspaper closed, compared to non-treated enterprises, after the newspaper closure took place. We find a negative and significant coefficient of the interaction term, highlighting decreased tax payments of treated firms after the local newspaper closure. This effect, consistent with increased tax avoidance, is economically sizable with the effective tax rates of treated enterprises being 1.4 percentage points lower compared to untreated enterprises in the post period. Given the average effective tax rate of 0.284 in our sample, this translates into a relative decrease of 5 percent in the effective tax rates paid.

To support the causality of these findings, we proceed by delving deeper into the timing of our findings. This is necessary for two main reasons. First, a dynamic model enables us to check the parallel trends assumption of our DiD model, allaying any concerns regarding pretreatment trends (Beuselinck, Markarian, and Verriest 2021). Second, this specification allows us to examine whether the tax avoidance responses were only present instantaneously in the year after the closure or whether they persisted through time. To that end, we estimate a dynamic model in the spirit of Serfling (2016) where POST is replaced with interaction terms of TREATED and time indicator variables: $CLOSURE^{-2}$, $CLOSURE^{-1}$, $CLOSURE^{0}$, $CLOSURE^{1}$, $CLOSURE^{2+}$. To illustrate, $CLOSURE^{-2}$ is equal to 1 for enterprises headquartered in a county where a newspaper will close 2 years later, and 0 otherwise. $CLOSURE^{1}$, on the other hand, is equal to one if there was a newspaper closure in the prior fiscal year, with $CLOSURE^{2+}$ capturing two and three years after the closure.

The results of this analysis can be found in Table 3, Model (2). First, we note that reverse causality are allayed with pre-trends being absent in our data. That is, $CLOSURE^{-2}$ and $CLOSURE^{-1}$ are both insignificant. However, once the closure takes place, we observe an immediate and statistically significant increase in tax avoidance levels. This trend continues in the years after the closure with the interaction term of TREATED and $CLOSURE^{2+}$ also being negatively statistically significant. Taken together, these findings suggest a causal impact of the local newspaper closures on increased tax avoidance in line with our main hypothesis. That is, enterprises that operate in counties where a newspaper closure takes place increasingly resort to tax avoidance activities afterwards.

Moderators Affecting the Impact of Local Newspaper Closures On Tax Avoidance

The results discussed in section 4.1 suggest a tax avoidant response by enterprises headquartered in counties where a newspaper closure takes place. In this section, we examine five potential mechanisms influencing the relationship between newspaper closures and tax avoidance. First, we investigate whether agency and investment-based incentives can help explain our findings. Next, as the tax literature has highlighted a possible financing advantage associated with tax avoidance, we subsequently explore financial constraints as a third potential moderating factor. Additionally, as the reputational costs of not contributing their "fair share" to society are arguably larger for more locally active firms, we assess the role of local embeddedness as a fourth moderator. Lastly, we analyze external monitoring at both the state and county levels.

Agency and Investment Based Motives

The first two potential drivers of increased tax avoidance we investigate are rooted in agency- and investment-based motives. The former suggests that managers might make use of the reduced monitoring resulting from the newspaper closures to engage in tax avoidance and

obtain additional resources for their own benefit. The latter suggests that with reputational costs being lowered, tax avoidance may emerge as an interesting additional avenue to fund investment projects. We discuss both motives in detail below.

Agency theory dictates that agency conflicts arise when the interests of managers (agents) diverge from those of shareholders (principals). Managers might prioritize personal goals or projects that enhance their own status or compensation, even if these do not align with maximizing shareholder value. In this context, tax avoidance can be a tool for managers to secure additional funds, especially when external monitoring is reduced. Armstrong et al. (2012) present evidence supporting this view, showing that tax avoidance is related to tax director incentives. This finding indicates that top management may offer incentives to encourage tax avoidance, suggesting that tax avoidance is not solely a matter of strategic financial planning but also influenced by internal managerial incentives.

Second, the increased use of tax avoidance can be seen as a consequence investment-based motives. Both Richardson et al. (2015) and Edwards et al. (2016) argue that firms facing higher funding needs turn their attention towards corporate tax avoidance. Similarly, Compagnie et al. (2023) posit that tax avoidance can be used to fund green investments to deal with unexpected carbon price hikes. In our setting, the lowered reputational costs due to the diminished monitoring may reflect itself in tax avoidance constituting a cheaper alternative to raising money on the capital market or borrowing from creditors to fund investment projects.

To test both these lines of reasoning, we use: (1) sales to total assets as an inverse measure of agency conflicts (see e.g. Ang, Cole, and Lin (2000) for evidence of this measure), and (2) the annual industry-adjusted capital expenditures as our measure of investment incentives. Results for agency conflicts are reported in Table 4 Panel A, with those on investments motives being shown in Panel B. Our findings do not support the presence of agency-based motives as

we find lowered effective tax payments in both subsamples with high and low agency conflicts. A Wald test comparing the two coefficients further corroborates this finding. In addition, we also do not find evidence in line with the reasoning that tax avoidance might be a byproduct of investment decisions, as mainly low capital expenditure enterprises lower their tax payments after the newspaper closure.

Financial Constraints Motives

With both agency-based and investment-based incentives unable to explain the tax avoidance response, we direct our attention in this section to financial constraints as potential drive. Financially constrained firms are those that face limitations in generating sufficient funds to support their operations. These constraints can lead managers to seek alternative ways to secure the necessary funds, with tax avoidance emerging as a practical solution. In short, when funds are scarce, the relative benefits of tax savings become more significant (e.g., Edwards et al. 2016; Wang et al. 2019).

We test this reasoning by relying on two measures reflecting the presence financial constraints and lower financial flexibility, respectively. To this end, we use: (1) an indicator variable capturing whether a firm paid out dividends (e.g., Nguyen and Phan 2020), and (2) the firms' long term debt ratio (Barry, Campello, Graham and Ma 2022). Results are reported in respectively Panel A and B of Table 5. They are in line with financial constraints playing a moderating role. More specifically, we find that enterprises are more likely to resort to tax avoidance after the local newspaper closed down if they did not pay out dividends (Panel A Column 2, p-value< 0.01), and when they are faced lower financial flexibility as represented by higher levels of long-term debt (Panel B Column 1, p-value< 0.05). To that end, we find that tax avoidance is used as an alternative stream of funding in more financially constrained enterprises.

Local Embeddedness

The potential negative outcomes related to tax avoidance such as reputation losses, driven by local newspaper monitoring, are arguably more severe when a firm is more locally embedded. Indeed, while multinational enterprises‘ reputations might not be (severely) distorted by local newspaper coverage, locally embedded and smaller-sized enterprises' reputations are more likely to be affected. Therefore, enterprises with stronger local roots will most likely experience the monitoring role local newspaper coverage more prominently. Resultingly, they are also most likely increase tax avoidance when such coverage disappears due to newspaper closures.

To test this assumption of local embeddedness, we perform additional analyses where we split the sample based on: (1) an indicator variable equal to one when the firm is a multinational enterprise as reflected in the payment of foreign income taxes, and (2) the mean value of the number of employees with larger firms typically being more dispersed. Our results in Table 6 indeed present evidence that the increase in tax avoidance after the newspaper closures is driven by locally embedded enterprises (Panel A Column 2, p-value<0.01) and smaller-sized firms (Panel B Column 2, p-value<0.01). Wald tests corroborate this assertion.

External Monitoring

As external monitoring is known to be a key factor in how corporate governance influences firms’ tax behavior, we now direct our attention to various external monitoring proxies as final moderating analysis. First, we explore whether the coverage by local newspapers, with local being defined as county-level coverage, is a complement or substitute to broader media coverage (i.e., state-level newspaper coverage). The decreased monitoring by local newspapers due to closures may affect tax avoidance behavior less strongly if the firm continues to be monitored by other newspapers in the same state (Gao et al. 2020; Heese et al. 2022). To test this, we focus on the differences in the number of newspapers per capita at the state level. We retrieved these data from the US News Deserts Database Archive. The results of this moderating analysis, found in Table 7, Panel A, indicate that increased tax avoidance is indeed most likely

in states with lower newspapers per capita after the local newspaper closure in firms' headquarter counties.

Next, we examine the potential moderating influence of informal institutions as proxied by religiosity. The tax avoidance literature is well established in that informal institutions, alongside effective legal systems, play a crucial role in influencing tax avoidance incentives (Lei et al. 2022). These informal institutions come to the forefront as they shape individual and collective perspectives of social norms. One of the most pressing social norms for corporations is to pay a fair share to society through corporate taxes. Religiosity has been found to be negatively related to corporate and financial misconduct (e.g., Dyreng et al. 2012; McGuire et al. 2012; Amin et al. 2021; Cowan et al. 2024). We claim, in line with prior literature, that religiosity is one of such crucial informal institutions that can influence corporate tax avoidance (see e.g. Boone et al. (2013) and Hasan, Hoi, Wu, and Zhang (2017) for evidence). Specifically, failing to contribute a "fair share" to society is less likely to be accepted in more religious counties, increasing the reputational costs of tax avoidance. Similar to Cowan et al. (2024), we collected data about the religious adherents in each county from the Association of Religion Data Archives (ARDA)[10] and defined *RELIGIOSITY_PER_CAPITA* as the number of religious adherents in a certain county divided by its population. In Table 7, Panel B, we present evidence in line with our reasoning and find that tax avoidance is especially prominent in less religious counties after local newspaper closure. As such, religiosity operates as is an effective external monitoring channel to lower corporate tax avoidance.

Robustness Tests

In this section, we report and discuss the various robustness tests implemented to ensure the validity of our findings.

[10] https://thearda.com/data-archive/browse-categories?cid=B-A#B-A

Alternative Dependent Variables

As a first robustness analysis, we transform our dependent variable from a one-year into a three-year GAAP ETR (GAAP_ETR3), which we calculate as the sum of total tax expense scaled by the total pre-tax income from t minus 2 to t (Schwab et al. 2022). Column 1 of Table 8 shows that the coefficient on TREATED x POST is again negatively significant (p-value<0.05). Second, we follow the seminal paper on tax aggressiveness by Balakrishnan et al. (2019) and adjust the three-year GAAP ETR of each firm by the three-year ETR for the portfolio of firms in the same industry and the same quintile of total assets for the same period. We define the new dependent variable TA_GAAP as the industry-size matched GAAP ETR less the firm's GAAP ETR, in which a greater values suggests greater tax aggressiveness. The positive coefficient loading on the interaction term in column 2 is indeed consistent with our main results that firms increasingly resort to aggressive tax strategies once local newspapers close. As a third check, we transform our dependent variable into a binary indicator, as in Chyz and Gaertner (2019). Specifically, we define a binary measure of tax aggressiveness (D1_GAAPETR) equal to one if the GAAP ETR of a firm is in the lowest decile of tax payments within our sample. Given the binary nature of this variable, we re-estimate our baseline model from Equation (1) using both a linear probability model (LPM) and logistic regression (LOGIT). Columns 3 and 4 of Table 8 corroborate that firms headquartered in areas where the local newspaper closes are more likely to adopt aggressive tax planning.

To further substantiate these results, we again follow Chyz and Gaertner (2019) and also investigate cash effective tax rates. As such, we construct the dependent variable D1_CASHETR, which equals one if the firm is in the lowest decile of cash effective tax rate (CASH ETR) payments. Here, CASH ETR is defined as total income tax paid divided by pre-tax book income less special items. Once more, both the linear probability model and logistic regression confirm that the closure of the local newspaper increases the likelihood of firms

headquartered in the same county adopting highly aggressive tax behavior in subsequent periods (Table 8, Columns 5 and 6).

Alternative Definition of Newspaper Closures

As a second robustness test, we expand our definition of newspaper closures. That is, we now also consider firms as treated if they are headquartered in counties where the local newspapers stopped printing and switched to online publication (Kim et al. 2021). Note that this is not a complete closure, but it can still have an impact with online publications typically catering to a broader audience and therefore dividing their attention between local news and broadly appealing news for online consumers. This robustness test adds 109 more firm-year observations. Table 9 shows this alternative treatment to yield similar results to our baseline results reported in Table 3.

Placebo Test

As a third and final robustness check, we perform a placebo test in line with Compagnie et al. (2023) and Dutordoir and Struyfs (2024). We also performed a placebo test by running Model (1) 3,000 times on a random subsample of 2,000 firm-year observations, each assigned a random treatment year for the treated firms. In all analyses, the baseline coefficient estimate of TREATED x POST lay outside the 90 percent confidence interval of the mean coefficient estimates from the simulations, corroborating that the observed influence is due to local newspaper closures rather than other confounding factors driving tax avoidance.

V. CONCLUSION AND AVENUES FOR FUTURE RESEARCH

In our current era of digitization, the United States has witnessed a significant decline in local newspaper circulation, marked by numerous closures and extensive layoffs. This study

investigates a potential unintended side-effect of this trend by examining the impact of these local newspaper closures on corporate tax avoidance. Our study reveals that the cease of operations from local newspapers lead to a substantial increase in tax avoidance levels among firms located in counties where the closure took place. Specifically, our difference-in-difference analysis shows that these firms experience a 5 percent decrease in effective tax rates following the closures relative to untreated firms, underscoring the critical role of local newspapers in corporate governance. Upon closer examination, we further uncover financially constrained firms to resort most prominently to tax avoidance strategies, with local embeddedness and external monitoring mitigating these responses.

These findings make several key contributions to the literature on corporate monitoring and tax avoidance. First, we provide evidence that local newspapers serve as essential watchdogs in monitoring corporate activities and ensuring that firms contribute their fair share of taxes. While prior literature focused on media coverage and found no direct evidence of a relation between these two concepts (Chen et al. 2019), our empirical specification using newspaper closures as an exogenous shock allows for a clean identification process and substantiates the importance of local newspaper coverage in safeguarding government revenue.

Second, our study identifies financially constrained as particularly susceptible to increasing tax avoidance following newspaper closures. These firms are more likely to exploit the reduced scrutiny costs that accompanies the absence of local newspapers and consider the benefits from additional cash generating tax savings to outweigh the reduced reputational costs.

Third, the study underscores the mitigating effects of local embeddedness and external monitoring. Locally embedded firms and those in areas with higher media presence or strong informal institutions, such as religiosity, are less likely to increase tax avoidance following local newspaper closures. The former substantiates that local newspapers still function as a crucial

information provider for local firms, while the latter is consistent with robust external governance structures partially compensating for the loss of local newspaper monitoring.

Our results also have important policy implications. The decline in local newspapers poses a significant challenge to public revenue collection and corporate governance. Policymakers and tax authorities should consider supporting local journalism to maintain effective oversight of corporate activities. Legislative measures or financial incentives aimed at sustaining local news organizations could help preserve their monitoring role.

To conclude, we also provide avenues for future research. This study focuses on publicly listed firms due to data availability constraints. However, prior research indicates that private firms may be more prone to tax avoidance than publicly listed ones. This tendency is likely due to the lower visibility and scrutiny private firms encounter from stakeholders concerning their tax practices (Hanlon and Heitzman 2010). By replicating our analyses with private firms, it is possible that a an even stronger relation between newspaper closures and tax avoidance may emerge. Furthermore, we also urge future research to explore alternative mechanisms for corporate monitoring in the absence of local newspapers. To this end, examining the impact of digital news platforms and other forms of media as potential substitutes for traditional newspapers could provide valuable insights. Given the ongoing decline in local newspaper circulation, it is imperative to seek alternative ways to ensure corporate transparency and accountability, thereby safeguarding public finances and promoting “fair” corporate contributions to society.

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Table 1. Descriptive statistics

The table shows the descriptive statistics of the main variables used in this study. All continuous variables are winsorized at the 1% and 99% level. *N* represents the number of firm-year observations. Variables are defined in the appendix, Table A.1.

	N	Mean	St. Dev	Q1	Median	Q3
GAAP_ETR	2,155	0.284	0.152	0.193	0.325	0.378
SIZE	2,155	5.592	2.032	4.132	5.456	7.080
LTD	2,155	0.199	0.196	0.014	0.159	0.317
CASH	2,155	0.092	0.114	0.016	0.048	0.120
ROA	2,155	0.157	0.083	0.101	0.144	0.197
MULTI	2,155	0.382	0.486	0.000	0.000	1.000
TAXRELIEF	2,155	0.421	0.494	0.000	0.000	1.000
INTANGIBLES	2,155	0.114	0.170	0.000	0.032	0.154
PPE	2,155	0.368	0.277	0.127	0.293	0.589
ΔWORKINGCAP	2,155	0.072	0.257	-0.021	0.022	0.091
ΔNCO	2,155	0.032	0.200	-0.044	0.015	0.079
COUNTYINCOME	2,155	10.370	0.352	10.090	10.278	10.612
COUNTYPOPULATION	2,155	13.964	0.990	13.330	14.102	14.908
SALES_TO_ASSETS	2,155	1.201	0.856	0.609	1.023	1.538
CAPEX	2,126	0.083	0.087	0.026	0.049	0.104
DIVIDEND	2,154	0.437	0.496	0.000	0.000	1.000
EMPLOYEES	2.088	6.699	14.083	0.273	1.237	5.304
NEWSPAPERS_PER_CAPITA	2,155	2.877	1.174	1.071	1.965	2.985
RELIGIOSITY_PER_CAPITA	2,145	0.569	0.125	0.464	0.583	0.619

Table 2. Pearson correlation matrix

The table shows the Pearson correlations of the main variables used in this study.* denotes significant correlations at the 1% level Variables are defined in the appendix, Table A.1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) GAAP_ETR	1.000												
(2) SIZE	0.115*	1.000											
(3) LTD	-0.098*	0.232*	1.000										
(4) CASH	-0.023	-0.145*	-0.341*	1.000									
(5) ROA	0.069*	-0.057*	-0.193*	0.131*	1.000								
(6) MULTI	0.084*	0.417*	-0.106*	0.120*	-0.026	1.000							
(7) TAXRELIEF	0.138*	0.084*	-0.035	0.008	-0.004	0.106*	1.000						
(8) INTANGIBLES	0.049	0.347*	0.217*	-0.087*	-0.104*	0.227*	0.058*	1.000					
(9) PPE	-0.201*	-0.039	0.312*	-0.357*	0.008	-0.325*	-0.088*	-0.448*	1.000				
(10) ΔWORKINGCAP	0.013	-0.158*	-0.134*	0.287*	0.097*	0.018	-0.003	-0.083*	-0.212*	1.000			
(11) ΔNCO	-0.014	-0.071*	-0.087*	-0.044	0.053	-0.116*	-0.074*	0.025	0.172*	-0.125*	1.000		
(12) COUNTYINCOME	-0.019	0.325*	-0.030	0.224*	0.003	0.314*	0.078*	0.377*	-0.331*	-0.073*	-0.051	1.000	
(13) COUNTYPOPULATION	-0.090*	0.009	0.073*	0.090*	-0.084*	0.056*	-0.022	-0.005	0.023	0.017	0.011	0.030	1.000

Table 3. Baseline regression results

The table presents the regression results for our baseline regression on the impact of local newspaper closures (TREATED) on corporate tax avoidance (GAAP_ETR). *N* represents the number of firm-year observations. Robust standard errors clustered by state are reported between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level respectively. Variables are defined in the appendix, Table A.1.

VARIABLES	(1) GAAP_ETR	(2) GAAP_ETR
TREATED	0.026***	0.045**
	(0.008)	(0.018)
POST	-0.046***	
	(0.002)	
TREATED ×POST	-0.014**	
	(0.005)	
TREATED ×CLOSURE^{-2}		-0.028
		(0.024)
TREATED ×CLOSURE^{-1}		-0.022
		(0.019)
TREATED ×CLOSURE^{0}		-0.003
		(0.026)
TREATED ×CLOSURE^{1}		-0.031*
		(0.016)
TREATED ×CLOSURE^{2+}		-0.044*
		(0.020)
CLOSURE^{-2}		-0.024
		(0.023)
CLOSURE^{-1}		0.134***
		(0.023)
CLOSURE^{0}		0.069***
		(0.015)
CLOSURE^{1}		0.099***
		(0.022)
CLOSURE^{2+}		-0.018**
		(0.008)
SIZE	0.009*	0.009*
	(0.004)	(0.005)
LTD	-0.010	-0.009
	(0.024)	(0.024)
CASH	-0.053	-0.053
	(0.042)	(0.042)
ROA	0.101*	0.104*
	(0.051)	(0.056)
MULTI	0.018**	0.019**
	(0.008)	(0.008)
TAXRELIEF	0.026***	0.026***
	(0.006)	(0.006)
INTANGIBLES	-0.072**	-0.074**
	(0.030)	(0.030)
PPE	-0.079**	-0.079*
	(0.036)	(0.036)
ΔWORKINGCAP	-0.001	-0.002
	(0.013)	(0.013)
ΔNCO	0.043	0.044
	(0.030)	(0.030)
COUNTYINCOME	-0.048**	-0.052**
	(0.021)	(0.021)
COUNTYEPOPULATION	-0.014**	-0.014**
	(0.006)	(0.006)
CONSTANT	0.802***	0.828***
	(0.241)	(0.240)
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	2,155	2,155
R-squared	0.259	0.260

Table 4. Agency and investment based motives

The table presents the regression results on the moderating impact of firm agency and investment based motives on the relation between media closures (TREATED) and corporate tax avoidance (TAXAVOIDANCE). *N* represents the number of firm-year observations. Panel A splits the sample based on sales to total assets. Panel B splits the sample based on the annual industry-adjusted capital expenditures. Robust standard errors clustered by state are reported between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level respectively. Variables are defined in the appendix, Table A.1.

PANEL A: Sales to assets	HIGH	LOW
	(1)	(3)
VARIABLES	TAXAVOIDANCE	TAXAVOIDANCE
TREATED	0.058**	0.025**
	(0.019)	(0.010)
POST	0.007	-0.062***
	(0.026)	(0.010)
TREATED×POST	-0.029**	-0.015*
	(0.011)	(0.008)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	825	1,330
R-squared	0.375	0.276
Wald test	0.51	
PANEL B: CAPEX	HIGH	LOW
	(1)	(3)
VARIABLES	TAXAVOIDANCE	TAXAVOIDANCE
TREATED	0.017	0.030***
	(0.011)	(0.008)
POST	-0.026**	-0.068***
	(0.010)	(0.004)
TREATED×POST	0.004	-0.031**
	(0.010)	(0.010)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	963	1,163
R-squared	0.363	0.289
Wald test	3.08**	

Table 5. Financial constraints motives

The table presents the regression results on the moderating impact of firm financial constraints on the relation between media closures (TREATED) and corporate tax avoidance (TAXAVOIDANCE). *N* represents the number of firm-year observations. Panel A splits the sample based on whether or not dividends are being given out. Panel B splits the sample based on the mean debt position. Robust standard errors clustered by state are reported between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level respectively. Variables are defined in the appendix, Table A.1.

PANEL A: Dividend	YES	NO
	(1)	(2)
VARIABLES	TAXAVOIDANCE	TAXAVOIDANCE
TREATED	0.029*	0.027**
	(0.015)	(0.011)
POST	-0.044***	-0.032***
	(0.010)	(0.009)
TREATED×POST	0.001	-0.032***
	(0.016)	(0.009)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	942	1,212
R-squared	0.359	0.292
Wald test	2.74**	
PANEL B: LTD	HIGH	LOW
	(1)	(2)
VARIABLES	TAXAVOIDANCE	TAXAVOIDANCE
TREATED	0.033**	0.021**
	(0.011)	(0.007)
POST	-0.131***	0.017*
	(0.016)	(0.009)
TREATED×POST	-0.036**	0.012*
	(0.012)	(0.006)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	944	1,211
R-squared	0.327	0.311
Wald test	5.53**	

Table 6. Local embeddedness

The table presents the regression results on the moderating impact of local embeddedness on the relation between media closures (TREATED) and corporate tax avoidance (TAXAVOIDANCE). *N* represents the number of firm-year observations. Panel A splits the sample based on whether or not the firm is a multinational as proxied by the payment of foreign income taxes. Panel B splits the sample based on the mean number of employees. Robust standard errors clustered by state are reported between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level respectively. Variables are defined in the appendix, Table A.1.

PANEL A: Multi	YES	NO
	(1)	(2)
VARIABLES	TAXAVOIDANCE	TAXAVOIDANCE
TREATED	0.040*	0.028**
	(0.020)	(0.013)
POST	-0.064***	-0.024***
	(0.016)	(0.006)
TREATED×POST	0.003	-0.025***
	(0.007)	(0.007)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	823	1,332
R-squared	0.243	0.351
Wald test	1.98*	
PANEL B: Employees	HIGH	LOW
	(1)	(2)
VARIABLES	TAXAVOIDANCE	TAXAVOIDANCE
TREATED	-0.011	0.032***
	(0.039)	(0.010)
POST	-0.117***	-0.012
	(0.027)	(0.009)
TREATED×POST	0.008	-0.022***
	(0.022)	(0.006)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	460	1,628
R-squared	0.393	0.299
Wald test	2.14*	

Table 7.Governance

The table presents the regression results on the moderating impact of corporate governance on the relation between media closures (TREATED) and corporate tax avoidance (TAXAVOIDANCE). *N* represents the number of firm-year observations. Panel A splits the sample based on the average number of newspapers per capita in a state. Panel B splits the sample based on the mean religiosity per capita in a county. Robust standard errors clustered by state are reported between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level respectively. Variables are defined in the appendix, Table A.1.

PANEL A: Newspapers per capita	HIGH	LOW
	(1)	(3)
VARIABLES	TAXAVOIDANCE	TAXAVOIDANCE
TREATED	0.023	0.036*
	(0.019)	(0.019)
POST	-0.036***	-0.129*
	(0.006)	(0.062)
TREATED×POST	-0.004	-0.039***
	(0.017)	(0.008)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	1,172	983
R-squared	0.319	0.234
Wald test	2.40*	
PANEL B: Religiosity per capita	HIGH	LOW
	(1)	(3)
VARIABLES	TAXAVOIDANCE	TAXAVOIDANCE
TREATED	0.015	0.061**
	(0.014)	(0.021)
POST	-0.050***	-0.047**
	(0.013)	(0.016)
TREATED×POST	-0.001	-0.031***
	(0.005)	(0.008)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	1,238	907
R-squared	0.290	0.340
Wald test	1.70*	

Table 8. Alternative dependent variables

The table presents the regression results of the robustness checks on the relation between media closures (TREATED) and corporate tax avoidance (TAXAVOIDANCE). *N* represents the number of firm-year observations. In Model 1, tax avoidance is proxied by *GAAP_ETR3*, which is the three-year GAAP effective tax rate. In Model 2, tax avoidance is measured using *TA_GAAP* which represents industry-size-adjusted tax aggressiveness, as defined in Balakrishnan et al. (2019). Models (3) and (5) and Models (4) and (6) examine an indicator of tax avoidance using a linear probability model and a logit model, respectively, similar to Chyz and Gaertner (2018). Specifically, Models (3) and (4) use the lowest deciles of GAAP_ETR (*D1_GAAPETR*), while Models (5) and (6) use CASH_ETR (*D1_CASHETR*). Robust standard errors clustered by state are reported between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level respectively. Variables are defined in the appendix, Table A.1.

	OLS	OLS	LPM	LOGIT	LPM	LOGIT
	(1)	(2)	(3)	(4)	(5)	(6)
DEP VAR =	GAAP_ETR3	TA_GAAP	D1_GAAPETR	D1_GAAPETR	D1_CASHETR	D1_CASHETR
TREATED	0.019*	-0.007	-0.029**	-0.610*	-0.056	-0.859***
	(0.009)	(0.010)	(0.010)	(0.325)	(0.019)	(0.247)
POST	-0.028***	0.004	-0.017	-1.569***	-0.039	-1.012***
	(0.009)	(0.019)	(0.010)	(0.568)	(0.011)	(0.183)
TREATED × POST	-0.008**	0.013**	0.030***	0.445**	0.042***	0.615**
	(0.003)	(0.005)	(0.007)	(0.179)	(0.013)	(0.257)
FIRM CONTROLS	YES	YES	YES	YES	YES	YES
STATE×YEAR FE	YES	YES	YES	YES	YES	YES
INDUSTRY FE	YES	YES	YES	YES	YES	YES
N	1,728	1,728	2,155	1,365	1,695	1,219
(Pseudo)R-squared	0.254	0.143	0.307	0.413	0.173	0.203

Table 9. Alternative definition of newspaper closures

The table presents the regression results for our baseline regression on the impact of local newspaper closures (TREATED) on corporate tax avoidance (GAAP_ETR). *N* represents the number of firm-year observations. Robust standard errors clustered by state are reported between parentheses. *, ** and *** represent significance at the 10%, 5% and 1% level respectively. Variables are defined in the appendix, Table A.1.

VARIABLES	(1) GAAP_ETR	(2) GAAP_ETR
TREATED	0.022** (0.008)	0.044* (0.021)
POST	-0.033*** (0.011)	
TREATED ×POST	-0.011** (0.004)	
TREATED ×CLOSURE^{-2}		-0.037 (0.025)
TREATED ×CLOSURE^{-1}		-0.022 (0.022)
TREATED ×CLOSURE^{0}		-0.007 (0.028)
TREATED ×CLOSURE^{1}		-0.027 (0.019)
TREATED ×CLOSURE^{2+}		-0.044* (0.022)
CLOSURE^{-2}		-0.039** (0.017)
CLOSURE^{-1}		0.070*** (0.013)
CLOSURE^{0}		0.078*** (0.023)
CLOSURE^{1}		0.066*** (0.015)
CLOSURE^{2+}		-0.004 (0.018)
CONSTANT	0.752*** (0.239)	0.798*** (0.245)
FIRM CONTROLS	YES	YES
STATE×YEAR FE	YES	YES
INDUSTRY FE	YES	YES
N	2,264	2,264
R-squared	0.250	0.252

Appendix

Table A.1. Variable definitions

Variable	Definition
GAAP_ETR	Total income tax expense scaled by pre-tax book income less special items.
TREATED	Dummy variable taking the value of '1' if the county faces a newspaper closure
POST	Dummy variable taking the value of '1' if the observation takes place in the post-closure period.
SIZE	The logarithm of total assets of the firm.
LTD	The firm's long-term debt divided by total assets.
CASH	Cash divided by total assets.
ROA	The firm's pre-tax return on assets.
MULTI	Dummy variable taking the value of '1' if the firm is a multinational firm.
TAXRELIEF	Dummy variable taking the value of '1' if the firm has used outstanding deferred tax assets for tax relief purposes, zero otherwise.
INTANGIBLE	The firm's intangible assets divided by total assets.
PPE	The firm's property, plant and equipment divided by total assets.
ΔWORKINGCAP	The change in current operating assets minus current operating liabilities, divided by total assets, relative to the previous financial year.
ΔNCO	The change in noncurrent operating assets minus noncurrent operating liabilities, divided by total assets, relative to the previous financial year.
COUNTYINCOME	The logarithm of the total income per capita in the county where the company has its headquarters.
COUNTYPOPULATION	The logarithm of the total number of inhabitants in the county where the company has its headquarters
SALES_TO_ASSETS	Sales divided by total assets
CAPEX	Capital expenditures divided by total assets
DIVIDEND	Dummy variable taking the value of '1' if the firm hands outs dividends
EMPLOYEES	Number of employees in millions
NEWSPAPERS_PER_CAPITA	Number of newspapers per hundred thousand inhabitants in the state where the company has its headquarters
RELIGIOSITY_PER_CAPITA	Number of religious adherents per total inhabitants in the state where the company has its headquarters

Table A.2. Newspaper Closures

Newspaper Name	City	County	Code	State	Year of closure
Arkansas Gazette	Little Rock	Pulaski	05119	AR	1991
Dallas Times Herald	Dallas	Dallas	48113	TX	1991
Richmond News Leader	Richmond	Independent City	51760	VA	1992
Tulsa Tribune	Tulsa	Tulsa	40143	OK	1992
Pittsburgh Press	Pittsburgh	Allegheny	42003	PA	1992
Sacramento Union	Sacramento	Sacramento	06067	CA	1994
The Press-Courier	Oxnard	Ventura	06111	CA	1994
Houston Post	Houston	Harris	48201	TX	1995
Phoenix Gazette	Phoenix	Maricopa	04013	AZ	1997
The North Hills News Record & Valley News Dispatch	North Hills	Allegheny	42003	PA	1997
The Banner	Nashville	Davidson	47037	TN	1998
Indianapolis News	Indianapolis	Marion	18097	IN	1999
Syracuse Herald-Journal	Syracuse	Onondaga	36067	NY	2001
Birmingham Post-Herald	Birmingham	Jefferson	01073	AL	2005
The Green Bay News-Chronicle	Green Bay	Brown	55009	WI	2005
Pasco News	Pasco	Pasco	12101	FL	2006
King County Journal	Seattle	King	53033	WA	2007
The Cincinnati Post	Cincinnati	Hamilton	39061	OH	2007
The Albuquerque Tribune	Albuquerque	Bernalillo	35001	NM	2008
Baltimore Examiner	Baltimore	Independent City	24510	MD	2009
Boca Raton News	Boca Raton	Palm Beach	12099	FL	2009
Rocky Mountain News	Denver	Denver	08031	CO	2009
Derby Reporter	Derby	Sedgwick	20173	KS	2009
News & Messenger	Manassas	Independent City	51683	VA	2012
North County Times	Escondido	San Diego	06073	CA	2013
The Californian	Temecula	Riverside	06065	CA	2013
Tucson Citizen	Tucson	Pima	04019	AR	2014
Daily Southerner	Tarboro	Edgecombe	37065	NC	2014
Hernando Today	Hernando	Hernando	12053	FL	2014
Tonawanda News	North Tonawanda	Niagara	36063	NY	2015
Daily News	McKeesport	Allegheny	42003	PA	2015
Valley Independent	Monessen	Westmoreland	42129	PA	2015
Murphysboro American	Murphysboro	Jackson	17077	IL	2015
Daily American	West Frankfort	Franklin	17055	IL	2015

management accounting

Enhancing a family firm's absorptive capacity: Is there a role for performance measurement systems?

Abstract:

This study explores the conditions under which small and medium-sized enterprises (SMEs) exhibit high levels of absorptive capacity (AC). Given that many SMEs are family-owned, we examine whether family ownership influences AC and whether this relationship is mediated by how these firms design and use their performance measurement systems (PMS). Using survey data from 210 SMEs, we find that the use of broad-scope PMS information in an interactive manner significantly and positively mediates the relationship between family ownership and an SME's realized AC. However, we find no evidence that broad-scope PMS information used diagnostically is linked to an SME's potential AC. These findings highlight an internal organizational mechanism through which family ownership is positively associated with realized AC in SMEs compared to non-family firms. This is particularly relevant as realized AC directly drives innovation in SMEs. While prior research has primarily focused on larger firms, innovative firms, or the design of PMS in isolation (see Pütz & Werner, 2024; Bedford et al., 2022), this study contributes to the management control, SME, and family business literatures by simultaneously examining the design and use of PMS across diverse industries, distinguishing between family-owned and non-family-owned SMEs.

Keywords: performance measurement system, diagnostic use, interactive use, family firm, absorptive capacity, SMEs

1. Introduction

In this study, we investigate the role of the design and use of a firm's performance measurement system as antecedents of the absorptive capacity in small and medium-sized enterprises. In an increasingly dynamic and global competitive environment, the capacity to acquire, assimilate, transform, and exploit external knowledge – that is *absorptive capacity* (AC) (Cohen and Levinthal, 1990) – is crucial for firms to innovate, renew their competitive advantage, and sustain performance (Kotlar et al., 2020; Volberda et al. 2010). According to Cohen and Levinthal (1990, p.128), absorptive capacity (AC) refers to the "ability of a firm to recognize the value of new, external information, assimilate it and apply it to commercial ends." Zahra and George (2002) reconceptualized the AC construct and added the dimension of knowledge transformation. They defined AC as "a set of organizational routines and processes by which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic capability." These processes are categorized into *potential AC*, which consists of acquisition and assimilation capabilities, and *realized AC*, which consists of transformation and exploitation capabilities.

Academic research so far revealed heterogeneity among firms with regard to their willingness and ability to foster their firm's AC (Kotlar et al. 2020; Van den Bosch and Volberda, 2005). It introduced a stream of research that investigates the firm-level antecedents of AC, such as the firm's existing knowledge, managerial capabilities, and cognitive frames (Todorova and Durisin, 2007; Volberda et al., 2010). Van den Bosch, Van Wijk, and Volberda (2003) introduced two clusters of *antecedents of AC*, being prior knowledge and internal organizational mechanisms. In this study, we build on Van den Bosch et al. (2003) and consider the design and use of a firm's performance information, stored in its performance measurement system (PMS), as an internal organizational mechanism.

An essential element of the design of the PMS is the *scope* of the performance measures it incorporates (Chenhall, 2005; Naranjo-Gil and Hartman, 2007). *Narrow scope* PMSs incorporate measures that are typically internally focused, financial, short-term and historically-oriented, providing only a partial view of the activities important for organizational performance (Gordon and Narayanan, 1984; Naranjo-Gil and Hartman, 2007). In contrast, *broad scope* PMSs include a wide diversity of measures that also provide externally-focused, non-financial, long-run and future-oriented information. Broad scope PMSs

provide greater informational diversity by presenting a more complete picture of organizational performance (Bedford et al. , 2022). Thus, a firm's PMS consists of a range of different indicators related to the operational and strategic objectives of a firm that are used for evaluating firm performance (Dekker et al., 2013). Depending on management's choice, only a few historically financially-oriented performance indicators can make up a firm's PMS, or a wider set of performance indicators, including both backward-looking and forward-looking financial and non-financial performance indicators, can be included in a firm's PMS. So, a firm's PMS can be considered as a formalized mechanism to collect information that can be used to develop organizational learning (Chenhall, 2005), which is important to stimulate AC. Therefore, we focus in this study on the scope of PMSs as a mechanism to enhance a firm's AC. So far, only Bedford et al. (2022) empirically examined for innovative firms the relationship between a firm's PMS and its AC. They incorporated two PMS design choices, namely PMS scope and PMS integration, and considered environmental dynamism as a moderator on the relationship between the two design choices and AC. They found that for innovative firms in all environments, broad-scope PMS is related to realized AC, but not to potential AC.

The novelty of our study is first that it does not limit itself to PMS design, as in Bedford et al. (2022), but that it also takes into account how the PMS is used and second that we include a wider population of firms from different industries. So our results generate insights on a wider set of firms than only innovative firms. As prior management control literature suggests a potential interdependence between design choices of PMS and the way in which the performance information is used (Guenther and Heinicke, 2019), we focus on whether different PMS design choices (being narrow scope PMS versus broad scope PMS) in combination with different types of use (diagnostic versus interactive use) can generate different firm outcomes with respect to AC (Guenther and Heinicke, 2019). In other words, we consider PMS design and PMS use choices simultaneously as relevant internal organizational mechanisms, being elements of the second cluster of Volberda et al.'s (2010) antecedents of a firm's AC and examine whether a firm's design and use of performance information is a variable that can explain the observed heterogeneity in firms' AC. To capture the use of the PMS, we focus on the diagnostic versus interactive use of control information, as identified in Simon's Levers of Control

framework. With diagnostic use, we refer to the practice whereby managers set clear targets, monitor their achievement, investigate deviations, and implement corrective actions (Simons, 1995). Interactive use of performance information enables discussions in meetings and debates regarding the underlying data and stimulates information sharing and communication: in contrast to the diagnostic use of performance information, where performance information is used by management to track and monitor critical success factors (Widener, 2007; Henri, 2006a; Simons, 1995). The scope of PMS and the use of that PMS information are unique resources of each firm[1] and can be considered as possible antecedents to a firm's AC through a resource-based view lens (Barney et al., 1991; 2021).

Next, in the AC literature, the majority of studies focus on AC in large firms (see Muller et al. , 2020, Pütz and Werner, 2022). However, AC is particularly important for small and medium-sized enterprises (SMEs) since SMEs need to rely more on the external environment to compensate for their shortage of internal resources (Flatten et al., 2011b; Zahra, Ucbasaran, and Newey, 2009). As a result, recent literature is calling to devote further attention to the underlying mechanisms that can stimulate AC in SMEs (Beford et al. 2022a; Bougerra et al. 2021; Miroshnychenko et al., 2021).

Zooming in on SMEs, it is noted that SMEs are often characterized by family ownership (Sciascia et al., 2015). The family's involvement in the firm, along with the unique resources shaped by their experiences, skills, and the business's history and culture, can significantly influence how resources and tacit knowledge are utilized and transferred (Pütz and Werner, 2024). Consequently, the mechanisms through which business families affect the firm's AC, are likely to be distinct from those observed in non-family businesses (Kotlar et al. 2019). Nonetheless, in a recent literature review, Pütz and Werner (2024) observe that research on AC in family firms is rather scarce and mostly conducted on a conceptual level. The few empirical studies examining AC in family firms usually draw on simple, one-dimensional constructs. Moreover, the ones that focus on potential and realized AC find both positive and negative effects of family ownership on AC (Patel and Chrisman, 2014; Kotlar et al. 2019). Given the ubiquity of family firms worldwide (De Massis et al., 2018) and increasing notions that family and non-family

[1] Unique information refers to the valuable information that a PMS accumulates internally within a firm. Therefore, a firm's PMS generates and accumulates a type of strategic resource relevant to possess a competitive advantage.

firms differ in their ability to foster AC (Pütz and Werner, 2024), delving into the antecedents of potential and realized AC in family firm SMEs and non-family firm SMEs presents a valuable opportunity to generate novel insights.

Building on this conflicting evidence in the family business literature and the scarce research attention with respect to AC in SMEs, we examine in this paper whether the design of a firm's PMS and its use are related to an SME's AC and whether this relationship is different in family firms compared to non-family firms. We do so by considering the choices in terms of PMS design and PMS use simultaneously, and study whether this combination acts as mediator to the relationship between ownership type of an SME and its AC. Apart from aiming to reduce the gap in the AC literature regarding SMEs and family firms, this study also more broadly responds to calls in the literature to pay more attention to the organizational mechanisms that antecede AC (Bouguerra et al., 2020; Volberda et al, 2010) and determine AC (Audretsch et al., 2021). We focus on the potential role of PMS design and use in this context, as its role for developing AC has largely been ignored (Bedford et al., 2022). As firms differ strikingly in their AC (Bouguerra et al., 2020), examining the effect of PMS practices has the potential to help explain why some firms are more successful than others in creating conditions conducive to its development.

Based on survey data of 210 firms, we find that the direct relationships between being a family-firm and experiencing potential AC and realized AC are negatively significant (for potential AC) or not significant (for realized AC). Focusing on whether design and use of performance information could act as a mediator on this relationship between firm ownership and both aspects of AC, we find that the interactive use of broad scope performance information is positively related to realized AC. We do not find a significant mediation for diagnostic use of broad scope information for potential AC. Since part of realized AC captures a firm's realized innovation, this result points at an information channel that can stimulate a family firm's innovation policies.

We contribute to the management control literature, family business literature and SME literature in the following ways. First, by considering simultaneously the design and use of performance information we contribute to the management control literature, since prior studies (e.g., Bedford et al., 2022) only

consider design elements of PMS and their relationship with AC. Second, we contribute to the family business literature by uncovering an internal organizational mechanism that enhances realized AC. We illustrate that using objective, broad scope, more formal performance information and sharing it explicitly in discussions, enhances a family firm's realized AC. So this internal organizational mechanism is complimentary with a family firm's tacit knowledge and informal information that are often used in family firms (e.g., Hiebl et al. 2018). Third, we contribute to the SME literature by focusing on underlying mechanisms that can stimulate an SME's AC, as most of the literature has focused on large or innovative small firms (Bedford et al., 2022; Pütz and Werner, 2022)

2. Literature Review

In today's global world a firm's AC can be an important antecedent towards survival, strategic change, growth and innovation. After all a firm's AC is key to acquiring, assimilating, transforming and exploiting new, external knowledge for purposes of value creation. Given the increasingly knowledge-based economy and the growing relevance of knowledge management (Pütz and Werner, 2024), research aimed at getting more insight into the underlying mechanisms that enhance a firm's AC is more than relevant in today's society. In this paper, we follow the definition of Zahra and George (2002, p. 186), who define AC as "a set of organizational routines and processes by which firms acquire, assimilate, transform and exploit knowledge to produce a dynamic capability." Zahra and George (2002) consider a firm's potential AC as the knowledge funnel that determines which external information crosses the firm's boundaries and a firm's realized AC as the transformation of the externally acquired knowledge into valuable outputs. According to Zahra and George (2002), the distinction between potential AC and realized AC enables researchers to clarify the different antecedents related to a firm's capabilities with respect to the development of AC.

With this study, we want to delve deeper into the underlying mechanisms stimulating the development of an SME's AC. We hereby pay attention to family ownership, as the family firm is one of the most common types of firms worldwide (De Massis et al, 2018). Family ownership can influence the hierarchical structure and informal social relations within the firm (Canella et al., 2015; Cruz et al., 2010; Patel and Cooper, 2014), as it sets constraints on which type of knowledge can be acquired,

assimilated, transformed and exploited (Lane et al., 2006; Mason and Leek, 2008; Todora and Durisin, 2007). This paper, therefore, focuses on differences in a firm's AC depending on firm ownership and investigates whether the combination of a particular design and a particular use of performance information has a mediating effect on this relationship. Pütz and Werner (2024) find that family firms have been largely neglected in AC research, although various studies have shown that family firms and non-family firms widely differ in their behavior due to the influence of the family on the firm (Berrone et al., 2012; Chrisman et al., 2012; Daspit et al., 2021). Moreover, the few studies focusing on AC in family firms often found conflicting results.

Recent reviews on accounting in family firms (Hiebl et al., 2018) indicate that family firms show lower levels of formalization of their accounting and control practices, exhibit specific and additional roles of accounting and control practices, and differ from non-family firms in important accounting choices (Helsen et al., 2017; Prencipe et al., 2014, Senftlechner and Hiebl, 2015; Songini et al., 2013). Also, Heinicke's (2018) results on the adoption and use of PMSs in SMEs underpin the specifics of family firms, as her findings indicate that family influence is one of the most important antecedents explaining the adoption and use of PMSs in small businesses. Although several studies reported that family firms adopt fewer operational and strategically oriented management accounting and control practices, this does not necessarily imply that this leads to inferior efficiency and performance in family firms (Daily and Dollinger, 1992; Dekker et al. 2015; Speckbacher and Wentges, 2012). In this paper we examine whether the design and use of performance information, being elements of management control, are antecedents to a firm's potential and realized AC and whether it represents a channel through which a firm's prior (often tacit knowledge) can be associated to a firm's potential and realized AC.

PMS design refers to the format, sophistication, comprehension, and extent of details collected with respect to the different aspects of performance of the firm (Bisbe et al., 2019). Design characteristics refer to the number of key performance measures used to create goal alignment and reduce uncertainty (Franco-Santos and Otley, 2018). The literature studying the balanced scorecard (being considered a broad scope PMS) underscores the desirability of using multiple financial (lag) and non-financial (lead) measures of performance instead of relying on a single measure (Carmona and Ezzamel, 2023). In

general, a PMS can be considered as a database that provides information concerning a firm's processes and outcomes and also as a management control mechanism that can influence the behavior of organizational members to facilitate the delivery of organizational goals (Franco-Santos et al., 2012; Ferreira and Otley, 2009). A key element however is the ability to both interpret and use this information included in the different performance indicators collected in a firm's PMS.

Relying on Resource-Based Theory, PMS design, reflected in the scope of the performance indicators present in the firm, is an accounting tool generating firm-specific information that can provide strategic and unique information about the firm (Hall, 2010) to a firm's management. When PMS information illustrates that targets or objectives are not achieved, this might stimulate the search for external information to get the firm on track again. Moreover, PMSs are integrated into a firm's formal structure since PMSs involve documenting information containing written communications, procedures, and instructions specific to the firm (Ali et al., 2018; Bedford et al., 2022; Jansen et al., 2005; Vega-Jurado et al., 2008).

Bedford et al. (2022) are the first researchers who studied the relationship between the design of PMS and firm's AC focusing on a population of innovative firms.. They study PMS from two design perspectives: scope (referring to the number of measures, their focus, orientation, and time horizon) and integration (the degree to which PMS information reveals the cause and effect of the relationship between actions and outcomes throughout the value creation chain). They include environmental uncertainty as a moderator on the relationship design of PMS and AC. They argue that PMS design choices can have different implications for each AC dimension (, potential AC, in contrast to realized AC) and find for a population of innovative firms that PMS design choices are only positively associated with realized AC.

As recent literature (Guenther and Heinicke, 2019) indicates that the design and use of performance information should be considered *simultaneously* to study the effect of the PMS on firm outcome, the novelty of this study is that it does not only incorporate the impact of the design of PMS, but also of the use of this performance information on AC. In this way, our study differs from Bedford et al. (2022),

who did not take into account a firm's use of performance information. For this study, we rely on Simons's definitions (1995) to categorize the use of performance information into either diagnostic use or interactive use. When performance information is used in a diagnostic way, managerial attention is focused on monitoring the achievement of pre-established standards, detecting deviations, and subsequently fostering corrective actions (Simons, 1995). When management uses performance information in an interactive way, this information is used in decision-making with respect to a firm's objectives and future through discussions, debates, and face-to-face meetings in a firm (Widener, 2007; Henri, 2006a; Simons, 1995). As a result, we add to the study of Bedford et al. (2022) by considering the simultaneous inclusion of PMS design and use while studying the relationship between the ownership type of an SME and the SME's potential and realized AC. We do so by examining whether the design of the PMS (captured in terms of scope) in combination with its use mediates the relationship between ownership type of the SME (family versus non-family firm) and potential and realized AC.

3. Hypotheses Development

3.1 A family SME's potential absorptive capacity

Potential AC entails departing from existing knowledge bases toward openness to broad and potentially distant knowledge sources (Benner and Tushman, 2002; Zahra and George, 2002). The underlying capabilities are primarily based on decision-making (Jansen et al., 2005; Todorova and Durisin, 2007) and on processes that enable identifying and evaluating externally generated knowledge to support analyzing, processing, interpreting, and understanding the information embedded in this knowledge (Zahra and George, 2002). Therefore, the firm's willingness to move away from current organizational routines and knowledge basis is essential to potential AC (Katila and Ahuja, 2002). Family firms are different from non-family firms because of the involvement of family members in the firm, which leads the family to exert a strong influence by deciding how resources and tacit knowledge should be passed on and used (Pütz and Werner, 2024).

Prior family business studies provided evidence that social capital and unique tacit knowledge allows family firms to achieve their competitive advantage (Pütz and Werner, 2024). Focusing on studies that examined a family firm's AC and its antecedents, Andersén (2015) and Daspit et al. (2019) reported a

negative effect of familiness on potential AC, which was triggered by the drive of the family to preserve power and avoid collaborations. The stronger the family owners' emotional attachment to the firm, the more likely they are to value the firm's existing knowledge assets, to attribute lower value to external knowledge that is distant from their existing knowledge bases (König et al., 2013), and consequently avoid diverging from the firm's current stock of knowledge (Kotlar et al., 2019). So family owners will become increasingly committed to current knowledge assets and less willing to consider diverse sources of external knowledge (Pierce et al. 2001). This attitude engenders insularity, with family firms relying on their existing knowledge (Belkhodja and Daghfous, 2021; Daspit et al. 2019). Hence, although familiness is considered in the literature as a competitive advantage because of unique resources and knowledge, too specific knowledge can have a negative effect on potential AC (Daspit et al. 2019). Based on families' fear to lose control and as a result its more limited outreach to external parties, we argue that family SMEs are characterized by less potential AC in comparison to non-family SMEs. In other words, we hypothesize a negative direct relationship between being a family SME and the presence of potential AC.

H1: *Being a family SME is related to lower potential absorptive capacity in comparison to non-family SMEs.*

3.2 *The mediating effect of PMS design and use on potential absorptive capacity*

Family firms are often characterized by the presence of informal control systems, including the use of informal information or tacit knowledge for decision-making, and social capital (Hiebl et al., 2018). Examining the direct relationship between firm ownership and a firm's AC might capture the informal character of the information system. *Informal controls*, on the one hand, offer flexibility and adaptability (Kreutzer et al., 2016), but they carry the risk of ambiguity and may lack specificity, potentially jeopardizing outcomes (Durden, 2008). *Formal controls*, on the other hand, provide structure and clarity, while they might risk stifling creativity (Grabner and Speckbacher, 2016). An SME's PMS is a formal information system in which information on firms' performance indicators is collected.

In order to achieve knowledge assimilation in a firm, it is crucial for the actors involved that they experience congruence and a similar interpretation of relevant knowledge (Pütz and Werner, 2024). As formal firm information facilitates a congruent and similar interpretation of relevant knowledge, it results more easily in congruence and a similar interpretation in comparison to informal information. It means that a firm's PMS, which is a formal information system and is part of the input to a firm's stock of prior knowledge, can play a crucial role for recognizing the value of external information (Todorova and Durisin, 2007). Prior knowledge is the backbone for comprehending the external information received and the type of information sought (Cohen and Levinthal, 1990). Therefore, the more extensive the existing knowledge, the greater the likelihood that firms will be able to grasp the significance of external information. Bedford et al. (2022) argue that the scope of the PMS is a design attribute that is tailored to the needs of firms without restricting the search for new knowledge and its understanding. Moreover, the way a PMS is designed shapes managers' attention patterns (Bedford et al., 2022; Dalla Via et al, 2019) and cognitive representations (Hall, 2011; Micheli and Mari, 2014). Henderson and Cockburn (1994) emphasize the importance of PMSs in influencing the ability to access and flexibly integrate new external knowledge, which are important processes underlying AC (Zobel, 2017).

However, the literature provides mixed evidence with respect to formalization and its effect on AC. Jansen et al. (2005) find a negative relationship whereas Vega-Jurado et al. (2008) find a positive relationship. While PMSs are indeed formal systems, their broad scope is a particular design attribute tailored to the needs of the firm, whose purpose is precisely not to restrict focus (Bedford et al., 2022). This opens the possibility for broad scope PMS to stimulate potential AC (Bedford et al., 2022). The broader the PMS scope, the more diverse the facets related to an organization's objectives that are captured in codified, consciously designed format (Henri and Wouters, 2020; Naranjo-Gil and Hartmann, 2007). In particular broader scope PMS include more externally-focused information (Bouwens and Abernethy, 2000; Hall, 2008). Moreover, as pointed out by Cohen and Levinthal (1990) and Elbashir et al. (2011), prior relevant knowledge and context are necessary to facilitate assimilation of new external knowledge. Broader scope PMSs can also contribute to collective ability of managers and employee to value, interpret and understand acquired, external relevant knowledge (Elbashir et al.,

2011; Lewin et al., 2011; Zahra and George, 2002). According to Bedford et al. (2022) broad scope PMSs give an opportunity to put newly acquired external knowledge in a richer informational context provided by a more diverse set of performance measures.

A diagnostic use of formal performance information resulting from a firm's PMS could amplify this effect as it involves a similar interpretation of the performance on key indicators of a firm. According to Simons (1995) diagnostic control systems monitor outcomes and facilitate goal revision, ensuring alignment with documented firm objectives (Simons, 1995). As such a diagnostic use of PMS information could stimulate the assimilation of information, which is an element of potential AC. So diagnostic use of performance information serves as feedback on whether or not pre-determined organizational targets or objectives are achieved, it allows to track and monitor critical success factors. The traditional feedback role of diagnostic use is to align the performance of the firm with the goals of the organization and to maintain the alignment (Henri, 2006a). It is likely that the feedback process motivates an organization with negative variances to seek a solution and subsequently acquire external information as a remedy (Ben-Oz and Greve, 2015). Pre-established goals in a formal feedback system of diagnostic use highlight the relevancy of external information with the organization's plan (Mundy, 2010; Henri, 2006). Therefore the existence of regular feedback incorporated in the diagnostic use of formal performance information can be associated with higher information acquisition, since feedback can indicate that more information is required and therefore will initiate attempts to acquire external information (Nonaka and Toyama, 2003; Zhou and Li, 2012). Diagnostic use of information directs the channel of information flow to specific people and conditions (Henri, 2006)[2]. Moreover, the ability to direct external information to the right people within the organization is vital for the assimilation of information.

The broader the scope of a PMS, the more areas where actual scores of metrics related to performance may depart from the stated objectives, and the more chances to detect such departures. Therefore Bedford et al. (2022) state that broader PMS scope tends to provide more motivation to increase potential

[2] The feedback inherited in the diagnostic use of PMS information causes information related to performance beyond the expected range to be reported for further discussion between managers and subordinates. Therefore, the diagnostic use of PMS develops information flow hierarchically within firms.

AC. Consequently, it is reasonable to expect a positive relationship between the diagnostic use of PMS and the assimilation of information. A diagnostic use of performance information stimulates single loop learning, since feedback on performance measures is a key process in the adaptation of routines and the learning of new routines over time (Ben-Oz and Greve, 2015; Grafton et al, 2010; Lewin et al., 2011).

At the same time, there are other dynamics that might play a role in SME family firms. Quite often, they are characterized by an overlap between family ownership and family management. As family owners of SMEs often have undiversified portfolios, they might feel a need to evaluate the performance of their SME family firm in a more formal way in order to safeguard their wealth. In that instance family owner/managers can opt to install a broad scope PMS in the firm, which captures in a formal way the performance of the firm on a number of indicators chosen by the family owners/family managers. In addition families can choose to use the formal performance information in a diagnostic way so that their attention is immediately drawn to deviations of actual firm performance from objectives and they might feel the need then to look for outside information to solve the performance deviations from the stated objectives and targets of the family firm. We expect this mediating effect to be particularly impactful in family SMEs, as compared to non-family SMEs, as the latter tend to make less use of tacit knowledge and social capital and, therefore, are already expected to have more formal information systems in the first place. For non-family SMEs, we, therefore, expect this mediation effect to be less significant. Based on these insights we put forward that the effect of a diagnostic use of broad-scope performance information on a firm's potential AC differs in terms of SME ownership type (family versus non-family), and therefore we hypothesize:

H2: *The diagnostic use of broad-scope PMS information positively mediates the relationship between being a family SME and its potential AC.*

3.3 A family firm's realized absorptive capacity

Realized AC requires integrating newly acquired knowledge into the existing knowledge base and depends on the firm's capabilities to refine, extend, and leverage this stock (Cohen and Levinthal, 1990; Zahra and George, 2002). With respect to the presence of realized AC in family firms, mixed evidence

is found in prior family business studies. According to resource-based theory, a family's social capital is an important factor in knowledge transformation and implementation (Andérsen, 2015) as it enables communication and knowledge sharing (Wang et al., 2016). Family firms can build on the complex knowledge construct of family members and in this way achieve realized AC. In addition, family business research indicates that uncertainty on the scope and complexity of external knowledge arguably lessens once it is acquired, combined with the firm's existing knowledge, and integrated into the family owners' cognitive frames (Benner and Tushman, 2002; Jansen et al., 2005). While resource-based theory provides arguments for a positive impact on realized AC in family SMEs, a couple of other studies report that the development of realized AC can be hindered in family firms, for example when family conflicts hinder the flow of knowledge (Eniola, 2022) or when a family's tacit knowledge is not shared with non-family members (being non-family managers or non-family employees) (Belkhodja, 2022). In other words, while there is evidence in the family business literature that familiness can hinder realized AC, we follow the insights of the resource-based view, which highlights the potential of a firm's social capital and tacit knowledge for developing realized AC (Frank et al., 2010; Pearson et al., 2008). We therefore hypothesize a positive relationship between being a family SME and realized AC.

H3: *Being a family SME is related to higher realized AC.*

3.4 *The mediating effect of PMS design and use on realized absorptive capacity*

According to Cohen and Levintahl (1990,1994), the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends, is based on existing knowledge that cumulatively develops. A firm's PMS provides firm-specific information that contributes to such firm-specific internal knowledge. The broader the scope of the PMS, the more likely it will support a firm in synthesizing new knowledge with prior knowledge, since diverse performance information allows more interpretations and meanings of performance measures, enabling the development of new alternatives (Bedford et al., 2022). Moreover, we argue that a broader scope PMS enriches organizational memory to facilitate the retrieval of prior knowledge and identify outdated systems for modification or gaining new insight (Franco-Santos et al., 2012;; Zahra and George, 2002).

The knowledge base that is relevant for realized AC exists at the firm and the employee levels. It means that the ability to internally share knowledge is crucial (Brinkerink, 2018; Cohen and Levintahl, 1990, 1994; Eniola, 2022). To achieve internal knowledge transfers, companies require effective communication between employees and management and employees (Szulanski, 1996). In this manner knowledge can be utilized, and exchange and mutual learning can transpire between departments and within the firm to develop new products (Tsai, 2001). Learning new knowledge requires the integration and input of internal and external knowledge sources (Pütz and Werner, 2024). When the PMS has a broad scope, this will improve the usefulness of accounting information (Hall, 2010), in the sense that it contains more cues related to strategic issues that can stimulate debate and promote discussion (Henri, 2006b). In this way, it allows an interactive use of the PMS information, that can stimulate double loop learning (Henri, 2006a; Muller-Stewens et al., 2020). Using this PMS information in an interactive way will stimulate communication across the firm with employees and non-family managers and can lead to a shared vision on the future of the firm and a transfer of (tacit) knowledge from family members to non-family members. We, thus, argue that an interactive use of performance information can stimulate discussion and a knowledge transfer throughout the firm, which will create a path towards exploitation of that knowledge. We find support for this relationship in the MCS literature. Carmona and Ezzamel (2023) conclude in their literature review that organizations undergoing changes in their strategies rely more heavily on interactive budgets that use communication, dialogue and learning. Also, Naranjo-Gil and Hartmann (2007) find that broad-scope MCS and interactive use of MCS are positively related to strategic change. Relatedly, Simons (1995) finds that Strategic Business Units competing through product innovation use MCS interactively to stimulate face-to-face dialogue and develop information bridges among different hierarchical levels in decentralized organizations. An interactive use of MCS performs three functions: signaling, surveillance, and decision ratification, all of which help stimulate organizational learning (Simons, 1990). As interactive control systems promote dialogue and learning in an organization, they consequently facilitate the transfer of knowledge and the use of that knowledge in innovation activities, which refers to the exploitation part of realized AC. We therefore hypothesize that

H4: *The interactive use of broad-scope PMS information positively mediates the relationship between being a family SME and its realized AC.*

Figure 1 shows the hypothesized model.

[INSERT FIGURE 1 ABOUT HERE]

4. Research Method

4.1 Survey population and design

We opted for cross-sectional data from an online questionnaire because it suits our research questions targeting higher-level managers in SMEs (Bedford & Speklé, 2018; Guenther & Heinicke, 2019). The target population for the survey consisted of all active Belgian firms (privately held) from all industries except finance, insurance, and government organizations. Moreover, we applied sample selection criteria of having a minimum of 10 full-time employees, considering that these companies are more likely to apply management controls (Davila, 2005). We used the Bel-first database of Bureau Van Dijk to select our companies. The database includes the financial statements for all Belgian companies. Reporting requirements imposed by the Belgian government require all limited liability firms—irrespective of size and age—to file detailed financial statements annually with the Belgian National Bank. We randomly selected 4,531 companies out of the 26,279 active Belgian companies in the population in 2020 to determine the sample of companies to which the survey was sent. Next, we used the database Trends, a Belgian commercial mailing list provider, to obtain the email addresses of the CEOs of the selected firms in our sample. Furthermore, we rely on the respondents' job titles[3] and a minimum tenure of one year at the firm to prove the adequacy of respondents' information concerning management decisions. When sending out the survey, only 4102 respondents were reached.

The measures included in the survey are based on prior research and they are all measured for the year 2020. First, we translated the survey into Dutch and French. Then we translated it back into English to compare with the original survey items and validate the similarity between information content across

[3] More than 90% of the respondents are CEO directors, and in the remaining part, the majority hold the CFO title.

languages. Moreover, following Collins's (2003) suggestions to consider cognitive testing before the survey submission, we applied a pilot test. Five practitioners and two academics participated in pretesting the questionnaire. The suggested adjustments were conducted to ensure face validity and readability.

In total 556 surveys were returned which yielded a response rate of 13,55%. A number of these questionnaires were only partly filled out. We considered for this study the questionnaires filled out for more than 80%. The missing values are considered as random since the pattern of missingness is more due to the length of the survey rather than the value of the other variables in the study (Bennett, 2001). Therefore, missing values in the dataset cannot influence inferences about the population (Bennett, 2001). We focus on SMEs by defining SMEs as firms with less than 500 full-time employees. Using the mean substitution method to replace missing values, our final sample of firms with less than 500 full-time employees for this paper includes 210 observations.

To control for non-response bias, we run t-tests for all the measured items, including the firms' characteristics such as age and industry, to see whether late respondents answered significantly differently from early respondents (Mellahi & Harris, 2016). We found no significant difference between the two groups at the 0.05 level.

Concerning common method bias, evidence suggests substantial bias can be involved in self-administrated modes of data collection like surveys (Brenner & DeLamater, 2016). To mitigate this threat, we have carefully designed our survey by assuring confidentiality, reverse coding, offering mid-point in questions with Likert-scale, and offering various response formats. Also, we run three ex-post CMV tests. As a first test, we run Harman's one-factor test for all items of the research constructs with the Likert scales as one of the common post-hoc tests to detect common method bias (Fuller et al., 2016). The principal component analysis for the unrotated factor solution reveals that the variance explained by the first component explains only 15.77% of the total variance. Based on our analysis, we have determined that there is little reason for concern regarding single-source bias, as suggested by Podsakoff and Organ (1986). For a second test, we run an unmeasured latent method factor model on the four

variables of our research model for which CMV could be a problem (diagnostic use, interactive use, realized AC, absorbed AC) (Podsakoff et al., 2011). The result shows a common factor value of 0.62, representing a common variance of $(0.62)^2 = 0.3844$ or 38.44 percent, which is below the recommended cut-off value of 50% (Posch & Garaus, 2020). Lastly, we apply the common marker variable technique (Lindell & Whitney, 2001), identifying a variable in our dataset that could serve as a viable marker variable for this test: we asked our respondents three questions gauging the frequency with which they used the web to search for financial information (Simmering et al., 2014) and composed a web use variable with these three items. These items are not correlated with our multi-item variables (the correlations range from 0.03 to 0.10) and are expected to share potential common rater, common item method, and social desirability bias with them (Podsakoff et al., 2011). Thus, this variable makes for a suitable marker variable. Furthermore, the correlations between the constructs remained significant even after controlling for the effect of the marker variable. In summary, the results of Harman's one-factor test, the variance explained by the unmeasured latent method factor technique, and the marker variable test suggest that common method bias was not a major concern.

4.2 Variable measurement

All variables are measured based on existing scales. Details of the items used to calculate the constructs in our model are provided in the Appendix.

Absorptive Capacity. The respondents answered 15 questions of Flatten et al.'s (2011) measurement, indicating the extent to which they agreed or disagreed with the provided statements on a scale from (1) strongly disagree to (7) strongly agree. In line with previous research (Jansen et al., 2005; Zahra & George, 2002), we conceptualize both forms of AC as multidimensional constructs, each consisting of two dimensions. *Potential AC* includes dimensions that capture the acquisition and assimilation of new external knowledge, while *realized AC* encompasses dimensions focused on the transformation and exploitation of new knowledge.

Family firm status. We defined family as the people who are linked by blood or marriage. We asked respondents to consider the following statements (1) More than 50% of the ownership is in the control

of one family; (2) One family has a decisive influence on business strategy or succession planning; (3) Two members (or more) of the management are from one family; (4) The firm is considered a family business; and (5) None of the above answers apply. The respondents who chose option 5 are categorized as *non-family firms* and coded as 0; those who chose other options (or a combination of other options) are considered *family firms* and coded as 1 (Chua et al., 1999; Westhead & Cowling, 1998).

Broad Scope Performance Measurement Systems. Following the measurement of Dekker et al. (2013), we captured broad scope MCS present in a firm (*PMS*) by providing a list of performance indicators that reflect a firm's performance: (1) number of customer complaints, (2) on time delivery, (3) labor efficiency variance, (4) employee turnover, (5) operating income, (6) sales growth, (7) return on investment, (8) net cash flows, (9) costs per unit produced, (10) market share, (11) customer response time, (12), survey of customer satisfaction, (13) employee satisfaction, (14) number of new product launches, (15) time-to-market for new products, and (16) materials efficiency variance. Respondents were asked to indicate the importance of each item for the evaluation of firm performance by using a 7-point scale ranging from 1 (not important at all) to 7 (extremely important) in 2020. *Broad-scope PMS* was calculated as the mean score across all items (Dekker et al., 2013).

Diagnostic Use and Interactive Use. We measure the diagnostic use of performance information using a measurement of Bedford and Malmi (2015). Diagnostic use (*Diagnostic Use*) is a construct that focuses on using performance information in five different situations. The construct captures to what extent performance information is used in 2020 for monitoring a firm's performance and to take corrective actions when performance deviates from the prespecified targets (Bisbe & Otley, 2004). The respondents were requested to assess and indicate how much management relies on companies' performance measures in five areas. A Likert-type scale in a reversed coded format ranges from (1) strongly agree to (7) strongly disagree. After solving the reversed coding, we interpret the higher score of their accordance as the more diagnostic use of performance measures.

In order to measure an interactive use we rely on Kruis et al. (2016), who applied five questions of Henri (2006a) to measure the interactive use (*Interactive Use*) of performance measures in 2020. The questions

were reversely coded, ranging from (1) strongly agree to (7) strongly disagree. After solving the reverse coding, we interpret the higher the score of the respondents, the more interactive use of performance information in the firm.

Controls: Age, Size, Environment, Strategy, and Industry. We controlled for several potentially influential variables such as age, size, environmental unpredictability, strategic orientation, and industry measured in 2020. Firm age (*Age*) refers to the years since the firm was incorporated till 2020. Firm size (*Size*) is calculated as the natural log of the total number of full-time employees; given the skewed distribution of this variable, we applied the log-transformed measure in the analyses. We consider the external environment's potential influence on our interest variables via perceived environmental unpredictability (*Environment*). It is recommended to consider the unpredictability of the competitive condition when studying the antecedents of AC (Bedford et al., 2022). In a more turbulent environment where unpredictability is higher, the reliance on external knowledge and innovation is more critical compared to a more stable environment (Bedford et al., 2022; Ben-Oz & Greve, 2012). Thus we asked our respondents to assess and rate five changes in various environmental aspects (in terms of customers, suppliers, competitors, technological changes, and regulation) on an increasing 7-point Likert scale (Bedford & Malmi, 2015) (based on Doty et al., 1993; Gordon & Narayanan, 1984). *Environment* is measured as a mean score of the five questions suggested by Bedford and Malmi (2015). We also control for the strategy of firms by three variables suggested by Kruis et al. (2016) that capture three dominant strategic orientations, including low-cost, low price (*Low Price*), differentiation (*Differentiation*), and delivery and service (*Delivery & Service*). We ask 11 questions about strategy (Kruis et al., 2016), and then we follow Chenhall's (2005) measurement, which uses an aggregated measure to capture and control for the strategic orientations. Concerning industry effect, we broadly categorize industries applying 2-digit NACE codes to make 3 cohorts of *Manufacturing*, *Retail*, and *Service*. We use *Service* as the reference industry.

4.3 Statistical methods

We employ Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4 software (Ringle et al., 2024), the most frequently used software for PLS-SEM analyses (Sarstedt et al., 2022).

PLS-SEM is particularly effective for analyzing research models involving numerous constructs, indicator variables and structural paths such as in this study (Sarstedt et al., 2020). Furthermore, PLS-SEM application has been gaining traction in family business research (Hair et al., 2021) and recognized as an important analysis tool in management control literature (Nitzl & Chin, 2017). To evaluate the results obtained through PLS-SEM, we follow the guidelines and standards outlined by Hair et al. (2019) and Ringle et al. (2023).

5. Results

5.1 Descriptive statistics

Table 1 provides the descriptive statistics. Most of the firms (67%) in the sample are family firms. Firms are on average 39 years old, and have an average of 87 full-time employees. Regarding industry distribution, 38% of the firms operated in the manufacturing sector, 26% in retail, and 36% in services.

[INSERT TABLE 1 ABOUT HERE]

5.2 Reliability and validity of the measurement model

Our measurement model included four reflective constructs, namely, Diagnostic Use, Interactive Use, Potential AC, and Realized AC. The assessment of the measurement model includes an evaluation of its reliability, convergent validity, and discriminant validity. Results show robust reliability and convergent validity are present in Table 1. First, Cronbach's alpha and composite reliability (CR) of *Diagnostic Use, Interactive Use, Potential AC,* and *Realized AC* exceed 0.75 (Nunnally, 1967), indicating a high level of internal reliability of the measurement model. All the outer loadings are over 0.50; thus, the indicators in the reflective measurement models reach satisfactory indicator reliability levels (Chin, 1998; Hair et al., 1998).[4] Second, we assessed convergent validity with the average variance extracted (AVE) from these constructs. AVE values ranged from 0.512 to 0.828 in the measurement model, suggesting that a high level of convergent validity exists in the model (Fornell & Larcker, 1981). Finally,

[4] Initially, two items in the questionnaire loaded lower than 0.50, i.e., "The search for relevant information concerning our industry is every-day business in our company" and "Our management supports the development of prototypes." Following the suggestion of Hair et al. (2019), we excluded these items from the measurement model.

we assessed discriminant validity using the square root of the AVE and the HeteroTraitMonoTrait (HTMT) ratio of correlations. As presented in Table 2, the values of the square root of AVE for the study constructs are greater than the highest correlation between study constructs (Fornell & Larcker, 1981). Table 3 shows that the HTMT ratios fall below the threshold of 0.90. These results provide support for discriminant validity.

[INSERT TABLES 2 AND 3 ABOUT HERE]

5.3 Structural model results

Before evaluating the structural relationships, it is important to check for collinearity to ensure it does not bias the regression results. The variance inflation factors (VIFs) for all constructs were below 1.6, suggesting that multicollinearity is unlikely to be a major issue (Hair et al., 2019).

In line with Hair et al. (2011), bootstrapping (5,000 resamples) was used to generate standard errors and t-statistics. This allowed us to assess the statistical significance of the path coefficients. Table 4 presents the results of the structural model. The path from family firm status to potential AC is negatively significant (β= -0.350, $p<0.05$). Thus, H1 is supported. However, contrary to our prediction in H3, the path from family firm status to realized AC is negatively significant (β= -0.345, $p<0.01$). Hence, H3 is rejected.

[INSERT TABLE 4 ABOUT HERE]

In H2, we posited that the diagnostic use of broad scope PMS positively mediates the relationship between the ownership type of an SME and its potential AC. While the relationship between family firm status and PMS (β= 0.465, $p<0.01$), PMS and diagnostic use (β= 0.224, $p<0.01$), diagnostic use and potential AC (β= 0.154, $p<0.05$) are all positively significant, the indirect effect between family firm status, PMS, diagnostic use, and potential AC is not significant. Therefore, H2 is not supported.

In H4, we proposed that the interactive use of broad scope PMS positively mediates the relationship between the ownership type of the SME and its realized AC. The results show that the relationship between family firm status and PMS (β= 0.465, $p<0.01$), PMS and interactive use (β= 0.251, $p<0.001$),

interactive and realized AC (β= 0.243, p<0.01) are all positively significant. The indirect effect between family firm status, PMS, interactive use, and realized AC is positively significant (β= 0.028, p<0.10), and the 95% bias-corrected confidence interval does not include 0 (0.006, 0.073). Based on Hair et al.'s (2019) suggestion regarding the criteria to evaluate the statistical significance of weights, H4 is supported. Interestingly, the direct and indirect effects point in a different direction, which indicates the presence of competitive mediation (Nitzl et al., 2016). This result suggests that PMS and interactive use can resolve the negative magnitude of the relationship between family firm status and realized AC.

Regarding the control variables, firm age, environment uncertainty, and firms emphasizing delivery and service as the primary strategy have no significant relationship with realized/absorptive AC or diagnostic/interactive use of performance information. Similarly, firms in the retail industry have no significant difference concerning realized/absorptive AC or diagnostic/interactive use of performance information. Larger firms have significantly higher levels of diagnostic use of performance information. Firms with a low-price strategy demonstrate significantly lower levels of diagnostic and interactive use of performance information as well as realized and absorptive AC. In contrast, firms pursuing differentiation as a strategy show significantly higher levels of interactive use of performance information as well as realized and absorptive AC. Finally, firms in the manufacturing industry have significantly lower realized AC than those in the service industry. Figure 2 summarizes the structural model results.

[INSERT FIGURE 2 ABOUT HERE]

5.4 Additional analyses

Several additional analyses confirm the consistency of the main results. First, in terms of the SMEs involved, we limit ourselves to the firms with fewer than 250 employees instead of our original definition of SMEs as firms with less than 500 full-time employees. With this restriction, the sample now encompasses a total of 188 observations. After checking that the overall model fits the measurement model and assuring that the load of the item is as expected, we observe that the hypothesized relationships align with the primary model. Figure 3 shows that family firm status is related to lower

potential AC (β= -0.324, p<0.05) and lower realized AC (β= -0.316, p<0.05). The indirect effect of family firm status on potential AC via broad scope PMS and diagnostic use is not significant, whereas its indirect effect on realized AC via broad scope PMS and interactive use is still positive with the 95% bias corrected confidence interval not including 0 (0.009, 0.098).

[INSERT FIGURE 3 ABOUT HERE]

Second, we redefine broad-scope PMS. While in the main analysis, broad-scope PMS is measured as the mean score across all items, we now create an alternative measurement that provides a value of 1 only when items score 6 or 7, and then take the sum over all items (Dekker et al., 2013). We re-run the analyses with this alternative measurement of broad-scope PMS. The key findings remain the same, as illustrated in Figure 4. Family firm status is related to lower potential AC (β= -0.350, p<0.05) and lower realized AC (β= -0.345, p<0.01). The indirect effect of family firm status on potential AC via broad-scope PMS and diagnostic use is not significant, while its indirect effect on realized AC via broad-scope PMS and interactive use is still positive with the 95% bias-corrected confidence interval not including 0 (0.005, 0.072).

[INSERT FIGURE 4 ABOUT HERE]

Finally, as Zahra and George (2002) suggest that potential AC can increase realized AC, we control for the possible influence of potential AC on realized AC. As shown in Figure 5, the effect of potential AC on realized AC is positive and significant (β= 0.589, p<0.001). Moreover, the results are almost identical to the findings of the main analyses. Family firm status is related to lower potential AC (β= -0.350, p<0.05). While the indirect effect of family firm status on potential AC via broad-scope PMS and diagnostic use is not significant, its indirect effect on realized AC via broad-scope PMS and interactive use is positive with the 95% bias-corrected confidence interval not including 0 (0.004, 0.051). Notably, the direct effect of being a family firm on realized AC is no longer significant. This result conforms with the literature, that is, the effect of family firm status on realized AC depends on the indirect mechanisms that family influence may exert (Kotlar et al., 2020).

[INSERT FIGURE 5 ABOUT HERE]

6. Discussion and Conclusion

Resource-based theory claims that superior resources and knowledge positions relate to organizational success (Barney et al., 1991; 2021). It thereby suggests that the absorptive capacity (AC) of an organization is of utmost importance for its chances to innovate, remain competitive and perform well in the long run (Volberda et al. 2010; Kotlar et al., 2019). Since SMEs are typically limited in terms of internal resources (de Araujo Burcharth et al., 2015), their capacity to acquire and assimilate external knowledge (potential AC) and next to transform and exploit it (realized AC) is crucial for their success. As a large part of SMEs consists of family firms (De Massis et al., 2018), it is relevant to study the underlying mechanisms that are related to an SME's AC. Family firms have particular characteristics: they tend to rely heavily on their social capital and tacit knowledge, and are known to adopt fewer operational and strategically oriented management accounting and control practices (Daily and Dollinger, 1992; Speckbacher and Wentges, 2012; Dekker et al., 2015). Despite its importance, there is a lack of academic research on the factors that antecede AC in the SME – family business context (Pütz and Werner, 2024). Moreover, the limited number of studies on AC in family firms shows conflicting results (Kotlar et al., 2019; Pütz and Werner, 2022).

Using 210 SME observations and testing the direct relationships between being a family firm or a non-family firm and AC, we find that both potential and realized AC are less present in family firms compared to non-family firms. The novelty of this study is that we capture the design and use of performance information simultaneously to investigate whether it acts as a possibly significant mediator on the relationship between being a family firm or not and potential or realized AC. Our results indicate that when family firms adopt broad-scope performance information in an interactive way, this organizational mechanism significantly positively influences realized AC. However, diagnostic use of broad-scope performance information is not a significant mediator for potential AC. We can conclude that our results highlight that when family firms consider broad-scope firm-specific information for evaluation purposes, and discuss and share this information in an explicit interactive way in the firm, this approach provides a channel through which innovation in a family SME can be stimulated. Indeed,

a part of realized AC - namely exploitation - represents a firm's innovation. These results indicate that using formal and objective firm-specific information is more helpful in enhancing a firm's realized AC than relying on tacit knowledge and informal systems to guide a family firm and make decisions about a firm's innovation policies.

Our insights are novel in the sense that they illustrate that adopting more formal performance measurement systems and using that performance information in an interactive way is beneficial for innovation in SME family firms. This is a remarkable observation given that an SME family firm context is usually characterized by informality and tacit knowledge (Quinn et al., 2018). Given the importance of innovation for a successful survival of family-owned SMEs, this result has also practical relevance for this group of important firms in the worldwide economy.

This study is also subject to a number of limitations that represent, at the same time, avenues for future research. First the insights of this study are based on cross-sectional survey data. It would be interesting to see whether this information channel consisting of a simultaneous broad scope PMS used in an interactive way has also more longitudinal effects on a firm's AC and related innovation policy. Second we focus in this study on the difference between family firms and non-family firms. However we are aware that there is a lot of heterogeneity present within family firms. Future studies could delve deeper into this heterogeneity by collecting data on a family firm's Socio-Emotional Wealth or non-economic firm objectives. In addition more granular data on generational involvement and active versus passive family ownership could be collected to uncover differences in this mediation relationship of PMS design and use and an SME's AC. Third the more general caveats with respect to survey research also apply to this study (e.g. Bedford and Speklé, 2018), however when developing the research design of this study, we were very careful to include suggestions made in the literature to accommodate the criticism with respect to the design of surveys.

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Appendix

Questionnaire items

Absorptive Capacity

Please indicate to what extent you agree or disagree with the following statements

1. Strongly disagree
2. Disagree
3. Rather disagree
4. Neutral
5. Rather agree
6. Agree
7. Strongly agree

Potential AC

1. The search for relevant information concerning our industry is every-day business in our company
2. Our management motivates the employees to use information sources within our industry
3. Our management expects that the employees deal with information beyond our industry
4. In our company ideas and concepts are communicated cross-departmental
5. Our management emphasizes cross-departmental support to solve problems
6. In our company there is a quick information flow, e.g., if a business unit obtains important information it communicates this information
7. Our management demands periodical cross-departmental meetings to interchange external developments, problems, and achievements

Realized AC

1. Our employees have the opportunity to structure and use self-collected knowledge
2. Our employees are used to absorbing external knowledge
3. Our employees process external knowledge and make it available for further purposes
4. Our employees successfully link existing knowledge to external insights
5. Our employees are able to apply external knowledge in their practical work
6. Our management supports the development of prototypes
7. Our company regularly reconsiders technologies and adapts them accordant to external knowledge
8. Our company has the ability to work more effectively by adopting external technologies

Family firms

Please indicate which statements apply to your company (multiple answers are possible) (a family refers to people who are linked by blood or marriage)

1. More than 50% of the property is in the control of one family
2. One family has a decisive influence on business strategy or succession planning
3. Two members (or more) of the management are from one family
4. The company is considered as a family business
5. None of the above answers apply

PMS design

How important are each of the indicators below in evaluating the company's performance?

1. Not important at all
2. Not important
3. Rather not important
4. Neutral
5. Rather important
6. Important
7. Extremely important

1. Operating income
2. Sales growth
3. Return-on investment (ROI)
4. Net cash flows
5. Costs per unit produced/or for services
6. Market share
7. Customer response time
8. On-time delivery
9. Number of customer complaints
10. Survey of customer satisfaction
11. Materials efficiency variance
12. Labor efficiency variance
13. Number of external product launches
14. Time-to-market for external products
15. Employee satisfaction
16. Employee turnover

Use of control information

Please assess the extent to which management (including the CEO) relies on the company's performance measures (KPIs) and budgets

1. Strongly disagree
2. Disagree
3. Rather disagree
4. Neutral
5. Rather agree
6. Agree
7. Strongly agree

Diagnostic use

1. To identify the critical variables (especially those factors leading to the achievement of the current strategy)
2. To set targets and objectives for those critical variables
3. To assess the achievement of those targets and objectives (monitoring - comparing the results with the expectations)
4. To obtain information to correct deviations between objectives and actual performance
5. To evaluate critical performance areas

Interactive use

1. To enable discussion in meetings of supervisors, subordinates and peers
2. To provide a shared view of the organization
3. To tie the organization together
4. To enable the organization to focus on common issues
5. To develop a common vocabulary in the organization

Environmental unpredictability

How predictable or unpredictable were the following actions or changes in the external environment over the past three years?

1. Very unpredictable
2. Unpredictable
3. Rather unpredictable
4. Neutral
5. Rather predictable
6. Predictable
7. Very predictable

1. Actions of customers
2. Actions of suppliers
3. Actions of competitors
4. Technological changes
5. Economic / regulatory changes

Strategy

How important are the following dimensions to your company?

1. Not important at all
2. Not important
3. Rather not important
4. Neutral
5. Rather important
6. Important
7. Extremely important

Low price

1. Low production costs
2. Low price

Differentiation

1. Providing high quality products
2. Provide unique product features / services
3. Make design changes and quickly introduce new products / services
4. Make quick volume and production mix changes
5. Adapt products and services to the needs of the customer

Delivery & service

1. Ensure fast delivery
2. Make reliable delivery promises
3. Provide effective after-sales service and support
4. Availability of products / services we provide

Tables

Table 1. Descriptive statistics

Construct and item description (Average variance extracted, Cronbach alpha, Composite reliability)	Mean	Standard deviation	Outer loading
Diagnostic Use (AVE=0.828, alpha=0.948, CR=0.960)			
To identify the critical variables (especially those factors leading to the achievement of the current strategy)	5.452	1.327	0.873
To set targets and objectives for those critical variables	5.490	1.331	0.927
To assess the achievement of those targets and objectives (monitoring - comparing the results with the expectations)	5.448	1.341	0.935
To obtain information to correct deviations between objectives and actual performance	5.371	1.311	0.924
To evaluate critical performance areas	5.323	1.290	0.889
Interactive Use (AVE=0.728, alpha=0.906, CR=0.930)			
To enable discussion in meetings of supervisors, subordinates and peers	5.324	1.448	0.864
To provide a shared view of the organization	5.323	1.287	0.871
To tie the organization together	5.316	1.343	0.899
To enable the organization to focus on common issues	5.476	1.215	0.854
To develop a common vocabulary in the organization	4.952	1.440	0.774
Potential AC (AVE= 0.512, alpha=0.804, CR=0.859)			
Our management motivates the employees to use information sources within our industry	4.838	1.246	0.582
Our management expects that the employees deal with information beyond our industry	4.733	1.340	0.553
In our company ideas and concepts are communicated cross-departmental	5.414	1.147	0.847
Our management emphasizes cross-departmental support to solve problems	5.738	1.050	0.831
In our company there is a quick information flow, e.g., if a business unit obtains important information it communicates this information	5.419	1.220	0.635

Our management demands periodical cross-departmental meetings to interchange external developments, problems, and achievements	5.419	1.228	0.748
Realized AC (AVE=0.583, alpha=0.869, CR=0.903)			
Our employees have the opportunity to structure and use self-collected knowledge	5.435	0.979	0.764
Our employees are used to absorbing external knowledge	5.290	1.127	0.843
Our employees process external knowledge and make it available for further purposes	5.038	1.161	0.853
Our employees successfully link existing knowledge to external insights	5.129	1.123	0.884
Our employees are able to apply external knowledge in their practical work	5.258	1.131	0.876
Our company regularly reconsiders technologies and adapts them accordant to external knowledge	5.878	1.178	0.502
Our company has the ability to work more effectively by adopting external technologies	5.879	1.160	0.506
PMS	5.414	0.905	-
Number of customer complaints	6.000	1.400	-
On time delivery	5.710	2.030	-
Labor efficiency variance	5.000	1.978	-
Employee turnover	5.767	1.480	-
Operating income	6.522	1.043	-
Sales growth	5.510	1.370	-
Return on investment	5.526	1.516	-
Net cash flows	5.876	1.302	-
Costs per unit produced	2.258	1.751	-
Market share	4.462	1.777	-
Customer response time	5.876	1.475	-
Survey of customer satisfaction	4.957	2.087	-
Employee satisfaction	6.238	1.226	-
Number of new product launches	4.552	2.007	-
Time-to-market for new products	4.419	1.873	-

Materials efficiency variance	4.957	2.227	-
Family firm status	0.667	0.471	-
Age	38.830	29.89	-
Size	86.786	101.984	-
Environment	4.183	0.953	-
Low Price	4.974	1.289	-
Differentiation	5.556	0.827	-
Delivery & Service	6.007	0.973	-
Manufacturing	0.376	0.484	-
Retail	0.262	0.44	-

N=210

Table 2. Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Potential AC	0.716													
(2) Realized AC	0.688	0.764												
(3) Diagnostic Use	0.195	0.236	0.910											
(4) Interactive Use	0.186	0.313	0.425	0.853										
(5) PMS	0.139	0.141	0.189	0.242	-									
(6) Family firm status	-0.183	-0.179	-0.037	-0.038	0.219	-								
(7) Age	-0.071	-0.030	-0.003	0.091	0.077	0.017	-							
(8) Size	-0.001	-0.077	0.153	0.097	0.080	0.037	0.115	-						
(8) Environment	0.075	0.004	-0.003	-0.013	-0.079	-0.123	-0.098	0.092	-					
(10) Low Price	-0.184	-0.288	-0.140	-0.109	0.169	0.119	0.049	0.080	-0.032	-				
(11) Differentiation	0.179	0.262	0.051	0.176	0.326	0.131	0.086	0.058	-0.224	0.016	-			
(12) Delivery & Service	0.189	0.229	0.072	0.074	0.361	0.096	0.027	0.056	0.050	-0.016	0.550	-		
(13) Manufacturing	-0.123	-0.216	-0.085	-0.100	-0.033	0.049	0.154	0.050	-0.071	0.264	-0.008	-0.109	-	
(14) Retail	-0.063	0.027	0.014	0.060	0.151	0.123	0.047	-0.017	0.042	-0.064	0.034	0.056	-0.463	-

N=210. Pearson bivariate correlations. Square-root of AVE shown on the diagonal.

Table 3. HTMT results

	Diagnostic Use	Interactive Use	Potential AC
Diagnostic Use			
Interactive Use	0.457		
Potential AC	0.199	0.202	
Realized AC	0.263	0.355	0.796

Table 4. Results of the structural path model.

Independent variables	**Dependent variables**				
	PMS	Diagnostic Use	Interactive Use	Potential AC	Realized AC
Direct effects					
Family firm status	0.465** (3.430)			-0.350* (2.371)	-0.345** (2.626)
PMS		0.224** (3.407)	0.251*** (3.571)		
Diagnostic Use				0.154* (2.294)	
Interactive Use					0.243** (2.886)
Controls		YES	YES	YES	YES
Specific indirect effect					
FF status → PMS → Diagnostic Use				0.016 [0.002 0.049]	
FF status → PMS → Interactive Use					0.028† [0.006 0.073]
R^2	0.048	0.094	0.117	0.158	0.275

N=210. Each cell contains the standardized path coefficients (t statistics) and [CI bias corrected].
† p < .10; * p < .05; ** p < .01, *** p<.001 Two-tailed. N=210.

Figures

Figure 1. Model of hypothesized relationships

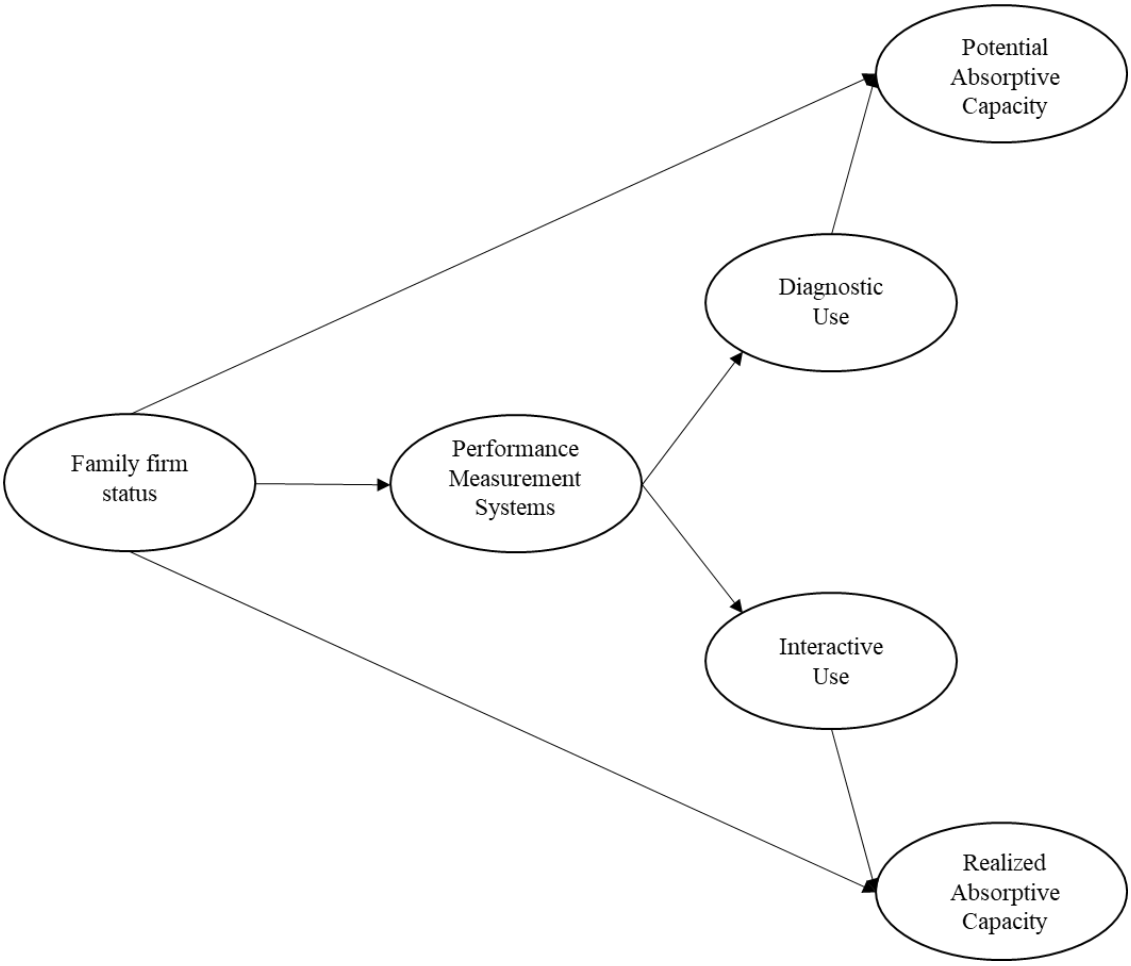
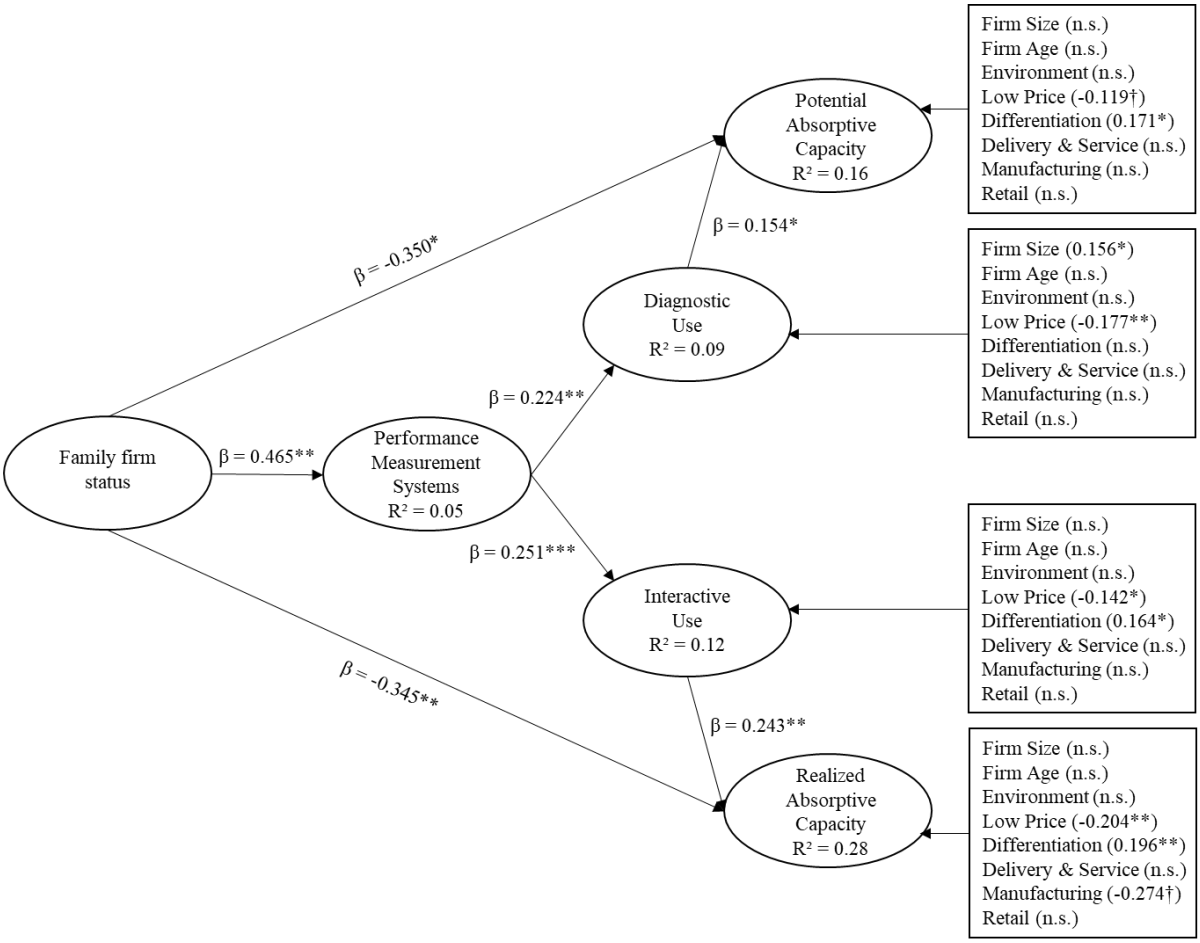
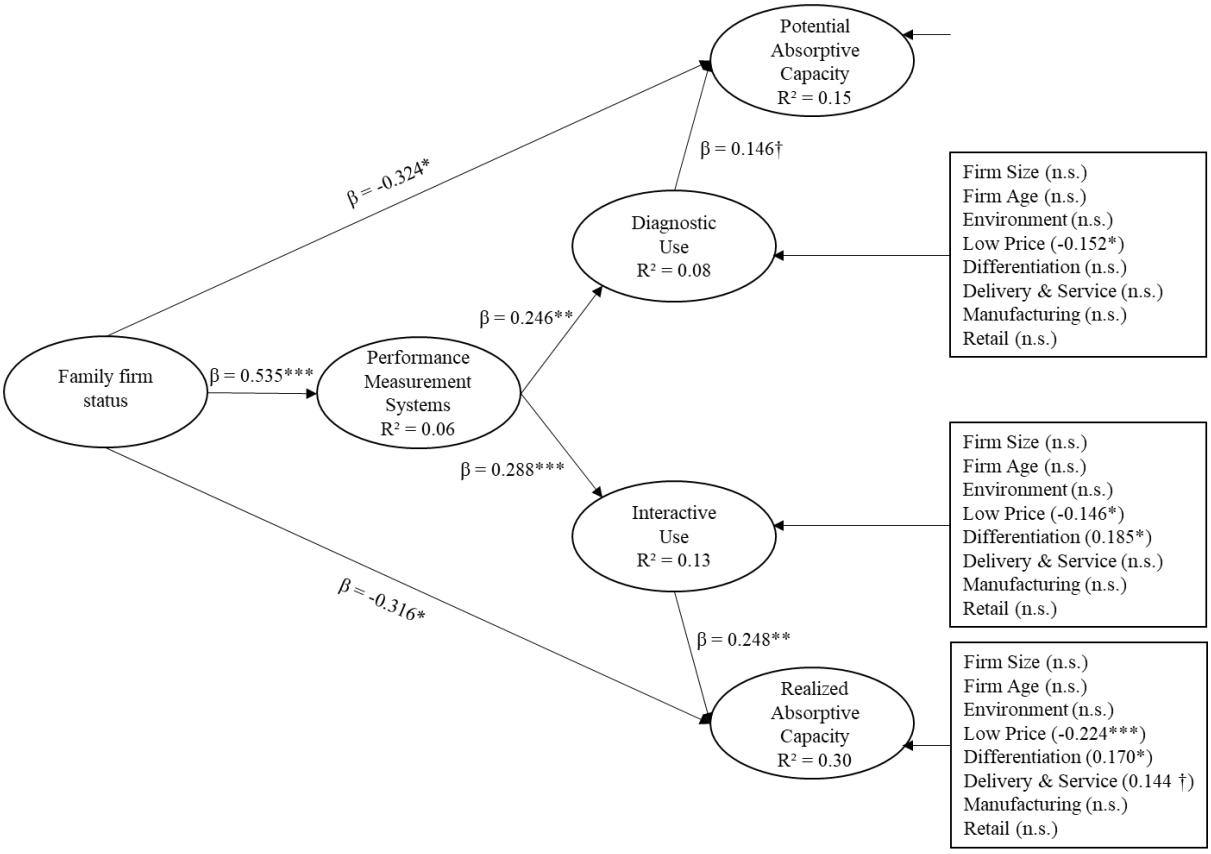


Figure 2. Structural model results



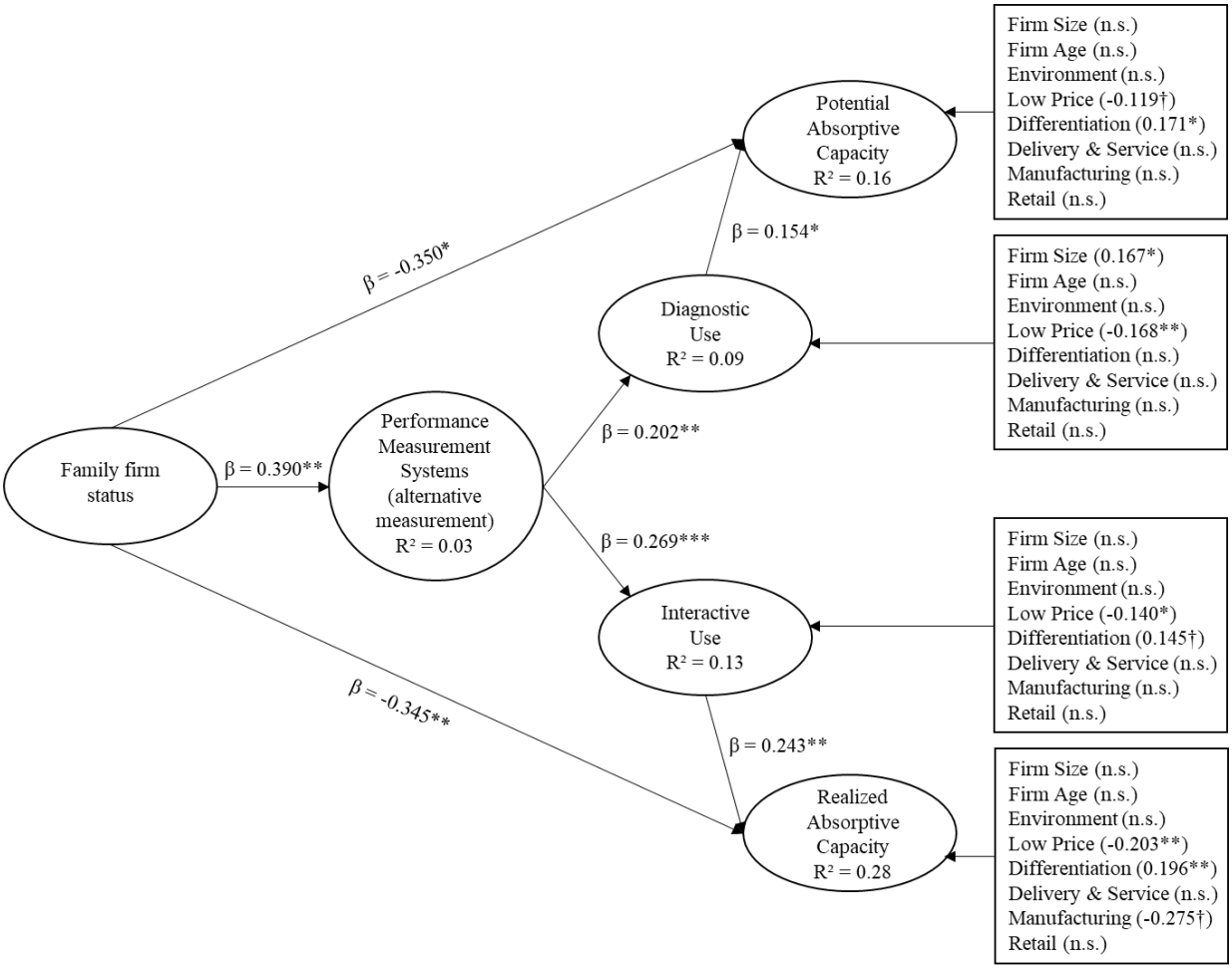
Note: N=210. † p < .10; * p < .05; ** p < .01; *** p<.001; n.s.: not significant

Figure 3. Structural model results for the sample with firms having fewer than 250 employees



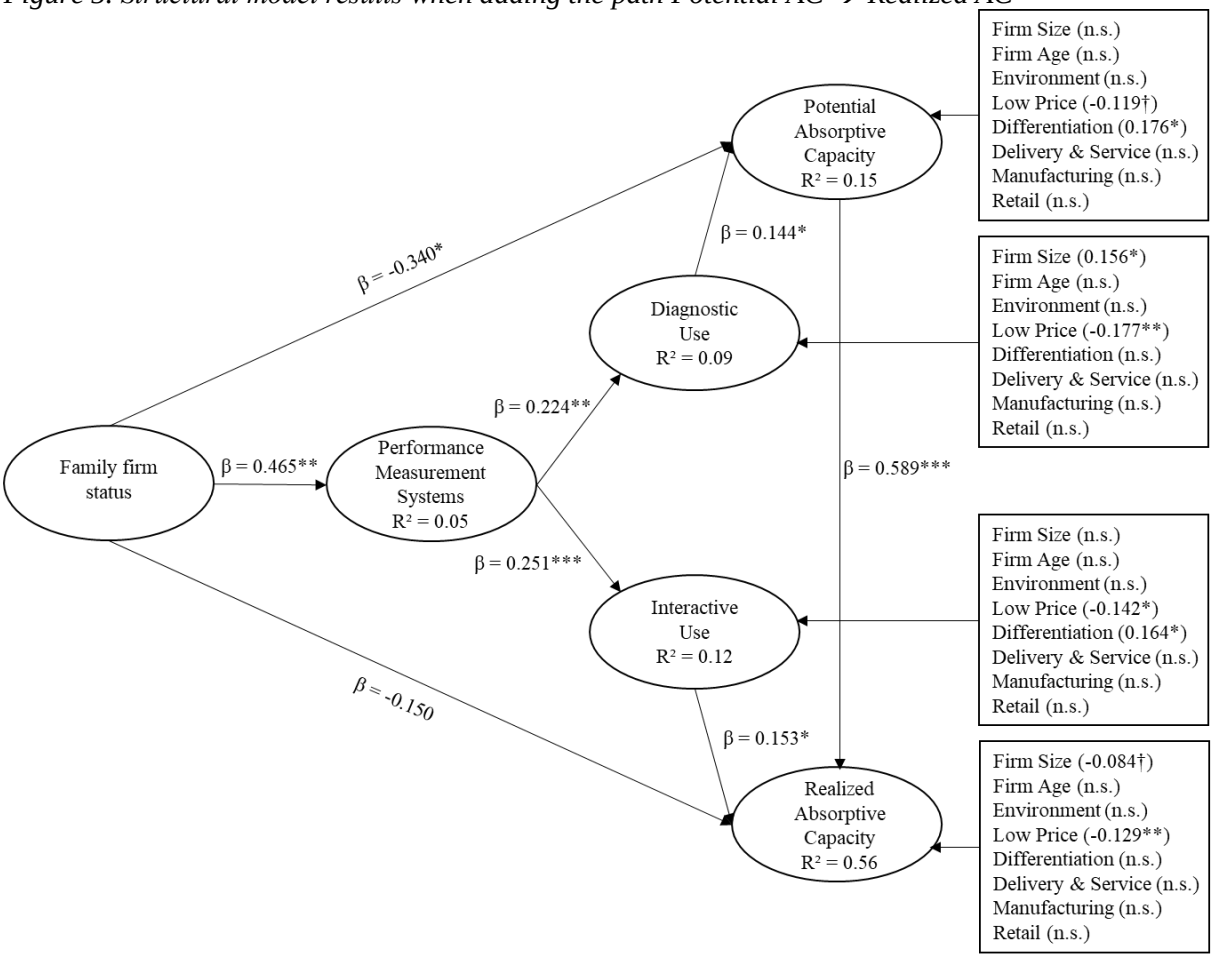
Note: N=188. † p < .10; * p < .05; ** p < .01; *** p<.001; n.s.: not significant

Figure 4. Structural model results with an alternative measurement of broad scope PMS



Note: N=210. † p < .10; * p < .05; ** p < .01; *** p<.001; n.s.: not significant

Figure 5. Structural model results when adding the path Potential AC → Realized AC



Note: N=210. † p < .10; * p < .05; ** p < .01; *** p<.001; n.s.: not significant

It Takes Two to Tango: Do Rankings and Resource Competition Influence the Collusive Dance?

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It Takes Two to Tango: Do Rankings and Resource Competition Influence the Collusive Dance?

Abstract

This study explores how internal reporting elements in a multi-agent capital budgeting setting, specifically performance rankings and resource competition, influence collusive behavior among managers. Given the increasing losses from fraud – especially collusive fraud – this study responds to the need for insights into managerial collusion dynamics. The online experiment involves two subordinates in a mutual monitoring framework, manipulating the presence of performance rankings and the level of resource competition by varying between two different funding rules, i.e., hurdle rate (non-competitive) and lowest cost funding (competitive). Findings indicate that collusion is significantly impacted by these factors. Specifically, a non-competitive funding rule combined with the presence of a ranking creates perceived equal power among managers, thus reducing collusion. This study makes a significant contribution to the accounting literature and has important practical implications emphasizing the role of management accountants in designing controls to mitigate ethical conflicts and fraud.

Keywords collusion; hurdle rate; perceived power; rankings; resource competition

1 Introduction

According to the most recent 'Report to the Nations' by the Association of Certified Fraud Examiners (ACFE, 2024) organizations lose, on average, five percent of revenue to fraud each year. Although prior accounting research predominantly focused on individual fraud and misreporting (e.g., Anand, Dacin, & Murphy, 2015; Brown, Evans, & Moser, 2009; Evans, Hannan, Krishnan, & Moser, 2001; Free & Murphy, 2015), most of the fraud cases are conducted by multiple collaborating perpetrators. This number is increasing over time: from 36.1 percent in 2008 to 47 percent in 2016 to 54 percent in 2024 (ACFE, 2008, 2024). Moreover, collusive fraud ($250,000) caused median losses more than three times as high as individual fraud cases ($75,000). Importantly, organizations also suffer from non-fraudulent collusion such as collusive rent extraction (Evans, Moser, Newman, & Stikeleather, 2016; Maas & Yin, 2022; Nikias, 2019; Way, 2022; Zhang, 2008). In budgeting, collusive rent extraction may occur since the budgeting mechanisms in place require interactions among division managers (Chen, 2003). Because of these significant losses due to employee collusion, it is important to understand how elements of the internal reporting environment impact collusive behavior. In this study, we focus on a multi-agent capital budgeting setting in which mutual monitoring is present and investigate the impact of rankings and resource competition, induced by different funding rules, on collusion. We define collusion as the cooperation or coordination among managers that is not in the firm's best interest (cf. Maas & Yin, 2022; Way, 2022; Zhang, 2008).

Although peer reporting or mutual monitoring contracts in which managers report both their own as well as their peer's costs should, economically, work truth-inducing, they are not fully collusion proof (Evans et al., 2016; Way, 2022; Zhang, 2008). We therefore study how collusion is impacted by two specific design elements of a capital budgeting process with unequal project

costs under a mutual monitoring contract. First, we argue that rankings based on own payoff (see Brown, Fisher, Sooy, & Sprinkle, 2014) impact collusion. Managers' own payoff reflects project performance since it represents the difference between the budgeted cost and the implementation cost. The larger the difference, the more efficiently the project was implemented (compared to the budget). Although a ranking does not impact managers' payoff (i.e., we do not study a setting with a tournament prize), managers strive for the highest rank (Festinger, 1954). Moreover, due to unequal project costs, managers start from an unequal position which becomes more salient when a ranking is present. Since people are inequity averse, they will try to move in the direction of more equitable outcomes (Fehr & Schmidt, 1999), i.e., an equal chance to be ranked first. However, funding rules determine managers' power positions, and hence their ability to enforce a more equitable outcome, in this non-monetary competition. In particular, different funding rules may result in different levels of resource competition among managers (cf. Nikias, 2019). When the funding of one project depends on the reported cost of another project because only the project with the lowest cost receives funding, resource competition is induced. When all projects with a cost below a certain profitability threshold (i.e., hurdle rate) receive funding, on the other hand, resource competition is absent. When resource competition is absent, all projects can receive funding which results in equal power positions for managers. When a ranking is then introduced, managers have an equal chance to be ranked first when reporting honestly. Alternatively, they could coordinate their actions and collude, but due to the increased coordination risk and high required level of trust, this is less likely. As such, when resource competition is absent, we expect rankings to decrease collusion. When resource competition is present, however, managers with higher project costs are in a weaker position. Since their project can only be funded by colluding, we expect rankings to lose their ability to decrease collusion.

We conducted an online experiment on Prolific with a 2 (rankings) × 2 (resource competition: hurdle rate versus lowest cost) between-subjects design to test these effects. In particular, we used a multi-agent capital budgeting task (similar to Evans et al., 2016; Way, 2022) in which two subordinates privately observed the actual estimated project costs for their own project and the other subordinate's project. Subordinates reported their own as well as their peer's project cost to the firm (i.e., mutual monitoring), facing an incentive for honest reporting that outweighs the incentive to (collusively) extract rents from the firm (i.e., include budget slack). Within this setting, we manipulated whether or not subordinates are ranked after project implementation on their payoff. We further manipulated the level of resource competition by distinguishing two funding rules, determining acceptance of a project based either on the lowest cost (i.e., resource competition present) or on a hurdle rate (i.e., resource competition absent).

Our results show, as predicted, a significant ordinal interaction effect such that rankings decrease collusion when resource competition is absent and resource competition increases collusion when rankings are being used. Process evidence reveals that managers' perceived power is impacted by our manipulations. Importantly, in the experimental condition where collusion significantly drops (i.e., resource competition absent and rankings present), both managers perceive an equal level of power, which is in line with our theory. Our results are robust for using collusion initiation as an alternative dependent variable. We also perform additional analyses on the level of misreporting.

Our study contributes to the literature in three important ways by studying the under-researched phenomenon of collusion and, in particular, how two independent control practices jointly influence collusive behavior of managers in a budgeting context (Gondowijoyo, Hayne, & Murphy, 2021; Luft, 2016). First, we extend prior management accounting studies on collusion in a budgeting setting (Evans et al., 2016; Nikias, 2019; Way, 2022). In particular, we add to these

experimental budgeting studies by explicitly focusing on unequal cost pairs for managers. While prior research often focused on settings where managers' project costs are equal (e.g., Way 2022), in practice, project costs are often unequal. These unequal costs introduce important dynamics, such as managers' perceived power, and it is crucial to gain more insight into the consequences of these dynamics for employee collusion. As such, our study tests the boundary conditions of the implications of prior studies. Hannan, Towry, et al. (2013) explicitly call for more literature on asymmetric tournaments, where some employees possess advantages over others. Responding to this call, our theory and results imply that when project costs are unequal, power positions between managers can be neutralized by combining a non-competitive funding rule with rankings, resulting in a strong decrease in collusion.

Second, we respond to calls to study the interdependence of the decision facilitating and decision influencing role of accounting information (Sprinkle, 2003; Sprinkle & Williamson, 2007). Budgets are one of the most widely used tools for planning and controlling. In particular, budgets may be used for resource allocation (decision facilitation) as well as for performance evaluation (decision influencing). In this experimental study, we manipulated two aspects of the internal reporting environment which reflect both roles of managerial accounting information (i.e., decision facilitation and decision influencing). First, funding rules determine resource allocation. Second, rankings provide relative performance information. Hence, this study contributes to both literature and practice by studying how both roles of managerial accounting information interact and stimulate or dampen the understudied phenomenon of employee collusion. Specifically, we show that collusion decreases when rankings are combined with a non-competitive funding rule.

Third, we also contribute to an extensive body of research focusing on mutual monitoring contracts. Past literature (e.g., Zhang, 2008) has often emphasized the truth-inducing mechanism of mutual monitoring schemes as part of the larger management control system. However, follow-

up studies (e.g., Hannan, Towry, & Zhang, 2013) have shown that this may not always be the case. More specifically, given that mutual monitoring reduces horizontal information asymmetries, it also creates opportunities for collusive behavior among managers. Therefore, it is important to look at how these mutual monitoring schemes, which are an integral part of budgeting processes, interact with other management control practices, such as funding rules, which have the goal to increase the effectiveness of the budgeting process, and rankings, which may also be implemented to increase managerial honesty (Brown et al., 2014). Our study shows that it is critical to align both practices such that the decrease in collusion, initiated by mutual monitoring, can be further strengthened. In particular, our results reveal that the use of rankings further decrease collusion only when resource competition is absent. These insights have important practical implications. In particular, both academia (e.g., Endenich & Trapp, 2020) and practice (e.g., IMA Management Accounting Competency Framework, 'Professional Ethics & Values' pillar) acknowledge the important role that management accountants play in applying internal control expertise and designing procedures that reduce the likelihood of fraud and ethical conflicts.

2 Literature review and hypothesis development

2.1 Related studies on collusion

The number of collusive frauds, as compared to single-perpetrator frauds, has increased substantially over the past decade, from 36.1 percent in 2008 up to 54 percent in 2024 (ACFE, 2008, 2024). One potential cause for this may be the change in organizations' information environment. In particular, opportunistic behavior by employees due to information asymmetry has always been a key concern for organizations. When both horizontal and vertical information

asymmetry[1] are present, individual employees have the opportunity to exploit this informational advantage by privately extracting rents from the organization (e.g., Brunner & Ostermaier, 2019; Cannon & Thornock, 2019; Guo, Libby, Liu, & Tian, 2020; Maussen, Cardinaels, & Hoozée, 2024). However, increases in organizational transparency, more open information environments, and an emphasis on the benefits of information and knowledge sharing have successfully decreased horizontal information asymmetries within organizations. Notwithstanding the large number of benefits created through open information environments, it also provides an opportunity for collusive behavior among employees (Evans et al., 2016; Guo, Huo, & Libby, 2023; Hannan, Towry, et al., 2013; Maas & Yin, 2022; Towry, 2003; Way, 2022; Zhang, 2008). More specifically, when peer managers have more access to each other's private information, they might cooperate and coordinate their behavior. Although cooperation may lead to positive outcomes for the firm, it may also result in collusively extracted rents.

As a response to this potential increase in collusion, organizations often implement mutual monitoring contracts to diminish agency problems caused by vertical information asymmetries (e.g., Towry, 2003; Zhang, 2008). In mutual monitoring or peer reporting contracts, managers report both their own private information as well as their peer's private information, which is observable because of a more open information environment. Typically, these contracts include an incentive for honest reporting. As such, in these contracts, managers' dominant strategy is to report honestly. Such truth-inducing contracts, should, from a wealth-maximizing point of view, deter collusion because managers have conflicting objectives. These conflicting objectives should increase coordination risk among potential colluders and, therefore, result in lower levels of trust

[1] Horizontal information asymmetry refers to information asymmetry between employees on the same hierarchical level. Vertical information asymmetry refers to information asymmetry between a subordinate and superior, on different hierarchical levels.

among managers. However, prior research has shown that, although mutual monitoring might limit collusion, it does not eliminate it (e.g., Evans et al., 2016; Way, 2022; Zhang, 2008). In other words, the impact of mutual monitoring alone is not sufficiently strong to decrease perceived trust among colluders to such an extent that misreporting is prevented. Hence, it is important to understand when collusion occurs and how it can be prevented under a mutual monitoring contract.

The main focus of recent prior research on collusion was on the transparency or openness of internal reporting in which the communication between a manager and a superior was transparent to peers or not (Evans et al., 2016; Maas & Yin, 2022; Way, 2022). Evans et al. (2016) find that an open internal reporting environment, where managers can observe a peer's communication with the supervisor, increases collusion as compared to a closed internal reporting environment. Second, Way (2022) replicates the findings from Evans et al. (2016) in a repeated-interaction setting. In particular, he shows that the frequency of collusion between managers in a repeated-interaction setting is largest when one can view the other's report before making their own (i.e., open internal reporting). Furthermore, when the slack obtained from misreporting is shared with a non-reporting employee, misreporting increases even more (Way, 2022). Maas and Yin (2022) add that revealing how kindly managers are treated by their superiors helps managers to seek for potential colluders. Taken together, these studies clearly show that environments that decrease the need for trust among colleagues (e.g., open internal reporting environments) create a fruitful setting for collusion. In particular, without the possibility to observe peer or superior behavior, managers have to trust each other for successful collusion, which typically decreases collusion, whereas reciprocity is the driving force in more transparent settings.

In the following sections we will first elaborate on the basic setting that we are studying. Next, we will develop our hypotheses on how rankings and resource competition as two specific design elements of a capital budgeting process influence collusive behavior.

2.2 Basic setting

We study a multi-agent capital budgeting setting similar to Evans et al. (2016) and Way (2022) in which two managers (i.e., subordinates) have private information regarding their own and their peer's estimated cost. As such, this setting induces vertical information asymmetry while alleviating horizontal information asymmetry. In this setting, our key interest is collusive behavior among managers. Managers complete a budgeting task in which they report their estimated cost while facing incentives to overstate this cost and, thus, to include budget slack. However, a truth-inducing mutual monitoring contract is in place such that managers' incentive to report both their own as well as their peer's project cost honestly outweighs the incentive to misreport (cf. Evans et al., 2016; Way, 2022; Zhang, 2008). In the presence of mutual monitoring, both managers have to report their own project cost, as well as their peer's project cost. Only when both reports match (i.e., both managers report the same cost for a project), the budget is accepted by the firm without having the cost report audited. In other words, one manager's payoff is dependent upon the other manager's verification (Zhang, 2008). The presence of mutual monitoring introduces coordination risk which should limit collusive reporting among managers.

Although our setting is very similar to Evans et al. (2016) and Way (2022), it differs in three important ways. First, both Evans et al. (2016) and Way (2022) manipulate whether there is a closed or an open internal reporting environment. In the closed reporting condition, neither manager observes the other's report before making their own report. In the open reporting condition, managers observe the other manager's report before making their own report, but the other manager cannot see their report. Since this open internal reporting environment triggers reciprocity (Evans et al., 2016), our setting focuses on a closed internal reporting environment in which neither manager observes the report from the other manager before submitting their own report. This allows us to exclude effects of reciprocity and focus on trust between managers.

Second, in our experimental design, we rely exclusively on unequal project cost pairs across the different periods whereas Evans et al. (2016) combine equal and unequal project cost pairs and Way (2022) only relies upon equal project cost pairs in each period. The presence of unequal cost pairs is an important design feature in our study, because it will potentially place one manager in a weaker position than the other manager due to less available budget slack to include in the budget proposal, and is an integral part of our theory. This may influence managers' collusive behavior, depending upon the controlling environment in which they operate.

Third, we include an exogenous shock that impacts projects' actual costs during project implementation, reflecting the uncertainty around project implementations that is present in reality. As such, managers observe the *estimated* cost for which they make a budget proposal. After the funding decision of the firm, the exogenous shock impacts the project's actual implementation cost (within specific limits) which also affects manager's payoff.[2]

Within this specific setting, we study the (joint) impact of rankings based on project implementation performance and the presence versus absence of resource competition on managers' collusive behavior.

2.3 Hypothesis development

Organizations typically use rankings, containing relative performance information, to increase employees' motivation, effort, performance, and honesty levels (e.g., Brown et al., 2014; Hannan, McPhee, Newman, & Tafkov, 2013; Newman & Tafkov, 2014; Tafkov, 2013). In particular, the presence of a ranking induces non-monetary competition among employees. Social comparison theory states that individuals frequently experience an upward drive motivation to

[2] Besides external validity, it also provides internal validity. Specifically, this is a necessary design choice to prevent managers from knowing each other's exact payoff which would enable them to rank themselves, even in the ranking absent conditions, which would make our manipulation of rankings redundant.

exceed others' performance and that they will take actions to improve their performance to achieve a more favorable comparison (ranking), even when no financial incentives are tied to the position in the ranking (Festinger, 1954). In our budgeting setting, ranking managers based on their own payoff is relevant (see Brown et al., 2014), since it reflects project performance. Given managers' unequal project costs, their available slack or potential payoff differs. Managers with higher project costs are more likely to earn a lower payoff than their colleague and thus to receive a lower rank when colluding instead of reporting honestly. Since people are inequity averse (Fehr & Schmidt, 1999), and rankings make inequality between managers more salient, reaching a collusive agreement will be more difficult. As such, we expect that the non-monetary competition introduced by rankings can decrease collusion in a setting with unequal project costs. Importantly, these arguments assume that, by reporting honestly, all managers have equal power positions when rankings are present, meaning that they have an equal chance to get their project funded and to be ranked first. However, since funding decisions depend on the level of resource competition in the firm, we argue that the ability of rankings to decrease collusion depends on the absence versus presence of resource competition.

Firms can have different levels of resource competition depending on their funding rules to accept or reject budget proposals. Hurdle rates and only accepting the project with the lowest cost, for example, are common techniques to decide which projects to fund (Arya, Glover, & Young, 1996). If the firm implements a hurdle rate reflecting the minimum profitability of a project, it accepts all projects with a cost below a certain threshold. In this situation, there is no resource competition among managers. On the contrary, if only those projects with the lowest cost receive funding, resource competition is present (cf. Nikias, 2019).

When resource competition is absent, all projects can be funded without the necessity of misreporting any project costs, as long as the project costs are below a certain threshold. Thus,

when rankings are present, managers have equal power positions and those managers with higher initial costs have the ability to enforce an equitable outcome by reporting honestly. Specifically, all managers have an equal chance to be ranked first when reporting honestly. Hence, this ranking should allow managers with higher project costs to at least partially resolve the initial imbalance which was created by unequal project costs. Although both managers miss out on the financial payoff they could obtain by colluding to the maximum extent, we argue that they will collude less and, thus, report more honestly when rankings are present than when they are absent. More specifically, if managers would try to negotiate a collusive agreement, the manager with the lowest project cost has an initial advantage (i.e., the lowest project cost allows for more budget slack to be included) which they may want to exploit. Exploiting this initial advantage would allow them to easily outperform the other manager in the ranking. These conflicting objectives, due to inequity aversion, result in a higher necessity of trust between managers and a higher level of perceived coordination risk,[3] making successful collusion less feasible when rankings are present. We thus expect that rankings decrease collusion when resource competition is absent.

When resource competition is present, on the contrary, managers with higher project costs have a weaker power position as only the project with the lowest cost gets funded. If they strive for project acceptance, they have to convince the other manager to misreport the cost of their project such that the project costs are equally high. Only then, both projects will be funded. Thus, we expect that managers will reach out more and try harder to form collusive agreements.[4] By colluding, the manager with the lower initial project cost is still more likely to have the best project

[3] Managers have to coordinate their actions if they both want to receive funding. Hence, they have to form a collusive agreement and report the same cost for both projects. If one of the potential colluders decides not to honor this collusive agreement and reports a lower cost, the other manager's project does not receive funding.

[4] Although a coordination risk exists and managers have to rely upon trust, it is reasonable to believe that when managers reach a collusive agreement, they will honor these agreements because people are guilt averse (Ellingsen, Johannesson, Tjøtta, & Torsvik, 2010).

performance (i.e., highest payoff). When rankings are introduced, this manager will thus likely be ranked first. Although we expected managers with higher project costs to enforce equitable outcomes when resource competition is absent, we argue that they are more likely to accept the lower rank when resource competition is present. In particular, the combination of resource competition and rankings puts them in a weak position. Since we expect them to strive for project acceptance – because without project acceptance, there is no project to be ranked – they will have to accept the lower rank and are not able to enforce equitable outcomes. Furthermore, their weak power position caused by the resource competition within the firm results in feelings of unfairness, causing these managers to behave more opportunistically towards the firm compared to when resource competition is absent. Thus, although Nikias (2019) concluded that a higher level of resource competition results in less collusion, we argue that, under unequal project costs, resource competition increases collusion when rankings are present and prevents rankings from decreasing collusion.

In sum, we predict an ordinal interaction effect between rankings and resource competition. Specifically, we formulate the following hypotheses:

H1a: Rankings based on project implementation performance decrease collusion when resource competition is absent (i.e., hurdle rate contract), but not when resource competition is present (i.e., lowest cost contract).

H1b: Resource competition increases collusion when a ranking based on own payoff is present, but not when such ranking is absent.

Figure 1 graphically presents our hypothesized effects, based on the reasoning above.

-- Insert Figure 1 here --

3 Methodology

3.1 Experimental design and participants

We performed an online experiment in Lioness Lab (Giamattei, Yahosseini, Gächter, & Molleman, 2020). We recruited 614 participants via the online platform Prolific. To participate in the experiment, participants should be between 18 and 65 years old, should at least be parttime employed, have an approval rate of at least 98 percent, be native English speakers, and should be living in the US or the UK. Demographics show that 20.9 percent is living in the US and 47.1 percent is female. On average, participants are 37.5 years old (S.D. 11) and have 1,016 approvals in Prolific (S.D. 1,472).

Our experiment had a 2 (ranking) × 2 (resource competition) between-subjects design in which we manipulated whether rankings were absent versus present and whether funding was based on a hurdle rate (i.e., resource competition absent) or on the lowest cost (i.e., resource competition present). Participants were randomly assigned to one of the four experimental conditions. All participants assumed the role of subordinate and worked in randomly assigned pairs, which were re-matched in the second period to represent a "one-shot setting" and to exclude reputational effects. Our experiment consisted of two periods. 560 participants successfully completed both periods, resulting in 560 (= 560 / 2 managers × 2 periods) unique reporting pairs. In addition, we have 44 participants who completed only the first period,[5] resulting in 22 (= 44 / 2 managers) additional reporting pairs. In total, we have 582 unique reporting pairs or 1,164

[5] We made groups of four participants to play two reporting periods with re-matching. When one of these four participants dropped out of the study during the reporting periods (i.e., during the game), the experiment also ended for the remaining three participants. When the dropout occurred in the second period, the remaining participants were re-directed to the PEQ. We do not have data on their second period, but we have their first period data and their answers to the PEQ. Groups in which participants dropped out during the first period are not included in our dataset, because we do not have any usable data for these participants. When a participant dropped out before the game started, all other participants could proceed, because the groups were formed "on the fly" right before the game (period 1) started. Due to technical issues, 5 dyads (10 participants) had to be deleted because reported costs were not registered or chat messages could not be sent.

observations. In line with Evans et al. (2016), we did not have participants assume the role of the firm.

To check whether our random assignment to treatment was successful, we performed a χ^2 on gender and one-way ANOVAs on variables that we expect to be similar across conditions (i.e., clarity of the instructions, whether the task was fun to perform, task motivation, experience with reporting tasks, total approvals on Prolific, and age). We do not find significant differences across conditions (all $p \geq 0.377$), suggesting that randomization was successful.

3.2 Experimental task

Our experimental task is adapted from prior collusion experiments in a capital budgeting setting (Evans et al., 2016; Way, 2022). In particular, two subordinates (i.e., subordinate A and subordinate B)[6] privately observed the estimated project costs for their own project and the other subordinate's project and made a budget proposal about both project costs to the (hypothetical) firm under a peer reporting contract, i.e., mutual monitoring (cf. Evans et al., 2016; Towry, 2003; Way, 2022; Zhang, 2008). In each period, subordinate A managed project A and subordinate B managed project B. Importantly, project B's estimated cost (C_B) was always higher than project A's estimated cost (C_A). The firm only knew that possible estimated costs for each project ranged from 10 to 100 lira.[7,8] Relying upon the funding rule in place, which depended on the experimental condition, the firm decided whether or not to implement the projects. As such, subordinates could

[6] In the experiment, we referred to the 'orange manager' and the 'blue manager'.
[7] Lira is an experimental currency converted to pounds at an exchange rate of 100 lira = £1.
[8] In every period, each subordinate pair observed one of the following pairs of actual estimated costs, (C_A, C_B): (16, 32) and (51, 61). We pre-selected actual estimated cost pairs prior to the experimental sessions to ensure that all subordinate pairs would act on the same cost information which facilitates comparisons across conditions. We randomly selected C_A in each cost pair as an amount between 10 and 80 and then randomly determined C_B on the condition that it should be minimum 10 lira and maximum 20 lira higher than C_A to ensure that project B's estimated cost always outweighs project A's estimated cost. We deliberately chose to limit the difference between project A's and project B's costs to 20 such that there is a small chance that project B could get ranked above project A to ensure that our manipulation of rankings is not redundant. Without this small chance, participants would always be able to rank themselves, even in the rankings absent conditions.

obtain slack from the firm by reporting a higher cost and the firm decided to implement the project. However, the peer reporting contract could trigger an additional audit. More specifically, in line with prior research (Evans et al., 2016; Way, 2022; Zhang, 2008), if subordinates A and B reported different costs for a project, the project is audited; otherwise no audit was conducted. An audit always revealed the actual estimated cost of the project to the firm and resulted in not implementing the project if the project manager overstated the cost. Importantly, each subordinate always had a financial incentive to report honestly to the firm because of this audit bonus. Hence, this peer reporting contract has a truth-inducing role which results in the economic prediction that both subordinates will report both project costs honestly.

3.3 Procedure

Participants first read the instructions and participated in a practice tool.[9] They then took a quiz to ensure they understood the task and the payoff structure. They had to answer all questions correctly before they could move on to the lobby (i.e., waiting stage). When four participants proceeded to this stage, a group was formed "on the fly" and proceeded to the budgeting game. Participants were assigned to the role of subordinate A or subordinate B and remained in this role in both budget reporting decision periods. One subordinate A is matched with one subordinate B and in the second period they were re-matched. Figure 2 summarizes the procedure within a period. In each period, subordinates observed the estimated cost for their own project and for the project of the other subordinate. In the experiment, we referred to the observed costs. Subordinates received three minutes to communicate privately with each other via a chat box. We did not provide subordinates with guidelines as to what should be discussed, but we asked them not to share any

[9] The practice tool included a calculation exercise in which participants had to calculate their payoff based on an example. They could not proceed before their calculation was correct. This served as a strong attention check to make sure our participants understood the instructions before starting the budgeting game and to limit dropouts during the game.

personal information (as in Evans et al., 2016; Hannan, Towry, et al., 2013; Way, 2022). Subordinates then privately reported the cost of both projects (of their own and the other subordinate) to the firm, choosing any amount between the observed cost and 100 lira (in increments of 1 lira). Subordinates did not observe the other subordinate's cost report before submitting their own cost report, representing a closed internal reporting setting (Evans et al., 2016). After submission of both cost reports, the funding rule in place was applied and it was communicated to subordinates whether their project and the other subordinate's project were funded or not. If an audit was conducted, the result of this audit was also shown. Next, the funded projects were implemented and an exogenous shock took place. The shock was a random amount between [-10; 10] (in increments of 1 lira) and was independent across participants and periods (cf. Hannan, Towry, et al., 2013). The purpose of this exogenous shock was to prevent that subordinates knew each other's exact payoff. Without the exogenous shock, our peer reporting contract would induce that subordinates know each other's exact payoff such that, even in the rankings absent conditions, subordinates were able to rank themselves which would make our manipulation of rankings redundant. Depending on the experimental condition, in the next stage, a ranking was displayed representing relative performance ranking of the projects. At the end of each period, subordinates observed their own payoff of this particular period. The experiment ended with a post-experimental questionnaire (PEQ), which included process variables, manipulation checks, control variables, and demographics. We use seven-point Likert scales to measure all variables in the PEQ, except for the demographics and manipulation checks.

-- Insert Figure 2 here --

3.4 Experimental factors

Our first manipulated factor is whether relative performance rankings are present or absent after implementation of the funded projects. When a ranking was present, subordinates were ranked based on their payoff from highest (first) to lowest (second). Importantly, the ranking did not impact participants' payoff, i.e., there was no tournament prize or something similar. When a ranking was absent, this stage was skipped. This manipulation is similar to the *Own Compensation Ranking condition* in Brown et al. (2014).

Our second manipulated factor is the funding rule in place to decide whether projects' cost reports will be accepted or rejected. We manipulated this experimental factor at two levels. Under a hurdle rate funding rule, all projects with a reported cost lower than 100 lira were always accepted, while projects with a reported cost above that threshold were always rejected. As such, subordinates' projects were not in competition with each other for the allocation of resources. In line with Evans et al. (2001), the hurdle rate was communicated to subordinates. Hence, we excluded the effects of uncertainty around project acceptance or rejection. Under the competitive funding rule, funding one subordinate's project depended on the other subordinate's cost report (Nikias, 2019). In particular, only the lowest cost report was funded. Only if both projects had the same reported cost, both projects were funded (cf. Arya et al., 1996). Hence, subordinates competed for resources and they could obtain funding for both projects only when they coordinate their reported costs. This type of funding rule can be thought of as a hurdle rate which is not fixed, but rather updated or moved by the firm, based upon the submitted cost reports by the subordinates (Arya et al., 1996).

We performed two direct and three indirect manipulation checks. We directly asked participants in the PEQ whether they were ranked based on their payoff. 19.7 percent of our participants failed this manipulation check. In the second direct manipulation check, we asked

participants whether the funding rule in the experiment restricted funding to the projects with the lowest cost or allowed any project with a cost up to 100 lira to be funded. 25.2 percent of our participants failed this manipulation check.[10]

Due to the relative high number of failed manipulation checks, we also report three indirect manipulation checks. In particular, our setting in which managers face unequal project costs, assumes and heavily builds upon the competition between both managers. In the PEQ, we measured two items related to perceived resource competition. We argued that a funding rule based on lowest cost introduces resource competition between both managers. Since managers A face a lower project cost than managers B, managers A can be expected to feel more convinced about their project's acceptance. Managers A indeed score higher on the PEQ item "The chances of getting my project funded were very high" than managers B under a lowest cost contract ($t_{(283)}$ = 5.877, p < 0.001) and not under a hurdle rate contract ($t_{(298)}$ = -1.123, p = 0.262). In contrast, Managers B indeed score higher on the PEQ item "My peer's chance of getting their project funded was very high" than managers A under a lowest cost contract ($t_{(283)}$ = 3.225, p = 0.001) and not under a hurdle rate contract ($t_{(298)}$ = 0.514, p = 0.607). In addition to resource competition induced by the funding rule, we expected rankings to introduce non-monetary competition. We measured perceived competition based on the PEQ item "I felt that competition was high between me and my peer". We performed an ANOVA test on perceived competition with Funding rule and Rankings as independent variables. Untabulated results show a significant main effect of Funding rule ($F_{(1, 585)}$ = 22.176, p < 0.001), a significant main effect of Ranking ($F_{(1, 585)}$ = 4.557, p = 0.033), and a non-significant interaction effect ($F_{(1, 585)}$ = 0.109, p = 0.741). In sum, we conclude that our

[10] Excluding participants who failed one or both manipulation checks does not impact our results.

manipulations successfully induced resource competition (funding rule) and non-monetary competition (rankings).

3.5 Payoff structure

All subordinates faced the same payoff structure across all conditions. A subordinate's payoff could vary across periods depending on the estimated cost of their project for the period, the subordinate's reported cost for the period, the other subordinate's reported cost for the period, and the random exogenous shock. To avoid wealth effects, final payoffs were determined based on one randomly chosen period. In addition, all participants received a fixed participation fee of £4.

Subordinate's payoff = base wage + project slack +/- exogenous shock + audit bonus

(i) Base wage: 10 lira or zero. Each subordinate received a base wage of 10 when their own project was funded. When a project was not implemented due to the funding rule in place or an audit which revealed project cost overstatement, the base wage equaled zero. We set the size of the base wage equal to the maximum payoff loss caused by the exogenous shock, such that participant's payoff cannot be negative. As such, we excluded the possibility that subordinates would justify an overstatement of 10 lira based upon uncertainty around the exogenous shock to prevent a negative payoff.

(ii) Project slack: reported cost – observed cost, or zero. Each subordinate received the claimed slack for their implemented project. When a project was not implemented due to the funding rule in place or an audit which revealed project cost overstatement, the project slack equaled zero.

(iii) Exogenous shock: any amount between -10 lira and +10 lira (in increments of 1 lira), or zero. Each subordinate's payoff was influenced by an exogenous shock

during the implementation of the project, which was randomly determined in each period. When a project was not implemented due to the funding rule in place or an audit which revealed project cost overstatement, there was no exogenous shock impacting subordinate's payoff.

(iv) Audit bonus: a single audit bonus of 91, a double audit bonus of 182 lira, or zero. For each project that was audited, the subordinate received an audit bonus of 91 lira[11] if the audit revealed that s/he reported the cost of the audited project honestly. The audit bonus equaled zero if none of the projects was audited.

Figure 3 summarizes the payoff structure.

-- Insert Figure 3 here --

3.6 Dependent variable

Similar to prior research (Way, 2022), we measure Collusion as the submission of matching inflated cost reports by subordinate pairs. Collusion equals one if both inflated cost reports match and equals zero in all other cases. As such, Collusion is a binary variable. Alternatively, Collusion can be measured through checking two conditions (as in Evans et al., 2016; Guo et al., 2023). First, subordinates have to reach a collusive agreement in the chat box. Second, subordinates have to report costs as agreed. Only if both conditions are met, our dependent variable Collusion has the value of one. In all other cases, Collusion equals zero. All chat boxes were coded on four variables. Collusion initiation equals one when the participant made an attempt to collude with the other participant or agreed with the proposition of the partner to collude. Agreement equals one when both participants came to a collusive agreement in the chat box. Honoring Agreement equals one

[11] In line with prior studies on collusion, our (single) audit bonus always (i.e., under each possible estimated cost) outweighs the maximum amount of slack claimed (Evans et al., 2016; Way, 2022). As such, the mutual monitoring contract (of which the audit bonus is part) should work truth-inducing.

when the participant reported the costs as agreed upon in the chat box. Collusion equals one when both participants honored the agreement. This alternative operationalization of Collusion leads to the exact same results, because none of the inflated cost reports matched by coincidence.

An alternative dependent variable for additional analyses, is the level of misreporting, which can be measured through budget slack (e.g., Evans et al., 2001). This measure can range from 0 to 1, whereby 0 occurs when the participant reported honestly and 1 if they maximized self-interest and reported the maximum amount of slack. Budget slack is calculated as [slack claimed/slack available] and equals:

$$Misreporting = \frac{reported\ cost - actual\ estimated\ cost}{maximum\ cost - actual\ estimated\ cost}$$

4 Results

4.1 Descriptives

Table 1 shows that we observe the least collusion (7.5%) when funding is based on a hurdle rate (resource competition absent) and rankings are present. The other three conditions show similar collusion percentages (14.4%, 15.9%, and 13.9%). Overall, 12.9% of the reporting pairs successfully colluded. 29.9% of all observations made an attempt to collude. 20.6% of all reporting pairs came to an agreement in the chat box to collude. In line with prior research (Evans et al., 2016), most managers honored the collusive agreement (78.8% of managers who came to an agreement). Across conditions, we observe similar patterns as for our main dependent variable Collusion.

On average, the level of misreporting amounts to 0.154. We observe the lowest level of misreporting (0.113) when funding is based on a hurdle rate (i.e., resource competition absent) and rankings are present and the highest level of misreporting (0.178) when funding is based on the

lowest cost (i.e., resource competition present) and rankings are absent. When we only select the managers who successfully colluded, our descriptives show that even when managers collude, they do not include the maximal amount of slack and are thus partially honest (Evans et al., 2001). Overall, the level of misreporting for collusive managers amounts to 0.539. We observe the highest level of misreporting when funding is based on a hurdle rate (i.e., resource competition absent) and rankings are absent and the lowest level of misreporting when funding is based on the lowest cost (i.e., resource competition present) and rankings are present.

-- Insert Table 1 here --

4.2 Hypotheses testing

We perform our hypotheses tests on the unique reporting pairs (N = 582). Since we predict an ordinal interaction effect between the funding rule and the use of rankings on Collusion, we use contrast analysis to test our hypotheses (Buckless & Ravenscroft, 1990; Guggenmos, Piercey, & Agoglia, 2018). We follow the three-step procedure as outlined by Guggenmos et al. (2018). First, we provide visual fit evidence by comparing our predicted pattern (Figure 1) to the observed pattern (Figure 4). Second, we test the significance of our predicted contrast and the non-significance of the residual between-cells variance. Because our dependent variable is a binary variable, we use a nominal logistic model. Specifically, we test our hypothesis by calculating the likelihood-ratios using a chi-square test. Table 2 summarizes these results. For full disclosure, Panel A reports the main and interaction effects. We specify the contrast [1, 1, -3, 1] in Panel B. Results in Panel C show that the contrast test is significant (χ^2 = 4.898, p = 0.027) and the residual between-cells variance test is non-significant (χ^2 = 0.998, p = 0.607), confirming that our observed pattern is in line with the predicted pattern. Follow-up simple effects demonstrate that the use of rankings decreases Collusion only when funding is based on a hurdle rate (χ^2 = 3.472, p = 0.062), but not

when funding is based on the lowest cost (χ^2 = 0.222, p = 0.638), supporting H1a. Next, moving from a funding rule based on a hurdle rate to lowest cost increases Collusion only when rankings are present (χ^2 = 3.047, p = 0.081), but not when rankings are absent (χ^2 = 0.124, p = 0.725), which is in line with H1b. Third, we quantitatively evaluate the contrast variance residual (q^2). We conclude that only 5.1% (= q^2) of the between-cells variance is not explained by the contrast.

In sum, the evidence above provides strong support for an ordinal interaction effect between the funding rule and the use of rankings such that the use of rankings only decreases Collusion when funding is not competitive (H1a) and moving from a funding rule based on a hurdle rate to lowest cost only increases Collusion when rankings are present (H1b).

-- Insert Table 2 here –

-- Insert Figure 4 here --

4.3 Process evidence

We argued that the unequal project costs impact managers' power positions differently across conditions. In particular, manager B always faces a higher project cost than manager A, which puts manager B in a weak position. Specifically, manager A has more available slack than manager B and manager A has an additional advantage when resource competition is present. As such, manager A typically has a stronger power position than manager B. However, we argued that when rankings are present and resource competition is absent (i.e., hurdle rate contract), manager B faces an equally strong power position. We measured perceived power based on the PEQ item "I felt that I was in a stronger position than my peer".

First, we analyze the effects of our manipulated variables on perceived power for managers A and managers B separately. For managers A, we find two significant main effects (see Table 3, Panel A). Both the use of rankings (F = 4.960, p = 0.027) and a competitive funding rule (F =

13.232, $p < 0.001$) increase managers A's perceived power. For managers B (see Table 3, Panel B), we find a significant interaction effect between the use of rankings and funding rule ($F = 5.615$, $p = 0.018$). Follow-up simple effects (see Table 3, Panel C) show that a competitive funding rule increases managers B's perceived power only when rankings are absent ($F = 3.785$, $p = 0.053$) and that the use of rankings increases managers B's perceived power only under a hurdle rate ($F = 20.167$, $p = 0.007$). Second, we test whether Perceived power is different for managers A versus managers B in each experimental condition. Panel D of Table 3 summarizes these independent *t*-tests. Managers A's perceived power is always higher than manager B's perceived power (all $p < 0.058$), except when a hurdle rate contract is combined with the use of rankings ($p = 0.836$). Hence, as we predicted, managers A and B perceive an equal level of power in this experimental condition which resulted in a decrease in Collusion.

-- Insert Table 3 here --

4.4 Robustness checks

Since the variable Collusion depends on the willingness to collude of two managers, we also test whether our results are robust for an alternative measure. In particular, we re-run our analyses on the variable Collusion Initiation on the manager level (instead of the dyad level; N = 1,164). When more managers make an attempt to collude, the likelihood of successful collusion increases. Specifically, our data show that 69.0% of the managers who made an attempt to collude were able to form a collusive agreement with their partner.

Table 4 summarizes the results of this robustness check. Panel A shows a significant interaction effect between the funding rule and the use of rankings on Collusion Initiation ($\chi^2 = 5.551$, $p = 0.018$). Re-running the contrast test (Panel B and C) also reveals a significant contrast test ($\chi^2 = 20.156$, $p < 0.001$) and a non-significant between-cells variance test ($\chi^2 = 2.188$, $p =$

0.335). Follow-up simple effect tests (Panel D) are in line with our main analysis, indicating that a more competitive funding rule (i.e., lowest cost contract) increases Collusion Initiation only when rankings are used ($\chi^2 = 13.689$, $p < 0.001$) and that the use of rankings decrease Collusion Initiation only when funding is not competitive (i.e., hurdle rate contract; $\chi^2 = 12.952$, $p < 0.001$).

-- Insert Table 4 here --

4.5 Additional analyses

We performed two additional analyses. First, we analyze the effects of our manipulated variables on the level of misreporting. Panel A of Table 5 and Panel A of Figure 5 show that a more competitive funding rule (i.e., lowest cost contract) increase Misreporting ($F = 3.269$, $p = 0.071$) and that the use of rankings decreases Misreporting ($F = 4.610$, $p = 0.032$). Second, we re-run this ANOVA when only selecting the managers who successfully colluded. Panel B of Table 5 and Panel B of Figure 5 show that the use of rankings significantly decreases Misreporting ($F = 3.476$, $p = 0.064$). The effect of Funding rule and the interaction effect are non-significant (both $p > 0.235$).

-- Insert Table 5 here –

-- Insert Figure 5 here --

5 Conclusion

This study reports the results of an online experiment on how internal reporting elements in a multi-agent capital budgeting setting influence collusive behavior among managers under a mutual monitoring contract. Building on the report by the Association of Certified Fraud Examiners (ACFE, 2024), which highlights increased losses from fraud – especially collusive fraud – this study responds to the need for insights into managerial collusion dynamics. Specifically, we manipulated the competitiveness of the funding rule and the use of rankings. Our results reveal a significant ordinal interaction effect between these two management control practices such that

collusion strongly decreases when a non-competitive funding rule (i.e., hurdle rate) is combined with the use of rankings. Process evidence indicates that in this experimental condition, both managers perceive an equal level of power. Since collusion depends on the willingness of both managers to collude, we perform a robustness check on collusion initiation. When more managers make an attempt to collude (i.e., collusion is initiated), the likelihood of successful collusion increases. Our results are robust, and even stronger, for this alternative measure. Additional analyses on the level of misreporting reveal that rankings successfully decrease misreporting.

An important feature in our study is the use of unequal project costs, which is different from prior accounting studies on collusion (Evans et al., 2016; Way, 2022). Because of these unequal project costs, we predicted and found that managers' perceived power is impacted by resource competition and the use of rankings. Although Nikias (2019) finds that resource competition decreases collusion, we find that in a setting with unequal project costs, resource competition increases collusion when rankings are present. Hence, by relying exclusively on unequal project costs, we test the boundary conditions of prior research on collusion. As such, we extend the accounting literature on collusion. This study also contributes to research studying the interdependence of the decision facilitating and decision influencing role of managerial accounting information (Sprinkle, 2003; Sprinkle & Williamson, 2007) by studying two aspects of the internal reporting environment reflecting both roles (i.e., funding rules for resource allocation and rankings).

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Figures

Figure 1. Hypothesized effects.

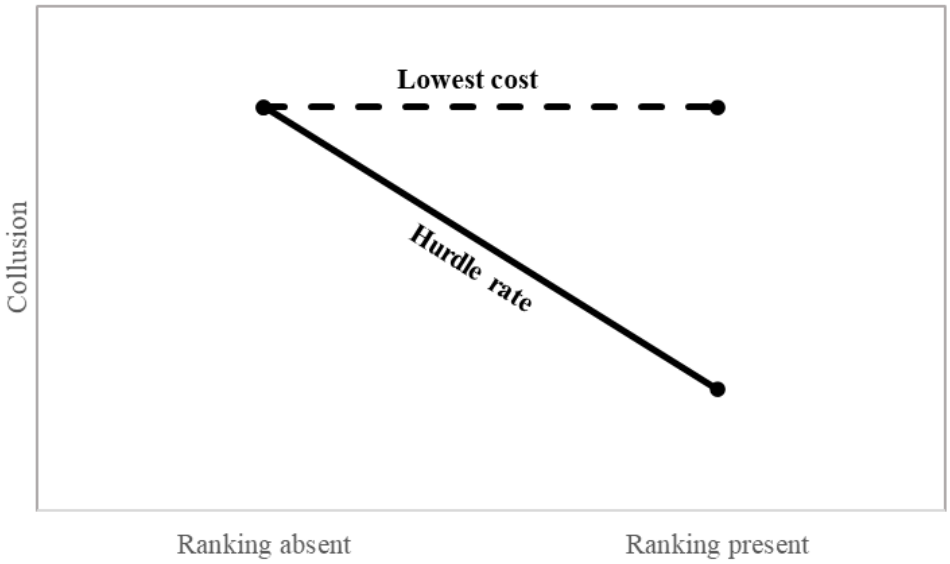


Figure 2. Experimental procedure of one period.

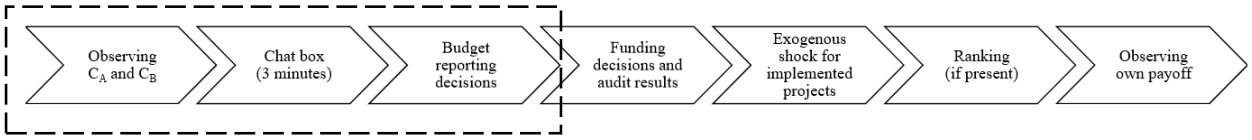


Figure 3. Payoff structure.

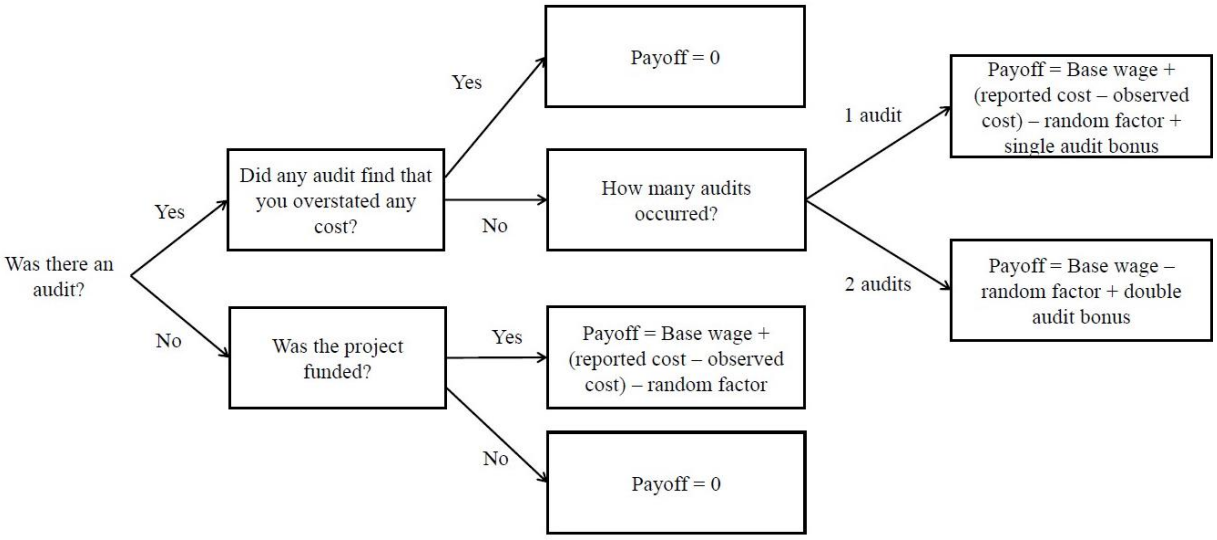


Figure 4. Observed pattern of percentage of Collusion across conditions.

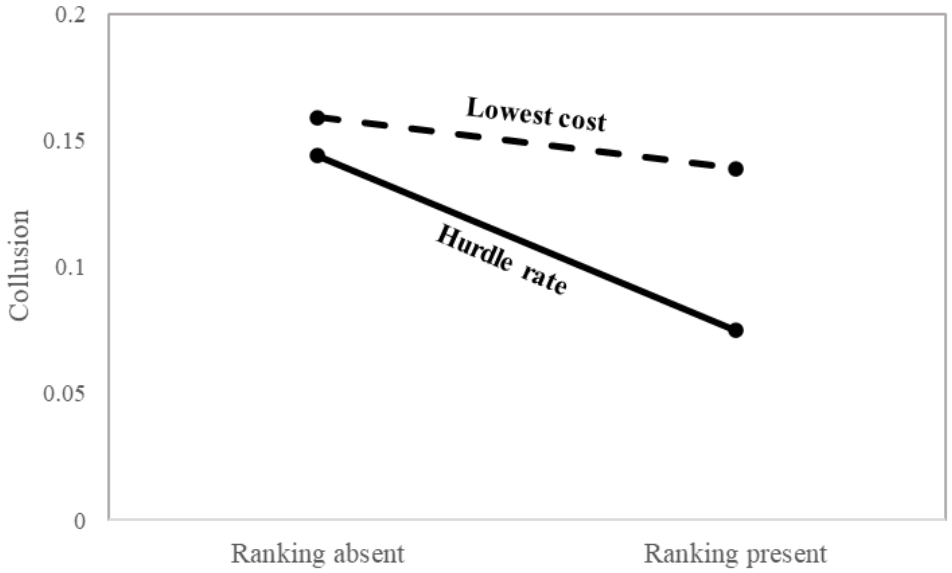
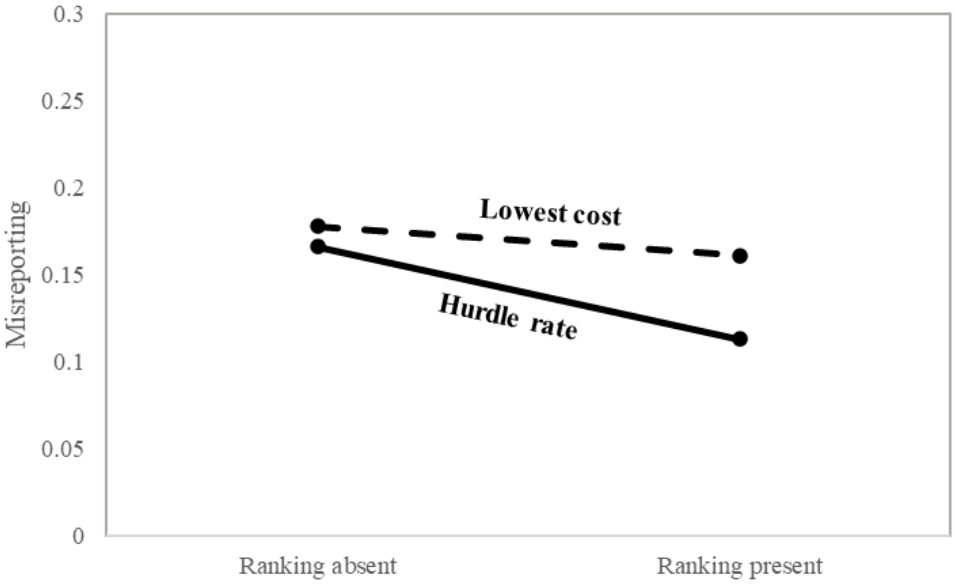
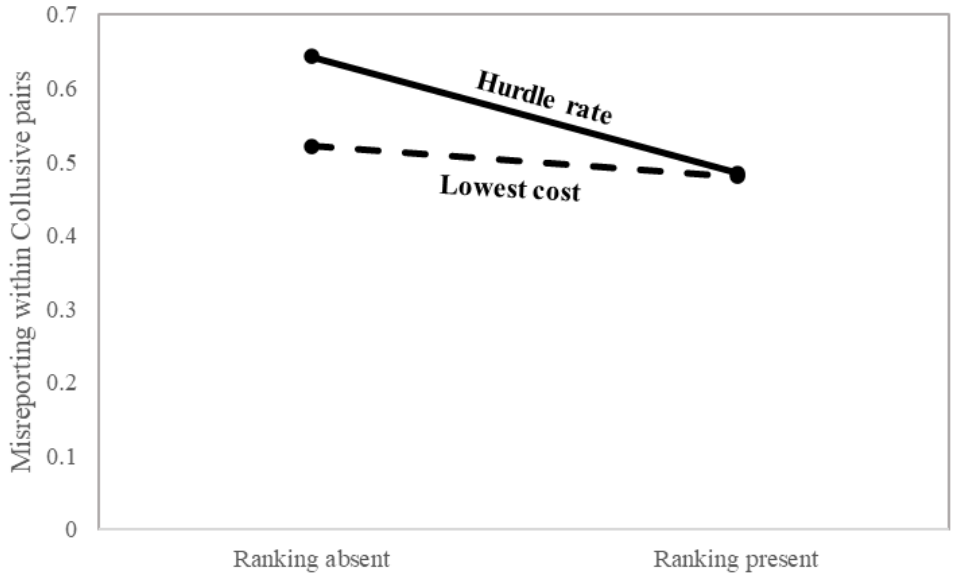


Figure 5. Additional analyses.

Panel A: Observed means Misreporting



Panel B: Observed means Misreporting within Collusive pairs



Tables

Table 1. Descriptive statistics.

	Overall	Ranking absent			Ranking present		
		Hurdle rate	Lowest cost	Total	Hurdle rate	Lowest cost	Total
Collusion[a] (reporting pairs)	12.9% (75/582)	14.4% (21/146)	15.9% (23/145)	15.1% (44/291)	7.5% (11/147)	13.9% (20/144)	10.7% (31/291)
Collusion Initiation[b] (individual managers)	29.9% (348/1,164)	32.5% (95/292)	34.8% (101/290)	33.7% (196/582)	19.4% (57/294)	33.0% (95/288)	26.1% (152/582)
Collusive Agreement[c] (reporting pairs)	20.6% (120/582)	21.9% (32/146)	24.8% (36/145)	23.4% (68/291)	12.9% (19/147)	22.9% (33/144)	17.9% (52/291)
Honoring Agreement[d] (individual managers)	16.2% (189/1,164)	17.1% (50/292)	20.0% (58/290)	18.6% (108/582)	10.2% (30/294)	17.7% (51/288)	13.9% (81/582)
Misreporting[e] (individual managers)	0.154 (0.283) N = 1,164	0.166 (0.301) N = 292	0.178 (0.297) N = 290	0.172 (0.299) N = 582	0.113 (0.262) N = 294	0.161 (0.268) N = 288	0.136 (0.266) N = 582
Misreporting within collusion[f] (individual managers)	0.539 (0.318) N = 150	0.643 (0.329) N = 42	0.521 (0.325) N = 46	0.580 (0.331) N = 88	0.485 (0.337) N = 22	0.480 (0.271) N = 40	0.482 (0.293) N = 62

Notes

[a] Each cell shows the percentage (number) of collusive pairs.

[b] Each cell shows the percentage (number) of individual managers who made an attempt to collude with the other participant or agreed with the proposition of the partner to collude.

[c] Each cell shows the percentage (number) of agreements in collusive pairs.

[d] Each cell shows the percentage (number) of individual managers who honored the agreement.

[e] Each cell shows the mean (standard deviation) level of misreporting of individual managers.

[f] Each cell shows the mean (standard deviation) level of misreporting of individual managers who successfully colluded.

Table 2. Hypothesis testing.

Panel A: main and interaction effects

Factor	χ^2	df	*p*-value[a]
Funding rule	2.507	1	0.113†
Ranking	3.050	1	0.081*
Funding rule × Ranking	1.269	1	0.260

Panel B: Contrast weights

	Hurdle rate, ranking absent	Lowest cost, ranking absent	Hurdle rate, ranking present	Lowest cost, ranking present
Contrast weights	1	1	-3	1

Panel C: Contrast test

Source of Variation	χ^2	df	*p*-value[a]
Hypothesized contrast	4.898	1	0.027**
Residual	0.998	1	0.607
Total between-cells variance	5.896	3	0.117†

Panel D: Follow-up simple effects

Simple effect tests	χ^2	df	*p*-value[a]
Effect of Funding rule within ranking absent	0.124	1	0.725
Effect of Funding rule within ranking present	3.047	1	0.081*
Effect of Ranking within hurdle rate	3.472	1	0.062*
Effect of Ranking within lowest cost	0.222	1	0.638

Notes

[a] *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively (two-tailed). † indicates marginal significance.

Table 3. Process evidence.

Panel A: ANOVA on Perceived power – Manager A				
Factor	SS	*F*-value	df	*p*-value[a]
Funding rule	41.305	13.232	1	< 0.001***
Ranking	15.482	4.960	1	0.027**
Funding rule × Ranking	2.135	0.684	1	0.409
Error	902.125		289	
Panel B: ANOVA on Perceived power – Manager B				
Factor	SS	*F*-value	df	*p*-value[a]
Funding rule	0.397	0.146	1	0.703
Ranking	5.521	2.024	1	0.156
Funding rule × Ranking	15.316	5.615	1	0.018**
Error	785.561		288	
Panel C: Simple effects – Manager B				
Factor	SS	*F*-value	df	*p*-value[a]
Effect of Funding rule within ranking absent	10.323	3.785	1	0.053*
Effect of Funding rule within ranking present	5.390	1.976	1	0.161
Effect of Ranking within hurdle rate	20.167	7.393	1	0.007***
Effect of Ranking within lowest cost	1.190	0.436	1	0.509
Panel D: Independent t-tests on perceived power between Manager A and Manager B				
Experimental condition	Manager A[b]	Manager B[b]	*t*-value	*p*-value[a]
Hurdle rate + ranking absent	3.197 (1.592) N = 76	2.693 (1.498) N = 75	2.003	0.047**
Lowest cost + ranking absent	3.778 (1.802) N = 72	3.225 (1.649) N = 71	1.912	0.058*
Hurdle rate + ranking present	3.486 (1.925) N = 74	3.427 (1.578) N = 75	0.208	0.836
Lowest cost + ranking present	4.408 (1.737)	3.042 (1.870)	4.510	< 0.001***

Notes

[a] *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively (two-tailed).

[b] Each cell shows the mean value (standard deviation).

Table 4. Robustness check on Collusion Initiation.

Panel A: main and interaction effects				
Factor			χ^2	df	*p*-value[a]
Funding rule			9.922	1	0.002***
Ranking			8.949	1	0.003***
Funding rule × Ranking			5.551	1	0.018**
Panel B: Contrast weights				
	Hurdle rate, ranking absent	Lowest cost, ranking absent	Hurdle rate, ranking present	Lowest cost, ranking present
Contrast weights	1	1	-3	1
Panel C: Contrast test				
Source of Variation			χ^2	df	*p*-value[a]
Hypothesized contrast			20.156	1	< 0.001***
Residual			2.188	2	0.335
Total between-cells variance			22.344	3	< 0.001***
Panel D: Follow-up simple effects				
Simple effect tests			χ^2	df	*p*-value[a]
Effect of Funding rule within ranking absent			0.343	1	0.558
Effect of Funding rule within ranking present			13.689	1	< 0.001***
Effect of Ranking within hurdle rate			12.952	1	< 0.001***
Effect of Ranking within lowest cost			0.219	1	0.640

Notes

[a] *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively (two-tailed).

Table 5. Additional analyses.

Panel A: ANOVA on Misreporting				
Factor	SS	*F*-value	df	*p*-value[a]
Funding rule	0.261	3.269	1	0.071*
Ranking	0.368	4.610	1	0.032**
Funding rule × Ranking	0.095	1.190	1	0.276
Error	92.485		1,160	
Panel B: ANOVA on Misreporting within Collusive pairs				
Factor	SS	*F*-value	df	*p*-value[a]
Funding rule	0.140	1.419	1	0.235
Ranking	0.344	3.476	1	0.064*
Funding rule × Ranking	0.116	1.169	1	0.281
Error	14.435		146	

Notes

[a] *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively (two-tailed).

Managers' usage of management control instruments and employees' engagement in skill development

ABSTRACT

We use an experiment to investigate how managers' use of management control instruments can affect employees' willingness to invest in skill development. Specifically, we examine how performance goals set by managers and the presence and timing (intra-period vs. beginning-of-period) of managers' training recommendations interact to influence employees' willingness to take training. We predict and find that performance goals negatively affect employees' willingness to take training that boosts future productivity as these goals focus both managers and employees narrowly on current as opposed to future performance. We also predict and find that intra-period training recommendations increase employees' willingness to take training, but only when performance goals are absent. Finally, we find that compared to intra-period recommendations, beginning-of-period recommendations make managers better balance the resources needed to achieve current performance vs. develop skills to boost future productivity, which increases employees' willingness to take training when performance goals are present. Our study contributes to the emerging literature on how management controls affect employee skill development.

JEL-Codes: M21, M41, M52

Keywords: Skill development; training; performance goals; training recommendations.

I. INTRODUCTION

The development of organizational human capital is a critical factor that determines organizational success and competitiveness in today's fast-changing, global economy (SHRM n.d.; De Koning 2024). In times of global skilled labor shortage, firms have increasingly recognized the importance of developing existing workforce skills internally, thereby investing billions of dollars in employee training (Freifeld 2024; Friedman 2023, 2024; World Economic Forum 2024; Vroman and Danko 2022). Recent work provides evidence that management control instruments usually deployed to motivate transitory effort can influence employees' willingness to engage in more permanent skill development, even in the absence of active managerial choices about how to use these instruments (Arnold, Shi, Tafkov, and Voermans 2025). In contrast, this study investigates how *managers' actual use* of management control instruments can affect employees' willingness to engage in skill development.

One of the most important management control instruments in practice are performance goals that managers usually set for their employees (Dekker, Groot, and Schoute 2012; Feichter, Grabner, and Moers 2018). These goals may directly impact employees' willingness to engage in skill development via training as they leave employees with more or less resources (i.e., time) to take training. In fact, employees often identify a lack of time to take training as a major obstacle to skill development (e.g., SHRM 2022; Valamis 2022). It is therefore important that employee skill development becomes a shared responsibility between managers and employees (Ballard 2017; Bozinelos, Lin, and Li 2020; CIPD 2021; LinkedIn 2018), and many companies have made developing employee skills an important part of managers' job descriptions (Chopra-McGowan 2022; CIDP 2021). As managers often have superior information about the content of various trainings, a potential way to overcome obstacles to employees' skill development could be managers' guidance for employees in their training decisions via making training

recommendations. However, whether managers recommend employees to take training may be influenced by the performance goals managers have set as well as by the employee's performance relative to these goals. Therefore, this study examines how performance goals affect employees' willingness to engage in skill development via training and how the effect is influenced by the presence and timing of managers' training recommendations.

Understanding the effects of performance goals and training recommendations on employee willingness to engage in skill development is important because practitioners have identified motivating employees to invest time and effort in skill development and getting managers to take an active role in employee skill development as the #1 and #2 challenges facing organizational human capital development (LinkedIn 2018). Moreover, getting managers to take an active role in employee skill development has been suggested as "a viable solution to overcoming the #1 challenge."

In practice, there is significant variation in the timing of managers' training recommendations. In some cases, managers provide their training recommendations to employees at the time when a training opportunity becomes available to an employee (i.e., intra-period training recommendation, Nassif 2020) as this allows managers to be more flexible in their recommendations. In other cases, managers make their training recommendations part of the annual employee review or employee development discussion and thus make the recommendations at the beginning of the period, along with communicating their performance goals to employees (i.e., beginning-of-period training recommendation, Peuchot 2024).

As explained above, performance goals are among the most commonly used management control tools (Feichter et al. 2018), because goals communicate performance expectations and motivate employee effort and performance even when they are not directly linked to employee compensation (Gómez-Miñambres 2012; Locke and Latham 1990, 2002; Locke, Latham, Erez

1988; Webb 2004). Whereas proponents of actively involving managers in employee skill development often maintain that both the communication of training recommendations and clear performance expectations to employees are integral components of successful developments of organizational human capital (Bozinelos et al. 2020; Helsin, Vandewalle, and Latham 2006; Joo, Song, Lim, and Yoon 2012; Hagen 2010), these two practices are often discussed separately by practitioners and researchers (e.g., Joo et al. 2012; Bozinelos et al 2020; Webb et al. 2013). Our understanding of the effects of managers' training recommendations and performance goals on employees' skill development, however, is likely incomplete if we do not account for their interrelated nature. The reason is that, by enhancing a focus on *current* performance, performance goals make it harder for managers and employees to recognize the value of training for improving *future* performance. We seek to fill that gap, arguing that performance goals can have a profound effect on both the willingness of managers to recommend training and the willingness of employees to take training. We also argue that this effect will be impacted by the timing of training recommendations.

We examine our research question using a 2 x 3 between-participants experimental design in which employee-manager dyads interact for seven periods. Employees solve multiplication problems and could take training that provides techniques that improve their ability to solve problems more accurately and quickly. We manipulate the presence of performance goals by making managers set (or not set) a performance goal for their employees at the beginning of each period. We manipulate managers' training recommendations at three levels: absent vs. intra-period recommendation vs. beginning-of-period recommendation. Importantly, in our experiment, the incentives of employees and managers are fully aligned and neither the performance goal nor the training recommendation is linked to compensation. Employees can always freely decide on whether to take training or not.

We predict and find that performance goals negatively affect employees' willingness to take training that boosts future productivity as they focus both managers and employees narrowly on *current* as opposed to *future* performance. Managers set very ambitious goals and both employees' and managers' commitment to reaching these goals hinder employees' willingness to allocate time to take training. We also predict and find that intra-period training recommendations can increase employees' willingness to take training, but only when performance goals are absent. When goals are present, the temporal disconnect between setting goals at the beginning of the period and recommending training intra-period prevents managers from sufficiently adjusting goals to give employees enough time to take training. In contrast, setting goals and recommending training together at the beginning of the period make managers better balance the resources needed to achieve current performance and to develop skills, which increases employees' willingness to take training. The effect is smaller when goals are absent. Finally, we find that taking training increases employees' performance. Thus, we show that goals can make managers and employees act against their own financial interests by causing managers to recommend and employees to take less training, which ultimately leads to lower performance and payoff.

By providing evidence about how performance goals and training recommendation decisions affect employee skill development in a controlled experimental setting, our study contributes to the emerging literature on how management controls affect employee skill development (Arnold et al. 2025). We find that performance goals can interfere with employees' engagement in training that benefits future productivity, even in a setting in which goals are not linked to compensation, financial incentives of employees and managers are fully aligned, and no other complicating factors like scarcity of training resources or training for future jobs exist. The finding highlights how managers' use of management controls designed to motivate *transitory* effort could also affect employees' engagement in more *permanent* skill development.

Importantly, we also show that the effectiveness of training recommendations as a low-cost way to mitigate the negative effect of performance goals depends on their timing. Thus, more broadly, our findings underscore the interrelated nature of different managerial controls in impacting the development of human capital and the need for firms to consider these controls in their entirety rather than analyzing components in isolation.

Our study also contributes to the research examining the motivational effects of performance goals (e.g., Fisher, Peffer, Sprinkle, and Williamson 2015; Matějka and Ray 2017; Presslee, Vance, and Webb 2013). This research shows that performance goals can motivate transitory effort when they come from a legitimate source of authority, such as management, even when they are not linked to compensation (Locke and Latham 1990, 2002; Locke et al. 1988; Webb 2004). We show, however, that such transitory effort increase can come at the cost of hindering employee skill development and long-term performance because goal-induced performance focus *decreases* employees' willingness to learn new skills via taking training. Moreover, whereas prior studies focus mainly on the information managers use to set goals and the difficulty level of the goals (e.g., Feichter et al. 2018), we adopt a novel angle to provide evidence that the extent to which performance goals hinder skill development depends on whether managers set goals and make training recommendations jointly or separately in time.

Our study also has important practical implications. Despite firms spending billions of dollars on employee training, such spending is often ineffective in reducing skill gaps in the existing workforce (CIPD 2021; Freifeld 2023). Practitioner literature often explains this with managers not being actively involved in employee skill development and not "doing enough to train employees for the future" (Ballard 2017). However, evidence for managers' active involvement in employee skill development is sparse. Our results show that managers' training recommendations to their employees can be a low-cost way to boost employees' willingness to

take training, but that their inclusion into the annual employee review or development discussion can be critical in the presence of performance goals. One important implication of our results could be that in the absence of performance goals, firms can leave it to managers to decide whether to make training recommendations at the beginning of the period or intra-period when training becomes available. However, in the presence of performance goals, firms should ask managers to make training recommendations at the beginning of the period.

II. THEORY AND HYPOTHESIS DEVELOPMENT

Training Recommendation

Many organizations offer voluntary training to their employees (Hurtz and Williams 2009; Morrell and Korsgaard 2011; Sitzmann 2012). Recent research suggests that skill development activities such as training can only truly increase job performance if employees freely choose to dedicate their time and effort to the activities (Dachner, Ellingson, Noe, and Saxton 2021; Molloy and Noe 2010). That said, even though employees make the final decisions about whether to take the voluntary training offered by the firm, managers can make training recommendations to their employees (Bell, Tannenbaum, Ford, Noe, and Kraiger 2017; Chopra-McGowan 2022; Dragoni, Park, Soltis, and Forte-Trammell 2014). Prior studies on training have shown that managers' active involvement and support can increase employees' motivation to engage in skill development (Birdi, Allan, and Warr 1997; Hurtz and Williams 2009; Noe and Wilk 1993; Park, Kang, Kim 2018). In practice, managers can make training recommendations to their employees either at the time when an opportunity for training becomes available to employees (i.e., intra-period training recommendation) or make it part of, for example, the annual employee review or employee development discussion (i.e., beginning-of-period training recommendation) (Nassif 2020; Peuchot 2024).

Training recommendations from managers serve as guidance or an additional piece of information for employees when they decide about taking training. In fact, many employees indicate that they would engage more in skill development if their managers provided guidance to relevant opportunities (LinkedIn 2018). We expect that, in general, employees will follow these recommendations for three main reasons. First, managers often have superior information about the content of trainings that allows them to better assess the usefulness of trainings and thus provide valuable guidance to employees. Second, because manager and employee incentives are often aligned as employees' compensation and managers' own financial success and career advancement are often tied to employee performance (Arnold, Artz, and Tafkov 2022; Benson 2015), managers are incented to use their training recommendations in a way that improves employee performance. Finally, employees tend to follow guidance from legitimate sources of authority, such as management (Locke and Latham 2002; Locke et al. 1988).

Hypothesis Development

Effect of Performance Goals

We first examine the effect of performance goals on employees' willingness to take training. From an economic standpoint, employees and managers should understand the value of training in improving future performance and compensation regardless of performance goals. However, we rely on behavioral theory to predict that such goals negatively affect training.

Performance goals motivate effort and performance, even when they are not directly linked to compensation, when the goals come from a legitimate source of authority, such as management, and when the goals are clearly communicated (Gómez-Miñambres 2012; Locke and Latham 1990, 2002; Webb 2004). By focusing managers and employees on *current* performance, performance goals will make it harder for managers and employees to recognize the value of training for improving *future* performance. A goal presents a benchmark that

individuals can compare their performance to, and they experience (negative) positive emotions when they (fail to) achieve it (Latham and Locke 2007). We argue that performance goals affect employees' and managers' focus on current versus future performance (Merchant 1990; Otley 1999; Van der Stede 2000). Specifically, as taking training to increase future performance can come at the cost of hurting current performance (Arnold et al. 2025), the focus on current performance induced by performance goals will hamper employees' willingness to take training.

Prior research shows that goals direct attention to goal-relevant activities (Locke and Latham 2002). The narrow focus induced by goals can come at the expense of neglecting other important aspects that are not directly linked to the goal, focusing more on ends than means, and myopia (Ordóñez, Schweitzer, Galinsky, and Bazerman 2009). The presence of a performance goal for the current period will increase managers' focus on current performance (Ordóñez et al. 2009). This current performance focus will make it more salient that spending time and effort to take training may negatively affect current performance and goal achievement, making it harder for managers to recognize the value of training for improving future performance. As a result, when performance goals are present, employees are less likely to take training because managers are less likely to recommend training to them.

Additionally, regardless of whether managers can (or cannot) recommend training to employees, the current performance focus induced by the goals will also make it harder for employees to recognize the value of training for improving future performance. As goals generally need to be challenging to motivate high levels of current performance (Locke and Latham 1990, 2002, 2013), we expect managers, in general, to set challenging goals. Such challenging goals will discourage employees from taking training because they leave employees with limited, if any, available resources to devote to training while they are simultaneously committed to achieving the goal. Prior research shows that individuals continue to exert effort in

pursuit of a goal even in situations where it is unlikely that the goal will be achieved (Bonner and Sprinkle 2002; Locke and Latham 1990, 2002). This suggests that employees are unlikely to abandon the pursuit of a challenging goal to take training. Thus, we expect the presence of a performance goal to reduce employees' willingness to take training, and predict a main effect:

> *H1: Employees' willingness to take training is lower when performance goals are present than when it is absent.*

Effect of Intra-Period Training Recommendations

In the absence of performance goals, we expect employees to take more training when their managers make intra-period training recommendations than when they do not make training recommendations. We argue that, compared to employees, managers are more likely to recognize the importance of taking training for improving future performance. This is because, compared to employees, managers often have superior information about the content of the training. Further, managers' greater distance from employees' work can allow managers to better see the "big picture" and pay attention to long-term performance (Trope and Liberman 2010). Given the long-term benefits of skill development, managers are more likely to recognize the value of training for future performance and thus recommend it to employees. In contrast, employees are closer to their own work and more focused on how to do their jobs (Trope and Liberman 2010), which makes it harder for them to consider future performance and recognize the importance of taking training.

Given that managers are more likely to recognize the importance of training for improving future performance, and employees' general willingness to follow managers' training recommendations, we state the following hypothesis:

> *H2a: In the absence of performance goals, employees' willingness to take training is greater under intra-period training recommendations than no training recommendations.*

We expect the effect of intra-period training recommendations on employee training to be *less positive* when a performance goal is present than when it is absent. Performance goals focus managers and employees more on current performance and how it compares to the goal, which will impede managers' ability to (appropriately) balance the resources needed to achieve current performance and resources needed to develop skills to improve future performance. Specifically, as goals generally need to be challenging to motivate high levels of performance (Locke and Latham 1990, 2002, 2013), we expect managers who are focused on the current performance to set challenging goals at the beginning of the period that leave limited, if any, available resources to devote to training later in the period. Prior research shows that individuals continue to commit resources in pursuit of a goal even in situations where it is unlikely that the goal will be achieved (Bonner and Sprinkle 2002; Locke and Latham 1990, 2002). This suggests that the discrepancy between performance and the challenging goal set by the managers, that is likely to exist at the time training becomes available to employees, is likely to decrease managers' willingness to recommend training to employees (Balcetis et al. 2015; Devine et al. 2024; Sleesman et al. 2012).

Similar to managers, employees are also likely to be overly focused on and committed to reaching the current performance goal. Thus, we expect them to continue to expend time and effort in pursuit of the goal, even if the goal is unlikely to be achieved, leaving them with limited, if any, resources to devote to training. Accordingly, we state the following hypothesis:

> *H2b: The effect of intra-period training recommendations on employees' willingness to take training is less positive when performance goals are present than when they are absent.*

Effect of Timing of Training Recommendation

We expect that, when a performance goal is present, employees' willingness to take training is greater when training recommendations are made at the beginning-of-period than intra-period for two reasons. Prior research suggests that considering interrelated decision

choices such as performance goals and training recommendations together, rather than separately at different points of time, may lead to improved decision making. Specifically, research suggests that individuals engage in more comprehensive and in-depth cognitive processing when they evaluate two choices together, rather than separately at different points of time (Basu and Savani 2017). Consistent with this, healthcare research finds that making decisions regarding various resources at a single point in time, such as beds and staffing, leads to better system performance than making the decisions at different points in time (Gnanlet and Gilland 2009). Experimental research in accounting indicates that analysts are better able to recognize and incorporate the positive signal about management quality from issuing warnings of negative earnings surprises when the warning and the subsequent earnings announcement are processed together, rather than separately at different points of time (Libby and Tan 1999).

Building on prior research, we argue that setting performance goals together with making training recommendations at the beginning of the period helps managers better recognize the interdependence of the two decisions and make more consistent decisions. Specifically, when managers make the two decisions together, they better balance the resources needed to achieve current performance and resources needed to develop skills to improve future performance. In this case, they are less impacted by performance goal than when making intra-period training recommendations. The reason is that no resources (e.g., employee time and effort) have been expended yet in pursuit of the performance goal at the beginning of the period, while substantial resources have likely already been expended intra-period. This makes it easier for managers to recognize the value of training for improving future performance at the beginning of period than intra-period. As a result, we expect managers to be more likely to recommend training in the former than in the latter case. To the extent that employees follow managers' training recommendations, this leads to employees taking more training when managers make beginning-

of-period than intra-period training recommendations.

Second, as explained above, when managers make performance goals and training recommendations decisions separately, we expect them to mainly focus on improving current performance, thereby setting challenging goals that leave employees with limited, if any, available resources to devote to training. In contrast, when managers make performance goals and training recommendation decisions together, we expect them to adjust the goal downwards to a greater extent to better incorporate time for employees to take training during the period. The lower performance goal provides a credible signal that managers recognize the value of training for improving future performance. It also leaves employees with more free resources (i.e., time) to devote to training in addition to achieving the goal, which increases the likelihood of them taking the training. Put differently, we argue that performance goals and training recommendations are more inherently consistent when managers make performance goals and training recommendations decisions together (i.e., both beginning-of-period) rather than in separate points of time (i.e., beginning-of-period and intra-period, respectively). As a consequence, employees follow managers' recommendations more when they are made at the beginning of the period than intra-period. Based on the above reasons, we state the following hypothesis:

> *H3a: In the presence of performance goals, employees' willingness to take training is greater when training recommendations are made at the beginning-of-period than intra-period.*

We expect the positive effect of beginning-of-period, compared to intra-period training recommendation to be smaller when a performance goal is absent than when it is present. This is because when a performance goal is absent, the issues about goals fixating managers and employees narrowly on current performance, or managers making inconsistent performance goal and training recommendation decisions do not exist. That is, in the absence of a performance

goal, managers who make intra-period training recommendations no longer have to consider two interrelated decisions (i.e., setting performance goals and making training recommendations) separately (at different point of time) as now they only have to make a single (training recommendation) decision. Thus, we expect the timing of the training recommendation to make less of a difference when a performance goal is absent than when it is present, and state:

> *H3b: The positive effect of beginning-of-period training recommendation, compared to intra-period training recommendation, will be smaller when performance goals are absent than when they are present.*

III. METHOD

Experimental Design and Task Overview

We use a 2 x 3 between-participants experimental design. We vary the presence of a performance goal (present vs. absent) and the training recommendation (absent vs. intra-period recommendation vs. beginning-of-period recommendation).[1] As the experiment lasts for seven periods, *Period* is a within-participants factor. We conduct the experiment using z-Tree software (Fischbacher 2007).

We randomly assign participants to the role of employee or manager in a dyad. Participants remain in the same role and dyad during the entire experiment. Employees perform a math task that involves solving two-digit by two-digit multiplication problems. They have to solve the problems mentally without any outside aids, such as calculators or pen and paper.[2] Managers' tasks are to review and assess the trainings available to employees as well as to set a performance goal (in the corresponding conditions) and to make recommendations to their

[1] The data collection of this paper was approved by the IRB of the university where we collected the data.
[2] In the post-experiment questionnaire, we asked employee participants (on seven-point Likert scales) how much they enjoyed working on the math problems (overall mean = 4.33), whether they perceived the math problems as challenging (overall mean = 5.05), and whether they are confident in their math abilities in the first period (overall mean = 5.23). None of the questions is significantly different across conditions (one-way ANOVA: all p's > 0.80). Thus, differences across conditions cannot be driven by differences in participants' perceptions of the task.

employees about whether to take or not to take training (in the corresponding conditions).

Each period lasts 480 seconds in which employes can work on 38 multiplication problems (7 periods × 38 = 266 overall). In each period, all problems are presented on one screen and in the same order for all employees. Employees can freely choose the number and order of problems to work on. While working on the problems, employees, in all conditions, receive real-time performance feedback on their screens about the number of problems correctly solved. Problems for which employees have submitted an answer disappear from the screen.

In all conditions, employees earn $0.35 for each problem correctly solved. Additionally, employees receive a time bonus of $0.002 for every second they do not work on the task as a proxy for their disutility of effort. We determined the time bonus parameter such that it is generally financially beneficial to work on the multiplication task, but such that someone who never worked, would—in addition to the show-up fee—be compensated for the time spent in the lab (7 x $0.96 (maximum time bonus for a period) = $6.72). Managers know about employees' possibility to earn a time bonus but are not informed about employees' time bonus in any period.

Managers also earn $0.35 for each problem their employee solves correctly. They cannot receive a time bonus but, in each period, receive an initial balance of $0.45, which amounts to approximately half of the maximum employee time bonus of a period. Importantly, this implies that managers' and employees' financial incentives are fully aligned. As we will explain in more detail below, this design choice excludes any agency problem between manager and employee that may arise from misaligned financial incentives. This allows us to analyze how managers' decisions about goals and training recommendations can affect employees' investments in skill development and training even in a setting with *fully aligned* financial incentives.

Possibility to Take Training

Starting from Period 2, trainings on improving employees' skills in solving a subset of the problems are made available to all employees. We use the same training design as Arnold et al. (2025). Each training consists of two parts: an explanation of the technique with solved examples and an exercise to practice the technique. Table 1 presents an overview of the trainings. The three trainings are made available one at a time and in the same order for all employees. Employees must take each training in the order they are first made available, i.e., they can only take trainings 2 (3) after they have taken training 1 (trainings 1 and 2). The first (second) [third] training is made available for the first time in Period 2 (3) [4]. Once a training is made available, it remains available until Period 6. At the beginning of the experiment, all participants know that three trainings on solving multiplication problems more accurately and quickly will be available and that each training focuses on a different technique for solving a different type of problems.

Each training is available after 300 seconds of a period and takes 180 seconds to complete. Employees can freely decide on whether to take the training. Specifically, after 300 seconds of a period, they can decide to take training, take a break, or continue working on multiplication problems.[3] Panel A of Figure 1 illustrates the timeline of Periods 2-6. Once employees have taken a training, they can review the insights of the training in the next periods. However, an employee is not able to work on the problems during the time he or she reviews the insights.

In every period, the first (second) [third] training applies to four (six) [eight] problems. That way, after taking the first training, taking the second and the third training still helps increase employee performance as, otherwise, providing these trainings would be inefficient. Thus, together, the three trainings help solve 18 out of the 38 problems more quickly and accurately.

[3] Prior work has shown that 180 seconds are sufficient for most participants to complete the training and that all trainings improve participants' skills in solving multiplication problems (Arnold et al. 2025). We provide evidence on the productivity-enhancing effects of the trainings in our study in the Results section.

Managers spend 180 seconds to review the content of the trainings one period before they become available to the employees. That means, managers can review training 1(2)[3] in Period 1(2)[3]. In each period, managers can also decide to review any training that has already been made available to them in a prior period. Thus, managers have an informational advantage over employees that is likely descriptive of corporate practice where managers usually know the training content before they make training recommendations to their employees. Employees are informed of the managers' possibility to review the trainings.

We introduced the first training in Period 2 to ensure that employees could experience their problem-solving ability during a full 480-second period in Period 1 and to give managers the possibility to review training 1 before employees could take it. Training is not available in Period 7 as skill development is irrelevant in the final period of the experiment. It also allows us to unambiguously compare employee performances in Period 7 across all conditions. Panel B of Figure 1 illustrates the timeline of Periods 1 and 7.

Neither managers nor employees incur any direct costs of training beyond the time lost that employees could not spend working on the multiplication problems. This reflects that in practice, training costs are, in many cases, strongly driven by the foregone productivity when employees take training (LinkedIn 2024).

Performance Goal Manipulation

We manipulate the presence of performance goals by making the manager set a performance goal for their employee at the beginning of each period (Goal-present) or not (Goal-absent). In the Goal-present conditions, managers set a performance goal for their employees equal to the number of multiplication problems the managers want the employees to solve correctly in this period. The performance goal is communicated to the employee at the beginning of the period before they start working on the problems. When employees make their training decision after

300 seconds in the period, they can see their performance goal for this period. This is descriptive of practice where employees have access to their performance goals for the period.

We use performance goals that are not tied to compensation because such goals are commonly observed in practice (Bonner et al. 2000; Brüggen, Feichter, and Williamson 2018; Locke and Latham 1990) and because this allows for a cleaner test of our underlying theory. Specifically, as employees' and managers' financial incentives are held constant across conditions, we can compare results between the Goal-absent and Goal-present condition and, thus, isolate the effect of the presence of a goal itself. In contrast, linking a bonus to goal achievement when the manager is the residual claimant creates an agency-problem between manager and employee due to misaligned financial incentives by introducing a hold-up problem between manager and employee in a multi-period setting (Rogerson 1992; Williamson 1979). Managers could, after employees have taken a training to improve their skills, raise the goal required to earn a bonus, thereby benefiting from employees' increased performance after training. While the question of how to address such hold-up problem is interesting, it makes the setting more complex to assess for employees and managers and, thus, decreases experimental control. Additionally, as our focus is on the effect of the presence of a goal itself, the misaligned financial incentives from the hold-up problem would no longer allow us to elicit this effect and thus are beyond the scope of our study. Finally, not linking the bonus to goal achievement (i.e., excluding the hold-up problem) likely biases *against* our prediction of a negative effect of the presence performance goals on taking training as employees tend to be even more reluctant to take training if they anticipate this hold-up effect.

Before the first period, we provide managers with performance information from a prior session in which employees performed the same math task for 480 seconds and received the same variable compensation as in this study. We inform managers that, in this prior session, 80%

of the employees solved between 0 and 12 math problems, with the bottom 10% solving 0 problems and the top 10% solving 12 or more. This guides managers in setting initial goals when no data on their employee's performance was yet available. From Period 2 onward, managers were informed about their employee's prior performance and training history. Employees were not informed about the pretest outcomes to prevent any potential relative comparisons.

As indicated in Figure 1, Panel C, at the end of each period, employees are informed about their performance, their earnings for the period (including the time bonus) and, in the Goal-present condition, their performance goal and whether they achieved the goal. Managers are informed about their employee's performance, their own period earnings and, in the Goal-present condition, the performance goal and whether the employees achieved the goal.

Training Recommendation Manipulation

We manipulate the training recommendation at three levels: absent (No-Rec) vs. intra-period recommendation (Rec-Intra) vs. beginning-of-period recommendation (Rec-Begin). The manager's training recommendation consists in either sending a message to their employee stating "I recommend that you take training in the current period" or "I do not recommend that you take training in the current period". We inform participants that training recommendation reflects whether the manager wants an employee to take training in that period, but it is entirely up to the employee to decide whether to take the training or not. Importantly, as with goals, whether or not an employee follows the manager's training recommendation does not have any payoff consequences for the employee as it could be the case, for example, when the manager had discretion over an employee's bonus.

In the No-Rec condition, managers cannot make training recommendations to their employees. In the Rec-Intra condition, managers make their training recommendation intra-period at the time where training was offered to the employee. In the Rec-Begin condition,

managers make their training recommendation at the beginning of the period, together with the decision on performance goal (in the Goal-present conditions).

As explained above, in all conditions, the manager is informed about the employee's prior period performance and training history at the beginning of a period. In all conditions, at the time training is offered to the employee, the manager is informed about the employee's performance up to this point. At the end of a period, managers are reminded of their training recommendation and are informed about the employee's training decision in this period.

Participants and Procedures

We recruited 222 undergraduate students from a large U.S. university to participate in our experiment, between 36 and 38 in each condition. Participants are, on average, 20.5 years old, and 50 percent are female. They took, on average, 3.1 college-level math classes. There are no significant differences regarding gender or math classes taken across conditions (all p's ≥ 0.60). Participants' age in one condition is significantly higher than in the other conditions (21.4 vs. 20.4, t-test, $p = 0.01$). However, age does not significantly affect our results. Each session took about 120 minutes. Including a show-up fee of $5, participants receive an average total pay of $28.64. We conducted three sessions for each condition.

After reading the instructions, employees complete an incentivized 240-second practice period in which they earn $0.35 per correctly solved problem.[4] All participants then complete a quiz to reinforce their understanding of the instructions and the task. They can proceed to the experiment only after passing all quiz questions. Then, the seven periods of the experiment start, followed by a post-experiment questionnaire.

IV. RESULTS

[4] Practice period output is insignificantly different across conditions ($p > 0.60$).

Descriptive Statistics

Table 2 reports descriptive statistics on key measures. *Number of trainings* is the total number of trainings taken in all periods. *Number of early trainings* is the total number of trainings taken in Periods 2 to 4 (the first three periods where training was available). *Number of training recommendations* is the number of times managers recommend employees to take training. *Follow recommendation* is an indicator variable equal to 1 if the employee took training (did not take training) when the manager recommended taking training (not taking training) and 0 else. *Average goal* is the average goal set in the Goal-present conditions in all periods. *Average (final) goal achievement* is an indicator variable equal to 1 if an employee achieved the goal in Periods 1-7 (Period 7). *Final output* is the number of problems solved in Period 7. *Final performance efficiency* is the number of problems solved in Period 7 per minute spent on the task.

In line with H1, Table 2 shows that *Number of trainings* is always smaller when a goal is present than when it is absent (No-Rec: 1.21 vs. 1.95; Rec-Intra: 1.22 vs. 2.67; Rec-Begin: 2.05 vs. 2.78). In line with H2a and H2b, the table also shows that intra-period recommendations increase *Number of trainings* compared to no recommendations when goals are absent (2.67 vs. 1.95), but much less so when goals are present (1.22 vs. 1.21). Finally, in line with H3a and H3b the table shows that, when moving from intra-period to beginning-of-period recommendations, *Number of trainings* increases when goals are present (2.05 vs. 1.22) and less so when goals are absent (2.78 vs. 2.67). Figure 2 illustrates these results. Results are similar for *Number of early trainings* and *Number of training recommendations*.

In line with our design choice to make trainings productive for employees, Table 2 shows that differences in *Final output* and *Final performance efficiency* across conditions parallel those of *Number of trainings*. Additionally, in line with our design choice that managers have an informational advantage over employees regarding the trainings, employees mostly follow

managers' recommendations (*Follow recommendation* between 0.88 and 0.95 in all conditions). Finally, even though *Goal achievement* is generally rather low, it is clearly higher in the Rec-Begin condition (0.51) than in the No-Rec (0.35) or Rec-Intra condition (0.24). This provides initial evidence that when managers make recommendations at the beginning of the period, they are able to better balance the resources needed to achieve the goal and to take training.

Hypotheses Tests

We always run three regressions for each hypothesis test: one including all observations from Periods 2-6 in which training was possible, one including Periods 2-6 but controlling for whether employees have already taken the maximum of three trainings and one including only Periods 2-4, i.e., the first three periods in which training could be taken.

Effect of Performance Goals on Taking Training

To test H1, we use a Logit regression to regress *Take training*, equal to 1 (0) if an employee takes (does not take) training in a specific period, on an indicator variable, *Goal*, equal to 1 (0) for the Goal-present (Goal-absent) condition. We control for *Period* to capture general time effects. All regressions in the paper cluster standard errors at the individual participant level to account for multiple observations within participant. We then calculate the marginal effect of *Goal* on the likelihood of taking training. Table 3 reports our results. Supporting H1, we find that the marginal effect of *Goal* on *Take training* is significantly negative in all three regressions (Model 1: -0.1909, $p < 0.01$; Model 2: -0.3018, $p < 0.01$; Model 3: -0.2327, $p < 0.01$).[5]

To test H2a and H2b, we use the No-Rec and Rec-Intra conditions. In Logit regressions, we regress *Take training* on *Goal*, an indicator variable *Rec-Intra* equal to 1 (0) for the Rec-Intra (No-Rec) condition, their interaction, and *Period*. Again, based on the regression, we calculate

[5] *P*-values in the Hypotheses Tests section are one-tailed for directional predictions and two-tailed otherwise.

the marginal effects of *Goal* and *Rec-Intra* on the likelihood of taking training. Table 4 shows that the coefficient of *Rec-Intra*, reflecting the effect of intra-period recommendations when goals are absent, is significantly positive in all models as well as the corresponding marginal effects at the bottom of the table (Model 1: 0.1439, p = 0.02; Model 2: 0.2782, p = 0.01; Model 3: 0.2865, p = 0.01). These results support H2a. The table also shows that the effect of *Rec-Intra* is weaker when goals are present (interaction term: Model 1: -0.64, p = 0.08; Model 2: -1.25, p = 0.03; Model 3: -1.00, p = 0.08). Marginal effects at the bottom of the table show no significant effect of *Rec-Intra* on *Take training* (Model 1: 0.0023, p = 0.97; Model 2: -0.0053, p = 0.93; Model 3: 0.0741, p = 0.41). These results support H2b.

To test H3a and H3b, we use the Rec-Intra and Rec-Begin conditions. In Logit regressions, we regress *Take training* on *Goal*, an indicator variable *Rec-Begin* equal to 1 (0) for the Rec-Begin (Rec-Intra) condition, their interaction, and *Period*. We then calculate the marginal effects of *Goal* and *Rec-Begin* on the likelihood of taking training. As reported at the bottom of Table 5, the marginal effect of *Rec-Begin* when goals are present is significantly positive in all models (Model 1: 0.1661, p < 0.01; Model 2: 0.1977, p < 0.01; Model 3: 0.2417, p < 0.01). This supports H3a. Additionally, the table shows that the interaction term is positive in all three models (Model 1: 0.87, p = 0.01; Model 2: 0.56, p = 0.22; Model 3: 0.65, p = 0.20) even though it is only significant at conventional levels in Model 1. Thus, the positive effect of beginning-of-period instead of intra-period training recommendations is less pronounced when goals are absent. In line with this, all marginal effects of *Rec-Begin* are small and insignificant when goals are absent (Model 1: 0.0222, p = 0.65; Model 2: 0.0654, p = 0.56; Model 3: 0.0556, p = 0.61). Together, we interpret our findings as supporting H3b. In line with H1, all simple effects of *Goal* on *Taking Training* in Tables 3 and 4 remain significantly negative (all p's < 0.10).

Supplemental Analyses

Usefulness and Productivity of Training

We asked all participants who took (employees) or assessed (managers) a specific training in the post-experiment questionnaire whether they agreed that the training is useful (from 1 – strongly disagree to 7 – strongly agree). The perceived usefulness of all trainings is high and amounts to 5.77 for training 1, 6.01 for training 2, and 6.02 for training 3. All scores are significantly higher than 5 (t-tests, all p's < 0.01). While managers and employees do not differ in their assessment of trainings 1 and 2 (t-tests, both p's > 0.20), employees find training 3 more useful than managers (6.25 vs. 5.93, p = 0.06).

To test the productive effects of training, we regress, separately, *Final performance efficiency* and *Final output* on *Number of trainings* and Period 1 performance efficiency as a proxy for an employee's initial ability. We find that *Number of training* significantly increases employees' *Final performance efficiency* (0.42, p < 0.01) and *Final output* (3.34, p < 0.01).[6]

As we provided evidence that taking training increases employees' performance, we now examine the effect of our manipulations on performance. Note that, despite goals' negative effect on taking training, we do not necessarily expect a negative effect of goals on employee performance because goals can be motivating themselves (e.g., Dekker et al. 2012). This could (partially) counteract the negative performance effects of taking less training. We ran two OLS regressions using the No-Rec and Rec-Intra conditions and regress both *Final output* and *Final performance efficiency* on the *Goal*, *Rec-Intra*, their interaction and *Initial (Period 1) performance efficiency* to proxy for employee ability (Models 1 and 2 in Table 6).[7] We then

[6] We also substitute an employee's total payoff (including time bonus) for *Final performance efficiency* and reran the regression. Again, we find a strong positive effect of *Number of training* on employees' total payoff (3.20, p < 0.01). Thus, taking training surpasses both continuing working or taking a break (time bonus) in its effect on payoff.
[7] While we are aware that *Initial performance efficiency* may be influenced by the goals set by managers in Period 1, we use this measure as a proxy for employee ability because Period 1 has the same length as Period 7 and allows us to obtain a more differentiated measure of employee ability. However, none of our findings changes when we use performance efficiency based on the practice period as proxy for employee ability.

rerun these regressions using the Rec-Intra and Rec-Begin conditions and substituting *Rec-Begin* for *Rec-Intra* (Models 3 and 4 in Table 6). The results are included in Table 6.

Models 1 and 2 show that the effect of *Goal* on *Final output* and *Final performance efficiency* is insignificantly negative under No-Rec (Model 1: -0.02, $p = 0.98$; Model 2: -0.01, $p = 0.95$). The effect of *Rec-Intra* when goals are absent is significantly positive (Model 1: -4.21, $p < 0.01$; Model 2: 0.52, $p < 0.01$), and this effect is less positive when goals are present (interaction: Model 1: -3.61, $p = 0.03$; Model 2: -0.45, $p = 0.03$). In this case, the effect of *Rec-Intra* is insignificant when goals are present (Model 1: 0.60, $p = 0.53$; Model 2: 0.07, $p = 0.51$).

Models 3 and 4 provide evidence that the effect of *Goal* on *Final output* and *Final performance efficiency* is significantly negative under Rec-Intra (Model 3: -4.46, $p < 0.01$; Model 4: -0.56, $p < 0.01$). When goals are absent, the effect of *Rec-Begin* is insignificant (Model 3: -0.77, $p = 0.45$; Model 4: -0.10, $p = 0.45$), but it is more positive when goals are present (interaction: Model 3: 3.66, $p < 0.01$; Model 4: 0.46, $p < 0.01$). In this case, the effect of *Rec-Begin* is significantly positive (Model 3: 2.89, $p < 0.01$; Model 4: 0.36, $p < 0.01$).

These results show that our findings on performance mimic those of taking training. Importantly, they also provide evidence that goals can make managers and employees act against their own financial interests by recommending less training and taking less training, which ultimately leads to lower performance and payoff.

Managers' Training Recommendations and Employees' Training Decisions

In our theory development, we argue that when making recommendations intra-period, managers recommend less training when goals are present than absent because managers set challenging goals at the beginning of the period to motivate employees without sufficiently factoring in training into these goals. As the period progresses, the focus on achieving the challenging goals leads managers to prioritize current performance over training, particularly

when employees are underperforming relative to the goal. In contrast, beginning-of-period recommendations make managers consider training more while setting the goals, resulting in less challenging goals and recommending more training. On the employee side, decisions about taking training are influenced by the presence of goals, particularly, the distance between current performance and the set goal. Employees likely forego training when they perceive themselves as falling short of the goal. We will now provide evidence for these arguments.

First, using a Logit regression, we regress an indicator variable *Recommend training* equal to 1 (0) when the manager recommended training (recommended not taking training) on *Goal*, *Rec-Begin*, their interaction, and Period. In line with our evidence from Table 2 and our theory, we find that under intra-period recommendations, managers recommend taking training significantly less frequently when goals are present (marginal effect: -0.1270, $p < 0.01$). This effect is significantly less pronounced when recommendations are made at the beginning of the period (interaction: 0.4570, $p = 0.10$). In this case, the effect of goals is insignificant (marginal effect: -0.0347, $p = 0.36$). Thus, managers' training recommendations are in line with our theory.

Second, we examine whether in the intra-period recommendation condition, managers' recommendations to take training become less likely, the more the employee is underperforming the current goal at the time of the training recommendation. We use an OLS regression to regress *Recommend training* on *Distance to goal* (the difference between goal and current output), the *Squared distance to goal* to allow for nonlinear effects, and *Period*. We find that *Distance to goal* has a significant nonlinear u-shaped effect on *Recommend training* as the linear *Distance to goal* term is significantly negative (-0.26, $p < 0.01$) while the *Squared distance to goal* term is significantly positive (0.02, $p < 0.01$). *Ex post* calculations show that all our observations of *Distance to goal* are on the falling part of the u-shaped curve. Thus, managers' decisions to recommend training intra-period seem to be affected by the (too high) goal they set at the

beginning and employees falling short of it at the time of the recommendation.

Third, we provide evidence that managers set lower goals in the Rec-Begin than Rec-Intra condition. We regress *Performance goal* on an indicator variable *Recommendation* equal to 1 (0) when managers could make (could not make) training recommendation, *Rec-Begin*, the number of trainings taken in prior periods and Period. The coefficient of *Recommendation* picks up the effect of the intra-period recommendation compared to no recommendations and is insignificant (0.28, p = 0.33). In contrast, the coefficient of *Rec-Begin*, reflecting the effect of beginning-of-period vs. intra-period recommendations, is significantly negative (-0.76, p = 0.01). Thus, in the Rec-Begin condition, managers set lower goals.[8]

On the employee side, Table 7 shows that when goals are *absent*, employees nearly always take training when the manager recommends doing so (Panel A: Rec-Intra: 0.96; Rec-Begin: 1.00) and sometimes even take training when the manager recommends not to take it (Panel B: Rec-Intra: 0.07; Rec-Begin: 0.21). In contrast, when goals are *present*, employees *never* take training when the manager recommends *not* to take training (Panel B: Rec-Intra: 0.00; Rec-Begin: 0.00). Even if the manager recommends taking training, employees do not always take it, particularly in the Intra-period recommendation condition (Panel A: Rec-Intra: 0.67; Rec-Begin: 0.87). Simultaneously, when the recommendation is positive, *Distance to goal* is larger under Rec-Intra (1.6970) than under Rec-Begin (-0.0889). Thus, the presence of goals makes employees deviate more from managers' recommendations in the direction of *not* taking training.

As explained above, we also suggest that employees are more willing to follow managers' recommendations when they are made at the beginning of the period rather than intra-

[8] This also leads to a higher goal achievement. Regressing *Goal achievement* on the same independent variables shows that *Recommendation* (i.e., the intra-period recommendation) has a significantly negative effect (-0.60, p = 0.04) while *Rec-Begin* has a significantly positive effect (1.04, p < 0.01).

period. Therefore, in the training recommendation conditions, we regress *Follow recommendation* on *Rec-Begin* in case managers recommend taking training. Supporting our theory, we find that the effect of *Rec-Begin* on *Follow recommendation* is significantly positive (0.09, $p = 0.07$).

Finally, we regress employees' training decisions (*Take training*) on *Distance to goal* and *Period* for the cases in which managers recommend taking training. We find that for both intra-period recommendations (-1.60, $p < 0.01$) and beginning-of-period recommendations (-2.52, $p = 0.04$), the effect of *Distance to goal* is significantly negative.[9] Thus, *beyond* the negative effect of *Distance to goal* on managers' training recommendations, it also negatively affects employees' decisions to take training even when managers make positive recommendations. Taken together, this provides evidence in favor of our theory of how the temporal (dis)connect of training recommendations and goals interact to affect managers' and employees' behavior.

Taking Training when Goals are Present

So far, we have provided evidence that the presence of goals decreases employees' willingness to take training. Now, we examine whether the presence of goals may affect the effectiveness of the training itself *given that* an employee takes a training when goals are present. As explained above, employees could review the main insights of the training while solving problems in the next periods. However, reviewing these insights comes at a cost of time that could not be spent working on the problems, pointing to ineffective training. We regress the number of times employees reviewed the training insights on *Goal*, *Recommendation* (equal to 1 when managers could make a recommendation), their interaction, *Period* and the number of trainings taken in prior periods. We find that the effect of *Goal* on the number of training reviews is significantly negative (-0.31, $p < 0.01$) while the interaction is insignificant (0.01, $p = 0.94$).

[9] Likewise, in the No-Rec condition, *Distance to goal* also negatively affects the decision to take training (-0.28, $p = 0.05$).

These results suggest that the presence of goals increases the effectiveness with which employees who take a training apply it.

Post Experimental Questionnaire Evidence

In our theory development, we argued that when managers recommend training, employees feel more supported by the manager. On the post-experimental questionnaire (PEQ), we asked employees to indicate their agreement to the statement that the manager cared very much about them (on a 7-point Likert scale). In line with our theory, the response to this question and *Number of training recommendations* is highly correlated in the Recommendation-present conditions (i.e., Rec-Intra and Rec-Begin). Thus, when performance goals are absent, responses are significantly higher in both Recommendation-present conditions than in the Recommendation-absent condition (No-Rec = 3.42, Rec-Intra = 5.06, Rec-Begin = 5.28, t-tests, both p's < 0.01). When goals are present, responses are only significantly higher in the Rec-Begin than in the No-Rec condition (4.68 vs. 3.15, t-test, p<0.01) but no longer significantly higher in Rec-Intra vs. No-Rec condition (3.61 vs. 3.15, t-test, p = 0.33).

We also argue that employees commit to their goals which prevents them from taking training and instead makes them pursue goal achievement. On the PEQ, we asked employees whether it was important to them to achieve their performance goals and whether they were highly committed to achieving these goals (both on a 7-point Likert scale). We use an index based on the two questions to assess their goal commitment. In all three goal-present conditions, employees were highly committed to goals (No-Rec: 5.18, Rec-Intra: 4.94, Rec-Begin: 5.60, all means larger than 4, all p's < 0.01). Additionally, goal commitment is significantly negatively associated with *Number of trainings* (Pearson r = -0.28, p = 0.04), supporting our arguments.

In the theory development, we also argue that performance goals make managers focus more on current (vs. future) performance and that only considering training recommendations

and performance goals together at the beginning of the period may mitigate this effect. To measure managers' orientation towards current performance vs. investment in future skills, we asked managers on the PEQ, whether (i) high output is mainly driven by employees working longer on a task (-3) vs. employees taking training to develop skills (+3), and that (ii) employees can improve their performance by solving more problems (i.e., learning-by-doing) (-3) vs. taking more training (+3). Supporting our theory, managers indicate higher agreement to question (i) under goal absent than under goal present for both No-Rec (0.63 vs. -0.11, t-test, p = 0.03) and Rec-Intra (0.44 vs. -0.39, t-test, p=0.07) but not under Rec-Begin (0.72 vs. 0.63, t-test, p = 0.81). We also obtain similar results for question (ii) (t-tests, No-Rec: 0.47 vs. -0.16, p = 0.07; Rec-Intra: 0.67 vs. -0.44, p = 0.02; Rec-Begin: 0.78 vs. 0.53, p = 0.44).

Additionally, we argue that goals, in general, focus managers more on the output itself and less on how the output is produced (input), thereby neglecting training as a potential way to improve employees' input into the process. On the PEQ, we asked managers whether they agree to the statement that achieving high output is important but the way in which this output is produced is less important (on a 7-point Likert scale). Supporting our theory, we find that agreement is always higher when a goal is present than when it is absent (t-tests, No-Rec: 5.42 vs. 5.05, p = 0.33; Rec-Intra: 5.72 vs. 4.72, p = 0.01; Rec-Begin: 5.47 vs. 4.50, p = 0.01).

V. CONCLUSION

This paper uses an experiment to examine how performance goals set by managers and the presence and timing (intra-period vs. beginning-of-period) of managers' training recommendations interact to influence employees' willingness to take training. We predict and find that performance goals negatively affect employees' willingness to take training that boosts their future productivity as these goals focus managers and employees narrowly on *current* as opposed to *future* performance. We also predict and find that intra-period training

recommendations can increase employees' willingness to take training, but only when performance goals are absent. Finally, we find that, compared to intra-period recommendations, beginning-of-period recommendations make managers better balance the resources needed to achieve current performance vs. develop skills to boost future productivity, increasing employees' willingness to take training when performance goals are present.

Our study contributes to the emerging literature on how management controls affect employee skill development (Arnold et al. 2025) by providing evidence about how managers' actual use of performance goals and training recommendations affects employee skill development in a controlled experimental setting. The findings that even performance goals that are not linked to compensation can interfere with employees' skill development and that managers' training recommendations can be a low-cost way to mitigate this negative effect highlight the importance of investigating how management controls developed to motivate *transitory* effort could also affect employees' investment in more *permanent* skill development. Our study also contributes to the research examining the motivational effects of performance goals (e.g., Presslee et al. 2013). While prior studies focus mainly on the information managers use to set goals and the difficulty level of goals (e.g., Feichter et al. 2018), we provide evidence that the extent to which performance goals hinder skill development depends on whether managers set goals and make training recommendations jointly or separately in time.

The results of this study have important practical implications for firms that have made developing employee skills part of managers' job descriptions. Our results suggest that, in the absence of performance goals, firms can leave it to managers to decide whether to make training recommendations at the beginning of or intra-period. However, in the presence of performance goals, the firms should ask managers to make training recommendations at the beginning of the period (e.g., by including them in the annual employee review or development discussion).

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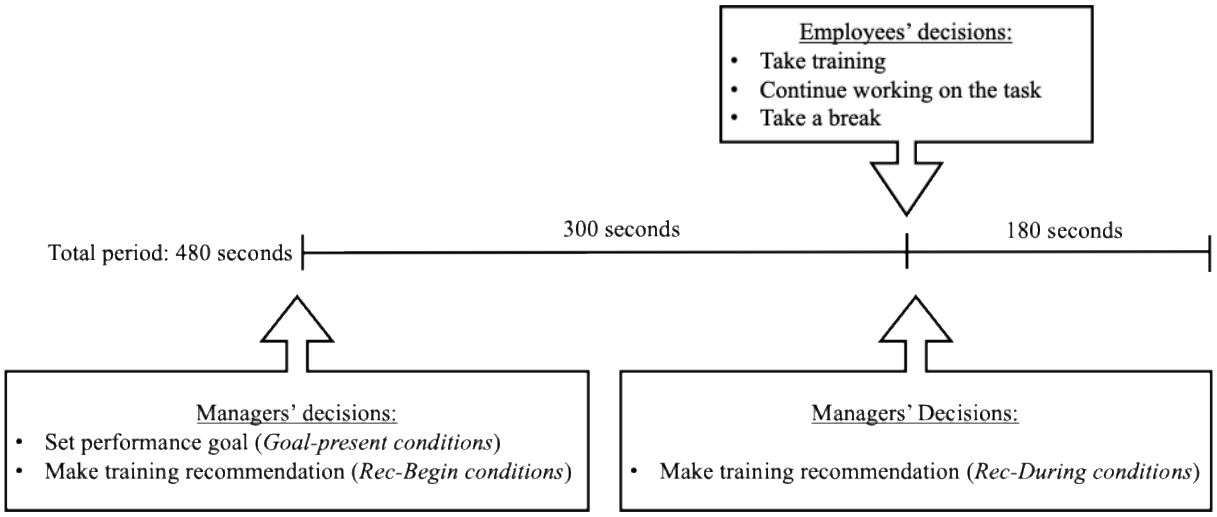
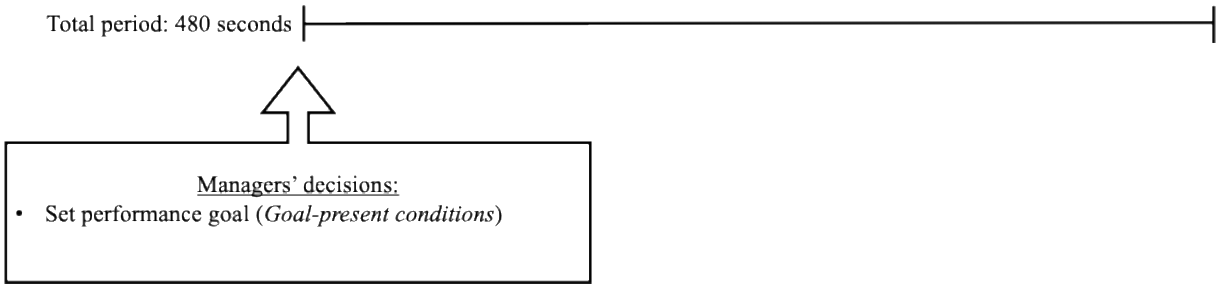
FIGURE 1

Timeline in a period

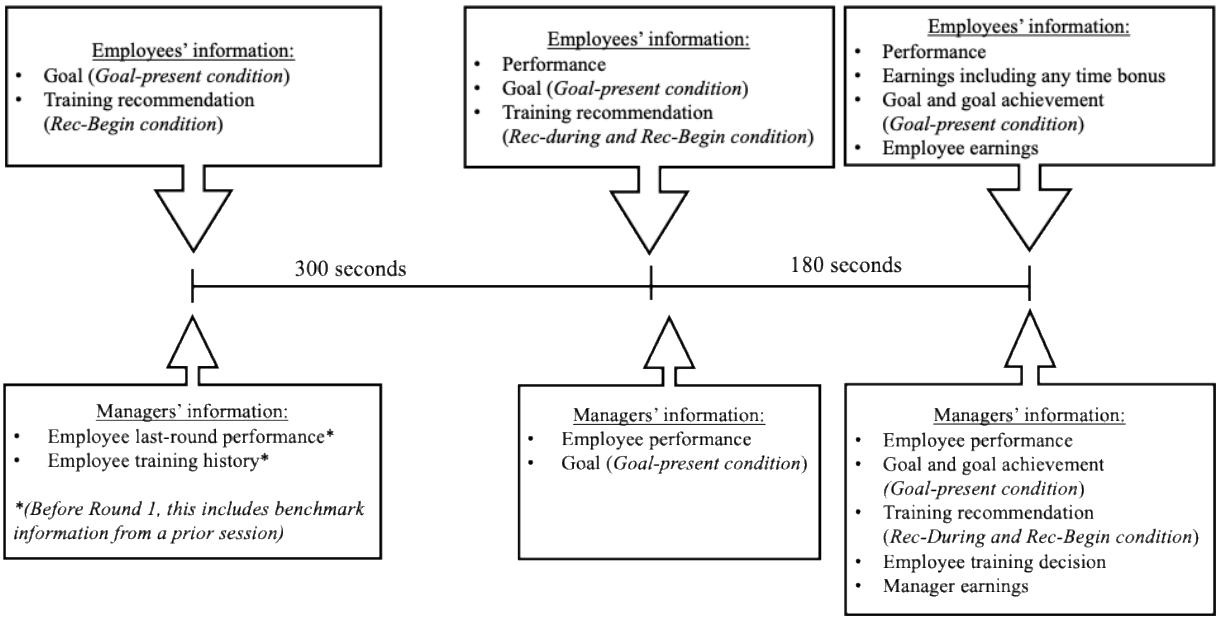
Panel A: Timeline in Periods 2 to 6:



Panel B: Timeline in Periods 1 and 7



Panel C: Information available to managers and employees

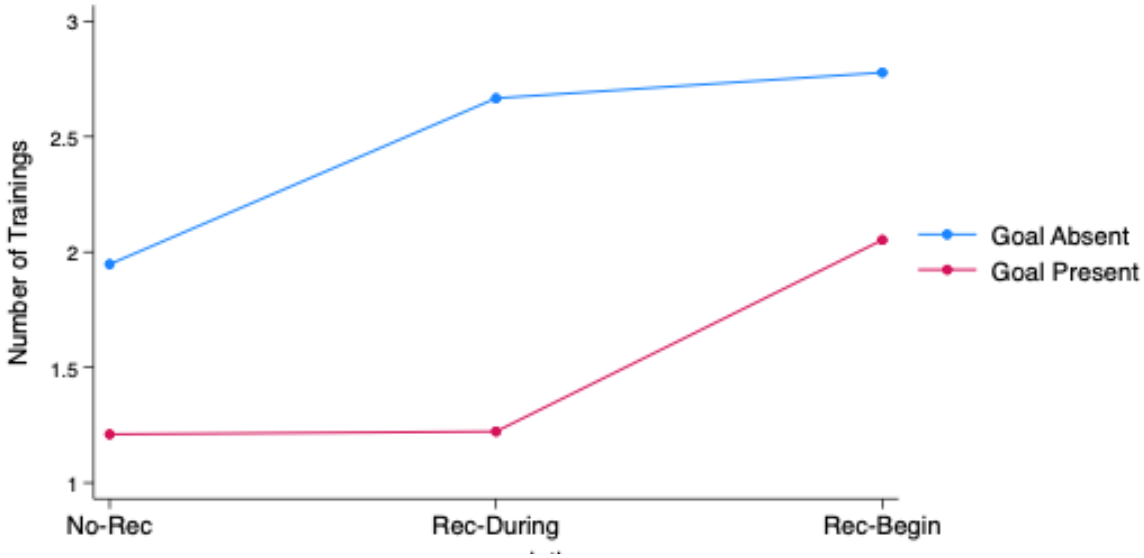


All information relates to information in this round, unless explicitly stated otherwise

FIGURE 2

Effect of Goals and Training recommendations on the Number of Trainings Taken

Panel A: Number of Trainings Taken



Notes: The table displays the total number of trainings taken in all periods per employee.

TABLE 1
Overview of Trainings

Training	Technique	Numerical Example
Training 1: Multiply a two-digit number by 25	*Step 1:* Divide the two-digit number you are multiplying by 25 by 4 *Step 2:* Multiply the answer from step 1 by 100	*Example:* 24 x 25 Step 1: 24 ÷ 4 = 6 Step 2: 6 x 100 = 600 Final answer: 600
Training 2: Multiply a two-digit number by 11	*Step 1:* Add the digits of the number you are multiplying by 11 *Step 2:* Insert your answer from step 1 in the middle of the original number	*Example*: 54 x 11 Step 1: 5 + 4 = 9 Step 2: 5 9 4 = 594 Final answer: 594
Training 3: Multiply two two-digit numbers that have the same tens place digit, and the sum of their unit place digits is 10	*Step 1:* Multiply the tens digit by the next higher number. The product will be the first two digits of the final answer. *Step 2:* Multiply the unit digits. The product will be the last two digits of the final answer.	*Example*: 53 x 57 Step 1: 5 x 6 = 30 Step 2: 3 x 7 = 21 Final answer: 3021

TABLE 2
Descriptive Statistics
Mean, (Standard Deviation), [number of observations]

	Goal absent			Goal present		
Mean (SD)	No-Rec	Rec-Intra	Rec-Begin	No-Rec	Rec-Intra	Rec-Begin
Number of trainings	1.95 (1.31) [19]	2.67 (0.84) [18]	2.78 (0.65) [18]	1.21 (0.92) [19]	1.22 (0.73) [18]	2.05 (0.71) [19]
Number of early trainings	1.47 (1.22) [19]	2.33 (1.03) [18]	2.50 (0.99) [18]	1.00 (0.94) [19]	1.22 (0.73) [18]	1.95 (0.62) [19]
Number of training recommendations	N/A	2.72 (0.83) [18]	2.61 (0.98) [18]	N/A	1.83 (0.99) [18]	2.37 (0.60) [19]
Follow recommendation	N/A	0.95 (0.21) [64]	0.95 (0.22) [61]	N/A	0.88 (0.33) [90]	0.93 (0.25) [87]
Average goal	N/A	N/A	N/A	9.70 (3.03) [133]	10.21 (3.49) [126]	10.62 (4.62) [133]
Average goal achievement	N/A	N/A	N/A	0.35 (0.48) [133]	0.24 (0.43) [126]	0.51 (0.50) [133]
Final goal achievement	N/A	N/A	N/A	0.32 (0.48) [19]	0.17 (0.38) [18]	0.32 (0.48) [19]
Final output	11.74 (4.59) [19]	16.22 (3.41) [18]	15.06 (2.90) [18]	10.47 (3.91) [19]	10.78 (2.88) [18]	14.00 (3.79) [19]
Final performance efficiency	1.47 (0.57) [19]	2.03 (0.43) [18]	1.88 (0.36) [18]	1.31 (0.49) [19]	1.35 (0.35) [18]	1.75 (0.47) [19]

Notes: The table displays mean, (standard deviation), and the [number of observations] of our main dependent variables.
Number of trainings represents the total number of trainings taken in all periods.
Number of early trainings represents the total number of trainings taken in Periods 2, 3, and 4.
Number of training recommendations represents the total number of training recommendations a manager made.
Follow recommendation
Average goal is the mean of the goals set by the manager in all periods.

Average goal achievement is the mean frequency of employees' goal achievement in all periods.
Final goal achievement is the frequency of employees' goal achievement in Period 7.
Final Output is the number of problems solved in Period 7.
Final performance efficiency is the number of problems solved in Period 7 per minute spent on the task.

TABLE 3

Effect of the Presence of Goals on Trainings Taken

Coefficient (std err) p-value	**Take training (1/0)** **Model (1)** **All periods**	**Model (2)** **Control for maximum number of trainings**	**Model (3)** **Periods 2 to 4**
Goal	-0.95***	-1.33***	-1.00***
	(0.195)	(0.261)	(0.298)
	<0.01	<0.01	<0.01
Period	-0.62***	-0.38***	0.40***
	(0.081)	(0.069)	(0.130)
	<0.01	<0.01	<0.02
Constant	2.44***	1.98***	-0.34
	(0.404)	(0.362)	(0.444)
	<0.01	<0.01	0.45
Pseudo R2	0.142	0.122	0.059
N	555	475	333
Marginal effect	-0.1909	-0.3018	-0.2327
Goal present	p < 0.01***	p < 0.01***	p < 0.01***

Notes: The table displays the results of logit regressions. Standard errors are clustered at the individual participant level. * $p \leq 0.1$; ** $p \leq 0.05$; *** $p \leq 0.01$, *p*-levels are one-tailed for directional predictions and two-tailed otherwise.

Take training is an indicator variable equal to 1 (0) if a participant took (did not take) training in a period.

Goal is an indicator variable equal to 1 (0) for the Goal Present (Absent) condition.

Period reflects the seven periods of the experiment.

TABLE 4
Effect of Intra-Period Training recommendations on Trainings Taken

Coefficient (std err) p-value	**Take training** **Model (1)** **All periods**	**Model (2)** **Control for maximum number of trainings**	**Model (3)** **Periods 2 to 4**
Goal	-0.76**	-0.87**	-0.68*
	(0.369)	(0.417)	(0.505)
	0.02	0.02	0.09
Rec-Intra	0.65**	1.22***	1.33***
	(0.330)	(0.554)	(0.606)
	0.02	0.01	0.01
Goal x Rec-Intra	-0.64*	-1.25**	-1.00*
	(0.457)	(0.638)	(0.729)
	0.08	0.03	0.08
Period	-0.50***	-0.27***	0.50***
	(0.095)	(0.084)	(0.162)
	<0.01	<0.01	<0.01
Constant	1.48***	0.80*	-1.53***
	(0.478)	(0.455)	(0.612)
	<0.01	0.08	0.01
Pseudo R2	0.120	0.136	0.110
N	370	327	222
Marginal effect Rec-Intra	0.1439	0.2782	0.2865
when Goal = 0	p = 0.02**	p = 0.01***	p = 0.01***
Marginal effect Rec-Intra	0.0023	-0.0053	0.0741
when Goal = 1	p = 0.965	p = 0.929	p = 0.412
Marginal effect Goal	-0.1474	-0.1887	-0.1579
when Rec-Intra = 0	p = 0.02**	p = 0.02**	p = 0.09*
Marginal effect Goal	-0.2889	-0.4722	-0.3704
when Rec-Intra = 1	p < 0.01***	p < 0.01***	p < 0.01***

Notes: The table displays the results of Logit regressions. Standard errors are clustered at the individual participant level. * $p \leq 0.1$; ** $p \leq 0.05$; *** $p \leq 0.01$, *p*-levels are one-tailed for directional predictions and two-tailed otherwise.

Take training is an indicator variable equal to 1 (0) if a participant took (did not take) training in a period.

Goal is an indicator variable equal to 1 (0) for the Goal Present (Absent) condition.

Rec-Intra is an indicator variable equal to 1 (0) for the intra-period recommendation present (absent) condition.

Period reflects the seven periods of the experiment.

TABLE 5
Effect of Beginning-of-Period Training recommendations on Trainings Taken

Coefficient (std err) p-value	Take training **Model (1) All periods**	**Model (2) Control for maximum number of trainings**	**Model (3) Periods 2 to 4**
Goal	-1.66***	-2.11***	-1.67***
	(0.350)	(0.482)	(0.523)
	<0.01	<0.01	<0.01
Rec-Begin	0.12	0.38	0.36
	(0.267)	(0.665)	(0.723)
	0.65	0.57	0.62
Goal x Rec-Begin	0.87***	0.56	0.65
	(0.397)	(0.717)	(0.788)
	0.01	0.22	0.20
Period	-0.86***	-0.50***	0.39**
	(0.122)	(0.097)	(0.199)
	<0.01	<0.01	0.05
Constant	3.64***	2.85***	0.11
	(0.610)	(0.601)	(0.735)
	<0.01	<0.01	0.88
Pseudo R2	0.236	0.219	0.109
N	365	302	219
Marginal effect Rec-Begin when Goal = 0	0.0222 p = 0.65	0.0654 p = 0.56	0.0556 p = 0.61
Marginal effect Rec-Begin when Goal = 1	0.1661 p < 0.01***	0.1977 p < 0.01***	0.2417 p < 0.01***
Marginal effect Goal when Rec-Begin = 0	-0.2889 p < 0.01***	-0.4461 p < 0.01***	-0.3704 p < 0.01***
Marginal effect Goal when Rec-Begin = 1	-0.1450 p < 0.01***	-0.3139 p < 0.01***	-0.1842 p = 0.02**

Notes: The table displays the results of Logit regressions. Standard errors are clustered at the individual participant level. * $p \leq 0.1$; ** $p \leq 0.05$; *** $p \leq 0.01$, *p*-levels are one-tailed for directional predictions and two-tailed otherwise.

Take training is an indicator variable equal to 1 (0) if a participant took (did not take) training in a period.

Goal is an indicator variable equal to 1 (0) for the Goal Present (Absent) condition.

Rec-Begin is an indicator variable equal to 1 (0) for the beginning-of-period recommendation present (absent) condition.

Period reflects the seven periods of the experiment.

TABLE 6
Performance Effects

Coefficient (std err) p-value	**Model (1)** **Final output**	**Model (2)** **Final performance efficiency**	**Model (3)** **Final output**	**Model (4)** **Final performanc e efficiency**
Goal	-0.02	-0.01	-4.46***	-0.56***
	(1.216)	(0.151)	(1.096)	(0.136)
	0.98	0.95	<0.01	<0.01
Rec-Intra	4.21***	0.52***		
	(1.324)	(0.165)		
	<0.01	<0.01		
Goal x Rec-Intra	-3.61**	-0.45**		
	(1.627)	(0.203)		
	0.03	0.03		
Rec-Begin			-0.77	-0.10
			(1.008)	(0.126)
			0.45	0.45
Goal x Rec-Begin			3.66***	0.46***
			(1.345)	(0.168)
			<0.01	<0.01
Initial performance efficiency	7.62**	0.94**	4.14*	0.52*
	(3.210)	(0.399)	(2.410)	(0.301)
	0.02	0.02	0.09	0.09
Constant	6.22***	0.79***	13.07***	1.64***
	(2.208)	(0.273)	(1.841)	(0.230)
	<0.01	<0.01	<0.01	<0.01
N	74	74	73	73
R-squared	0.398	0.398	0.328	0.328
Simple effect Rec-Intra/ Rec-Begin when Goal = 1	0.60 p = 0.53	0.07 p = 0.51	2.89 p < 0.01***	0.36 p < 0.01***
Simple effect Goal when Rec-Intra= 1 / Rec-Begin = 1	-3.63 p < 0.01***	-0.46 p < 0.01***	-0.80 p = 0.48	-0.10 p = 0.48

Notes: The table displays the results of OLS regressions. Standard errors are clustered at the individual participant level. * $p \leq 0.1$; ** $p \leq 0.05$; *** $p \leq 0.01$, *p*-levels two-tailed.
Final performance efficiency is the number of problems solved in Period 7 per minute spent on the task.
Final Output is the number of problems solved in Period 7.
Goal is an indicator variable equal to 1 (0) for the Goal Present (Absent) condition.
Rec-Intra is an indicator variable equal to 1 (0) for the intra-period recommendation present (absent) condition.
Rec-Begin is an indicator variable equal to 1 (0) for the beginning-of-period recommendation present (absent) condition.
Initial performance efficiency is the number of problems solved in Period 1 per minute spent on the task.

TABLE 7
Effects of Previous Ranks on the Likelihood of Taking Training under RPI

Mean (Std dev) N	Goal absent		Goal present	
	Rec-Intra	**Rec-Begin**	**Rec-Intra**	**Rec-Begin**
Panel A: Manager training recommendation positive				
Take training	0.9592	1.0000	0.6667	0.8667
	(0.1999)	(0.0000)	(0.4787)	(0.3438)
	49	47	33	45
Distance to goal	N/A	N/A	1.6970	-0.0889
			(2.3115)	(1.6352)
			33	45
Panel B: Manager training recommendation negative				
Take training	0.0667	0.2143	0.0000	0.0000
	(0.2582)	(0.4258)	(0.0000)	(0.0000)
	15	14	57	42
Distance to goal	N/A	N/A	4.1930	3.9524
			(1.9860)	(1.9749)
			57	42

Notes: The table displays mean, (standard deviation), and the [number of observations] for employees' training decisions and the distance between their current output and their goal for positive (Panel A) and negative (Panel B) recommendations.
Take training is an indicator variable equal to 1 (0) if a participant took (did not take) training in a period.
Distance to goal is computed by subtracting the current output at the time of the training decision from the employee's goal.

Creating ESG Risk Silos or Breaking Them Down? The Effects of Risk Inventory Format and ESG Mission on Risk Response

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Creating ESG Risk Silos or Breaking Them Down? The Effects of Risk Inventory Format and ESG Mission on Risk Response

Abstract:

We examine the impacts of presentation of ESG (Environment, Social & Governance) risks in a risk inventory and ESG mission statement on risk response. We hypothesize that under a substantive ESG mission, creating a separate ESG risk category within the risk inventory leads to increased investment in ESG risk management. We test our prediction using a 2x2 between-subjects experiment. Half of the participants are given a risk inventory with a separate ESG risk category, while the other half are given a risk inventory with ESG risks integrated into traditional risk categories. We also manipulate the company's ESG mission statement, i.e. genuine commitment to ESG (substantive ESG mission statement) vs. an ESG approach aimed at securing financial performance (symbolic ESG mission statement). Our results indicate that a distinct ESG risk category, combined with a substantive ESG mission, leads to increased allocation to ESG risk management whereas no effect is observed with a symbolic ESG mission. Further analyses confirm that a distinct ESG risk category enhances saliency, prompting greater managerial attention and supporting the signalling role of the ESG mission. However, we caution against the formation of an 'ESG risk silo', which could lead to the prioritization of ESG risks at the expense of other risk types.

Keywords: risk management; ESG risk; substantive ESG; symbolic ESG; risk response; risk perception.

I.INTRODUCTION

Companies today face an increasingly complex landscape of ESG (Environment, Social & Governance) risks that can impact their profitability, success and even survival (COSO & WBCSD, 2018). ESG risks, defined as *"the environmental, social, and governance-related risks and/ or opportunities that may impact an entity*" (COSO & WBCSD, 2018, p. 1), were once considered 'black swans'[1] but are now more widespread (Deloitte, 2021; World Economic Forum, 2024). ESG risks differ from traditional risks in that they are harder to identify and quantify, typically materialize over the long term and their focus and scope evolve quickly (Borsa et al., 2014; COSO & WBCSD, 2018; WBCSD, 2017).

Although managing ESG risks is crucial—given that risk and performance are inherently linked (Van der Stede, 2009) and ESG performance impacts long term financial performance—many organizations struggle to incorporate these risks into their Enterprise Risk Management[2] (ERM) practices (EY, 2023). While most companies have ERM processes in place to identify, assess, manage, monitor, and communicate risks, the effectiveness of ESG risk management and disclosure remains limited (WBCSD, 2017). However, failing to address these risks can result in severe reputational, financial, and legal consequences (Bryce et al., 2019; Chartered Accountants Australia and New Zealand, 2020; ERMA, 2023). High-profile incidents, such as Volkswagen emissions scandal and BP 2010 disaster, have brought ESG risks further into the spotlight (Esty & Cort, 2020; Gaganis et al., 2023).

Many companies use a risk inventory to document the risks they face, employing standardized categories and definitions to effectively assess and address them. It is essential to incorporate ESG risks into these risk inventories for comprehensive risk management (COSO & WBCSD, 2018). However, a critical consideration is how ESG risks should be represented—whether as a distinct risk category or integrated in traditional ones—to ensure adequate management. Moreover, the ESG values communicated by the company play a significant role in shaping risk awareness (Braumann, 2018;

[1] Black Swans are events that are very improbable but have a significant impact if they materialize i.e., events that transcend the bounds of conventional expectations, yet can have a large (extreme) impact. The term is used by former option trader Nassim Taleb in his book "*The Black Swan: The Impact of Highly Improbable Events*". This book delves into the profound consequences of rare and unpredictable outlier occurrences. Taleb explores how humans often seek simplistic explanations for these events, especially in hindsight.

[2] ERM can be defined in various ways (cf. Bromiley et al., 2015 for a review). COSO ERM defines it as *"The culture, capabilities, and practices, integrated with strategy-setting and performance, that organisations rely on to manage risk in creating, preserving, and realizing value."* (COSO, 2017, p. 10).

Braumann et al., 2020; Collier et al., 2007) which likely shapes how representation and reporting are perceived. To address these gaps, our research aims to answer the following question: Does categorizing ESG risks separately in a risk inventory lead to more active management of these risks, and what role does ESG mission play in this process?

To address this research question, we conduct a 2x2 between-subjects experiment with scenarios containing both information on the company's risk inventory as well as the company's ESG mission. We manipulate the risk inventory (with ESG risks presented either as a separate category or ESG risks integrated into the traditional risk[3] categories) and the ESG mission statement (substantive vs. symbolic). We investigate how these factors affect risk response. Specifically, participants are assigned a budget allocation task, where they determine how to allocate funds between to two different risk events: one involving a strategic ESG risk and the other a traditional (non ESG) strategic risk. We analyse what portion of an available budget participants allocate to each risk and how their decisions are shaped by the company's risk inventory format and the ESG mission.

Drawing on saliency theory, we expect that a separate ESG risk category increases managerial awareness of ESG risk. However, whether this increased awareness translates into a higher perceived importance of ESG risks depends on the company's ESG mission. According to signalling theory, a substantive ESG mission statement signals the importance of managing ESG risks. We expect that these two factors combined will lead to increased management of ESG risks.

Our results demonstrate that a separate ESG risk category, when paired with a substantive ESG mission, significantly increases the allocation of resources to ESG risks, whereas no such effect is observed with a symbolic ESG mission. These findings suggest that a distinct ESG risk category enhances the salience of ESG risks, prompting greater managerial attention. Further analyses validate the signalling role of the substantive ESG mission in influencing risk response. However, we caution

[3] The COSO (2004) ERM framework defines four broad risk categories: strategic, operational, reporting, and compliance. With traditional risk categories we mean strategic risks, operational risks and financial risks. Strategic risks are more external and less controllable (Kaplan et al., 2012). Strategic risk can be defined as *"any exposure (event, occurrence, or situation) and the associated uncertainty that foundationally threatens or enhances a company's competitive advantage or its viability as a going concern"* (Godfrey et al., 2020, p. 33). Operational risks include risks such as cyber risk, natural disasters, supply chain risk, pandemics and failure of processes and systems (World Economic Forum, 2024). Financial risk can be defined as *"the exposure to adverse events that erode profitability and in extreme circumstances bring about business collapse. It can include the failure of financial systems, regulatory non-conformances or compliance issues, as well as bad debt, adverse changes in exchange rates, overdependence on a single supplier, loss of a key customer, loss of overseas investments and poor hedging decisions"* (Chapman, 2011, p. 249).

against creating an 'ESG risk silo', which may result in an overemphasis on ESG risks at the expense of traditional non-ESG risks.

This study makes several academic and practical contributions. First, it contributes to the literature on ERM (e.g., Braumann et al., 2024; Mikes, 2011; Nocco & Stulz, 2006; Paape & Speklé, 2012; Posch, 2020) by examining how the presentation of ESG risks in risk inventories affects managers' interpretation and response. Second, it contributes to ESG and sustainable development literature by demonstrating how ESG risks can be more actively managed, which is crucial for sustainable growth (Lueg & Radlach, 2016; Schaltegger et al., 2016). Third, it advances the management literature on internal communication (e.g., Milliken et al., 2003) by highlighting the role of risk inventories on internal ESG communication. Our study underscores that how ESG risks are presented in the risk inventory alone is not sufficient to increase management of ESG risks, but that a substantive ESG mission matters as well. Fourth, it provides valuable insights for the management accounting literature on internal reporting (e.g., Cardinaels, 2016; Deore et al., 2023) by examining how risk inventory formats shape managerial perceptions of ESG risks—a behavioural aspect of risk management that has been underexplored in prior literature. Lastly, this study offers practical implications for accountants, controllers, (risk) managers, and practitioners on how ESG risks can be presented in the company's risk inventory and how these presentation formats, in conjunction with the company's ESG mission, shape perceptions of ESG risks and influence risk response.

II.BACKGROUND AND HYPOTHESIS DEVELOPMENT

Reporting format: separation vs. integration of ESG risks into risk inventories

Cognitive cost-benefit theories of decision making (Kelton et al., 2010; Payne et al., 1993; Vessey, 1991) suggest that how information is presented significantly influences decision processes, attention, choice and perception. Prior research supports this, showing that the presentation, organization, and labelling of information can shape individuals' decisions and judgments (Cardinaels, 2008; Ko et al., 2023; Maines & McDaniel, 2000; Vera-Muñoz et al., 2001).

In the context of risk management, the choice of reporting formats plays a critical role due to their potential cognitive impact. Decision-making around risks, particularly ESG risks, is prone to biases because of how our brains process risk-related information (COSO & WBCSD, 2018; Groves, 2021).

Risk information often carries negative connotations, involves probabilistic assessments, and can be challenging to verify (Dobler, 2008). This may lead to the use of cognitive heuristics and biases, which can be exacerbated or alleviated by the reporting format. Effective communication is essential to the risk management process (Ballou et al., 2011; COSO, 2017; ISO, 2018). Risk management can be viewed as a continuous process of framing and 'toolmaking', that is, the creation and reconfiguration of tools that frame risk issues for decision makers throughout the different stages of the risk management process (Hall et al., 2015; Mikes, 2020, 2021). Moreover, risk reporting tools and formats provide the foundation for ERM success by enhancing risk awareness (Braumann, 2018; Braumann et al., 2020; Collier et al., 2007; COSO, 2017; Mikes, 2009, 2011), which is essential for forming risk perceptions and driving risk mitigation behaviours (Braumann, 2018).

Our study delves into how the representation of ESG risks in a risk inventory[4] (or risk register) affects the management of these risks. The risk inventory, as a catalogue of the risks faced by the company, serves to inform the management and the board of the company's primary risks, thereby serving as the initial step in raising managerial awareness of ESG risks. Additionally, the risk inventory provides the foundation for risk assessment, prioritization, and resource allocation, which are essential for effectively managing ESG risks (COSO & WBCSD, 2018). However, the way ESG risks are represented in the risk inventory significantly influences risk awareness, risk perception, and management.

Presenting ESG risks as a separate risk category can enhance visibility and focuses managerial attention on social and environmental responsibility (Epstein & Wisner, 2001; Figge et al., 2002; van der Woerd & van den Brink, 2004). For example, CSR (Corporate Social Responsibility) measures have greater impact on investors' judgments when reported separately (Bucaro et al., 2020), and managers make more favourable strategic recommendation judgments when risks presented as a stand-alone list (Cheng et al., 2018). However, simply separating information does not always increase its decision-making weight (Alewine & Stone, 2013; Kaplan & Wisner, 2009; Lipe & Salterio, 2002) and may even lead to cognitive overload, hindering efficient information processing (Alewine & Stone, 2013).

[4] Companies may organize the risk inventory by risk category, depending in the number of individual risks identified, to establish standard definitions for different risks. This enables the grouping of similar risks (COSO, 2017). These categories may be organized by functional areas (e.g., operational risk management) or may be based on the size, scale and complexity of the entity (COSO, 2017).

Moreover, companies may adopt a separate risk category merely to comply with external regulation — such as the Pillar 3 reports for banks, TCFD report, or sustainability reports — using a tick-box mentality, without truly integrating these risks into their core business processes (Aboud et al., 2023; Aguinis & Glavas, 2012; De Silva Lokuwaduge & De Silva, 2022). Some companies may even engage in greenwashing by using a distinct ESG risk category to appear socially responsible without genuine commitment (Khanchel et al., 2023; Santos et al., 2023; Yu et al., 2020; Zhang, 2023). Additionally, creating a separate ESG risk category may foster a silo mentality, where risks are managed in isolation without recognizing correlations across categories (Hansen & Schaltegger, 2016; Ko et al., 2023; Schaltegger et al., 2006). While silos are not inherently detrimental (Tett, 2015), they can lead to suboptimal[5] risk management by overemphasizing specific risks and neglecting others (Jankensgård, 2019; Tufano, 1998). This could leave the company exposed to certain risks or lead to resource wastage (COSO, 2017).

In contrast, integrating ESG risks into traditional risk categories acknowledges the dynamic, fluid and highly interdependent nature of risks. Integration signals that ESG issues are embedded throughout the company, fundamental to day-to-day operations, and closely linked to performance and value creation (Butler et al., 2011; Figge et al., 2002). This approach reduces the likelihood of ESG risks being isolated in a 'risk silo' and makes companies less likely to abandon sustainability initiatives during financial downturns (Butler et al., 2011). Furthermore, integration aligns with the holistic approach of Enterprise Risk Management (ERM) (Arena et al., 2010, 2017; Mikes, 2009), which addresses a wider range of risks as well as growing complexity and interdependencies[6] between risks (Gatzert & Martin, 2015).

ESG mission statements: substantive vs. symbolic

Concepts such as CSR (Carroll & Shabana, 2010), ESG (diBartolomeo & de Jong, 2022), stakeholder theory (Freeman et al., 2004; Wall & Greiling, 2011), corporate sustainability (Epstein & Roy, 2001;

[5] Aven & Aven (2015) suggest that 'suboptimization risk'– the result of either 'too much' or 'too little' risk management - could be associated with the MBO (Management By Objectives) thinking of an enterprise. Managers often 'undermanage' low-probability, high-impact risks like climate-related risks, while 'overmanaging' high-probability, high-salience risks, potentially reducing future cash flows (Jankensgård, 2019).

[6] When risks are interdependent or correlated, their consequences are multiplied (Lam, 2017). ERM takes into account the interdependencies between risks, providing a clearer understanding of the company's risk landscape and improving decision-making for both strategic and operational initiatives (Hoyt & Liebenberg, 2011; Meulbroek, 2002; Nocco & Stulz, 2006).

Searcy, 2012), and triple bottom line (Svensson et al., 2018) all advocate for companies to explicitly consider environmental and social issues alongside financial objectives. However, many companies still struggle to integrate multiple values and stakeholder considerations into their risk management practices (Mikes, 2020, 2021). A company's core values, reflected in its actions, decisions, and tone from the top, are crucial to effective risk management. Tone from the top, as a form of cultural control (Merchant & Van der Stede, 2017), shapes risk awareness and helps cultivate a strong risk culture (Braumann, 2018; COSO, 2017). Mission statements[7], reflecting this tone, have evolved to encompass not only financial performance but also environmental and social concerns (Deore et al., 2023), guiding employee behaviour and aligning it with organizational goals (Babnik et al., 2014; Epley & Kumar, 2019).

Values outlined in a mission statement are not always genuine and may merely serve to establish legitimacy with external stakeholders. Without a deep commitment to those values, risk awareness can be undermined, leading to decisions that are inconsistent with those values. Scholars and regulators increasingly emphasize the need for alignment between organizational rhetoric and actions (Bromley & Powell, 2012; Christensen & Cornelissen, 2011). Companies are urged to embody the principle of 'practicing what they preach' by cultivating authentic values (McShane & Cunningham, 2012), which go beyond rhetoric and are not merely 'spin' (Waddock & Googins, 2011). The focus must be on ensuring that actions align with words, thus genuinely 'walking the talk' (Spallek et al., 2023; Wickert et al., 2016).

Despite this, many companies still treat ESG as separate from core business processes, using it in a largely symbolic role rather than embedding it into their organizational culture (Graafland & Smid, 2019; Wright & Nyberg, 2017). Merely having an ESG mission is not enough; it must be embedded in decision-making structures and integrated into the company's culture to be genuine (Collier & Esteban, 2007). Literature on CSR often distinguishes between initiatives focused on benefiting society (substantive CSR) and those designed to improve the company's image (symbolic CSR). Symbolic CSR allows companies to engage in impression management by crafting a favourable self-image (Highhouse

[7] As they are crafted and implemented within the company by top management (Alegre et al., 2018), these statements provide valuable insights into the cognitive frameworks, ideologies, and motivations of organizational leaders. For example, CSR 'tone at the top' in a company's mission statement conveys the importance attached to individual CSR engagement within the company (Church et al., 2019; Collier & Esteban, 2007; Lueg & Radlach, 2016; Slack et al., 2015).

et al., 2009; Schlenker, 1980), which aligns with the concept of greenwashing—where companies engage in self-serving behaviours under the guise of environmental or social responsibility.

When symbolic actions are not supported by substantive efforts, employees and other stakeholders[8] quickly recognize the inconsistency, leading to scepticism, mistrust, and reduced loyalty (Schons & Steinmeier, 2016; Story & Neves, 2015). In contrast, substantive CSR reflects a genuine commitment to deal with environmental and societal needs (Godfrey, 2005; Spallek et al., 2023) resulting in tangible, measurable and impactful initiatives. Thus, a symbolic ESG mission statement signals to managers that ESG matters only to the extent it affects profits and reputation, whereas a substantive ESG mission demonstrates a real commitment to sustainability and social responsibility as core values of the organization.

Interaction effect of risk inventory format and ESG mission statement on risk response

For each risk listed in the risk inventory, management chooses and implements a risk response, ultimately determining the company's ability to preserve or create long-term value (COSO & WBCSD, 2018). In this study, we propose that risk response is influenced by both the representation of ESG risks in the risk inventory and the company's ESG mission. We argue that it is unclear how using a separate ESG risk category affects risk response, as the outcome may depend on the ESG mission, which plays a critical role in driving risk awareness (Braumann, 2018; Braumann et al., 2020; Collier et al., 2007), and signals the company's risk appetite.

We argue that combining a separate ESG risk category with a substantive ESG mission will lead to a greater emphasis on ESG risks compared to traditional risks. Based on saliency theory (Bordalo et al., 2012; Kahneman, 2003) and the Gestalt psychology (Boeree, 2000; Wertheimer, 1944), which implies that organizing information into distinct groups enhances its salience, we argue that a separate ESG risk category increases managers' awareness of ESG risks by making these risks more prominent. As ESG risks become more salient, they become more accessible (Akinyele et al., 2020; Olson & Widing, 2002) and command greater attention (Kahneman, 1973; Plous, 1993). By forcing managers to consider ESG

[8] Employees (Donia et al., 2017, 2019; Donia & Tetrault Sirsly, 2016; Nejati & Shafaei, 2023; Vlachos, Epitropaki, et al., 2013; Vlachos, Panagopoulos, et al., 2013), consumers (Du et al., 2007; Ellen, 2006; Vlachos et al., 2010) and stakeholders in general (Godfrey, 2005; Rodrigue et al., 2013) make attributions of substantive and symbolic social and environmental initiatives.

risks alongside traditional risks, this increased salience can help mitigate status quo bias[9] — a bias that makes traditional risks are better understood and more familiar than ESG risks. However, saliency alone does not always translate into higher perceived importance (Alewine & Miller, 2016; Alewine & Stone, 2013; Butler et al., 2011; S. E. Kaplan & Wisner, 2009). Management communications emphasizing the strategic importance of environmental issues (S. E. Kaplan & Wisner, 2009) and positioning sustainability as a core value (Butler et al., 2011) are crucial. Additionally, past positive environmental performance (Alewine & Miller, 2016) and the psychological perspective of decision-makers (Alewine & Stone, 2013) significantly influence perceived importance. Hence, a substantive ESG mission, following the signalling theory (BliegeBird & Smith, 2005; Connelly et al., 2011; Song et al., 2024), can enhance the perceived importance of ESG risks. The combination of the increased visibility of ESG risks and the importance of ESG signalled by the substantive ESG mission encourages more active management of ESG risks. Moreover, a separate ESG risk category, supported by a substantive ESG mission, is seen as a strong indicator of top management's commitment to these issues (Epstein & Wisner, 2001), further reinforcing managers' confidence in allocating resources toward ESG risk management. The perceived congruency between the risk inventory and the mission enhances organizational legitimacy (Suchman, 1995) and strategic coherence (Porter, 1996), reducing concerns about greenwashing and fostering greater trust in the company's ESG commitment.

It is however less clear how a risk inventory will influence ESG risk response under a symbolic ESG mission. On the one hand, a separate ESG risk category can enhance the visibility, potentially increasing managerial awareness and investment in ESG risk management, even if ESG is not the company's primary focus. Integrating ESG risks into traditional categories may reduce their visibility, and when combined with a symbolic ESG mission — which may signal a lack of genuine commitment to ESG principles — could result in the marginalization or neglect of ESG risks as a less central or important category. This way a separate ESG risk category combined with a symbolic ESG mission may lead to increased management of ESG risks. On the other hand, according to information processing theory (Miller, 1956), limited cognitive resources may cause managers to simplify decision-making by

[9] Status quo bias is the tendency to prefer maintaining one's current or past situation, or the preference to avoid taking actions that would change it (COSO & WBCSD, 2018; Samuelson & Zeckhauser, 1988).

'chunking' information (Alewine & Stone, 2013; Shanteau, 1988), potentially downplaying ESG risks if the company's ESG commitment is seen as superficial. In such cases, a separate ESG risk category might be perceived as greenwashing (de Vries et al., 2015) or organizational decoupling, where ESG commitments are disconnected from actual risk management practices (Bromley & Powell, 2012; Heimstädt, 2017; Jabbouri et al., 2019; Talpur et al., 2023; Walker & Wan, 2012) and more central strategic goals. This disconnect could reinforce a status quo bias[10], reducing investments in ESG risk management. Managers will focus on the traditional risks they know will impact the company's financial performance. Integrating ESG risks into traditional risk categories may enhance information processing by highlighting the interdependencies between risks, increasing the perceived importance of ESG risks (COSO & WBCSD, 2018; Lam, 2017; World Economic Forum, 2024). This may be especially effective in combination with a symbolic ESG mission if ESG performance itself is not perceived as a central goal, as perceived causal relations between ESG risks and other strategic goals may increase perceived importance. Integration under a symbolic ESG mission may thus promote more holistic management, reducing the tendency to downplay ESG risks.

In summary, based on the saliency theory we expect that a separate ESG risk category increases managerial awareness of ESG risks. When combined with a substantive ESG mission that signals the importance of ESG risks, this is likely to result in more active management of ESG risks. In contrast, under a symbolic ESG mission, increased saliency of ESG risks may not lead to increased perceived importance and a separate ESG risk category could even result in less active management of those risks[11]:

> **H1:** Having a separate ESG risk category, compared to integrating it into other risk categories, leads to greater investment in ESG risks under a substantive ESG mission than under a symbolic one.

[10] ESG risks are seen as low probability – high impact risks leading to undermanagement according to Jankensgård (2019). The potential impact of ESG risks may not pose an immediate threat to the company's operations, leading the company to overlook this as a risk (COSO & WBCSD, 2018). This is potentially the consequence of a small step bias (Groves, 2021) which leads to managers having the tendency to be blind to significant changes when they are arrived at through many, small incremental steps. This corresponds to the normalization of deviance (Kaplan et al., 2012) where companies incubate risk rather than mitigate it.

[11] While our hypothesis predicts the circumstances under which managers will invest more or less in managing ESG risks, we do not claim that higher or lower investments are inherently better. Our aim is not to make value judgments, but to build theory and demonstrate that the presentation of ESG risks and the nature of the ESG mission influence the extent of managerial investment in ESG risk management.

III.METHOD

Experimental design and participants

To test our hypothesis, we conducted a 2x2 between-subjects experiment, manipulating two factors: the risk inventory (separate ESG risk category vs. ESG risks integrated in traditional categories) and the ESG mission statement (substantive vs. symbolic). Participants were randomly assigned to one of the four treatment conditions. The experiment was conducted online using the crowd-sourcing platform Prolific Academic[12]. Data collected through such platforms are considered as reliable as those gathered through traditional methods (Buhrmester et al., 2011). Following Bentley (2021) guidelines for improving statistical power and reliability, these online panels are expected to produce representative, high-quality data.

A total of 500 professionals from the UK and USA participated in the study[13]. Work experience was a critical inclusion criterion as it provides the practical knowledge and skills needed to understand the complexities of real-world risk scenarios, contributing to the validity and applicability of the study's findings. The study took approximately 11 minutes and participants received £2.5 for completing the study. Of the 481 participants who completed the experiment, about 44% were female (212 participants)[14], with an average age of 43.84 years old (SD = 10.94) and an average of 23.26 (SD = 11.12) years of work experience. Ninety-eight participants, randomly distributed across conditions, indicated they had no prior experience in risk management.

Task and procedures

Participants were asked to assume the role of a production manager of a hypothetical manufacturing company[15], 'FABRICFUSION'. After reading the instructions, participants reviewed background

[12] Data collected on Prolific Academic is found to be of higher quality compared to other online recruitment services (Peer et al., 2017).

[13] The experiment was approved by the Social and Societal Ethics Committee of the university at which the experiment took place.

[14] Five hundred professionals participated in the experiment. Nineteen participants were dropped: (i) 2 participants failed attention checks, (ii) 7 participants did not understand the case material and (iii) 1st and 99th percentile (10 outliers) of time spent on the budget allocation task page. What matters most is the time spent on the budget allocation task itself, as this is the focal task for our analysis. Participants that spent too little time on the budget allocation task might have skimmed through without properly engaging with the content. Participants that spent too much time on that page might have been distracted, left the page open without engaging, or encountered technical issues. Further, attention checks should allow us to filter out responses of inattentive participants and removing participants that did not understand the case material allows us to reduce noise in the data. Therefore, our analyses were conducted using the remaining 481 participants. Results remain the same if we work with the full sample.

[15] The case company is inspired by Spallek et al. (2023) and an industry-leading cotton textile company. We selected a mature and large company because such companies typically have established formal risk management processes in place (e.g., Paape & Speklé, 2012). Therefore, they are more likely to utilise risk workshops and establish a comprehensive risk inventory. Additionally, we opted for a manufacturing company due to the extensive regulatory landscape surrounding corporate activities such as manufacturing, mining, material

information about the company, including its ESG mission statement, a risk inventory and details of two risk events (an ESG risk and a non ESG risk). In their role as production manager, participants were tasked with allocating a budget of one hundred thousand euros across these two risk events.

[Insert Figure 1 here]

Manipulated variables

Risk inventory

Our first independent variable is risk inventory (cf. Appendix 1). Many companies keep a risk inventory or register to list the risks they face, using common categories and definitions to describe them. We manipulated two risk inventory conditions: ESG risks in the inventory are either included in a separate ESG risk category or they are integrated into the three traditional risk categories (strategic, operational and financial risks). The instrument explicitly stated that the risk inventory included ESG risks to ensure that participants were aware of their presence. Both conditions listed an equal number of risk events in the risk inventory. In the integrated condition, the order of the risks was randomised to prevent ESG risks from consistently appearing in the same position within each traditional risk category.

ESG mission statement

Our manipulations (cf. Appendix 2) are based on CSR attributions (Donia et al., 2017; Du et al., 2007; Ellen, 2006; Vlachos et al., 2010; Vlachos, Panagopoulos, et al., 2013) and CSR mission statements (Spallek et al., 2023). The authenticity of the ESG commitment varies across conditions. In the substantive condition, the ESG commitment appears genuine and intrinsic, with the company actively investing in ESG initiatives and truly 'walking the talk'. Participants were informed that the company's mission is *"…to make a positive contribution to sustainable development. We are committed to ESG. Our ESG initiatives are driven by the desire to protect our environment. While financial prudence is important, our focus extends beyond profit, encompassing measurable ESG actions to address environmental and societal needs. We actively do this by reducing our carbon footprint, promoting diversity and inclusion, fostering ethical business practices, and supporting communities in need."*

imports, and automobile sales (Roberts & Frantisak, 2016). Environmental regulations, aimed at safeguarding the environment, play a significant role in industries like manufacturing.

Conversely, in the symbolic condition, the ESG commitment is extrinsic and insincere, focusing on ESG as a means to enhance profit and reputation. The company does not actively invest in ESG initiatives, reflecting 'talk but no walk'. In this condition, participants were presented with the following ESG mission *"At FABRICFUSION, our mission is to generate profitable growth. We are committed to ESG. Our ESG initiatives are driven by the desire to secure our long-term success. While social responsibility is important, our focus is on profit, leveraging ESG actions to strengthen our image and secure competitive advantages. We aim to do this by investing in initiatives that deliver financial returns alongside social and environmental benefits."*

Dependent variable

The dependent variable (DV) is risk response, measured through a budget allocation task that assesses how participants distribute funds to two different risk events (cf. Appendix 3) they face. Both events are strategic, with one representing an ESG risk and the other a traditional (non ESG) strategic risk. We assume that a higher allocation of funds to the ESG risk reflects more active management of ESG risk.

IV.RESULTS

Manipulation and randomization checks

Before participants allocated the budget, they were required to answer comprehension questions correctly to ensure they understood the experimental manipulations. This ensured that they had a clear understanding of the risk inventory and the company's ESG mission statement. Manipulation of ESG mission statement was checked by the following yes-no question (with correct answer yes): *"FABRICFUSION's mission is to generate profitable growth."* in the symbolic condition or *"FABRICFUSION's mission is to make a positive contribution to sustainable development."* in the substantive condition. For the risk inventory manipulation participants answered the following questions: (1) How many columns does the risk inventory have? and (2) How many risks are mentioned in each column? All participants provided correct answers to the manipulation questions. Furthermore, we do not find significant differences in distributions across conditions for variables such as age ($p = 0.14$), gender ($\chi^2(12) = 11.04$, $p = 0.53$), country of residence ($\chi^2(3) = 2.34$, $p = 0.51$), educational background ($\chi^2(9) = 7.64$, $p = 0.57$), type of work experience ($\chi^2(15) = 12.37$, $p = 0.65$), risk management

experience ($\chi^2(18) = 16.46$, $p = 0.56$) and years of work experience ($p = 0.13$). Therefore, using a chi-square and ANOVA test, randomization appears to be successful. Table 1 presents the demographics by experimental condition.

[Insert Table 1 here]

Hypothesis testing

We conducted an Analysis of Variance (ANOVA) with the budget allocated to the ESG risk as the dependent variable, and risk inventory and ESG mission as the independent variables. The descriptive statistics (Table 2, panel B) show that more money is allocated to ESG risk when they are presented in a separate risk category under a substantive ESG mission ($M_{sep,sub} = 51.78$ vs. $M_{int,sub} = 47.44$). Table 2, panel A also shows there is a significant main effect of risk inventory ($F_{1,477} = 2.92$, $p = 0.09$, two-tailed), indicating that more funds are allocated to ESG risks when they are represented as a separate risk category.

To investigate the hypothesized ordinal interaction, we performed a contrast analysis. For the contrast analysis (Buckless & Ravenscroft, 1990; Guggenmos et al., 2018), we applied contrast weights of {-1, -1, -1, +3}, with +3 for the separate/ substantive condition for an ordinal interaction effect. We find a significant ordinal interaction effect ($p = 0.03$). The approach by Guggenmos et al. (2018) suggests a strong fit, as the residual between-cells variance is not significant and the contrast variance residual (q^2) is 6.6%. We examine the simple effects to interpret this result. Consistent with H1, we find that under a substantive ESG mission, presenting ESG risks in a separate risk category significantly increases the amount allocated to ESG risk ($\beta = 4.34$, $p = 0.05$). We also observe a marginally significant effect ($\beta = 3.15$, $p = 0.15$), indicating that the amount allocated to the ESG risk increases when a substantive ESG mission is used compared to a symbolic ESG mission within a separate ESG risk category. In contrast, under a symbolic ESG mission, separating ESG risks does not significantly affect budget allocation ($\beta = 0.96$, $p = 0.66$).

To conclude, we find support for our hypothesis. This suggests the representation of ESG risks in the risk inventory matters when the ESG mission is substantive but has no effect when the mission statement is symbolic.

[Insert Figure 2 here]

[Insert Table 2 here]

Supplementary analyses

Robustness

First, we test using an Analysis of Covariance (ANCOVA) whether our results remain the same when controlling for work experience in risk management and social desirability bias. Work experience leads to expertise that can affect performance (e.g., Cardinaels, 2008; Libby & Luft, 1993; Shanteau, 1988; Vera-Muñoz et al., 2001). Therefore, it is important to control for work experience in risk management, as it can influence how specific risk management tools, such as the risk inventory, are interpreted, potentially affecting the amount allocated to ESG risks. Moreover, since the ESG mission shapes the expected norms and values within the organization and promotes socially desirable behaviours like sustainability, a social desirability bias may arise. This bias drives individuals to conform to these norms in order to present themselves favourably, which can significantly influence their attitudes and, consequently, their ESG risk response. We measure social desirability bias including 6 items ($\alpha = 0.71$) adopted from Bernardi (2006). The effects of work experience in risk management and social desirability bias are not significant. The results remain the same as in our main analysis. However, we now also find that when ESG risks are represented as a separate risk category, a substantive ESG mission significantly increases the amount allocated to ESG risk ($\beta = 3.85$, $p = 0.08$). This supports the idea that an ESG mission plays a signalling role.

Second, we examine various additional factors (cf. Appendix 4 for measurements) that could impact budget allocation decisions. First, the unfamiliarity of ESG risk might prompt more budget allocations to manage it compared to other risks. However, familiarity of ESG risk does not significantly ($p > 0.10$) affect budget allocation, providing no evidence for a status quo bias. Second, even if ESG risks are perceived as less important, their complexity might lead participants to allocate more funds for managing them. No significant effect ($p > 0.10$) of perceived complexity is found. Third, the expected timing of the ESG risk materialization can also impact budget allocation. Our findings suggest that the perception of an immediate impact from ESG risks on a company's performance has no significant effect ($p > 0.10$), whereas ESG risk perceived to have long-term impacts significantly increased budget

allocation ($\beta = 2.93$, $p < 0.001$). Fourth, perceived likelihood of ESG risks also significantly affects budget allocation ($\beta = 2.52$, $p = 0.001$), with more funds being allocated to ESG risk if ESG risks are perceived as more likely to materialize. Fifth, significantly more money is allocated to ESG risk when it is perceived to be in line with the company's ESG mission ($\beta = 1.99$, $p = 0.004$). Finally, the perceived impact of ESG risk management on non-ESG risks significantly affects overall budget allocation. When managing ESG risk is seen as having a positive effect[16] on the management of non-ESG risk ($p < 0.001$), the allocation to the ESG risk increases. Conversely, when ESG risk management is perceived to negatively impact non-ESG risk management, the amount allocated to the ESG risk decreases ($p = 0.03$). Including these alternative explanations as covariates does not affect the results; however, it accounts for a greater proportion of the variance in the dependent variable.

Alternative Dependent Variable (DV)

In addition to analysing the mean amounts allocated to ESG risks, we recode our data following Cheng et al. (2018) into two categories: (1) allocating more or the same amount to ESG risk (ESG risk ≥ non ESG risk) and (2) allocating less to ESG risk (ESG risk < non ESG risk). Using logit regression, we find that when both a separate ESG risk category and a substantive ESG mission are present, the likelihood of allocating more to ESG risks compared to non-ESG risks increases significantly (0.85, $p = 0.02$). The results show that under a substantive ESG mission, presenting ESG risks as a separate risk category significantly increases the likelihood of allocating more resources to ESG risks ($\beta = 0.17$, $p < 0.01$). In contrast, under a symbolic ESG mission, the risk inventory does not significantly influence this allocation ($\beta = -0.04$, $p > 0.10$). Furthermore, when ESG risks are categorized separately, a substantive ESG mission significantly enhances the probability of increased allocation to ESG risks ($\beta = 0.14$, $p = 0.03$). However, when ESG risks are integrated into traditional risk categories, the ESG mission has no significant effect ($\beta = -0.07$, $p > 0.10$). These logit regression results align with the findings from the contrast analysis, further supporting our hypothesis.

[16] Positive effect is defined as synergies in risk management and was measured using the item *'I felt that by managing risk event 1 (ESG), I can also reduce risk event 2 (non ESG).'* Negative effect is defined as antagonisms in risk management and was measured using the item *'I felt that managing risk event 1 can worsen the impact of risk event 2'* . Both items were measured on a 7-point Likert scale from Strongly Disagree to Strongly Agree.

[Insert Figure 3 here]

[Insert Table 3 here]

Mediation analysis

In our hypothesis development, we argued that (1) the ESG mission signals the importance of ESG risks, (2) a separate ESG risk category increases manager's awareness due to heightened visibility of ESG risks, and (3) the alignment between the risk inventory format and the company's ESG mission affects perceptions. To shed light on the underlying mechanism of the simple effect of risk inventory under a substantive ESG mission, we perform simple mediation analyses. We test our theoretical model using a generalized structural equation model and 5000 bootstrapped iterations (Hayes, 2022; MacKinnon et al., 2004; Preacher & Hayes, 2004).

We posited that creating a separate ESG risk category increases the saliency of ESG risks. To investigate the path of the simple effect of risk inventory under a substantive ESG mission, we include saliency as mediator. We measure the saliency of ESG risks using the following two items ($\alpha = 0.90$): "*The way ESG risks are presented helps me be aware of ESG risks"* and "*The way ESG risks are presented keeps me focused on ESG risks"*. Consistent with our theoretical model, we find that a separate ESG risk category enhances the visibility[17] of ESG risks under both substantive and symbolic ESG missions. In contrast, under a symbolic ESG mission, even though ESG risks are made salient, this saliency does not significantly affect risk response. More specifically, it does not translate[18] into an increased amount allocated to ESG risks under a symbolic ESG mission. Two potential explanations account for why this increased saliency under a symbolic ESG mission has no significant effect on risk response.

[Insert Figure 4 here]

First, a substantive ESG mission translates saliency into managerial action by signalling the importance of ESG risks, whereas a symbolic ESG mission lacks this signalling power to drive action

[17] Following Alewine & Stone (2013) we consider cognitive effort proxied by 'time spent' in decision making as a measure of attention given to analysing information (Menon, 1993; O'Donnell, 1996). Adding a separate ESG risk category to the risk inventory may increase attention as more data relevant for decision-making need to be acquired (Alewine & Stone, 2013). This increased attention is also used a proxy for saliency. Using time spent on the budget allocation task as proxy for attention we find similar results with significantly more time being spent on risk inventories with a separate ESG risk category than risk inventory with ESG risk integrated ($t_{(479)} = -1.92$, $p = 0.03$, one-sided). Therefore, having a separate ESG risk category makes ESG risks more prominent and raises awareness ($\beta = 6.56$).

[18] The interaction between the mediator saliency and the moderator ESG mission is not significant. The interaction between mediator saliency and moderator ESG mission (moderated mediation) was calculated using regression equations, following Muller, Judd and Yzerbyt (2005).

(contrast = 0.40, $p < 0.001$, untabulated). This is also evident from the path analysis of perceived importance of ESG risks as mediator. We measure perceived importance including 3 items ($\alpha = 0.91$). Participants were asked to answer the following questions on a 7-point Likert scale: "*How important are ESG risks compared to strategic, operational and financial risks?", "To what extent would you prioritize managing ESG risks?"* and *"To what extent would you give ESG risks a high weight in the calculation of the total company risk?".* For the substantive ESG mission there is no significant effect of risk inventory on perceived importance. This confirms that a substantive ESG mission itself signals ESG risk importance. In contrast, under a symbolic ESG mission, the risk inventory assumes the signalling role ($\beta = -0.25$, $p = 0.05$), with a separate ESG risk category potentially seen as organizational decoupling, reducing perceived importance. Second, the ESG mission has a significant effect on the perceived congruence between ESG mission and risk inventory (contrast = 0.31, $p < 0.001$, untabulated). The perceived congruence ($\alpha = 0.68$) is measured by the following two items: *"The way ESG risks are presented reflects the company's values"* and *"The way ESG risks are presented does not align with the company's values"*. The interaction between perceived congruency and ESG mission is close to the 10% significance level. Under a symbolic ESG mission, neither risk inventory format is seen as congruent, and managers might even question why ESG risks are included. In contrast, under a substantive ESG mission, including a separate ESG risk category aligns with the mission, leading to higher budget allocations. This combination is perceived as most congruent. Consequently, this perceived (in)congruency significantly affects risk response under a symbolic ESG mission ($\beta = 5.03$, $p = 0.001$, untabulated), but not under a substantive ESG mission ($\beta = 1.62$, $p = 0.27$, untabulated). When ESG risks are represented in a separate category under a substantive mission, it reinforces the company's commitment to ESG, prompting higher resource allocation to manage these risks. However, under a symbolic ESG mission, the lack of alignment between the ESG mission and the risk inventory leads to perceived 'incongruence', resulting in lower investment in ESG risks. This incongruence may stem from perceptions that including ESG risks is merely a superficial attempt at greenwashing.

[Insert Figure 5 here]

In summary, the mediation models highlight that both the visibility of ESG risks in the risk inventory as well as the signalling role of the substantive ESG mission shape manager's response to ESG risk, supporting our theoretical framework. The combination of enhanced visibility of the ESG risks and the importance signalled by the substantive ESG mission increases the budget allocated to the ESG risk. Moreover, the pairing of a separate ESG risk category with a substantive ESG mission is perceived as congruent ($\beta = 0.06$, $p = 0.001$, untabulated). When the ESG mission statement is substantive (i.e., genuine commitment to ESG), and this is coupled with a separate ESG risk category, managers perceive a strong alignment between the company's stated mission and its risk management practices. Finally, the lack of perceived congruency and the absence of signalling ESG risk importance in a symbolic ESG mission explains why the risk inventory format has no significant effect under a symbolic ESG mission.

V.CONCLUSION

In this paper, we examined the effects of risk inventory format and ESG mission on risk response. We conducted a 2x2 between-subjects experiment and manipulated both the risk inventory (separate ESG risk category vs. ESG risks integrated in traditional risk categories) and the ESG mission (symbolic ESG vs. substantive ESG). Participants engaged in a budget allocation task, deciding how much money to allocate to managing ESG risk versus non-ESG risk.

Our results show that the interaction of risk inventory and ESG mission significantly affects risk response (i.e., amount of money allocated to managing ESG risk). Specifically, the risk inventory format plays a crucial role when the ESG mission is substantive, with significantly more funds being allocated to ESG risk when there is a separate ESG risk category. This suggests that a separate ESG risk category alone is insufficient to increase the management of ESG risks. To motivate managers to address ESG risks the ESG mission matters as well. No significant effect of risk inventory is observed in case of a symbolic ESG mission. The results remain consistent when covariates were included. Further analyses support our theory that a distinct ESG risk category enhances the salience of ESG risks, thereby prompting managers to pay more attention to this risk category, which might otherwise be overlooked. Additionally, we find evidence for the signalling role of the ESG mission. Under a symbolic ESG mission, the lack of congruency and signalling explains why the risk inventory does not have the same

effect. Our results even suggest that ESG risks should not be included in the risk inventory under a symbolic ESG mission, as it may lead to perceptions of greenwashing.

A word of caution is necessary: combining a separate risk-category with a substantive ESG mission may create an 'ESG risk silo'. When ESG risks become more salient and perceived as more important, managers may focus excessively on these risks due to risk aversion (Jankensgård, 2019). This could result in the prioritization of ESG risks at the expense of other risks or lead to their management in isolation, without considering their linkages to broader risk categories.

Our paper makes important contributions to the literature. First, it contributes to the emerging research on enterprise risk management within management accounting (e.g., Braumann et al., 2024; Mikes, 2009, 2011), by examining how the representation of ESG risks in the risk inventory and the company's ESG mission affect how managers interpret and manage ESG risks. Second, our study contributes to the ESG and sustainable development literature by showing that a substantive ESG mission, when combined with a separate ESG risk category in the risk inventory, positively influences the management of ESG risks. Third, our study advances the management literature on internal communication by highlighting how the representation of ESG risks in a risk inventory potentially facilitates or hinders internal communication of ESG risks. Fourth, we offer insights into the management accounting literature on internal reporting (e.g., Cardinaels, 2016; Deore et al., 2023) by exploring how the risk inventory format affects managers' perceptions of ESG risks through the saliency mechanism. Finally, we provide practical implications for accountants, controllers, and (risk) managers by demonstrating how the presentation of ESG risks, in conjunction with the company's ESG mission, influences risk response strategies and by warning against the potential creation of ESG risk silos.

Like any empirical study, this study is not without its limitations. First, while we aimed to create a realistic managerial setting, the experimental environment may differ from real-world contexts. Notably, the risks presented in the budget allocation task might lack complexity as we do not mention the potential impact and likelihood of the risk events materializing. Future research could explore whether our findings hold when these factors are included Second, the measures used to assess risk response may not fully capture the depth of participants' decision-making processes. Future research might look at other ways of capturing risk response, such as 'do nothing', 'ignore the risk', or 'prioritize the risk'.

Third, our experiment examined a single moment in time, potentially missing the long-term implications of a certain risk response. Moreover, it could also be that people alter their risk response over time. Future research could investigate how ESG risk responses evolve over time. Finally, we only examined the risk inventory format in terms of separate vs. integrated ESG risks. Future research could explore hybrid formats, where some ESG risks are integrated while others are categorized separately, and determine which types of risks are best represented in each format.

This study opens additional avenues for future research. First, future research can look at how other traditional risk management tools can integrate ESG risks and how this affects risk response. Second, future research can investigate the effect of control systems such as risk culture on ESG risk response. Finally, future research can also explore how the reporting of ESG risks, internally as well as externally, can be motivated. This leaves extensive room for future research to explore the effects of how to integrate ESG risks into risk management practices.

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Table 1: Descriptive Statistics per Condition

	Integrated/ Symbolic (n = 129)	**Integrated/ Substantive (n = 111)**	**Separate/ Symbolic (n = 115)**	**Separate/ Substantive (n = 126)**	**Total**
Age	42.64 (10.37)	43.34 (11.08)	45.81 (11.73)	43.70 (10.53)	43.84 (10.94)
Work experience (in years)	21.85 (10.52)	22.70 (10.76)	25.16 (12.01)	23.46 (11.06)	23.26 (11.12)
Work Experience risk management	3.70 (1.93)	3.74 (1.98)	3.89 (1.88)	3.29 (1.91)	3.65 (1.93)
Work Experience CSR	2.81 (1.93)	2.83 (1.74)	2.86 (1.83)	2.52 (1.64)	2.75 (1.79)
Work Experience management	5.57 (1.54)	5.52 (1.63)	5.68 (1.42)	5.54 (1.47)	5.58 (1.51)
Budget Allocation (in seconds)	64.19 (36.15)	66.74 (33.18)	71.51 (34.72)	72.32 (44.73)	68.66 (37.68)
Duration (in seconds)	663.83 (379.55)	647.71 (254.13)	676.16 (364.31)	626.02 (322.03)	653.15 (334.81)

Means for each condition. Standard deviations are provided in parentheses.

Table 2: Risk Response

Panel A: ANOVA				
	Partial SS	**Df**	**F**	**p-value**
Risk Inventory	839.85	1	2.92	0.09*
ESG mission	256.47	1	0.89	0.35
Risk Inventory x ESG mission	341.49	1	1.19	0.28
Residual	*136964.74*	*477*		

Panel B: Means and Standard Errors of Risk Response per Condition				
ESG mission	**Risk inventory**	**Mean**	**SE**	**n**
Symbolic ESG	Separate	48.63	17.71	115
	Integrated	47.67	17.96	129
Substantive ESG	Separate	51.78	16.25	126
	Integrated	47.44	15.63	111

Panel C: Contrast				
	Partial SS	**Df**	**F**	**p-value**
Contrast	1388.65	1	4.84	0.03**
Residual between-cells variance	95.61	2	0.17	0.85
Total between-cells variance	1484.26	*3*	1.72	0.16

Panel D: Simple Effects				
	Contrast	**SE**	**|t|**	**p-value**
Sep_Sym vs Int_Sym	0.96	2.17	0.44	0.66
Sep_Sub vs Int_Sub	4.34	2.21	1.97	0.05**
Int_Sub vs Int_Sym	-0.23	2.19	0.10	0.92
Sep_Sub vs Sep_Sym	3.15	2.19	1.44	0.15

All p-values are two-tailed p-values. Sep: Separate ESG risk category, Int: ESG risks integrated, Sub: Substantive ESG mission; Sym: Symbolic ESG mission

Table 3: Alternative DV

Panel A: Risk response (Logit)				
	Coefficient	**SE**	**|z|**	**p-value**
Risk Inventory	-0.14	0.26	0.56	0.58
ESG mission	-0.28	0.26	1.09	0.28
Risk Inventory x ESG mission	0.85	0.37	2.30	0.02**
Constant	*0.27*	*0.18*	*1.49*	*0.14*
Panel B: Simple effects				
	Coefficient	**SE**	**|z|**	**p-value**
Sep_Sym vs Int_Sym	-0.04	0.06	0.56	0.58
Sep_Sub vs Int_Sub	0.17	0.06	2.70	0.01***
Int_Sub vs Int_Sym	-0.07	0.06	1.09	0.28
Sep_Sub vs Sep_Sym	0.14	0.06	2.17	0.03**

All p-values are two-tailed p-values. Sep: Separate ESG risk category, Int: ESG risks integrated, Sub: Substantive ESG mission; Sym: Symbolic ESG mission

Figure 1: Timeline of events in experiment

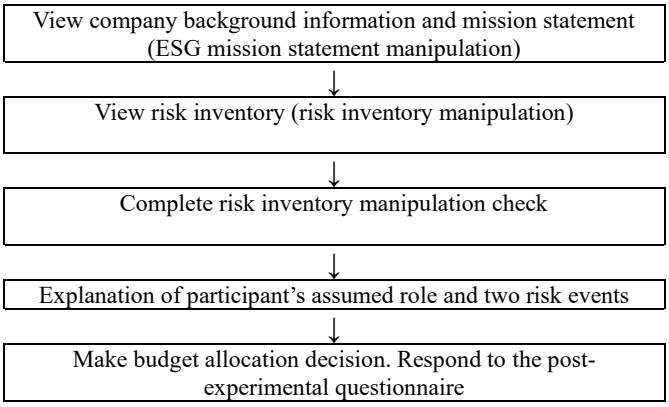


Figure 2: Risk response

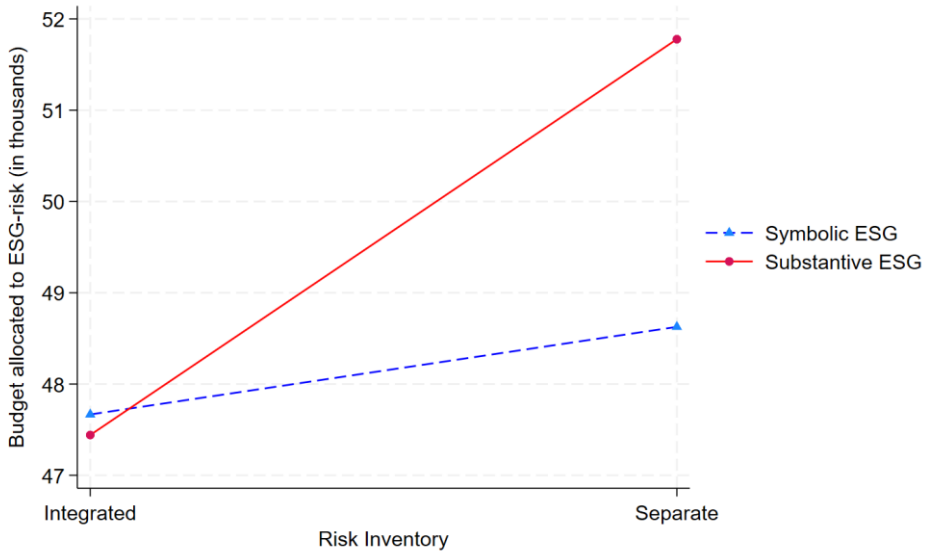


Figure 3: Risk response (dummy)

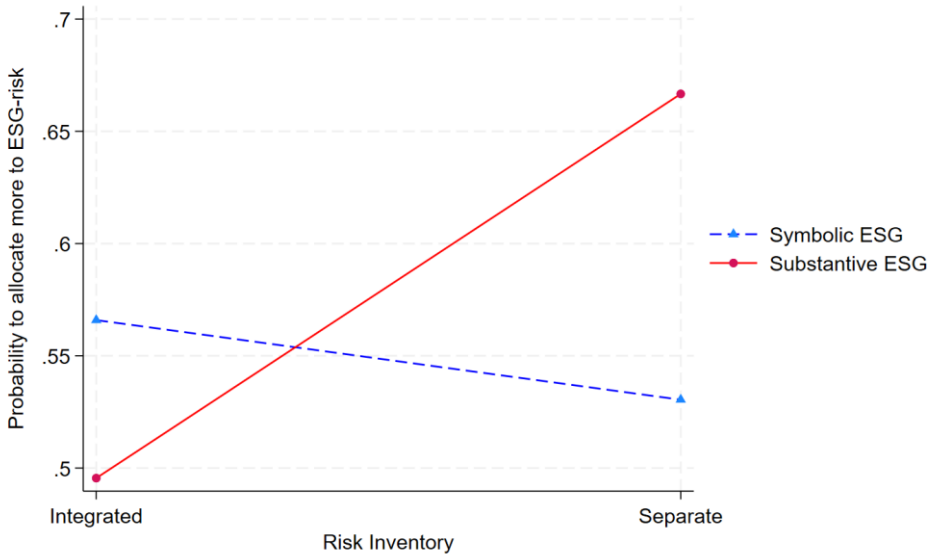
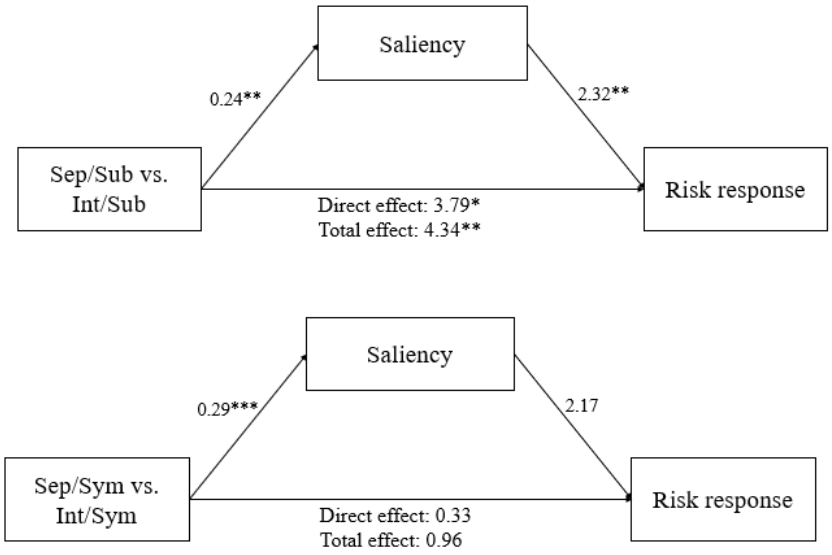
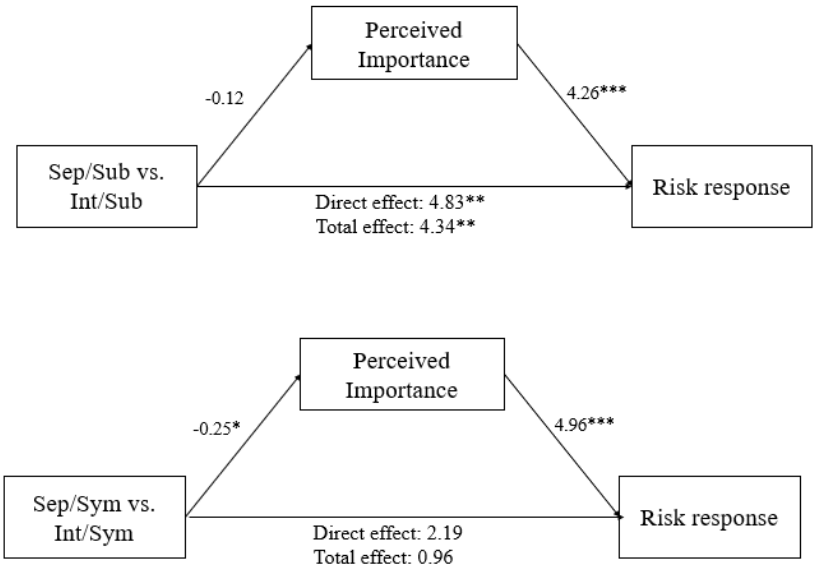


Figure 4: Path analysis simple effect risk inventory under substantive ESG mission – Saliency



*All the effects shown are standardized direct effects. *** p < 0.01, ** p < 0.05, * p < 0.1.*

Figure 5: Path analysis simple effect risk inventory under substantive ESG mission – Importance



*All the effects shown are standardized direct effects. *** p < 0.01, ** p < 0.05, * p < 0.1.*

Appendix

Appendix 1: Risk inventory

As part of its company-wide risk management strategy, FABRICFUSION has recently compiled a risk inventory covering a range of risks, including ESG (Environment, Social and Government)-risks. The identified ESG risks are shown in a separate category **[integrated in strategic, operational and financial risk categories]**. In each category, the risks are mentioned in no particular order:

Strategic	Operational	Financial	ESG
• Entrance of new competitor • Dependence on key alliances for critical resources • Disruption by emerging technologies	• Malfunctions or breakdowns in manufacturing equipment • Poor tracking of work-in-progress inventory • Inconsistencies or deviations in the manufacturing process	• Fluctuations in commodity prices • Default or non-payment by customers or counterparties • Fluctuations in interest rates impacting borrowing costs	• Emerging market for eco-products • Weather events causing disruptions in the supply chain • Climate-change liabilities

Strategic	Operational	Financial
• Entrance of new competitor • Dependence on key alliances for critical resources • Emerging market for eco-products • Disruption by emerging technologies	• Malfunctions or breakdowns in manufacturing equipment • Weather events causing disruptions in the supply chain • Poor tracking of work-in-progress inventory • Inconsistencies or deviations in the manufacturing process	• Fluctuations in commodity prices • Default or non-payment by customers or counterparties • Fluctuations in interest rates impacting borrowing costs • Climate-change liabilities

Appendix 2: ESG mission statement manipulation

Symbolic ESG	Substantive ESG
At FABRICFUSION, our mission is to generate profitable growth. We are committed to ESG. Our ESG initiatives are driven by the desire to secure our long-term success. While social responsibility is important, our focus is on profit, leveraging ESG actions to strengthen our image and secure competitive advantages. We aim to do this by investing in initiatives that deliver financial returns alongside social and environmental benefits.	At FABRICFUSION, our mission is to make a positive contribution to sustainable development. We are committed to ESG. Our ESG initiatives are driven by the desire to protect our environment. While financial prudence is important, our focus extends beyond profit, encompassing measurable ESG actions to address environmental and societal needs. We actively do this by reducing our carbon footprint, promoting diversity and inclusion, fostering ethical business practices, and supporting communities in need.

Appendix 3: Budget allocation task (Risk response)

Assume you are a production manager at FABRICFUSION. You play a pivotal role in coordinating and optimizing the entire production. Your responsibilities encompass various tasks, including planning and scheduling production activities, managing resources effectively, adhering to quality and safety standards and overseeing the procurement of raw materials. You work closely together with other departments to align production goals with the overall organisational objectives. FABRICFUSION uses conventional cotton in its production process.

As production manager you are faced with the following risk events:

Risk event 1: FABRICFUSION can buy expensive sustainable cotton from its U.S.-based supplier. FABRICFUSION might face challenges if the customer preference for eco-friendly textiles made with sustainable cotton increases, as it could result in overlooking a potential new market segment.

Risk event 2: FABRICFUSION might face new competitors entering the market with more cost-effective conventional cotton sourcing strategies. FABRICFUSION might face challenges if these competitors gain a competitive advantage, as it could lead to a loss in market share.

Appendix 4: Measured variables

Variable	Items	Cronbach's α	Source
Perceived importance[b]	– How important are ESG risks compared to strategic, operational and financial risks? – To what extent would you prioritize managing ESG risks? – To what extent would you give ESG risks a high weight in the calculation of the total company risk.	0.9051	(Bucaro et al., 2020; Ko et al., 2023; Roberts et al., 2004)
Attention - Saliency[a]	– The way ESG risks are presented helps me be aware of ESG risks. – The way ESG risks are presented keeps me focused on ESG risks.	0.9024	(COSO & WBCSD, 2018; Groves, 2021)
Perceived congruence[a]	– The way ESG risks are presented reflects the company's values. – The way ESG risks are presented does not align with the company's values.*	0.6788	N.A.
Budget allocation – alternative explanations[a]	– Budget complexity: Risk event 1 is more complex. – Budget familiarity: Risk event 1 is less familiar. – Budget long-term impact: Risk event 1 has a more long-term impact on FABRICFUSION's performance. – Budget short-term impact: Risk event 1 has a more immediate impact on FABRICFUSION's performance. – Budget likelihood: Risk event 1 is more likely to materialize.	N.A.	N.A.
Social desirability bias[a]	– Sometimes I tell lies if I have to. * – I never cover up my mistakes. – I always obey laws, even if I'm unlikely to get caught. – I have never dropped litter on the street. – I have done things that I don't tell other people about. * – I don't gossip about other people's business.	0.7099	(Bernardi, 2006)

**: Reverse coded items*

[(a)] Scale ranging from 1:strongly disagree to 7:strongly agree.

[(b)] Scale ranging from 1:not at all to 7:very much

Sustaining Cooperation in Long-term Hybrids: Management Control as a Multi-level System

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Accounting Research Day

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Abstract

Although interorganizational hybrids have become omnipresent across different industries, research lacks insights on how hybrids sustain cooperation over time. Existing literature has predominantly focused on the influence of interorganizational, interpersonal or network controls in isolation, largely ignoring the existing interdependences across these different levels of control. Using a multiple case study approach including five long-term public-private partnerships (PPPs), this paper develops a multi-level control framework towards sustained cooperation in long-term hybrids. Findings indicate that interorganizational controls trigger interpersonal mechanisms (i.e. sensemaking, reciprocity and trust) to sustain cooperation between partners even beyond the contractual boundaries of the partnership. Moreover, as the PPP market is characterized by a strong interconnectedness between the various partners, interpersonal experiences escalate to the network level, codetermining an organization's reputation within the PPP market. As upholding a good reputation is strategically important within such interconnected markets for the purpose of future projects, it contributes to sustaining cooperation within a focal PPP. My findings emphasize the importance of taking on a system-based and multi-level perspective towards management control in long-term hybrids.

1. Introduction

This paper takes on a multi-level approach to study how cooperation is sustained in long-term hybrids. Moving beyond interorganizational controls, it integrates interpersonal mechanisms and network dynamics into the research framework to study sustained cooperation in long-term hybrids. The focus is on public-private partnerships (PPPs) as a relevant type of long-term hybrid. I argue that interorganizational controls (such as operational control processes, meetings, and communication procedures) lead individuals operating the PPPs to engage in interpersonal mechanisms (sensemaking, reciprocity, and trust). This engagement fosters a cooperative attitude that goes beyond contractual specifications. In addition to examining the interplay between interorganizational controls and interpersonal mechanisms, this study also emphasizes the embeddedness of PPPs within a larger network. Network dynamics, particularly through organizational reputation, encourage anticipatory behavior that fosters goodwill and cooperation. The findings underscore the importance of a system-based perspective towards understanding sustained cooperation in long-term hybrids.

Interorganizational hybrids, which I will refer to as hybrids, can be defined as interorganizational arrangements that use resources and/or governance structures from more than one existing organization (Miller, Kurunmäki & O'Leary, 2008). Typically, their existence is explained through a resource dependence lens, in which problem resolution depends on various partners joining forces (Thambar, Brown & Sivabalan, 2019). Although hybrids have become common in many different industry settings, research lacks insights in the functioning of hybrids that focus on long-term problem resolution spanning several decades. As challenges will persist over time due to changing organizational dynamics and environmental conditions (Smith & Besharov, 2019), sustaining cooperation is crucial to avoid failure (Tracey, Philips and Jarvis, 2011). Yet we lack in-depth knowledge on the practices and processes that shape this cooperative behavior.

One type of long-term hybrid of which the usage has increased tremendously in recent years, is PPPs (Hodge, Greve & Biygautane, 2018; Jay, 2013; Wang et al., 2018). PPPs are generally defined as cooperative arrangements between public and private partners that involve the sharing of risks, resources, responsibilities, and rewards for the achievement of joint objectives (Kwak, Chih & Ibbs, 2009). They fill a space between traditional procurement and full privatization and cover a variety of transactions and organizational forms (Caperchione, Demirag & Grossi, 2017; Grimsey & Lewis, 2005; Steijn, Klijn & Edelenbos, 2011; Wang et al., 2018). Federal governments often rely on these types of partnerships to develop large scale

projects, such as highways and railroad construction. Furthermore, public entities on the municipal level increasingly engage in PPPs to organize public services, such as swimming facilities and urban regenerations. A lot of these partnerships entail a long-term commitment between the various partners, resulting in extensive contractual agreements that generally cover a construction and concession phase of 20 to 30 years (Reynaers, 2013). Depending on the type of PPP, this concession phase can entail the maintenance and/or operationalization of the public service delivery.

During the course of this long-term partnership, partners are confronted with changing circumstances such as developing stakeholder demands, alternating political parties and dynamic financial realities (Rybnicek et al., 2020; Wang et al., 2018). This puts pressure on the cooperative nature of a PPP, as it requires the partnership to maintain flexibility and allow for adaptive behavior after contractual agreements have been agreed upon (Wang, 2015). Prior research theorizing this long-term perspective predicts PPPs to be characterized by exploitative behavior rather than cooperative behavior, as private partners are expected to reallocate risks towards the public partner over time (Froud, 2003; Iossa & Martimort, 2012; Lonsdale, 2005). This opportunistic risk shifting would go against one of the main purposes of a PPP, namely dividing and sharing risk between public and private partners. However, few studies acknowledge that sustaining cooperation or exploiting power remains a strategic choice and exceeds interorganizational controls such as the contractual agreement itself (Birnberg, 2011). In line with prior research, these choices are also influenced by interpersonal mechanisms, such as sensemaking, reciprocity and trust, and network dynamics, such as organizational reputation (Dekker, 2016). How the interpersonal mechanisms, network dynamics and interorganizational controls interact to sustain cooperation in long-term hybrids, will be the focus of this paper.

To conduct this research, I qualitatively study five long-term PPPs after the initial contract was established. The five partnerships involved the construction of a multifunctional sports hall, an educational center, a national road, a swimming pool and a prison, and were all characterized by a long-term maintenance (and operationalization for the swimming pool facility) agreement as an integral part of the PPP. The data consists of relevant case documents (e.g. contractual agreements, negotiation outcomes, meeting notes et cetera) to describe the formal framework of the partnerships and semi-structured interviews with the cases' key informants to verify the information retrieved from the documents and to get more insights into the multi-level (i.e. interorganizational, interpersonal and industry) considerations that influenced cooperative behavior during the course of the PPP.

In all PPP cases, the contractual agreements that juridically define the partnerships were assessed as a rigid type of control, in the sense that adaptation to the original contract were generally redeemed as impossible. This is in line with prior theorization on the unfavourability of contract renegotiations in PPPs (Iossa & Martimort, 2012). However, no evidence of exploitative behavior of the private partner was found. Through a cross-case analysis, I identified two types of interorganizational operational control (i.e. regular meetings and registration platforms) to sustain cooperation within the contractual boundaries. Moreover, the interactive nature of the operational controls requires interaction between the people directly involved in the PPPs. This mutual involvement triggers sensemaking activities on how to interpret the partnership, its contractual agreement and the different operational controls and transform it into "workable certainties". Ultimately, these sensemaking activities result in reciprocity and trust on an interpersonal level, enabling cooperation even beyond the contractual boundaries. Furthermore, reputational considerations related to a strongly interconnected PPP market fosters a more cooperative attitude towards hybrid-specific decision making, counterbalancing power dynamics over time.

This paper makes several contributions to the academic field. The study advances the literature by developing a multi-level framework on cooperation in long-term hybrids. Inasmuch as the limited prior research underpins the relevance of the different levels in isolation (Donada & Nogatchewsky, 2006), I show how interorganizational, interpersonal and network controls interact with each other to impact cooperation within hybrids over time. Moreover, the findings highlight that additional interpersonal mechanisms are relevant to interorganizational cooperative outcomes than the trust narrative that is typically considered (Lau & Rowlinson, 2009; Lui, Ngo & Hon, 2006, Luo, 2009). Interpersonal trust takes time to materialize and there are crucial interpersonal mechanisms (i.e. sensemaking and reciprocity), induced by the operational controls, that precede trust. Furthermore, I investigate PPP dynamics beyond the contractual perspective that is usually theorized and applied (Iossa & Martimort, 2012). When taking on a purely contractual and interorganizational perspective, one would anticipate that private partners exploit their power in the long run. However, the findings show that reciprocity and interpersonal trust that result from sensemaking activities, and organizational reputation within a strongly connected network can counterbalance power imbalances on the interorganizational level. By linking cooperation within the partnership to interpersonal mechanisms and network dynamics, I point towards the importance of firm-level sourcing (i.e. human capital within the hybrid) and firm-level connectedness (i.e. industry embeddedness) for

organizational outcomes. As suggested by Anderson & Dekker (2014), this is potentially relevant to broader interorganizational relationships (IORs).

The remainder of this paper is structured as follows. First, an overview of the relevant literature is presented, which provides the building blocks for the theoretical framework. Second, the applied research method is explained. Third, findings from a cross-case analysis are presented, revealing the multi-level relations identified. In the last two sections, I discuss these findings, relate them to the current literature and acknowledge limitations to the study.

2. Literature review and theoretical framework

I develop a theoretical framework by focusing on three levels relevant to sustain cooperation within long-term hybrids. First, the existing IOR literature emphasizes the role of contractual agreements and operational controls on the interorganizational level. Second, I focus on the interpersonal mechanisms that characterize the operations of the hybrid on a more daily base. Third, the embeddedness of the hybrid in a larger network is presented as an influential force towards cooperative behavior within the hybrid. I then identify PPPs as a relevant research setting and argue that it is crucial to consider the interplay between these three levels to unravel the multi-level control system fostering cooperation over time.

2.1. Interorganizational controls

In an IOR context, hybrids are defined as interorganizational arrangements that use resources and/or governance structures from more than one existing organization (Miller, Kurunmäki and O'Leary, 2008). In other words, hybrids arise at the interplay between collaborating organizations, each of them characterized by their own values, goals and structures. Typically, the existence of hybrids is explained through a resource dependence lens, in which problem resolution depends on various partners joining forces (Thambar, Brown & Sivabalan, 2019). As a result, hybrids demand the coordination of tasks and decision making across organizational boundaries (Caglio & Ditillo, 2008; Dekker, 2004; Stouthuysen et al., 2019). To formally agree upon task assignment, decision rights et cetera, the organizations involved in hybrids often rely on contractual arrangements (Lafontaine & Slade, 2013). To control for the contractual requirements and to organize day-to-day responsibilities over a longer period of time, operational controls can be installed (Bernstein, 2012; Lin, Chen & Lin, 2017). These controls are thought to align interests across and foster coordination amongst the organizations involved.

Besides coordination risks, the long-term characteristic of these hybrids also raises value appropriation concerns (Anderson & Dekker, 2014; Caglio & Ditillo, 2008; Ding, Dekker &

Groot, 2013), which could potentially limit cooperation over time. In line with literature on strategic alliances, hybrids entail investments that are organization and hybrid specific (Anderson et al., 2014; Dekker, 2004). Accordingly, changing organizational dynamics and environmental conditions are likely to effect the benefits of these investments in a dissimilar way and to a different extent, resulting in asymmetric incentives over time. From a resource dependence perspective, this results in power imbalances (Crook & Combs, 2007) which increases value creation and appropriation risk (Anderson et al., 2014). To control for these appropriation risks and manage this exploitation versus cooperation trade-off, prior research suggests multiple solutions. Organizations involved in a long-term hybrid could draw up more complex and rigid contracts to protect organizational rewards (Ding, Dekker & Groot, 2013). Moreover, the control process and practices used, could be installed in an enabling way, allowing for sustained cooperation after initial agreements have been made (Brown et al., 2020; Ahrens & Chapman, 2004). Furthermore, interorganizational trust has been found to be relevant to safeguard cooperation over time. Often, interorganizational trust stems from prior experiences or builds up through information sharing practices (Dekker & Van den Abbeele, 2010). It can reduce the need for and work interrelatedly with more formal controls such as contracts and performance standards (Anderson et al. 2014; Ding, Dekker & Groot, 2013). Notwithstanding the potential interorganizational trust has to overcome power imbalances and eliminate risk appropriation concern, evidence is mixed as it has also been found to increase rigidity once established (Thorgen & Wincent, 2011), hampering cooperative corrective action over time. Put differently, once trust is established, going beyond the accepted behavior that has defined the trust relationship, is difficult.

However, this long-term perspective on hybrids does not only impact cooperation and the accompanying controls on the interorganizational level, it also drives interpersonal mechanisms and network dynamics. People that operationalize the hybrid have to work closely together to achieve predefined goals. Over time, these people have to establish work routines to deal with their different organizational structure, environmental changes and involvement of third-parties. On the industry level, industry networks evolve over time as prior experiences are likely to influence peers' future behavior through reputational dynamics. Therefore, exploiting power or achieving cooperation remains a strategic choice and goes beyond the hybrid level at which controls such as contractual agreements and operational processes are typically defined. In line with prior research on boundary spanners (Dekker, 2016; Stouthuysen et al., 2019) and as

suggested by Caglio and Ditillo (2021), these choices also depend on interpersonal mechanisms and network dynamics.

2.2. Interpersonal mechanisms: The role of boundary spanners

On the interpersonal level, boundary spanners are likely to play a key role coordinating the hybrid's operations. In this paper, boundary spanners are defined as employees that focus on the operationalization of the hybrid.[2] They are responsible for the attainment of the hybrid's objectives on a daily base (Stouthuysen et al., 2019) and operate at the interplay of the collaborating organizations. Research has related individual boundary spanning behavior to beneficial firm performance (Dekker et al., 2019) and increased communication and knowledge sharing within teams (Marrone, 2010). Mixed evidence exists on how boundary spanners' behavior is influenced by the IOR characteristics in which they need to navigate. Dissimilar objectives of the organizations that constitute the hybrid could trigger conflicting dynamics when operating the hybrid (Dekker, 2016). This could result in boundary spanners favoring the objectives of their own firm, undermining the hybrid's nature and needs (Richter et al., 2006). However, Tambar, Brown & Sivabalan (2019) found boundary spanners to be the ones that can operate with less tension when the organizations constituting the hybrid are strongly mutually dependent. To fully grasp the trade-offs underlying boundary spanning behavior within hybrids and the impact they have on sustained cooperation within the hybrid, accounting research needs more insights in the processes that shape boundary spanning behavior at the individual level.

In general, the interpersonal processes of obtaining cooperation is characterized by two important elements. First, an understanding of the context in which employees are able to cooperate, needs to be established. Prior literature on institutional logics underpins sensemaking as an iterative process through which the meaning of a specific context is defined, allowing for relevant actions to be undertaken (Jay, 2013; Weick, 1995). This approach provides individuals with the opportunity to reconcile opposing views, fostering "workable certainties", i.e. a playing field that focuses on moving forward rather than structural resolvement (Lüscher & Lewis, 2008; Smith & Besharov, 2019). Second, achieving cooperation also requires the willingness of the ones involved to take action after establishing a mutual understanding. Behavioral

[2] Stouthuysen et al. (2019) identify two types of boundary spanners. First, corporate boundary spanners are executive-level employees that have the power to influence the overall strategy of an IOR (Janowicz-Panjaitan & Noorderhaven, 2009; Janowicz-Panjaitan & Krishnan, 2009). Second, operating boundary spanners are employees of which their job description consists out of coordinating the everyday activities of the hybrid (Janowicz-Panjaitan & Noorderhaven, 2009; Van der Meer-Kooistra & Scapens, 2015). I focus on the latter interpretation of boundary spanners, as I am interested on the interpersonal mechanisms in relation to the operational controls.

research has emphasized the relevance of trust and reciprocity in this regard (Dekker, 2004; Zaidi & Demirag, 2024; Van der Meer-Kooistra & Kamminga, 2015). Interpersonal trust can alleviate concerns of self-interest initiating a request for action, whereas reciprocity highlights potential future benefits of taking up a request for action. Thus, both mechanisms fosters the willingness for cooperative action to be actually undertaken.

I posit that boundary spanners constituting the hybrid's operations engage in similar interpersonal dynamics, fostering cooperative behavior within the hybrid. Boundary spanners need to make sense of the hybrid's formal structure and correspond it to an operational reality. As this operational reality changes over time, boundary spanners need to maintain the ability and willingness to cooperate throughout the existence of the hybrid.

2.3. Network dynamics: Organizational reputation

On the network level, organizational reputation is likely to influence an organization's attitude towards cooperation within hybrids. IOR literature emphasizes the importance of indirect effects and the embeddedness of IORs in a broader network (Chua & Mahama, 2007; Håkansson & Lind, 2007). In such a setting, economic decision making is influenced by the network's information flow in which the IOR is embedded (Anderson & Dekker, 2014; Granovetter, 1985). Management studies highlight contagion dynamics as a potential consequence of informal networks, establishing shared attitudes and beliefs within these informal networks (Borgatti & Foster, 2003; Borgatti & Halgin, 2011). In other words, when an organization develops a reputation, it is likely that this reputation spreads across the network. This is especially relevant for hybrids, in which the different organizations involved rely heavily on each other to attain the hybrid's goal, but are unfamiliar with each other's organizational structures. To reduce this uncertainty, organizations are likely to gain information from their peers in search of capable and trustworthy organizations (Dekker & Van den Abbeele, 2010; Tomkins, 2001). This highlights the importance of organizational reputation.

I postulate organizational reputation influences decision making within the hybrid. More specifically, I expect that organizational reputation allows for sustained cooperation within the hybrid and prevents the exploitation of bargaining power. Because of network dynamics, organizations that exploit their bargaining power will potentially miss out on future opportunities with organizations connected to the ones involved in the focal hybrid. The existence of this indirect negative effect is thought to suppress exploitative behavior and is

likely to focus behavior towards cooperative behavior. Instead, by presenting themselves as a cooperative partner, organizations can safeguard access to future opportunities.

2.4. Sustaining cooperation in public-private partnerships

One type of hybrid of which the usage has increased tremendously in recent years, is PPPs (Hodge, Greve & Biygautane, 2018; Jay, 2013; Wang et al., 2018). PPPs are generally defined as cooperative arrangements between public and private partners (Kwak, Chih & Ibbs, 2009) and are typically used by the government to develop infrastructure projects, operate sports infrastructure et cetera. A lot of these partnerships entail a long-term commitment in which the private partner is responsible for operating and/or maintaining the public facility for an extensive period of time. During the partnership, the partners involved will be confronted with external shocks, in-house dynamics and changing demands. Therefore, necessity is high to face unexpected events, continuously align interests and take action. In other words, PPPs do not only require cooperation to establish the initial contractual agreement, but they also need to sustain cooperation throughout the operationalization of the PPP project.

However, prior research that builds on contract theory and bargaining power states that the adaptability of ongoing PPPs will entail a reallocation of risk towards the public partner. This is caused by the existence of system risk, in which ongoing commitments between the partners limit the public partner's negotiation power in the operationalization phase (Froud, 2003). PPPs lock the public partner in a long-term commitment with the private partner as the public partner's investments are often partnership specific, increasing the public partner's switching costs (Lonsdale, 2005). Theoretical models on renegotiations predict that information and resource asymmetry will result in a higher bargaining power for the private firm, allowing them to shift risk to the public partner over time (Iossa & Martimort, 2012). Additionally, public partners cannot afford public service disruptions as they would be held politically accountable by the community they serve (Philp, 2009; Sarmento & Renneboog, 2021). This potential opportunistic risk shifting is in line with the resource-based view from IOR literature (Anderson & Dekker) and would go against one of the main purposes of a PPP, namely dividing and sharing risk between public and private partners.

Nevertheless, I argue that private partners are likely not to exploit this so called "lock-in" situation. The reasoning for this is twofold and relies on perspectives beyond the interorganizational level. First, the prior theoretical models on contract renegotiations do not fully take into account the long-term nature of these arrangements and how this shapes

interpersonal relations throughout the partnership. PPPs are often initialized due to the complex and uncertain nature of the project, e.g. socio-political risks or regulatory and financial complexity that influence the potential outcomes of these projects (Cools, Van den Abbeele, Van Mele, 2023; Miller, Kurunmäki & O'Leary, 2008). In such contexts, people that operationalize the partnership have to rely heavily on each other's expertise and involvement to achieve goals and safeguard long-term success. As a result, interpersonal mechanisms are likely to prevent exploitative behavior and direct action towards sustained cooperation and mutual understanding.

Second, prior theoretical models largely ignore that the partnership is embedded in a larger network of relationships. By highlighting the embeddedness of PPPs in their industry, the paper recognizes that organizational reputation (Barnett, Jermier & Lafferty, 2006) can influence strategic choices within the partnership. Reputational risk especially originates from a strong informal network that can be anticipated in the public sector (Koger, Masket & Noel, 2009; Siciliano, Wang & Medina; 2021). This entails that a public partner's beliefs about a private partner can trickle down to third-party public entities. The latter are potential future partners for the private firm, increasing the private partner's incentive to behave cooperatively in the focal PPP, upholding a good organizational reputation.

Given the widespread usage of PPPs and the aforementioned elements that characterize both PPPs and hybrids in general, PPPs are identified as a suitable context to study cooperation within long-term hybrids.

2.5. Focus of the study: A multi-level analysis of PPPs

This paper takes on a multi-level approach to study sustained cooperation in PPPs as a relevant type of long-term hybrid. Prior research on IORs and PPPs has investigated interorganizational controls to preserve cooperation and has raised concerns regarding their effectiveness. Moreover, decision making towards cooperative behavior is not solely based on organizational considerations, but also involves interpersonal and network trade-offs. I argue that the operational controls initialize interpersonal mechanisms that contribute to sustain cooperation within the hybrid over time. In this regard, sensemaking is identified as a crucial activity to translate operational controls on the interorganizational level to "workable certainties", fostering interpersonal reciprocity and trust, consequently supporting cooperative behavior in the long run. Additionally, considerations regarding an organization's own reputation are thought to influence the cooperation versus exploitation trade-off within a partnership, as

organizational reputation is likely to spread across the partner's network, partly determining future collaboration opportunities within the network.

Although the relevance of these three levels towards long-term cooperative outcomes is generally recognized, prior literature has mostly advanced our understanding of these levels in isolation. A limited amount of research has focused on the link between interpersonal and interfirm mechanisms by focusing on interpersonal trust as a mediating variable (Lau & Rowlinson, 2009; Lui, Ngo & Hon, 2006; Luo, 2008) or by conceptualizing interpersonal ties as an exogenous phenomenon (Huang et al., 2016) that influences interorganizational outcomes. In this regard, we still lack knowledge on the underlying mechanisms within the interorganizational context that constitutes interpersonal trust and relationships over time. Furthermore, Donada & Nogatchewsky (2006) took a first step applying a multi-level approach towards interorganizational relationships. However, different from their approach which is more focused on control identification and takes on a "management control as a package"-perspective, this paper will focus more on the interplay and interdependences between the management controls across the different levels, taking on a "management control as a system"-perspective (Grabner & Moers, 2013).[3] This furthers our understanding of how hybrids are successfully governed, despite existing power imbalances. Moreover, to the best of my knowledge, this paper is the first one to apply this perspective in a context of hybrids, more specifically PPPs. This is different from market-based and hierarchical interfirm relationships that is often studied in e.g. buyer-supplier relationships (Donada & Nogatchewsky, 2006; Stouthuysen et al., 2019; Thambar, Brown & Sivabalan, 2019).

[3] I follow the reasoning of Grabner and Moers (2013) and define management controls as a system if the focus is on the existing interdependences between de various controls. Management controls as a package is more static in nature and relates to the complete set of controls that can be identified, regardless of their possible interdependences.

3. Research method

In this paper, I qualitatively study five long-term PPPs in which cooperation was desired over the course of the PPP. Using a contextual approach allows me to take into account the complexity of the interactions and integrate different sources of evidence. This is especially important given the research aim to take on a multi-level system perspective towards sustained cooperation in PPPs.

3.1. Case selection

The study takes on a multiple-case holistic design (Yin, 2018): it covers one unit of analysis, i.e. the partnership, and embeds five cases in order to enable a detailed cross-case analysis. Theoretical sampling informed the selection of the cases (Eisenhardt, 1989). Since I aimed at investigating sustained cooperation in long-term PPPs, two characteristics were redeemed as essential. First, I could only include cases in which cooperation is desired. As a result, only PPP's in which continuous involvement of both public and private partners is required, were eligible. Second, a case needed to entail a long-term commitment between the public and private partners. Therefore, only cases with an agreement duration of at least 25 years were included.[4] Although the financial and legal structures somewhat differ across the five cases, I made sure the following aspects applied to all selected cases:

- They were located in Flanders, Belgium. This ensures the same legal framework applies to all five cases.
- The private partners had experience with PPPs. This eliminates initial learning effects on the private side to influence the results and allows for a relevant analysis on the network level.

Case 1 entails the construction of a multifunctional sports hall, of which the private partner is responsible for maintaining the facility for 30 years. In case 2, public and private partners collaborated to construct an educational center housing an elementary and high school. The private partner has to maintain the entire facility for 30 years. In case 3, the private partner built a national road and maintains it for 30 years. Case 4 involves a swimming pool for one municipality. In this case, the private partner maintains an operates the facility for 30 years. Case 5 constitutes the construction of a prison. The private partner is responsible for

[4] In practice, this means that the private partner needed to be responsible for the maintenance and/or operationalization of the public service for at least 25 years. Therefore, in terms of PPP types, I focus on DBM, DBFM and DBFMO arrangements.

maintaining the prison for 25 years. More information on the selected cases can be found in Table 1.

[Insert Table 1]

3.2. Data collection and analysis

The data consists of semi-structured interviews with 22 people closely involved in the PPP projects. The selection of suitable interviewees was driven by snowball sampling and an overview can be found in Table 2. All interviews were conducted in 2024. In addition, an extensive set of relevant documents was gathered. I started the analysis using a coding scheme (Appendix A) including the concepts of interest extracted from the literature review. First, all relevant documents (i.e. contractual agreements, negotiation outcomes, meeting notes et cetera) were analyzed to describe the formal framework of the PPPs and how these allowed to sustain cooperation over time. I then compared the outcome of the document analysis with the interview data. Apart from confirming my understanding of the formal side of the PPPs, the in-depth interviews allowed me to analyze the interpersonal mechanisms and network dynamics. To increase the reliability of my findings, I used Nvivo software to code the interview transcripts according to the coding scheme.

[Insert Table 2]

When building theory from case studies, data analysis frequently overlaps with data collection, allowing for flexibility in the data collection. I ended the iterative research approach when reaching theoretical saturation (Eisenhardt, 1989). An important step in the analysis consisted of structuring the data in thematic, conceptual matrices (Miles, Huberman & Saldana, 2019). This allowed me to conduct a detailed cross-case analysis and ensured a structured overview of the multi-level dynamics within and across cases.

In sum, the aforementioned qualitative research method is well-suited to answer the research question as it allows me to identify how individuals involved in a PPP balance the various interests related to cooperative behavior and why these interests are even relevant in the first place.

4. Findings

In this section, I will present the findings that resulted from the cross-case analysis, including the five cases. Table 3 Panel A, B and C are the aforementioned thematic matrices that contain case-specific information on the various levels of control, i.e. interorganizational, interpersonal and network level.

4.1. Interorganizational controls

[Insert Table 3, Panel A]

Across all cases, the contract that formally constitutes the partnership is seen as a necessary control document to start from. It has to define the responsibilities, financially as well as operationally, for the duration of the PPP.

> "*Your contract is the basis of course. Someone else can always rely on that and it is also the only thing where we can get rights from to say it is like that or it is not like that*." (General director Maintenance Building Group B, Case 2)

However, all participants confirmed that this is not enough to guarantee cooperation over time. Although renegotiation procedures are often incorporated, contracts are seen as an extremely rigid control tool. Adaptations are generally redeemed as impossible due to ongoing liabilities and financial repercussions.

> "*As soon as you start to tinker with the agreement, it becomes difficult. You have to try to be as complete as possible…and live with the fact that a big change will be difficult and that it will cost a whole lot of money*." (Alderman spatial planning, Case 1)

> "*Once the building is delivered, adaptations are difficult… It costs a gigantic amount of money and a lot of administrative hustle. It is just a lot of work for everyone and it just costs a lot of money*." (Attaché general management Federal Agencies, Case 5)

Participants asses these often extensive contracts as "not workable" and emphasize the necessity to translate the contracts in light of the operational reality.

"*You sign it* [the contract]*, everyone knows the mindset, you put it in the closet and go for it together with the intention to never take it* [the contract] *out of the closet again.*" (Head R&D Financial Firm A, Case 2)

"*Have you ever seen the contract? Because it is gigantic. It is so bulky. We NEVER use it. Juridically, the story has to be right, but in practice it needs to be workable. And I think there are still two worlds far from each other.*" (Coordinator Sport & Youth, Case 1)

To guide this translation, the partners involved install operational controls. Across the different cases, I identified regular meetings and reporting platforms to foster cooperation between the different partners. Meetings were predominantly used to discuss operational requests, evaluate operational performance and continuously align interests. The frequency in which these meetings are held, varies between weekly and semi-annual meetings and depends on the people involved in these meetings (i.e. boundary spanners operating the PPP or directors). Reporting platforms largely anchor contractual obligations into the day-to-day operations of the partnership. For example, in case 5, the public partner had to log issues onto an online platform. The private partner had a contractually specified amount of time to solve these issues, depending on their severity. The online platform established when the request was initiated, kept track of how much time there was still left and informed parties when a problem was solved or whether a fine was applied in case a problem was not solved according to the agreed Service Level Agreements (SLA's).

Additionally, three building groups incorporate cooperation in their core vision on PPP's, which was acknowledged and valued by the public partner in case.

4.2. Interpersonal mechanisms

Across cases, these operational controls were found to trigger interpersonal mechanisms due to the interactive nature of these operational controls. Although meetings and registration platforms are useful to foster cooperation within the partnership on itself, employees have to interact with each other through these controls. These interactions are often characterized by conversations that define the playing field of the partnership on a interpersonal level.

"*How do we interact with each other? And that takes time. And is also something interpersonal […] For me, that is the essence. If you do not look for that, then this construction does not work.*" (Director prison, Case 5)

"*Better to have a good contact than a good contract.*" (General director Building Group D, Case 4)

Through dialogue, employees try to understand each other's perspective on the PPP, issues that occur, and work towards pragmatic compromises that are redeemed as possible within the contemporary reality of the partnership. These interactions can be seen as "sensemaking activities" in which contractual agreements and the corresponding operational controls provide, on the one hand, content and, on the other hand, the opportunity to discuss what is operationally feasible. Defining this operational feasibility guides employees in their day-to-day decision making and supports them to take responsibility for their actions.

"*That is pure a practical approach: searching where the problem is, how are we going to solve that. I repeat it endlessly, but it is the only way. It is just a matter of attitude that needs to be adapted and that is a search.*" (Coordinator Sport & Youth, Case 1)

"*So that is also something very difficult. Some things I just cannot allow. Other things they* [the private partner] *don't get why it cannot be allowed. That remains a search. That remains coming closer together and keep on searching for things that stay workable* […] *Sometimes you have to look. What is happening in reality and how are the things for real? And not only on paper.* " (Director prison, Case 5)

"*You cannot negotiate the maintenance price. You have yourself committed to that. But when you are too late* [according to the contract] *to solve an issue and you get a fine, that's where you can talk and negotiate* […] *Instead of charging a fine, we will solve this or that* […] *If you understand each other and you say -look, if there is something wrong, you call and we come to fix it-. And if they then say -we also have problems with this or that, can your technician take a look at it?-. Than you create goodwill.*" (General director Maintenance Building Group B, Case 2)

However, defining the playing field does not automatically mean that employees will take action and behave cooperatively. Interviewees emphasized two interpersonal mechanisms that relate to their willingness to cooperate with each other. First, the "give-and-take" principle (i.e. reciprocity) is seen as a crucial mechanism to sustain cooperation. Employees are more likely to react cooperatively upon an initial request when they get something in return. For example, in case 2, Building Group B regularly conducts extra-contractual tasks in return for small financial benefits or goodwill. The latter is especially useful in anticipation of an own future

request and also characterizes interpersonal mechanisms in case 3, 4 and 5. Moreover, interviewees confirmed that this is a continuous process for the duration of the partnership.

> "*It sounds easy, but that is not always the case. In the end, it is a very complex phenomenon* [sustaining a cooperative relationship] *and I often call it tightrope walking as well. It is give and take. Yes, that is the challenge we need to face every day.*" (Project manager 1 Building Group B, Case 5)

> "*It is the essence of a PPP. That you try to gain a good partner. Trusting blindly is never good, but you need to build a relationship that works well so to speak. That is always, I repeat myself, that is always give and take. And you need to have that flexibility as a municipal government, I think*." (Secretary municipality, Case 4)

> "*A permit was not obtained* [by the public partner]. [Contractually], *we had the right to ask for a compensation. We did not do that, that is how you cooperate. We finished it without the part for which there was no permit* […] *And also when we are in trouble, they try to help us. That is… Yes, that is cooperation. That is part of a PPP, for us that's important.* " (Managing director Building Group C, Case 3)

> "[After a call from the school that something needs to be repaired] *If you than say, it's okay, I will be there on Monday. Than the official log will be entered on Monday instead of Friday. Or it will be logged on Monday evening when the issue is already solved. Those are also things where you can… play is not the word… the contract a bit. I can say afterwards -that was the time it was logged-. Those are things you do to give goodwill and to get goodwill.*" (General director Maintenance Building Group B, Case 2)

Second, interviewees acknowledged the role of interpersonal trust to sustain cooperation over time. Once trust between employees of the different partners was established, employees believed that requests were based on good intentions and behaved cooperatively.

> "*If there is trust and you can sit around the table and talk things through, that goes always better than when a lawyer is involved*." (Project leader Road Management, Case 3)

> "*We do not apply the conflict model. We try to build sustainable relationships with our clients, which are based on transparency and cooperation, constructive cooperation,*

through which a relationship of trust materializes." (Project manager 2 Building Group B, Case 5)

"*If something* [e.g. equipment] *is broken, we are so open to communicate whether it really is damage and we are also the ones that are trusted when we say it was not damage but it just broke down. So this relationship, it is very humanely built on trust."* (Coordinator Sport & Youth, Case 1)

However, interviewees also explained that developing interpersonal trust takes time to materialize. How people behave during meetings, how they interpret rules and contractual guidelines, how they return a favor et cetera, all contributes to a growing interpersonal trust. Therefore, social skills and communicative capabilities are valuable assets in these types of partnerships.

"*The first 3 to 4 years, I had a lot more distrust and not enough trust. That is different now, I think. But that* [trust] *builds itself. That kind of trust comes throughout the years and is earned on a certain moment in time."* (Prison director, Case 5)

"*You don't get trust by saying -We are trustworthy- No, you build that, throughout the years, by delivering services appropriately, by dealing with requests constructively. Especially when it is a difficult request. That is the way you build trust."* (General director Building Group D, Case 4)

This implies, which was also recognized by the interviewees, that this type of trust is very person dependent. Even to the extent that when a partner changes staffing within the partnership, interpersonal trust again needs time to materialize.

"*If you get along well with the principal* [of the school] *and he knows that you are going to do everything to get things done, it can be the case that a severe defect can be logged as a small defect* [which gives the private partner more time to fix things]. *Just because he* [the principal] *knows that you will take it on and it will not take X months before it is fixed. But these are things that if the director changes… Same if our facility manager changes, then it's the same… If they change jobs, you have to rebuild that relationship.*" (General director Maintenance Building Group B, Case 2)

"*You know, I think that is one of the most enjoyable things. In the end, it* [cooperation] *depends on the person.*" (Project leader Road Management, Case 3)

"*It is the case that trust is often person-dependent… With one person you build a connection much faster than with someone else.*" (Attaché general management Federal Agencies, Case 5)

"*Why do you allow someone* [public partner] *something that you would not allow to someone* [public partner] *else? Why? Because you have a better feeling with that person, because you have a feeling that someone is in you in-group. That remains important everywhere.*" (General director Building Group D, Case 4)

[Insert Table 3 Panel B]

4.3. Network dynamics

A PPP is not a stand-alone partnership and cooperation in a focal PPP is influenced by market-related strategic concerns. Across cases, I identified public partners to be strongly connected with each other. Representatives of a public entity who want to start a new project, source information from public entities within their network that have experience regarding a similar project. In case 4, representatives from the municipality visited other municipalities that had recently constructed and operationalized a swimming pool facility through a PPP agreement with the same potential private partners. During these visits, the representatives of the public entities talked about their personal experiences with PPPs and, more specifically, about their experiences with the private partner in their specific project. In case 1, the Coordinator of Sports & Youth emphasized the role of network events. Coordinators of municipal sports departments gather frequently to inform each other on new initiatives and opportunities, sharing their personal experiences with private partners over the years. In case 4, Building Group D values the municipal representatives in their projects as their 'salespeople' in the PPP market during these network events.

Moreover, I found private partners to be strongly connected with public partners. In case 3 and 4, Building Group C and D source information on future opportunities through their personal connections with public partners' employees. This information sourcing was redeemed as crucial by the managing director of Building Group C to be prepared for future opportunities and to remain competitive within the PPP market. In case 1, the Coordinator of Sports & Youth

labeled the presence of private partners' employees during network events as important in regard to mutual knowledge and/or information sharing.

> "*As soon as we have our candidates, you check from your own knowledge or with other cities and municipalities how those projects* [past project with that private partner] *went*." (Alderman spatial planning, Case 1)

> "*Every project that comes on the market, we know at least a couple of months to a couple of years upfront. You know the project is going to come and you have already spoken to those people* [public partners]*. You know what's coming.*" (General director Building Group D, Case 4)

> "*As of day one, my team and I tried to make a interschool community between the different principals and school boards. The only disadvantage if you start a community, is that everyone knows everything*." (Head R&D Financial Firm A, Case 2)

The aforementioned connectedness within the PPP market causes personal experiences to influence how a partner, especially the private partner, is perceived within the partner's network, i.e. the partner's organizational reputation. As this organizational reputation is important to preserve access to information and potential future projects, being known as a trustworthy and cooperative partner is crucial. Furthermore, private partners also inform themselves on the reliability of a municipal government before submitting project tenders.

> "*These big players* [private partners] *cannot afford to, how can I say it, to trick the municipalities, because they would undermine their credibility for future projects*." (Secretary municipality, Case 4)

> "*If tomorrow a municipality X says they would maybe want a swimming pool, than we know within half an hour whether it is potentially an interesting location or not. Whether it is a municipal government where we want… Once, we did not submit a tender for a specific project, because the municipal government was rotten.*" (General director Building Group D, Case 4)

Besides personal experiences, also interorganizational experiences within the PPP can benefit organizational reputation. Interviewees from public partners confirmed that private partners who communicated frequently and proactively, and installed clear and easy-to-use coordination tools, were generally seen as reliable partners.

"[on why there was interorganizational trust] *It was a very professional and organized building company. The project was actually completed completely within the predefined timing and conditions.*" (Alderman spatial planning, Case 1)

[Insert Table 3 Panel C]

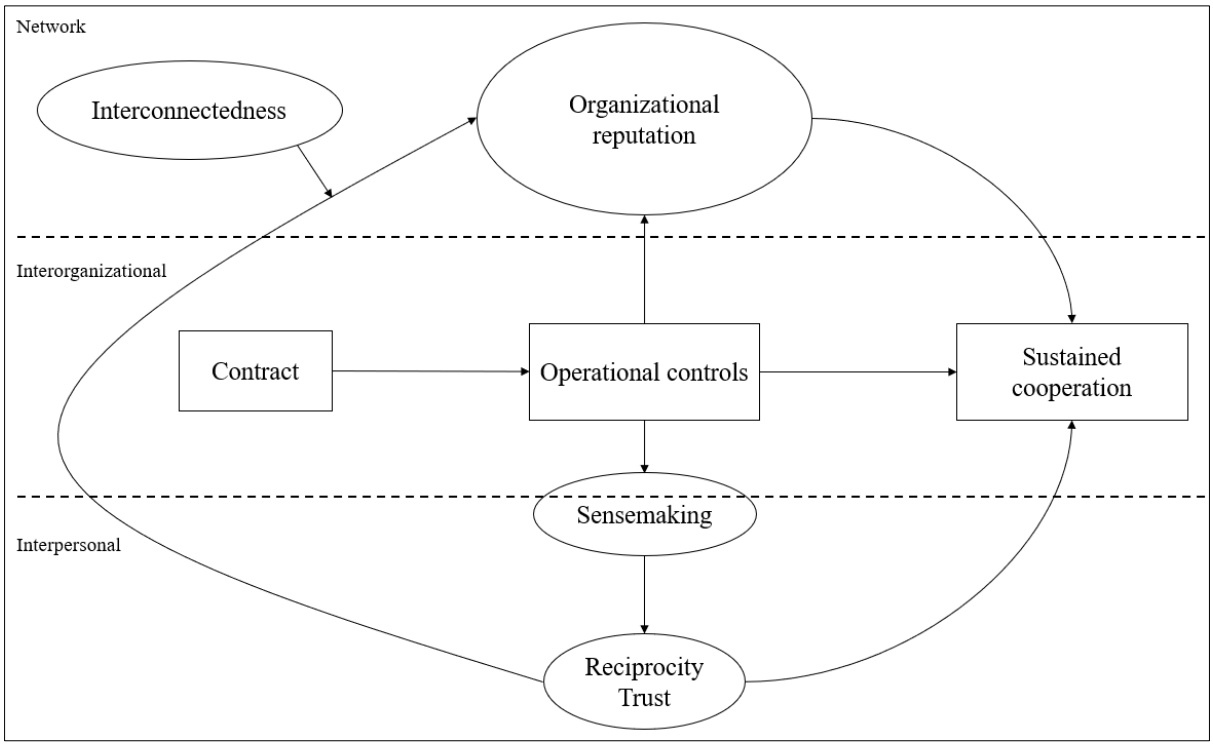
4.4. Multi-level framework

Based on the conducted interviews, a management control system based on three levels could be identified to sustain cooperation in PPPs over time. On the interorganizational level, operational controls (meetings and reporting platforms) are implemented to nest contractual responsibilities within the daily routines of the PPP, guiding day-to-day cooperation between public and private partners. On the interpersonal level, sensemaking activities defined the set of feasible actions that people employed within the PPP could undertake, creating a space in which reciprocity and trust can induce cooperative behavior. On the network level, organizational reputation in a strongly interconnected PPP market directed organizational ideology of the private partners towards cooperation rather than exploitation, benefitting cooperative behavior within the focal PPP.

Important to note is the interplay between the different levels. The usage of operational controls allowed for interpersonal mechanisms to play a decisive role towards sustained cooperation with the PPPs. Where regular meetings provided the opportunity, reporting platforms that anchor contractual obligations in the day-to-day routines provided content to engage in sensemaking activities. The creation of these "workable certainties" provided a reference frame on an interpersonal level in which these employees could reciprocate favors and build trust, supporting cooperation over time.

Moreover, the personal experiences of employees within a PPP affected how a partner is perceived within the network that constitutes the strongly connected PPP market. Due to strategic information sourcing from public partners and during network events, private partners valued their organizational reputation within the PPP market. To safeguard this information sourcing mechanism and their position in the PPP market as a reliable and trustworthy partner, private firms were focused more towards collaborative rather than exploitative behavior in a focal PPP. Figure 1 represents the identified multi-level system.

Figure 1: A multi-level system towards sustained cooperation



5. Discussion

This paper focuses on how cooperation is sustained in long-term hybrids. The analysis and findings are based on a cross-case analysis of five PPPs, an omnipresent type of hybrid in which public entities need to cooperate with private firms to provide public services in a more qualitative and profitable way. I identified interorganizational controls, interpersonal mechanisms and network dynamics to interact with each other, fostering cooperation over time. More specifically, the operational controls (interorganizational level) that are implemented to support and guide the daily execution provokes interaction amongst the employees operating the hybrid. Through interpersonal mechanisms such as sensemaking, reciprocity and trust, these employees transform partnership demands into cooperative behavior that go even beyond contractual agreements. Furthermore, interpersonal and interorganizational experiences also radiate on organizational characteristics, such as organizational reputation. When making recommendations and talking to industry peers, organizations will behave as allies or adversaries of a specific partner depending on their own personal or interorganizational experiences with that partner. Given this spillover effect of a focal hybrid on future opportunities, organizations take on a more cooperative attitude and are less likely to exploit power in the focal hybrid.

First, the study advances the accounting literature by developing a multi-level control framework on cooperation in long-term hybrids. Inasmuch as the limited prior research underpins the relevance of the different levels in isolation (Donada & Nogatchewsky, 2006), I show how interorganizational controls, interpersonal mechanisms and network dynamics interact with each other to impact cooperation within hybrids over time. The study highlights the impact interpersonal mechanisms (e.g. sensemaking, reciprocity and trust) can have on sustained cooperation within hybrids and emphasizes the dependency of these interpersonal mechanisms on the installed operational control processes. Whereas prior IOR literature has found learning processes on the operational level to influence management control adaptations and contract renegotiations on the interfirm level (Stouthuysen et al., 2019), I find that a lot of these learning processes remain at the interpersonal level and are not translated to interfirm controls. This is relevant to practitioners when making staffing decisions, given that the created "workable certainties" are, according to my findings, person-dependent.

Second, the findings highlight that additional interpersonal mechanisms are relevant to the hybrid's cooperative outcomes than the trust narrative that is typically considered (Lau & Rowlinson, 2009; Lui, Ngo & Hon, 2006, Luo, 2009). Interpersonal trust takes time to materialize and there are crucial interpersonal mechanisms (i.e. sensemaking), induced by operational controls, that precede trust. Practitioners as well as academics need to be informed about the antecedents of trust and the related mechanisms. Furthermore, this addresses a recent call from Cui et al. (2018) to take on a more informal framework approach regarding PPPs, advancing the project management literature.

Third, I investigate PPP dynamics beyond the contractual perspective that is usually theorized and applied (Iossa & Martimort, 2012). When taking on a purely contractual and interorganizational perspective, one would argue that private partners exploit their power in the long run. However, the findings show that reciprocity and interpersonal trust that result from sensemaking activities and organizational reputation within a highly interconnected network can counterbalance power imbalances on the interorganizational level. By linking cooperation within the partnership to interpersonal mechanisms and network dynamics, I point towards the importance of firm-level sourcing (i.e. human capital within the hybrid) and firm-level connectedness (i.e. industry embeddedness) for organizational outcomes. As suggested by Anderson & Dekker (2014), this is potentially relevant to broader interorganizational relationships (IORs). From a practitioner point of view, awareness about these ongoing dynamics between networks, organizational reputation, interpersonal relationships and

cooperative behavior will improve the management of PPPs. Furthermore, it informs parties involved in other types of hybrids of interpersonal or network factors potentially influencing cooperation within the hybrid.

6. Conclusion

Understanding how cooperation in sustained within long-term hybrids was the focus of this study. I develop a multi-level control framework on how interorganizational controls, interpersonal mechanisms and network dynamics contribute to sustain cooperation in hybrids over time. I highlight the importance of sensemaking, reciprocity an interpersonal trust as interpersonal mechanisms. These mechanisms allow people operationalizing the hybrid to safeguard sustained cooperation within the hybrid. It also emphasizes the necessity of operational controls beyond the contract that provide an opportunity for these interpersonal mechanisms to play a role in the first place. Moreover, interpersonal experiences escalate to the network level through strategic information sourcing mechanisms, emphasizing the relevance of an organization's reputation in a strongly interconnected industry. This directs effort in a focal hybrid towards cooperation rather than exploitation.

I acknowledge a set of limitations to this study. First, this paper focuses on sustaining cooperation in PPPs. Although PPPs are an omnipresent type of hybrid, other examples such as network organizations and joint ventures, exist as well. Characteristics that are more typical to this PPP context, e.g. socio-political risks (Cools, Van den Abbeele & Van Mele, 2023), might influence the relevance of the interpersonal mechanisms and network dynamics identified in the cases. Moving forward, future studies could apply the multi-level framework to other hybrid and, more broadly, interorganizational settings. Moreover, the developed framework is potentially relevant to intra-organizational settings that are characterized by vertical disaggregation in which departments have to sustain cooperation, notwithstanding the diverse goals and operational realities that characterize them.

Second, findings regarding the network dynamics are based on in-depth interviews with the key informants of the cases. Although it provides us unique insights on the existing network dynamics and their interplay with interorganizational controls and interpersonal mechanisms, it is difficult to assess the extent to which they influence each other. To understand their relative importance towards cooperative behavior over time, survey-based research seems a valuable method to test our multi-level framework and evaluate the relative importance of the different levels as a determinant of cooperation.

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Table 1: Case selection

	Case 1: Multifunctional sports hall	Case 2: Educational center housing elementary and high school	Case 3: National road	Case 4: Swimming pool	Case 5: Prison
Content of the PPP	Origin: Local sport associations were in need of new sports infrastructure Type: DBFM Maintenance period: 30 years	Origin: Part of an initiative of the Flemish government to modernize over 180 school accommodations Type: DBFM Maintenance period: 30 years	Origin: Construction of a national road to reduce traffic in several local municipalities Type: DBM (financial obligations besides the availability fees were put on the market as a separate agreement) Maintenance period: 30 years	Origin: Necessity to modernize the municipal swimming pool due to new regulation Type: DBFMO Maintenance period: 30 years	Origin: Construction of a new prison to modernize prison facilities and increase capacity on a national level Type: DBFM Maintenance period: 25 years
Partners involved	Public: City Development Company, Sports and Technical Services of the city Private: Building Group A responsible for the construction phase as well as the maintenance phase	Public: School board, Flemish Agency for Educational Infrastructure as a subsidizing entity Private: Building Group B responsible for the construction phase as well as the maintenance phase, Financial Firm A responsible for financing the Flemish government's initiative	Public: Ministry of Public Works, Local municipalities Private: Building Group C responsible for the construction phase as well as the maintenance phase	Public: Municipality Private: Building Group D responsible for the construction phase, the maintenance phase as well as the operationalization of the swimming pool facilities	Public: Federal Agency for Justice, Federal Agency for Building Management Private: Building Group B responsible for the construction phase as well as the maintenance phase

Table 2: Data sources

	Case 1: Multifunctional sports hall	Case 2: Educational center housing elementary and high school	Case 3: National road	Case 4: Swimming pool	Case 5: Prison
Interviews with key informants	Public: Chair 1 City Development Company, Chair 2 City Development Company, Alderman spatial planning, Coordinator Sport & Youth Private: General director Maintenance Building Group A, Operational manager Maintenance Building Group A	Public: Principal school, Financial and logistic director school Private: General director Maintenance Building Group B, Head R&D Financial Firm A	Public: Project leader Road Management, Mayor Municipality 1/Chair Regional Development, Mayor Municipality 2/Secretary Ministry of Public Works Private: Managing director Building Group C	Public: Head Sports department municipality, Secretary municipality Private: General director Building Group D	Public: Director prison, Attaché general management Federal Agencies Private: Project manager 1 Building Group B, Project manager 2 Building Group B, General director Maintenance Building Group B
Case-specific documents	Awarding guidelines, DBFM contract, contract appendices, selection report, project timeline, archaeological report, technical studies	Project overview Building Group B, newspaper articles	Awarding guidelines, risk assessment, environmental impact study, project notes, report audit commission, project timeline, selection reports	Report local council regarding awarding decision, newspaper articles	Project overview Building Group B, newspaper articles

Table 3: Analysis of the cases

Panel A: Interorganizational controls

	Case 1: Multifunctional sports hall	Case 2: Educational center housing elementary and high school	Case 3: National road	Case 4: Swimming pool	Case 5: Prison
Contract	Cooperation base of the PPP, specifying: - Framework conditions including fine clauses when responsibilities were not met - Long-term maintenance plan - Financial plan including availability fees to be paid by the public partner - Procedures related to unforeseen or changing circumstances and renegotiations Seen as a necessary, but unadaptable and not workable document	Cooperation base of the PPP, specifying: - Responsibilities of the various partners involved - Framework conditions including fine clauses when responsibilities were not met - Long-term maintenance plan - Financial plan including availability fees to be paid by the school board and the subsidizing entity to Financial Firm A and Building Group B - Procedures related to unforeseen or changing circumstances and renegotiations Starting point for long-term cooperation and seen as the only legal fallback during the different phases of the PPP Adaptable through amendments, but redeemed as not workable during day-to-day operations	Cooperation base of the PPP, specifying: - Configuration boundaries of the national road - Lane rental schemes to be paid by the private partner when the national road cannot be fully used due to reconstructions, maintenance et cetera - Long-term maintenance plan including quality requirements that need to be attained throughout the whole maintenance period - Financial plan including availability fees to be paid by the public partner - Procedures related to unforeseen or changing circumstances and renegotiations - Financial surplus sharing arrangement between the government and Building Group C	Central document throughout the whole duration of the PPP, specifying: - Responsibilities of the private partner in every phase of the PPP - Financial plan including availability fees to be paid by the public partner - Forecasted revenues including agreements on ticket prices for citizens, sport clubs, schools et cetera - Profit sharing agreement - Renegotiation procedures (e.g. thresholds regarding variable costs and number of visitors for which the private partner could ask to renegotiate the availability fee) - Commercial activities not to be undertaken by	Cooperation base of the PPP, specifying: - Services the private firm needs to deliver (e.g. repairs, catering and laundry) in return for the availability fee - The Service Level Agreements (SLA's) the private firm needs to adhere to - A fine system related to unacceptable behavior (e.g. tools unattended in the neighborhood of prisoners) or insufficient performance (e.g. SLA was not met) - Procedures related to changing demands and/or contractual changes Seen as rigid, even the procedures related to change Fallback document during discussions on the categorization of fines

				the private partner to protect local SME's	
Operational controls	Digital reporting platform Meetings: - Weekly or biweekly for both partners' employees involved in the day-to-day operations - Quarterly for managers of Building Group A and the City Development Company	Digital reporting platform Meetings: - Bimonthly for all partners involved - Ad hoc for School board and Building Group B	Translation of the long-term maintenance plan in a detailed, quarterly maintenance plan, which is discussed and shared between the public and private partners	Meetings: - Bimonthly for all partners involved to present financials, discuss complaints, prepare events et cetera - Ad hoc when the private partner had the right to initiate renegotiation procedures	Digital reporting platform Meetings: - Weekly for both partners' employees involved in the day-to-day operations - Monthly meetings based on the applied fines - Quarterly meetings involving managers of Building Group B and high-level officials of the Federal Government - Semi-annual meeting in which the prison's operations need to be discussed with the investors backing the project
Additional elements of importance	Building Group A carrying out a vision of cooperation Showing expertise in organizing capabilities	/	Building Group C values the 'partnership' element in a PPP as a strategic choice	Building Group D has a clear vision on how swimming pool facilities and its add-ons create synergies to add value to people's leisure	Building Group B wants to carry out the values of transparency, reliability and cooperation and wants to avoid conflict

Panel B: Interpersonal mechanisms

	Case 1: Multifunctional sports hall	Case 2: Educational center housing elementary and high school	Case 3: National road	Case 4: Swimming pool	Case 5: Prison
Sensemaking	Pragmatic attitude of the people involved in the day-to-day operations Evaluation of the reasons why delays occurred, not the delay itself Approaching problems from the other partner's perspective	Relating contractual obligations to what is currently feasible (e.g. dependency on third-party suppliers)	/	Searching for a pragmatic compromise between the juridical reality, i.e. the contract, and the operational reality	Ongoing process of understanding each other's goals, understanding what is feasible/workable, creating a mutual understanding Making a distinction between the contractual reality and the operational reality
Reciprocity	"Give-and-take" principle: seen as a continuous process to sustain cooperation over 30 years	"Give-and-take" principle as a natural consequence of "understanding" the contract Extra-contractual tasks executed by Building Group B in return for financial benefits (e.g. dropping fines, agreeing on the usage of less expensive materials) or goodwill	Building Group C is focused on building up goodwill, expecting the public partner to help out when Building Group C is confronted with difficulties	"Give-and-take" principle directs attention towards moving along instead of a standstill during conflict resolution Extra-contractual tasks executed by Building Group D in return for goodwill and to maintain a cooperative atmosphere	"Give-and-take" principle as an ongoing process, but seen as necessary to safeguard cooperation Extra-contractual tasks executed by Building Group B in return for financial or operational benefits (e.g. remit small performance delays, additional investment instead of a monetary fine)
Interpersonal trust	Depends on the attitude of the people involved Ensures reported problems are valid and trustworthy without objective proof Takes time and mutual effort to materialize	Person dependent Usage of operational controls in favor of the partner who bears the contractual obligation (e.g. reporting problems with delay or defining them as less severe to give the private	Seen as a necessity to talk things through and to avoid the involvement of lawyers to resolve disputes	Takes time and effort to build up Caution is warranted, but trust is needed	Person dependent, took years to materialize and has to be rebuilt when staffing decisions change the people operating the PPP Ensures open and honest communication

		partner more time or a decreased fine) Needs to be rebuilt when staffing changes			Allows for communication besides the formal channels (e.g. direct phone calls in stead of using the report platform)
Additional elements of importance	Communicative and organizational capabilities of the people operationalizing the PPP	/	How people operationalizing the PPP treat each other is seen as a strong determinant of PPP success or failure People involved in the PPP should have the right "PPP-mindset"	In election years, Building Group D has agreed upon conducting extra-contractual tasks with the idea to retain the same people on the public side	Interpersonal connection and mutual understanding is seen as the key determinant of success in this type of project A lot of informal calls, almost daily, between the people operating the PPP, such that the weekly meeting is not used to raise problems but to solve problems

Panel C: Network dynamics

	Case 1: Multifunctional sports hall	**Case 2: Educational center housing elementary and high school**	**Case 3: National road**	**Case 4: Swimming pool**	**Case 5: Prison**
Interconnectedness	Exchange of experiences, information and documents between public entities Congresses and network events that connect public entities and private partners	School board visited other schools to inform themselves on the operationalization of PPP projects Financial Firm A built an informal community amongst the different schools, organizing network events, newsletters, photo sessions et cetera	Informal meetings between people of the public partner and Building Group C to be informed on future projects, which is redeemed as strategically crucial by Building Group C	Exchange of experiences, information and documents between employees of different municipalities Municipal government visited similar projects to inform themselves on the operationalization of potential private partners Congresses and network events that connect public	Exchange of experiences between facilities on the public side Public entity has installed an overarching entity to discuss experiences and streamline decision making across PPP prison facilities

				entities and private partners Strategically schedule informal meetings between people of the public partner and Building Group D to be informed on future projects	
Organizational reputation	Reassures public partner of Building Group A's access to resources Taken into account during awarding process when multiple candidates are similar regarding financial and technical guidelines	/	/	Building Group D values municipal representatives as "salespeople" on the public side in the PPP market Building Group D does not initiate offers on projects in which the municipal government has a bad reputation Big private players in the market are seen as knowledge centers	Familiarity with Building Group B is seen as an advantage towards future projects because they already "know each other's world" Big private players in the market are seen as innovators of the sector

APPENDIX A

Coding Scheme

- Interorganizational
    - Contract
    - Operational control
- Interpersonal
    - Sensemaking
    - Reciprocity
    - Trust
- Network
    - Organizational Reputation
    - Interconnectedness
- Cooperation

Corporate Cultural Diversity and Long-Term Performance: The Role of Employee Ownership

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ABSTRACT

This paper investigates the relationship between corporate cultural diversity and long-term financial performance, focusing on the moderating role of employee ownership. We argue that corporate cultural diversity, the coexistence of multiple distinct values within an organization, allows firms to better adapt and refine their strategic focus, thereby enhancing firms' long-term financial performance. However, as corporate cultural diversity can also lead to misunderstandings and conflicts among employees, we suggest that firms with higher levels of employee ownership are better equipped to capitalize on the advantages of corporate cultural diversity. Employee ownership can mitigate the potential negative effects of corporate cultural diversity by fostering a stronger sense of ownership among employees, which aids in resolving conflicts. Drawing on a dataset of S&P 1500 firms, our findings reveal that corporate cultural diversity contributes to enhanced company performance only in the context of high levels of employee ownership. These findings highlight the dynamic between corporate cultural diversity and ownership structures, offering insights into how firms can leverage corporate cultural diversity to strengthen long-term performance.

Keywords: Corporate Culture; Cultural Diversity; Long-term Financial Performance; Employee Ownership

INTRODUCTION

The renowned quote, "Culture eats strategy for breakfast," attributed to management expert Peter Drucker, underscores the frequently overlooked influence of corporate culture on organizational performance. Culture acts as an invisible force that influences employee conduct, decision-making, and ultimately, the trajectory of organizations (Schein, 2010). Its importance is widely recognized, evidenced by a recent study showing that 91% of executives believe culture is essential to their business, and 79% consider it as a primary driver of firm value (Graham , Grennan, Harvey, & Rajgopal, 2022). Research indicates that corporate culture affects various firm outcomes, including its capacity to generate revenue, employee retention, survival, strategy, and financial well-being (Warrick, 2017; Barth & Mansouri, 2021; Li, Mai, Shen, & Yan., 2021; Hertel, Kaya, & Reichman, 2024).

A significant yet frequently overlooked aspect of corporate culture is the impact of value diversity within a company on its performance.. Prior literature focusing on corporate culture has mainly focused on cultural consistency, which assesses the strength of cultural values (e.g., Grabner, Klein, & Speckbacher, 2022; Passetti, Battaglia, Bianchi, & Annesi, 2022; Pfister & Lukka, 2019). However, much like diversity in the workforce, a diversity of corporate values can offer significant benefits to organizations. As Cox and Blake (1991) argue, workforce value diversity fosters creativity, enhances decision-making, and improves adaptability, all of which can similarly apply to corporate cultural diversity within organizations. Embracing a variety of cultural values (i.e. innovation, respect, integrity, teamwork, and quality) gives firms the flexibility to adapt their focus as circumstances change. This adaptability is becoming increasingly critical as modern business environments grow more dynamic and uncertain. The capacity of corporate culture to evolve during crises and consequently to draw upon a range of

values is essential for sustaining competitive advantage in these conditions (Reeves & Deimler, 2011).

We argue that corporate cultural diversity can positively influence firm performance, but its impact depends on the right organizational conditions. For corporate cultural diversity to be effective, employees must be engaged and aligned with the organization's goals. Without this, excessive corporate cultural diversity can lead to strategic misalignment or a lack of focus. We suggest that firms with high levels of employee ownership are better positioned to harness the benefits of corporate cultural diversity. In contrast, firms with low levels of employee ownership may struggle to realize these benefits, as corporate cultural diversity can exacerbate conflicts and disconnection among employees (Denison, 1996; Harrison & Klein, 2007).

To investigate our predictions, we create a new measure for corporate cultural diversity. We draw on the cultural dictionaries constructed by Li et al. (2021). The dictionaries cover the main corporate values identified by prior work of Guiso, Sapienza and Zingales (2015): innovation, integrity, respect, teamwork, and quality. We extract the prevalence of these five different cultural values from earnings conference calls and combine them into an entropy measure to assess diversity. We find evidence that employee ownership positively moderates the relationship between corporate cultural diversity and long-term financial performance, suggesting that higher levels of employee ownership lead to a positive effect of corporate cultural diversity on long-term financial performance.

This study contributes to the (corporate) culture literature in several ways. Firstly, it shifts the focus from the strength and consistency of cultural values (Grabner, Klein, & Speckbacher 2022; Pfister & Lukka, 2019), traditional themes in prior research, to exploring the diversity of cultural values within organizations. While most studies emphasize alignment and robustness of corporate culture, ours is among the first to examine how a variety of distinct cultural values (i.e. innovation, integrity, respect, teamwork, and quality) influence long-term

financial performance. In doing so, we offer a novel perspective on corporate cultural diversity, which aligns well with contemporary challenges that demand more flexible and comprehensive cultural strategies. Secondly, this study provides new insights into how structural mechanisms, like employee ownership, can enhance the benefits of corporate cultural diversity, making it a strategic asset. Finally, this study contributes methodologically by introducing a novel entropy-based measure of corporate cultural diversity: we combine the Shannon-Wiener entropy index with a text-based measure of corporate culture as developed by Li et al. (2021). This measure, derived from natural language processing of earnings calls, provides a novel quantification of cultural heterogeneity. This new measure complements traditional survey-based approaches and facilitates our insights into the complex influence of corporate culture diversity on firm performance.

THEORY AND HYPOTHESIS DEVELOPMENT

Corporate Culture and Cultural Variety

Over the years, scholars have explored and conceptualized corporate culture from a variety of perspectives. Defined as the collective values and norms that guide behaviour and decision-making within an organization (Schein, 2010), corporate culture shapes not only shapes shared values, but also acts as an internal control mechanism.

Whether intentionally designed or not (Anthony, Govindarajan, Hartmann, Kraus, & Nilsson, 2013), this cultural control aligns individual behaviors with broader organizational goals, fostering an environment where employees monitor and influence each other's actions, thus reinforcing desired outcomes with minimal need for direct supervision (Merchant & Van der Stede, 2017; Malmi & Brown, 2008). O'Reilly and Chatman (1996) describe corporate culture as "a system of shared values defining what is important, and norms, defining appropriate attitudes and behaviors, that guide members' attitudes and behaviors", which

reduces the necessity for formal supervision (pp. 160, 166). Therefore, as a social control, corporate culture plays an important role in shaping organizational behaviour and long-term performance by influencing how employees act and make decisions. However, instead of a closer examination of cultural control, empirical research has historically focused on formal, accounting-based controls, as these are more readily quantifiable and easier to analyse (Langfield-Smith, 1997). While this focus has generated valuable insights, it has also led to criticism for overlooking informal control mechanisms, such as culture, that play a critical role in driving organizational success (Cardinal, Kreutzer, & Miller, 2017; Chenhall, 2003; Malmi & Brown, 2008; Saffold III, 1988). Recent studies increasingly recognize cultural controls as influential informal mechanisms that shape behaviour and enhance organizational performance (Grabner et al., 2022; Kennedy & Widener, 2019; Passetti et al., 2022; Pfister & Lukka, 2019). Corporate culture, defined as a system of shared beliefs, norms and values, interacts with organizational structures and control systems to produce norms that influence individual behaviour, commonly referred to as "the way we do things around here" (Lundy & Cowling, 1996). Malmi and Brown (2008) challenge traditional views of corporate culture as merely contextual, instead positioning it as a critical element of management control systems.

Most prior research has focused on the consistency and strength of cultural values, defined as the degree to which values are widely shared and deeply embedded within an organization (Kotter & Heskett, 1992). While strong cultures are known to enhance cohesion, reduce turnover, and improve performance (O'Reilly & Chatman, 1996), they also come with limitations. An overemphasis on a single dominant cultural value can hinder creativity, reduce adaptability, and lead to groupthink, where diverse perspectives are overlooked and innovation is suppressed (Janis, 1982). In today's increasingly dynamic and uncertain business environment, organizations must find a balance between the stability offered by strong cultural

alignment and the flexibility required to adapt to ongoing changes (Chatman & Cha, 2003; Sørensen, 2002).

This necessity brings us to the importance of corporate cultural diversity, a relatively underexplored dimension of corporate culture. Corporate cultural diversity, defined as the coexistence of multiple values within an organization, complements the stability provided by cultural strength with adaptability and creativity. By fostering a diverse mix of values (e.g. innovation, respect, integrity, teamwork, and quality), corporate cultural diversity equips organizations to better navigate uncertainty. Certain values may serve as the core identity of the organization, while others provide flexibility to address specific challenges or opportunities (Cox & Blake, 1991; Reeves & Deimler, 2011). This diversity of values enables firms to adapt their strategic focus in response to changing market conditions, tailoring their emphasis on particular values as needed to achieve contextual adaptability.

However, while corporate cultural diversity introduces a broad range of valuable resources to organization, it also entail brings potential coordination costs. Coordination costs refer to the resources such as time, effort, and financial investment, needed to align teams and departments (March & Simon, 1958). The presence of multiple cultural values can complicate behaviors and decision-making processes across the organization (Denison, 1996; Harrison & Klein, 2007). For example, different priorities may create tension among employee and make it harder to find common ground in a decision-making process. The overall benefits of corporate cultural diversity thus likely depend on how effectively these coordination challenges are managed..

Research Question

Organizational outcomes can be significantly impacted by corporate cultural diversity. Defined as the coexistence of multiple values within an organization, corporate cultural diversity introduces a wide range of viewpoints that enhance creativity and adaptability (Cox

& Blake, 1991; Janis, 1982). In contrast, strong monocultures, while potentially fostering a unified direction, can limit adaptability, stifle creativity, and lead to groupthink. Over time, such monocultures may become rigid and dogmatic, diminishing an organization's capacity to evolve as circumstances change.. Firms that embrace multiple cultural values are equipped to "pivot" and leverage these diverse values to transform their corporate culture and strategies in response to shifting challenges and opportunities. As Reeves and Deimler (2011) highlight, this adaptive capacity is a critical source of competitive advantage, enabling firms to excel and achieve superior performance outcomes. At the same time, coordination cost could arise with increased cultural diversity (Harrison & Klein, 2007). However, embracing cultural diversity is not without its challenges. Increased cultural diversity can also lead to higher coordination costs, as aligning multiple different values and perspectives within a firm becomes more complex (Harrison & Klein, 2007). This necessitates effective management strategies to harness the benefits of diversity while mitigating potential frictions. Therefore, we posit the following research question:

RQ: *What is the relationship between corporate cultural diversity and long-term financial performance?*

Employee Ownership

Employee ownership refers to mechanisms such as stock options, profit-sharing plans, and employee stock ownership plans (ESOPs) that provide employees with a financial stake in the organization (Kruse, Blasi, & Freeman, 2012). These mechanisms serve a dual purpose: they align employees' economic interests with organizational success and they foster a psychological sense of ownership that deepens their commitment to shared goals (Pierce, Kostova, & Dirks, 2001). When employees have a tangible stake in the organization, they are more likely to engage in behaviours that support long-term organizational objectives, creating

alignment between individual efforts and collective outcomes, “going the extra mile” (Jensen & Meckling, 1976; Freeman, 2007).

Extensive research highlights the benefits of employee ownership in fostering engagement, collaboration, and productivity. For example, Blasi, Freeman, and Kruse (2017) argue that employee ownership reduces agency problems by aligning employees’ interests closely with the success of the firm. When employees perceive their contributions as directly influencing organizational performance, they are more inclined to take initiative, innovate, and collaborate effectively (Pendleton & Robinson, 2010; Freeman, 2007). This dynamic not only enhances organizational efficiency but also promotes stronger alignment of employee efforts with long-term organizational goals (O’Boyle, Patel, & Gonzalez-Mulé, 2016). However, some studies have noted negative effects of employee ownership (Hansmann, 1996; Kruse & Blasi, 1995). Although the overall impact of employee ownership is not universally large, a meta-analysis by O’Boyle et al. (2016) found a small but statistically significant positive effect on firm performance.

Corporate Culture (Diversity) and Employee Ownership

In this study, employee ownership is positioned as a key structural mechanism that influences the effectiveness of corporate cultural diversity within organizations. Corporate cultural diversity, defined as the coexistence of multiple cultural values within an organization, presents both opportunities and challenges (Harrison & Klein, 2007; Cox & Blake, 1991). On one hand, it fosters creativity and adaptability by bringing diverse perspectives and approaches into decision-making processes. On the other hand, it can lead to misalignment, competing priorities, and internal conflict if not managed effectively (Cox & Blake, 1991). Employee ownership mitigates these risks by fostering alignment and engagement among employees. When employees hold a financial and psychological stake in the organization, they are more

likely to view diverse cultural values as complementary rather than competing, thus reducing conflict and enhancing collaboration (Kruse et al., 2012; Pierce et al., 2001).

The theoretical foundation for this perspective is grounded in agency theory (Jensen & Meckling, 1976), which explains how mechanisms like employee ownership align individual incentives with organizational goals. By reducing agency costs, such mechanisms foster shared commitment and improve coordination within firms. Strong dominant cultures, characterized by widely shared and deeply held values, enhance behavioural consistency, facilitating coordination and reducing performance variability, and serving as a control mechanism in their own right (Sørensen, 2002). With cultural variety, employee ownership helps align interests and balance adaptability with cohesion. Literature on goal interdependence suggests that when objectives and rewards are shared, openness to different points of view and ideas significantly increases among individuals (Haesebrouck, Cools, & Van den Abbeele, 2018; Firk, Detzen, Hennig, & Wolff, 2024). This openness reinforces coordination and mutual understanding, even among teams prioritizing different values.

By understanding employee ownership as a structural mechanism that complements corporate cultural diversity, we gain insights into how organizations can strategically leverage both concepts. Ownership not only strengthens alignment but also enhances the organization's ability to harness the creative and adaptive potential of diverse cultural values. This interplay between employee ownership and corporate cultural diversity bridges the fields of corporate culture and strategy, offering a framework for understanding how structural mechanisms influence the outcomes of corporate cultural diversity.

Hypothesis Development

Nevertheless, corporate cultural diversity can also entail significant coordination costs and the potential for misalignment of employee goals (March & Simon, 1958; Denison, 1996). Organizations that adopt multiple cultural values simultaneously may experience differences

in how these values are prioritized across entities, departments, or teams, depending on their specific objectives. For example, one part of the organization might emphasize adaptability and forward-thinking to foster creativity, while another might focus on consistency and collaboration to meet operational goals. These varying emphases can create challenges in alignment, as competing priorities may lead to tensions or inefficiencies. These coordination costs can be alleviated when organizations design and implement effective control mechanisms (March & Simon, 1958).

Employee ownership, through equity-based incentives like stock options, can foster a stronger collective commitment to the organization in the presence of diverse perspectives. This shared stake deepens employees' dedication, encouraging them to seek solutions and work cooperatively even when individual values or priorities differ. Thus, firms encourage long-term-oriented behaviour in employees by allowing them to participate financially in the enterprise, eliciting cooperation from employees beyond the scope of their formal responsibilities (Kruse et al., 2010; Blasi et al., 1996). The outcome-based nature of the control thus unifies diverse teams by bridging differences in corporate values (Rousseau & Shperling, 2003), thus reducing coordination costs and enabling firms to effectively leverage the potential derived from a variety of cultural values. Stock options, for example, are normally awarded retrospectively on performance that has taken place in the past so that they are accurately targeted at employees who have already revealed strategic alignment with the firm's goals (Anderson et al., 2000; Core & Guay, 1999). Equity incentives serve as a tool to foster alignment and acknowledge employees' proven dedication.

Therefore, we hypothesize that:

Hypothesis 1 (H1)*: The extent of employee ownership positively moderates the relationship between corporate cultural diversity and long-term financial performance.*

METHODS

Sample Selection

We test our hypotheses using a large panel dataset of firms from the S&P 1500 index, spanning from 2006 to 2019. The starting year of 2006 is selected based on the availability of the options data needed for measuring employee ownership in Execucomp. We focus on the timeframe prior to the Covid-19 outbreak in 2020, as post-Covid data are not sufficiently available. Our sample construction process is detailed in Table 1. To derive our measure of cultural variety and the strength of the individual cultural values, we follow the approach used by Li et al. (2021), which involves collecting data from the Q&A sections of earnings conference call transcripts sourced from Thomson Reuters Street Events and the LexisNexis Full Disclosure Wire. Financial data are retrieved from from Compustat and compensation data from Execucomp. Our final sample comprises 8,647 firm-year observations across 1,258 firms.

Main Variables

Long-term financial performance. Our dependent variable *Long-term financial performance* is calculated as the average Tobin's q over the subsequent two years (t+1 and t+2). Tobin's q is defined as the sum of long-term debt (lt) and the market value of equity (common shares outstanding multiplied by the price per share, csho × prcc_f) divided by the book value of total assets (at).

Cultural variety. To operationalize corporate cultural diversity, we combine the Shannon-Wiener entropy index with a text-based measure of corporate culture as developed by Li et al. (2021). This methodology uses machine learning and textual analysis to quantify corporate culture based on discussions in the Q&A sections of earnings call transcripts. The word-embedding model derives scores for five essential cultural values: innovation, integrity, quality, respect and teamwork. These scores reflect the prevalence of each cultural value, as

articulated by senior management during unscripted discussions in the Q&A section, minimizing biases from scripted communications.. We use these scores to construct the Shannon-Wiener entropy index, a commonly applied metric of diversity in ecological, economic, and organizational contexts (Auerswald & Dani, 2022). This index quantifies diversity by considering the variety (quantity of unique cultural values) and balance (spread of those components) of cultural values present within a company. This method corresponds with Harrison and Klein's (2007) model, which recognizes variety as one of three essential diversity elements, together with separation and disparity. Variety highlights distinctions in type or category, such as knowledge, skills, or in this case, cultural values. The Shannon-Wiener entropy index effectively operationalizes variety by capturing the distribution of different cultural values and their relative presence within a company. The Shannon-Wiener index is calculated as follows:

$$H' = -\sum_{i=1}^{R} p_i \ln (p_i)$$

where p_i represents the proportion of the i-th cultural attribute (i.e. innovation, integrity, respect, teamwork and quality) within the organizational context. Higher values of H' indicate greater cultural variety, reflecting a more diverse and balanced set of cultural values within the firm.

Employee ownership. We measure employee ownership focusing on stock options granted to regular (rank-and-file) employees, which reflect the extent to which equity incentives are distributed across the organizational structure. This distinction is important as rank-and-file employee stock options differ from executive equity incentives, aligning broader employee interests with organizational goals (Hochberg & Lindsey., 2010). In our analysis, we follow a recently established approach (Call, Kedia, & Rajgopol, 2016; Holderness, Huffman, & Lewis-Western, 2019; Chen, Wu, Li, Obiri-Yeboah, 2024; Dasilas, 2024) that estimates

rank-and-file employee option grants by subtracting the options allocated to executives and non-executive managers from the total options issued by the firm, as reported in Compustat. To approximate the options granted to non-executive managers, this approach assumes that the top 10% of employees qualify as non-executive managers and that their option grants equal one-tenth of the average grants received by the second through fifth highest-paid executives (Oyer & Schaefer, 2005; Hochberg & Lindsey, 2010). The variable *Rank and File Stock Option Grants* is derived by subtracting the total grants allocated to executives and non-executive managers from the firm's total option granted, scaled by the number of common shares outstanding. From this, we calculate the outstanding unvested options allocated to rank-and-file employees (*Employee Ownership*) by applying a four-year vesting schedule, where 25% of the granted options vest each year. Following Call et al. (2016) and Holderness et al. (2019), this approach allows us to estimate the portion of options still unvested at any given time, reflecting the long-term incentive structure provided to rank-and-file employees.

Control Variables

In assessing the relationship between *Long-Term Financial Performance* and *Cultural Variety*, we control for the strength of individual cultural values as in Li et al. (2021): *Innovation, Integrity, Respect, Teamwork,* and *Quality*. This ensures that the main relationship is not confounded by the strength, and eases interpretability. Additionally, we control for several firm characteristics that may influence firm performance. Similar to prior corporate culture studies (e.g., Li et al., 2021), we control for firms' *Return on assets* (net income to total assets ratio), *Firm size* (natural logarithm of total assets) and *Leverage* (long-term debt to total assets ratio). To control for the effect of managerial ownership, we include *Executive director's shares* as the percentage of shares held by executive directors (Dasilas, 2024).

Empirical Strategy

To test our hypothesis, we analyse the relationship between *Long-Term Financial Performance* and *Cultural Variety*, particularly emphasizing the moderating impact of *Employee Ownership*. Considering the ongoing nature of our dependent variable, *Long-Term Financial Performance* (assessed as the average Tobin's Q over the forthcoming two years), we utilize an ordinary least squares (OLS) regression model. To address unobserved heterogeneity, we incorporate industry- and year-fixed effects, which encompass 2-digit SIC codes and yearly dummies. Given the relative stability of corporate culture over time, we refrain from using firm-fixed effects to preserve variation pertinent to cultural diversity. Standard errors are clustered at the firm level to account for within-firm correlations over time. This method enhances the reliability of our findings, addressing both firm-level and temporal heterogeneity.. In line with previous studies, we incorporate thus multiple control variables. The key variable of interest in our models is, however, the interaction term between Cultural Variety and Employee Ownership, which examines the moderating effect of equity compensation on the relationship between corporate cultural diversity and financial outcomes.

RESULTS

Descriptive Results

In Table 2, we present descriptive statistics for all variables used in our regression analysis. The mean and standard deviation of *Rank and File Stock Option Grants* align with findings from other studies that utilize the same methodology (Holderness et al., 2019), confirming the comparability of our measures. The means and standard deviations (SDs) of all control variables are in line with prior studies. In Table 3 we provide correlations for all regression variables. Our five cultural values are strongly intercorrelated, especially *Innovation* and *Quality*. Nonetheless, when computing variance inflation factors, we find all values to be

below 5, suggesting that multicollinearity does not unduly influence our regression results.. Furthermore, we identify the 50 S&P 1500 firms with the highest (50 highest Shannon entropy scores) and lowest levels (50 lowest Shannon entropy scores) of cultural variety. To examine potential changes over time, we split our dataset into two periods (2006–2012 and 2013–2019), following the approach utilized by Li et al. (2021).

Insert Tables 1, 2, 3 and 4 about here

Regression Results

Table 5 presents the outcomes of the regression analyses predicting *Long-Term Financial Performance*. Model 1 includes only the control variables, while Models 2 and 3 incorporate the main effects of *Cultural Variety, Employee Ownership,* and their interaction. Model 1 reveals that *Cultural Variety* is negatively but insignificantly related to *Long-Term Financial Performance* ($\beta = -0.022$, $p > 0.10$). Among the control variables, *Return on assets* ($\beta = 3.342$, $p < 0.001$) and *Firm size* ($\beta = 0.113$, $p < 0.001$) both demonstrate strong positive and significant effects on *Long-Term Financial Performance*. *Leverage* shows a weak negative relationship ($\beta = -0.33$, $p < 0.1$), while the other controls, including *Innovation, Integrity, Respect, Teamwork,* and *Quality,* do not show statistically significant coefficients.

Model 2 introduces the main effect of E*mployee Ownership,* which is positively and significantly associated with *Long-term Financial Performance* ($\beta = 0.094$, $p < 0.001$),suggesting that higher levels of *Employee Ownership* contribute positively to firm performance. In this model, *Cultural Variety* continues to show a negative and insignificant.

Model 3 introduces the interaction term between *Cultural Variety* and *Employee Ownership*. The interaction is positive and significant ($\beta = 0.054$, $p < 0.05$), providing support for the hypothesis that the effect of cultural variety on *Long-Term Financial Performance* is

moderated by the level of *Employee Ownership*. Specifically, the results indicate that *Cultural Variety* is more beneficial to *Long-Term Financial Performance* in firms with higher levels of *Employee Ownership*. Because interpreting interaction effects in regression models is often challenging, we use marginal effects analysis to further examine the interaction between *Cultural Variety* and *Employee Ownership*. Figure 1 illustrates the marginal effects of cultural variety on *Long-term Financial Performance* at low (-1 SD) and high (+1 SD) levels of *Employee Ownership*. The results show that at low levels of *Employee Ownership,* the relationship between *Cultural Variety* and *Long-Term Financial Performance* is negative. In contrast, at high levels of *Employee Ownership*, the relationship is positive, confirming the moderating role of *Employee Ownership* in this relationship. These findings emphasize the importance of *Employee Ownership* in leveraging cultural variety to improve firm performance. Firms with higher levels of *Employee Ownership* appear better equipped to harness the benefits of *Cultural Variety*, whereas firms with lower levels of *Employee Ownership* may face challenges in translating *Cultural Variety* into positive performance outcomes.

Insert Table 5 and Figure 1 about here

Robustness Tests

Alternative specifications. To ensure the robustness of our findings, we conducted several untabulated tests with alternative specifications and measures. First, we substituted the 2-digit SIC industry fixed effects in our primary models with Fama-French 48 (FF48) and Fama-French 10 (FF10) industry classifications. Our results stayed consistent and are not dependent on industry fixed effects used. Second, we recalculate the cultural variety measure

and individual cultural values over a one-year period, including the dependent variable. The relationships remained consistent under these adjustments. Finally, when re-estimating the models without winsorization, the results remained robust. These additional analyses provide evidence that our findings are robust across a range of methodological variations.

Correction for Endogeneity. Certain firms with distinct traits might consistently foster or draw in specific degrees of cultural diversity, which could lead to worries about possible endogeneity in our analysis. For example, companies in particular sectors or with distinct organizational frameworks could affect cultural diversity independently of its effect on sustained financial performance. To address this , we utilize a two-stage residual inclusion (2SRI) strategy, aligning with techniques employed in previous studies to address endogeneity (e.g., Larcker & Rusticus, 2010). In the initial phase, we perform a regression of the company's cultural diversity variable against the average cultural diversity of its industry counterparts, employing the average cultural diversity within the firm's 2-digit SIC industry as an instrumental variable. To prevent a mechanical connection, the focal company is not included in the peer average calculation. This instrument satisfies the exclusion criteria, showing a strong correlation with the company's cultural diversity due to common industry standards and practices, yet it is unlikely to directly influence the company's financial outcomes aside from its effect on cultural diversity. From this initial regression, we derived the residuals that represent the portion of the firm's cultural diversity unexplained by its industry peers. In the second phase, we included these residuals as an extra control variable in our primary regression models to address endogeneity in *Cultural Variety*. This two-phase residual inclusion technique ensures that the estimated connection between *Cultural Variety* and *Long-Term Financial Performance* is not confounded by unobserved factors or reverse causality. Information about the first stage and second-stage regression is available in Appendix 1.

DISCUSSION AND CONCLUSION

This research investigates the intricate relationship between corporate cultural diversity and long-term financial performance and explores the moderating role of employee ownership. Building on previous research (Li et al., 2021), we examine Q&A segments from earnings conference calls of S&P 1500 companies using textual analysis. This method enables us to capture firms' articulated cultural values (i.e. innovation, integrity, respect, teamwork and quality) as they are expressed by senior management. We then utilize the Shannon-Wiener entropy index to construct a cultural diversity measure, based on these values. The findings indicate that, although corporate cultural diversity does not have a significant direct impact on long-term financial performance, its beneficial effects are significantly heightened in firms with high levels of employee ownership. This moderation effect highlights the role of employee ownership structures in harnessing the advantages of cultural diversity and reduces potential coordination problems that may emerge from taking up multiple differing values.

Contributions

Our paper offers two main contributions. First, we contribute to the literature on corporate culture and firm performance by shifting the focus from the traditional emphasis on cultural (value) strength or alignment (e.g., Kotter & Heskett, 1992; Sørensen, 2002; Guiso et al., 2015) to the importance of corporate cultural diversity. This term is defined as the coexistence of multiple distinct values (i.e., innovation, integrity, respect, teamwork, quality) within a single organization. While prior research underscores how strong, uniform cultures and values can enhance firm value (Sørensen, 2002; Chatman & Cha, 2003), we build further on this line of research by demonstrating that the breadth and diversity of values can be critical for driving long-term financial performance. This new perspective aligns with studies that highlight the beneficial and adaptive advantages of cultural diversity on the group level within organizations (Cox & Blake, 1991). Specifically, corporate cultural diversity offers two

benefits. First, it brings together a range of perspectives that enhances creativity and problem-solving (Cox & Blake, 1991). Second, having multiple coexisting values can strengthen a firm's ability to leverage and pivot more easily (among those values) and therefore adapt and thrive (Reeves & Deimler, 2011), which ultimately supports long-term financial performance.

Second, we break new ground by investigating employee ownership as a moderating mechanism in the relationship between organizational culture and firm performance. Although numerous studies affirm that organizational culture can enhance performance (Kotter & Heskett, 1992; Sørensen, 2002; Guiso et al., 2015) and that broad-based ownership promotes alignment while reducing agency conflicts (Kim & Ouimet, 2014; Bryson & Freeman, 2012), there is, however, no existing work that specifically positions employee ownership as a moderator within these frameworks, especially in the case of corporate cultural diversity. By demonstrating that increased levels of employee ownership can alleviate the coordination challenges that arise from the coexistence of diverse values, our findings reveal how firms can more effectively harness cultural diversity for sustained financial success. In doing this, we enhance the understanding of how structural mechanisms such as employee ownership and corporate cultural diversity jointly bolster long-term financial performance.

Implications for Practice

While managers seek to maximize the advantage of corporate cultural diversity, they must also pay close attention to the rise of coordination costs with the coexistence of multiple values. Diversity in cultural values can create potential coordination problems, especially when different departments or units emphasize or prioritize different values. These risks can be mitigated if managers employ mechanisms of employee ownership that will align employees' financial interests with broader organizational goals. By creating shared ownership, such mechanisms may facilitate collaboration across departments, decrease risks of conflict, and assure that employees have an incentive to make the company successful. By aligning ESOPs

with the organization's cultural value(s), corporate cultural diversity (in values) becomes an asset rather than a liability. Managers can effectively leverage the use of a multitude of cultural values, and therefore improve the firm's long-term financial performance.

Limitations and Direction for Future Research

Although the findings of this study are robust, it is important to recognize its limitations. First, the measurement of corporate cultural diversity relies exclusively on the Q&A sections of earnings conference calls, which may not fully encompass an organization's cultural dynamics. Nonetheless, future research could employ other data sources to yield a more comprehensive assessment of cultural variety. Glassdoor, a platform widely utilized in the literature to analyse multiple indicators such as organizational culture, job satisfaction, and work-life balance (e.g. Swain et al., 2020, Hertel et al., 2024; Chiong & Xie, 2024), could facilitate a more thorough measure of cultural variety. In contrast to the values predicted in earning conference calls, data from Glassdoor is collected from the employee perspective, providing a different view on this cultural variety at the organizational level.

Additionally, the value of employee ownership mechanisms is not just determined by its existence. It heavily depends on complementary factors that shape their impact. Dasilas (2024) uses complementary measures such as employee engagement, the number of employees participating in ESOPs over total employees, and employee age to better understand these dynamics. Moreover, Park and Kruse (2004) demonstrate that opportunities for employee involvement in decision-making are essential to harness the full potential of employee ownership for organizational success. Kaswan (2022) further elaborates on this by underscoring the distinction between legal and psychological ownership, re-emphasizing the essential opportunity for genuine participation beyond simply holding shares or options. Without these complementary factors, employee ownership risks becoming less effective, failing to fully leverage its benefits. Therefore, further research should include complementary

factors to employee ownership to have a more comprehensive understanding of its moderating impact in this setting.

In conclusion, our results demonstrate that corporate cultural diversity significantly influences long-term financial performance, with its impact contingent on organizational context. Specifically, firms with higher levels of employee ownership are better positioned to harness the benefits of corporate cultural diversity, translating it into stronger financial outcomes. In contrast, firms with lower employee ownership may face challenges in aligning diverse values, potentially diminishing these benefits. These findings underscore the need to consider both the diversity of cultural values and the structural conditions, such as employee ownership, that enable their effective integration. By offering this perspective, our study highlights how corporate cultural diversity can serve as a strategic asset when supported by the right organizational mechanisms.

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TABLES

TABLE 1 Summary Statistics

Variable	Mean	Median	SD	p25	p75
Long-term financial performance	1.950	1.617	1.099	1.234	2.253
Cultural variety	-0.242	-0.184	0.978	-0.896	0.460
Rank and File Stock Option Grants	0.005	0.002	0.008	0.000	0.007
Employee Ownership	0.047	-0.263	1.012	-0.718	0.410
Innovation	0.016	0.015	0.008	0.011	0.020
Integrity	0.002	0.002	0.001	0.001	0.002
Respect	0.008	0.007	0.004	0.005	0.010
Teamwork	0.004	0.003	0.002	0.002	0.005
Quality	0.014	0.014	0.006	0.010	0.018
Executive director's share	1.847	0.308	5.102	0.076	10.056
Return on assets	0.048	0.053	0.101	0.024	0.089
Firm size	8.180	8.042	1.553	7.072	9.230
Leverage	0.239	0.232	0.176	0.106	0.346
Growth	0.058	0.048	0.191	-0.023	0.124

Notes: This table provides descriptive statistics for the variables used in our baseline regression model. All continuous variables are winsorized at 1% and 99% (except for Firm size and Cultural Variety). See Appendix 2 for variable definitions.

TABLE 2 Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Long-term financial performance	1.000												
(2) Cultural Variety	-0.146*	1.000											
	(0.000)												
(3) Employee Ownership	0.066*	-0.043*	1.000										
	(0.000)	(0.000)											
(4) Executive directors' shares	0.059*	-0.049*	0.066*	1.000									
	(0.000)	(0.000)	(0.000)										
(5) Innovation	0.205*	-0.436*	0.107*	0.075*	1.000								
	(0.000)	(0.000)	(0.000)	(0.000)									
(6) Integrity	-0.027*	0.502*	0.021	0.011	0.161*	1.000							
	(0.011)	(0.000)	(0.054)	(0.327)	(0.000)								
(7) Respect	0.078*	0.231*	0.066*	0.113*	0.320*	0.367*	1.000						
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)							
(8) Teamwork	0.057*	0.264*	0.120*	-0.004	0.448*	0.263*	0.320*	1.000					
	(0.000)	(0.000)	(0.000)	(0.710)	(0.000)	(0.000)	(0.000)						
(9) Quality	0.137*	-0.372*	0.133*	0.048*	0.497*	0.082*	0.250*	0.374*	1.000				
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)					
(10) Return on assets	0.391*	-0.122*	-0.083*	0.012	0.035*	-0.066*	-0.012	-0.095*	0.038*	1.000			
	(0.000)	(0.000)	(0.000)	(0.258)	(0.001)	(0.000)	(0.280)	(0.000)	(0.000)				
(11) Firm size	0.248*	-0.064*	-0.124*	-0.156*	0.120*	-0.035*	-0.146*	0.007	-0.054*	0.327*	1.000		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.521)	(0.000)	(0.000)			
(12) Leverage	-0.126*	0.105*	-0.131*	-0.130*	-0.064*	0.063*	-0.134*	-0.052*	-0.195*	-0.178*	0.161*	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
(13) Growth	0.098*	0.013	0.025*	0.000	0.000	-0.044*	0.043*	0.087*	0.041*	0.241*	0.082*	-0.049*	1.000
	(0.000)	(0.220)	(0.021)	(0.973)	(0.965)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Notes: This table provides correlations for the variables used in our baseline regression model. See Appendix 2 for variable definitions. *** p<0.01, ** p<0.05, * p<0.1

TABLE 3 Top and Bottom 50 by Cultural Variety S&P1500 firms, 2006-2012

Lowest Cultural Variety (The 50 firms with Lowest Entropy Score)	Highest Cultural Variety (The 50 firms with Highest Entropy Score)
TIFFANY & CO	MOODY'S CORP
CHITTENDEN CORP	SAVIENT PHARMACEUTICALS INC
FINISAR CORP	BANGOR HYDRO-ELECTRIC CO
OCLARO INC	GEO GROUP INC
TELLABS INC	RPT REALTY
AXCELIS TECHNOLOGIES INC	IRWIN FINANCIAL CORP
KELLOGG CO	DPL INC
SUPERTEX INC	PREFERRED BANK LOS ANGELES
COGENT COMMUNICATIONS HLDGS	HOPE BANCORP INC
HERSHEY CO	VALLEY NATIONAL BANCORP
XEROX CORP	GENON ENERGY INC
HITTITE MICROWAVE CORP	AMERICAN CAMPUS COMMUNITIES
INTEVAC INC	PG&E CORP
STAMPS.COM INC	FIRST MIDWEST BANCORP INC
VARIAN SEMICONDUCTOR EQUIPMT	DCT INDUSTRIAL TRUST INC
ADC TELECOMMUNICATIONS INC	SUNRISE SENIOR LIVING INC
GENERAL MILLS INC	MACK-CALI REALTY CORP
HI TECH PHARMACAL CO INC	CAPSTEAD MORTGAGE CORP
VF CORP	PUBLIC SERVICE ENTRP GRP INC
HNI CORP	PMI GROUP INC
WILLIAMS-SONOMA INC	AMBAC FINANCIAL GROUP INC
WESTERN DIGITAL CORP	NAVIGATORS GROUP INC
TARGET CORP	REPUBLIC BANCORP INC
LEXMARK INTL INC -CL A	OLD REPUBLIC INTL CORP
CHARTER COMMUNICATIONS INC	CENTURY ALUMINUM CO
THQ INC	NUVEEN INVESTMENTS INC
ABERCROMBIE & FITCH -CL A	FULTON FINANCIAL CORP
TRANSWITCH CORP	VANDA PHARMACEUTICALS INC
SBS TECHNOLOGIES INC	EPR PROPERTIES
FOSSIL GROUP INC	FINANCIAL ENGINES INC
LOWE'S COS INC	CHUBB LTD
ADTRAN INC	HOLLYFRONTIER CORP
MILACRON INC	LORILLARD INC
ENTERCOM COMMUNICATIONS CORP	PROTECTIVE LIFE CORP
ELECTRONICS BOUTIQUE HLDG CP	INTEGRAL SYSTEMS INC
BLACK & DECKER CORP	AVALONBAY COMMUNITIES INC
FORMFACTOR INC	NATIONAL CITY CORP
HAVERTY FURNITURE	NIC INC
WHIRLPOOL CORP	AMERICAN CAMPUS COMMUNITIES
KRAFT HEINZ CO	EXELON CORP
EXAR CORP	EVERGY INC
GYMBOREE CORP	INCYTE CORP
BUCKLE INC	DISCOVER FINANCIAL SVCS
MEADWESTVACO CORP	GENESEE & WYOMING INC -CL A
SOUTH JERSEY INDUSTRIES INC	RPT REALTY

DISNEY (WALT) CO	HANMI FINANCIAL CORP
ELECTRONIC ARTS INC	FULTON FINANCIAL CORP
DECKERS OUTDOOR CORP	UNITED STATES STEEL CORP
DOLLAR TREE INC	FINANCIAL FEDERAL CORP
FAMILY DOLLAR STORES	ENTERGY CORP

TABLE 4 Top and Bottom 50 by Cultural Variety S&P1500 firms, 2013-2019

Lowest Cultural Variety (The 50 firms with Lowest Entropy Score)	High Cultural Variety (The 50 firms with Highest Entropy Score)
SUPERTEX INC	PG&E CORP
PETMED EXPRESS INC	PROVIDENT FINANCIAL SVCS INC
KELLOGG CO	DAVITA INC
FINISAR CORP	MOODY'S CORP
MERCURY GENERAL CORP	M & T BANK CORP
AXCELIS TECHNOLOGIES INC	GENWORTH FINANCIAL INC
FOSSIL GROUP INC	SCICLONE PHARMACEUTICALS INC
LAUDER (ESTEE) COS INC -CL A	ARMOUR RESIDENTIAL REIT INC
AXCELIS TECHNOLOGIES INC	NEW YORK MORTGAGE TRUST INC
CAMBREX CORP	EDISON INTERNATIONAL
APPLIED OPTOELECTRONICS INC	CENTURY ALUMINUM CO
SUPERTEX INC	CATHAY GENERAL BANCORP
GENERAL MILLS INC	CENTENE CORP
KIRBY CORP	METLIFE INC
COGENT COMMUNICATIONS HLDGS	LHC GROUP INC
MOVADO GROUP INC	SELECT MEDICAL HOLDINGS CORP
VF CORP	GILEAD SCIENCES INC
COGENT COMMUNICATIONS HLDGS	EATON VANCE CORP
APPLIED OPTOELECTRONICS INC	REPUBLIC AIRWAYS HLDGS INC
GENERAL MILLS INC	AMERICAN EQTY INVT LIFE HLDG
MOVADO GROUP INC	PREFERRED BANK LOS ANGELES
VERIZON COMMUNICATIONS INC	M & T BANK CORP
GENERAL MILLS INC	INVESCO MORTGAGE CAPITAL INC
LUMENTUM HOLDINGS INC	NUVEEN INVESTMENTS INC
CAMBREX CORP	AMERICAN CAPITAL LTD
APPLIED OPTOELECTRONICS INC	ENTERGY CORP
MEADWESTVACO CORP	CHEMICAL FINANCIAL CORP
DIXIE GROUP INC	PROTECTIVE LIFE CORP
KELLOGG CO	PROVIDENT FINANCIAL SVCS INC
LUMENTUM HOLDINGS INC	OPUS BANK
GENERAL MILLS INC	AMERIGROUP CORP
RUBICON TECHNOLOGY INC	FINANCIAL ENGINES INC
FINISAR CORP	AVISTA CORP
EDGEWELL PERSONAL CARE INC	OFFICE PROPERTIES INCOME TR
ADVANCED MICRO DEVICES	SLM CORP
STAMPS.COM	GENWORTH FINANCIAL INC
LUMENTUM HOLDINGS INC	ROYAL GOLD INC
ENTERPRISE COMMUNICATIONS CORP	UNIVERSAL INSURANCE HLDGS
EDGEWELL SOLUTIONS GROUP	PROSPERITY BANCSHARES INC
RUBICON TECHNOLOGY INC	CATHAY GENERAL BANCORP
EDGE TECHNOLOGY GROUP INC	WORLD ACCEPTANCE CORP/DE
CENTURYLINK INC	GENESEE & WYOMING INC -CL A
DARDEN RESTAURANTS INC	RESOLUTE FOREST PRODUCTS INC
LUMENTUM HOLDINGS INC	CENTRAL PACIFIC FINANCIAL CP
WHIRLPOOL CORP	CHEMED CORP
HNI CORP	HOMESTREET INC

HASBRO INC	PENN NATIONAL GAMING INC
TIFFANY & CO	ENCOMPASS HEALTH CORP
DISNEY (WALT) CO	SELECT MEDICAL HOLDINGS CORP
PROCTER & GAMBLE CO	RESOLUTE FOREST PRODUCTS INC

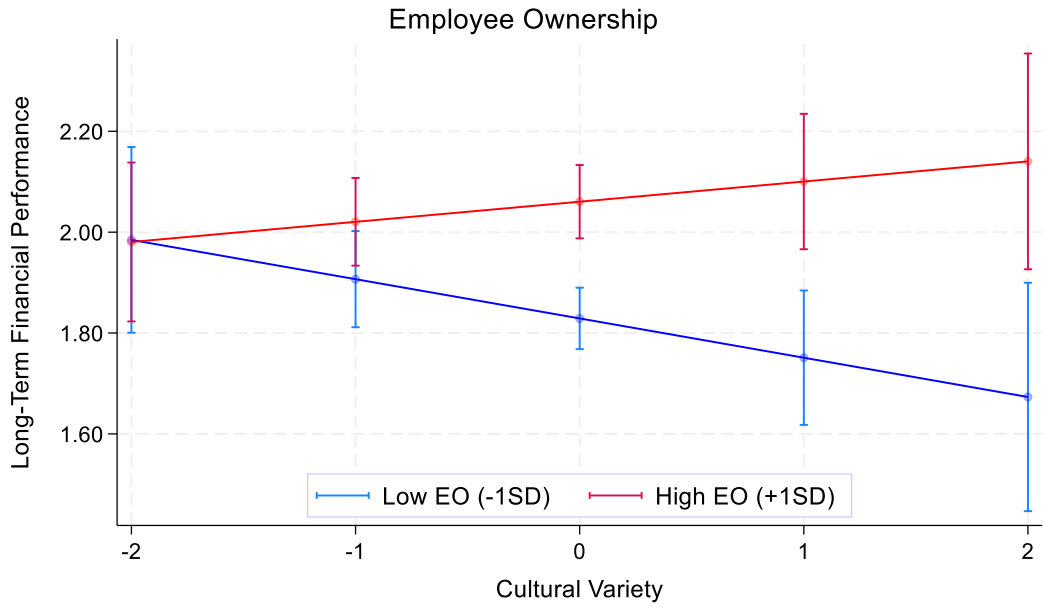
TABLE 5 OLS regression of Cultural variety on Long-term financial performance

	Model 1	Model 2	Model 3
DV	LT Financial performance	LT Financial performance	LT Financial performance
Cultural Variety	-.022	-.022	-.020
	(.050)	(.050)	(.049)
Employee Ownership		.094***	.107***
		(.028)	(.029)
Cultural Variety X Employee Ownership			.054**
			(.026)
Innovation	7.583	6.789	7.683
	(6.183)	(6.179)	(6.087)
Integrity	7.203	7.054	5.380
	(35.738)	(35.483)	(35.023)
Respect	9.163	8.985	7.910
	(8.054)	(7.967)	(8.01)
Teamwork	-11.460	-14.160	-16.503
	(18.042)	(17.826)	(17.342)
Quality	2.646	1.657	2.152
	(5.941)	(5.876)	(5.774)
Executive directors' shares		.009	.009
		(.007)	(.007)
Return on assets	3.342***	3.426***	3.444***
	(.477)	(.470)	(.462)
Firm size	.113***	.118***	.116***
	(.019)	(.019)	(.019)
Leverage	-.330*	-.268	-.279
	(.176)	(.173)	(.173)
Growth	.085	.071	.067
	(.089)	(.086)	(.084)
_cons	.732***	.692***	.711***
	(.159)	(.158)	(.157)
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	8647	8647	8647
R-squared	.320	.328	.330

Notes: Standard errors are provided in parentheses. *** p<0.01, ** p<0.05, * p<0.1 This table presents the results from an OLS regression. Model 1 shows the effect of our control variables on Long-term financial performance. Models 2 and 3 show the effect of rank-and-file employee ownership and the moderating effect of it on cultural variety.

FIGURES

FIGURE 1: The Moderating Effect of Employee Ownership on the Relationship Between Long-Term Financial Performance and Cultural Variety



Note: The graphs visualize the marginal effects of the moderating role of Employee Ownership (EO) on the relationship between Cultural Variety and Long-Term Financial Performance. The graphs compare the predicted Long-Term Financial Performance for firms with low EO (-1 SD, blue line) and high EO (+1 SD, red line) across different levels of Cultural Variety. The lines reflect the predicted performance, while the error bars indicate 90% two-tailed confidence intervals.

APPENDIX

APPENDIX 1: 2 Stage Residual Inclusion for Endogeneity Test (2SRI)

	(1) First stage Cultural Variety	(2) Second stage LT Financial Performance
Average peer cultural variety	-.250***	
	(.050)	
Executive director's shares	.001	.008
	(.002)	(.006)
Innovation	-77.178***	3.021
	(2.608)	(25.764)
Integrity	447.345***	31.746
	(12.988)	(148.807)
Respect	52.252***	11.128
	(5.205)	(18.453)
Teamwork	238.715***	-2.555
	(7.961)	(79.548)
Quality	-52.629***	-1.052
	(2.805)	(18.411)
Return on assets	-.120	3.438***
	(.108)	(.465)
Firm size	.022***	.117***
	(.008)	(.020)
Leverage	.144**	-.273
	(.060)	(.176)
Growth	-.019	.066
	(.031)	(.084)
Cultural Variety		-.079
		(.326)
Employee Ownership		.107***
		(.029)
Cultural Variety X		.054**
Employee Ownership		(.026)
Residuals		.059
		(.321)
_cons	-.580***	.683***
	(.079)	(.225)
Observations	8647	8647
R-squared	.808	.330

Notes: Standard errors are provided in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Model 1 shows the first-stage regression of 2SRI, industry-average cultural variety is used as instrumental variable for cultural variety. The second stage includes the residuals from the first stage as an additional regressor.

APPENDIX 2: Variable Definitions

Variable	Description/Calculation	Source
Dependent variable		
Long-term financial performance (t+1, t+2)	Long-term firm performance - the average Tobin's Q for the next two years (t+1 to t+2), where Tobin's Q is measured as the sum of market value of equity and debt scaled by the book value of total assets ((prcc_f*csho + dltt + dlc) / at)	Compustat
Independent variables		
Cultural Variety	Shannon entropy measure, calculated as $-\sum_{i=1}^{R} p_i \ln(p_i)$, where p_i represents the proportion of the i-th cultural value (e.g. innovation) in the firm's communication, z-scored	Conference calls
Rank and File Stock Option Grants	The firm's total number of option grants reported in Compustat (OPTGR) in year t, less grants to managers. Managers' grants include grants to the top five executives as reported in ExecuComp plus grants to managers outside of the C-Suite, which we calculate as one-tenth of the number of grants awarded to the second, third, fourth, and fifth highest paid executives in ExecuComp in year t. We scale grants by CSHO.	Compustat/ Execucomp
Employee Ownership	The total number of rank-and-file options (grants plus outstanding) calculated following Call et al. (2016): 1.00 × Rank and File Stock Option Grants + 0.75 × Rank and File Stock Option Grants_{t-1} + 0.50 × Rank and File Stock Option Grants_{t-2} + 0.25 × Rank and File Stock Option Grants_{t-3}.	Execucomp
Innovation Integrity Respect Teamwork Quality	Proportion of value-related words relative to the total word count, captured from earnings conference calls and calculated over a rolling 2-year period using dictionaries developed by Li et al. (2021). This measure reflects the prevalence and therefore the strength of the cultural value within the firm's communication.	Conference calls
Firm characteristics		
Firm size	Natural log of total assets	Compustat
Return on assets	Return on assets for the most recent year, winsorized at the 1% level.	Compustat
Leverage	Ratio of total debt (long-term + current) to total assets, winsorized at the 1% level	Compustat
Growth	Year-over-year revenue growth, winsorized at the 1% level	Compustat

The Role of Contractual Ambiguity and Joint Steering Committees for Managing non-equity R&D Alliances

Abstract:

This study aims to provide insights into the governance of R&D non-equity alliances by investigating the joint role of contractual ambiguity and joint steering committees (JSCs) as key governance mechanisms. Contractual ambiguity, arising when contractual language is open to multiple reasonable interpretations, presents unique challenges and opportunities for management control. A paradox arises because on the one hand, ambiguity allows for flexibility when drafting the contract, but on the other hand, this vagueness entails issues for accountability and enforcement. Building on Transaction Cost Theory, we hypothesize a positive association between the presence of a JSC and ambiguity, as JSCs function as interpretive bodies that help resolve the challenges of ambiguity. Thus, both control mechanisms can complement each other. Additionally, we hypothesize a moderating effect of the breadth of the alliance on this relationship: in comparison to a pure R&D alliance, an alliance that expands beyond R&D into commercialization, supply and distribution requires a shift towards enforcement at the cost of adaptability. We retrieved 269 R&D contracts from the SEC's Edgar electronic filing system and found support for our first hypothesis but not for the interaction effect. This study is novel and relevant because it provides new insights into the governance of non-equity R&D alliances and the use of JSC in this context, which have been under-researched despite their increasing importance in practice. Moreover, ambiguity is less understood as a linguistic feature of contracts, despite its significance in legal scholarship and strategic importance.

Keywords: Ambiguity, Non-equity alliances, Joint Steering Committee, Breadth of the alliance, R&D alliances

1. Introduction

In an era marked by rapid technological evolution and increasingly collaborative innovation strategies, non-equity Research and Development (R&D) alliances have emerged as important vehicles for corporate growth and competitiveness (Martínez-Noya & Narula, 2018). These alliances, characterized by their lack of equity stakes[1], rely heavily on well-structured contracts[2] to manage complex relationships and safeguard shared interests. Central to these contracts is the language used to define the terms of collaboration. This study examines the contractual linguistics of non-equity R&D alliances, focusing on the extent to which these contracts are imbued with ambiguity and how this ambiguity is influenced by the presence of Joint Steering Committees (JSCs) and the breadth of the alliance.

Contractual ambiguity in strategic alliances refers to the presence of terms or clauses in a contract that are not explicitly defined or are open to multiple interpretations (Zhao et al., 2022; Zheng et al., 2020). This ambiguity arises when the language is vague, general, or inherently uncertain. Unlike contract completeness or specificity, which addresses the presence and clarity of stipulations covering various contingencies, ambiguity involves a deliberate or unintentional lack of specificity that can lead to differing interpretations by the contracting parties. Ambiguity can be advantageous in certain strategic alliances, particularly those operating in environments characterized by high uncertainty and the need for flexibility. Parties may intentionally leave terms vague to adapt to uncertain or changing conditions (Zheng et al., 2020) in dynamic sectors such as technology or R&D. Ambiguity encourages partners to engage in dialogue and collaborative problem-solving, strengthening trust and fostering a cooperative atmosphere. Furthermore, drafting detailed contracts that cover every potential scenario in complex alliances requires significant time and resources (Reuer & Ariño, 2002). Ambiguity can reduce these upfront costs and the burden of anticipating every possible issue, allowing alliances to commence more swiftly. Sometimes, ambiguity may even serve as a compromise when parties cannot agree on specific terms during negotiations, leaving room for future resolution as more information becomes available or circumstances evolve (Zhao et al., 2022).

[1]Companies are increasingly opting to structure their R&D alliances through contractual or non-equity arrangements (Devarakonda & Reuer, 2018; Frankort & Hagedoorn, 2019). More precisely, we know from practice that more than 50% of the alliances choose to operate on a non-equity basis (Bamford et al., 2016; Tseng & Lien, 2024).

[2]In contrast, equity alliances tend to be better regulated due to stronger governance mechanisms, long-term commitment, and shared ownership. They can count on additional governance mechanisms—such as boards—that help support and guide the partnership (Choi & Contractor, 2019; Sampson, 2003).

Despite its advantages, contractual ambiguity also carries risks, including increased potential for disputes over interpretations, the possibility of opportunistic behavior, and challenges in enforcement (Duhl, 2009; Zheng et al., 2020). In this paper, we argue that contractual ambiguity can be successfully managed with a robust relational governance mechanism that emphasizes trust, communication, and mutual understanding alongside the formal contractual agreements. We investigate whether non-equity alliances install relational mechanisms like JSCs to manage the risks associated with ambiguity, ensuring flexibility while maintaining control. We, therefore, hypothesize that contractual ambiguity is positively associated with the presence of a JSC in non-equity R&D alliances.

Furthermore, we contend that this positive association is moderated by the breadth of alliance activities, as alliances that involve a wide range of interdependent activities—such as R&D, commercialization, manufacturing, supply chain integration, and distribution—require different governance approaches (Jiang & Li, 2009; Tseng & Lien, 2024). We argue that ambiguity is primarily an asset in alliances focusing on R&D and exploratory activities, as it provides flexibility for adaptation and discovery under uncertain circumstances. By installing JSCs, these R&D alliances are able to cope with the potential disadvantages of contractual ambiguity in a relational way. When alliances extend beyond R&D to incorporate activities such as commercialization, manufacturing, and distribution, the partners have less need for pure exploration, know much better what they are heading to, and so they experience less uncertainty than the pure R&D alliances. As this implies that the contracting parties know better what is expected from them. This context reduces the need for the relational mechanism, the JSC, to handle the downsides of the contractual ambiguity. In other words, its role in this context is expected to be less prominent. We, therefore, hypothesize that the breadth of alliance activities moderates the relationship between JSC presence and the level of contract ambiguity: as alliance activities expand beyond R&D into commercialization, supply, and distribution, the positive association between contractual ambiguity and JSC presence in non-equity alliances weakens.

To execute the study, we retrieved 269 R&D contracts using the SEC's Edgar electronic filing system. As hypothesized, we find that the presence of a JSC in non-equity alliances is positively associated with greater levels of contract ambiguity. Although our data indicate that alliance breadth and JSC are both positively associated with contractual ambiguity, we do not find a mitigating interaction of the breadth of the alliance on the relationship between JSC and ambiguity.

This study aims to contribute to a greater awareness of the concept of contractual ambiguity. Although contractual linguistic characteristics like complexity, detail, and completeness have been extensively researched, contract ambiguity has not received the same attention. However, studying ambiguity is valuable as it is more than a linguistic artifact—it is a governance tool that affects decision-making, accountability, and compliance mechanisms. Besides, the literature has underexplored the importance of such mechanisms in the context of non-equity alliances (Devarakonda & Reuer, 2018). We move beyond the implications of the equity–non-equity dichotomy and instead focus on the presence versus absence of steering committees in non-equity alliances and their role in addressing the ongoing challenges of contract design. This study contributes to understanding different governance mechanisms by examining contractual and relational control. Contractual ambiguity serves as a contractual control, allowing firms to embed flexibility into agreements while relying on governance structures like JSCs. JSCs, in contrast, function as relational control mechanisms, facilitating cooperation, dispute resolution, and strategic alignment (Devarakonda & Reuer, 2018). The interplay between these mechanisms is critical: while ambiguity in contracts provides adaptability, the presence of JSCs ensures that relational governance can guide interpretation and implementation. It also examines the moderating effect of the breadth of alliance activities on the relationship between JSCs and ambiguity, whereby more activities can weaken the relationship due to a shift from adaptability to enforcement. By integrating insights from contract theory, management control, and linguistics, this research contributes to both academic literature and managerial practice. Understanding ambiguity is not just a theoretical exercise—it is essential for firms seeking to navigate the complex realities of strategic alliances while maintaining control and accountability.

The structure of the paper is organized as follows: Section 2 outlines the theoretical framework and development of the hypotheses. Section 3 presents the results of our analyses. In the last section, we discuss the findings in detail, situate them within the context of existing literature, and highlight the study's limitations along with recommendations for future research.

2. Hypotheses Development

2.1. Contract Ambiguity

Contracts are key tools in managing alliances, serving as governance mechanisms to regulate interactions between firms. Research shows that contracts help mitigate risks by specifying rights and obligations, anticipating conflicts, and reducing the potential for opportunistic behavior (Arranz & de Arroyabe, 2012). However, while the stability these contractual specifications provide is valuable, some argue that they can also introduce rigidity, limiting the flexibility needed for long-term alliance success (Fortes et al., 2023; Keller et al., 2020; Schilke & Lumineau, 2018). In other words, contracts are essential for structuring interorganizational collaborations, yet they are inherently imperfect.

The literature on contracts in alliances is extensive, providing key insights into how contracts function as governance mechanisms (e.g., Ariño & Reuer, 2004; Arranz & de Arroyabe, 2012; De Jong et al., 2011; Schilke & Lumineau, 2018). They have been investigating various aspects of contract design, including contract complexity and detail. One dominant theoretical perspective has shaped this body of work: Transaction Cost Theory (TCT). TCT focuses on minimizing transaction costs by addressing risks such as opportunistic behavior (Williamson, 1985). The theoretical framework has devoted much attention to linguistic contract characteristics, such as detail, completeness, and complexity (Zheng et al., 2020). These attributes are considered essential for managing risks and ensuring effective collaboration. However, contract ambiguity has received comparatively less attention, which is surprising given its central role in contract law (Furlotti, 2007; Zheng et al., 2020).

Contract ambiguity, referring to the use of ambiguous terms, occurs when the contractual language can be interpreted in more than one way (Zhao et al., 2022). The concept is well embedded in studies of legal language, and typical examples of ambiguous terms are ’reasonable time’, ‘good faith effort’, and ‘according to the specific situation’ (Anesa, 2007; Zhao et al., 2022; Zheng et al., 2020). Firms often use ambiguous terms strategically (Bernheim & Whinston, 1998) to achieve particular objectives, including maintaining discretion, avoiding litigation, and enhancing flexibility in negotiations (Choi & Triantis, 2012; Malhotra & Lumineau, 2011). It may even be a deliberate strategy by one party to obscure the meaning of certain clauses to their advantage. Ambiguity is often conflated with other contractual features like incompleteness, specificity, and vagueness, but it is clearly distinct. Completeness refers to

whether all contingencies are covered in a contract (Kashyap et al., 2012; Zheng et al., 2020). An incomplete contract lacks provisions for certain scenarios, while an ambiguous contract contains provisions that can be read in different ways. Similarly, ambiguity is unlike contract detail as contract detail focuses on the content of the agreement and the information exchanged during the negotiation phase (Anesa, 2007; Zhao et al., 2022). Specificity determines how precisely terms are defined. A specific contract provision may still be ambiguous if it allows multiple reasonable interpretations. Vagueness implies a lack of precision, often due to broad language. Ambiguity, however, is more subtle—it results from the use of words that carry multiple meanings, sometimes deliberately. The main distinguishing feature of contractual ambiguity is consequently its strategic nature for governing inter-organizational relationships (Choi & Triantis, 2010), which is less prominent in contract completeness and detail (Zheng et al., 2020). In a study on franchising contracts, Zheng et al. (2020) discovered that ambiguity of franchisor obligations has a uniquely distinct empirical impact on franchisee performance and cooperation, compared to the effects of specificity and completeness, as the parties involved can intentionally leave terms vague to adapt to uncertain or changing conditions. Ambiguity can even create an atmosphere of trust and cooperation, because it stimulates the parties involved to engage in dialogue and collaborative problem-solving. Furthermore, drafting detailed contracts that cover every potential scenario in complex alliances requires significant time and resources (Reuer & Ariño, 2002).

The extant literature on contract ambiguity in inter-organizational settings is limited to researching the positive and negative implications of contract ambiguity, whereby the overall effect is not straightforward. On the one hand, Triantis (2002) finds that firms use ambiguity to reduce the likelihood of litigation in the context of corporate acquisitions, and Choi and Triantis (2010) argue that ambiguous terms can encourage investment in uncertain future scenarios. On the other hand, Zhao et al. (2022) suggest that ambiguity can lead to opportunism and potential misalignment between the partners. To summarize,

Ambiguity can reduce these upfront costs and the burden of anticipating every possible issue, allowing alliances to commence more swiftly. Sometimes, ambiguity may even serve as a compromise when parties cannot agree on specific terms during negotiations, leaving room for future resolution as more information becomes available or circumstances evolve (Zhao et al., 2022).

Ambiguity should be encouraged in certain circumstances during the drafting process, while in others, it should be actively avoided (Duhl, 2009). Unlike previous research, which has primarily explored contexts outside of R&D alliances, we investigate R&D alliances as they are typically characterized by high levels of uncertainty, especially when starting up such alliances. The context of high uncertainty implies unique needs for contract design and governance mechanisms (Choi & Contractor, 2019). In such uncertain contexts, the degree of ambiguity in the contract can be of strategic importance as it is particularly relevant in governance settings where flexibility and adaptation are required (Bernheim & Whinston, 1998). Ambiguity is distinct in its ability to simultaneously provide flexibility and uncertainty—a duality that is critical in alliance management. While clarity is often seen as an ideal in contract design, ambiguity remains a persistent and deliberate feature in many agreements. Our study aims to contribute to understanding why firms tolerate, or even intentionally embed, ambiguity in their contracts, particularly in strategic alliances. There is a lack of research exploring the conditions that influence the extent of ambiguity in R&D contracts. Therefore, we research how two conditions, i.e., the presence of JSC and the breadth of alliance activities, shape the degree of contractual ambiguity.

2.2. Ambiguity in Alliance Contracts & Joint Steering Committees

Existing research on non-equity alliances primarily focuses on contractual safeguards as the primary control mechanism, but contracts often fall short of ensuring effective coordination and adaptation. Non-equity alliances are often chosen for their flexibility (Tseng & Lien, 2024) and typically involve lower commitment levels than equity alliances, making them suitable for short-term arrangements. This form is often adopted in fast-moving industries like the biopharmaceutical industry (Tseng & Lien, 2024), as it is efficient for governing explicit collaborations that can be negotiated quickly. However, non-equity alliances often struggle with managing uncertainty, particularly when it comes to transferring and integrating intangible or tacit knowledge, due to the lack of hierarchical control and the weaker alignment of partner incentives (Bierly & Coombs, 2004; Gulati, 1995; Majocchi et al., 2013). In order to strengthen the alignment between the partners, additional governance mechanisms can be introduced. Recent literature has begun to explore these alternative control mechanisms, borrowing from practices commonly seen in equity alliances (Reuer & Devarakonda, 2016).

One such mechanism is the use of contractually stipulated committees (Robinson & Stuart, 2007), also called Joint Steering Committees (JSC), that are designed to manage alliances and more specifically to enhance inter-partner collaboration and strengthen control measures within the alliance. In other words, JSCs play a critical role in improving both the control and coordination of the partnership and thereby function as a relational governance tool (Devarakonda & Reuer, 2018). These committees are vested with decision-making authority over alliance operations and are tasked with monitoring the progress and performance of the collaboration. In other words, partners can delegate responsibilities to the JSC. Additionally, they serve as a platform for resolving conflicts between partners (Devarakonda & Reuer, 2018). An interesting observation in recent studies is that JSCs are increasingly installed in non-equity alliances, especially if the risks of the alliance are high. This means that installing JSCs is particularly valuable in complex R&D alliances, where contractual agreements alone may not adequately address the intricacies of the partnership (Choi & Contractor, 2019). Although this control mechanism is important, it is often overlooked in the literature on the governance of non-equity alliances (Devarakonda & Reuer, 2018). With some exceptions, the relationship between contracts and alternative governance mechanisms in non-equity alliances is poorly understood, particularly regarding how they integrate and whether they act as substitutes or complements.

TCT emphasizes the extensive use of contracts for governing and managing complex R&D alliances. It explains that the drafting, monitoring, and enforcement of contracts all entail costs, which increase with greater levels of uncertainty and complexity (Williamson, 1979). In the context of R&D alliances, the initial contractual ambiguity—while allowing for flexibility—also leads to increased transaction costs when conflicts arise, as ambiguity inherently also implies risks in terms of disputes over interpretations, opportunistic behavior, and challenges in enforcement (Duhl, 2009; Zheng et al., 2020). Installing a JSC can mitigate these costs as it can serve as an additional governance mechanism. For example, Duplat, Klijn, Reuer, and Dekker (2020) propose that the joint venture board can serve as a mechanism to address inefficiencies that arise in the contract. This suggests that installing a relational governance mechanism, such as a committee or board, allows the alliance partners to embed greater flexibility in managing uncertain areas (Devarakonda & Reuer, 2018), like by incorporating ambiguous provisions within the contract. More concretely, ambiguity is particularly salient in alliances governed by JSCs because the risks that ambiguity inherently entails, can be tackled by these committees operating in interpretive roles, tasked with resolving unclear provisions

and ensuring alignment between partners. JSCs are established to guide and oversee alliance activities, yet their existence and role may influence how ambiguity manifests in contracts. Ambiguity is not necessarily a flaw but a response to governance needs. When JSCs are present, ambiguity may be deliberately designed into contracts to provide flexibility, enabling JSCs to interpret and adjust terms as circumstances evolve. Alternatively, ambiguity may emerge as a byproduct, reflecting differences in partner expectations and interpretations.

From a management control perspective, contractual ambiguity presents a paradox. On the one hand, it provides firms with adaptability, allowing managers to respond to unforeseen circumstances without breaching contractual obligations. On the other hand, it creates challenges for accountability, measurement, and enforcement—core concerns in management accounting and control systems (Duhl, 2009). Accounting systems rely on clarity and verifiability. Yet, when contracts contain ambiguous provisions, firms still have to ensure compliance, assess performance, and allocate costs appropriately. Ambiguity may influence how alliance partners budget for joint activities, account for shared risks, and even report financial obligations. If JSCs function as interpretive bodies that resolve contractual ambiguities, they may serve a quasi-accounting role—aligning incentives and reducing opportunism.

To summarize, we consider ambiguity as a conscious contractual design choice, as it allows for the flexibility and adaptability that are crucial in the uncertain context of R&D non-equity alliances. By installing a JSC, the cooperating partners complement contractual design choices with a relational governance mechanism that ensures handling of the potentially detrimental challenges arising from ambiguity, such as opportunism in the initial contract. In other words, the JSC can absorb and manage ambiguity while still allowing ambiguity to play its strategic role. In other words, we propose that partners have greater flexibility to incorporate ambiguity during the contract drafting process when they decide to install a JSC as a complementary governance mechanism. In contrast, non-equity alliances without a JSC may be more susceptible to the negative effects of ambiguity because the written contract is their main governance mechanism. As a result, the way contract ambiguity is present in the initial contract may vary depending on the presence of a JSC. Thus, we propose the following hypothesis:

H1: The presence of Joint Steering Committees is positively associated with contractual ambiguity in non-equity (R&D) alliances.

2.3. Moderating Effect of the Alliance Breadth

While we propose in Hypothesis 1 that the presence of a JSC complements contract ambiguity in R&D alliances, we anticipate that this effect varies depending on the breadth of the non-equity alliance. More specifically, we consider the breadth of alliance activities as a moderator for the relationship between JSC presence and contractual ambiguity. Alliances that involve a wide range of interdependent activities—such as R&D, commercialization, manufacturing, supply chain integration, and distribution—require different governance tools (Jiang & Li, 2009; Tseng & Lien, 2024). An example of a shift in governance need is that alliances with more activities entail higher risks of misappropriation and unintended knowledge spillover (Lioukas & Reuer, 2020). As a consequence, the focus may lay more on clear rules in terms of knowledge sharing to avoid opportunistic behavior. More activities in alliances are often associated with higher demands for governance and administrative structures. For instance, Oxley and Sampson (2004) suggested that an alliance with more activities increases the likelihood of selecting a protective governance form, such as a joint venture, due to the greater need for asset protection in R&D alliances. The task of defining rights and obligations is also more challenging for an alliance with more activities (Ryu et al., 2018).

For alliances that focus primarily on R&D and exploratory activities, we argue that ambiguity is primarily an asset that provides flexibility for adaptation and discovery under uncertain circumstances. By installing JSCs, these R&D alliances are able to cope with the potential disadvantages of contractual ambiguity in a relational way: JSCs in these settings may allow ambiguity by fostering a governance environment that prioritizes agility over contractual rigidity. They provide a structured forum for managing ambiguous provisions, allowing for flexible interpretations that accommodate technological evolution and market shifts. Here, ambiguity is not necessarily a drawback but a strategic feature that enables learning and iterative development (Zheng et al., 2020), whereby JSCs help to oversee the contractual ambiguity.

In contrast, when alliances extend beyond R&D to incorporate activities such as commercialization, manufacturing, supply chain integration, and distribution, the cooperating partners have less need for pure exploration, know much better what they are heading to, and so they experience less uncertainty than the pure R&D alliances. The operational execution requires clear rules, accountability measures, and performance tracking. Alliances with more activities are characterized by a more tangible focus on control and rules compared to purely R&D-focused alliances. In other words, ambiguity is still present in the contract, but since both

partners now have a clearer sense of direction, there will be less focus on managing ambiguity. Instead, the role of the JSC will primarily be to oversee enforcement. The need for structured control mechanisms grows, and the need for flexibility decreases. In these cases, firms may rely more on contractual specificity rather than relational mechanisms, reinforcing the idea that broad activity structures necessitate greater contractual control. This context makes the need for JSCs to managing ambiguity less prominent. To conclude, the nature of the alliance (the breadth) will likely change the interplay between JSC and contractual ambiguity. Thus, we suggest the following hypothesis:

H2: The breadth of alliance activities negatively moderates the relationship between Joint Steering Committees and contractual ambiguity, such that as alliance activities expand beyond R&D into commercialization, supply, and distribution, the positive association between the presence of JSCs and ambiguity in non-equity alliances weakens.

3. Empirical analysis

3.1. Data and Sample Description

We use publicly available information retrieved from several (US) databases. The contracts were accessed through the SEC's Edgar electronic filing system. They were incorporated in this system because of Regulation S-K, mandating publicly traded companies to disclose complete contracts as exhibits to Security and Exchange Commission (SEC) filings when such contracts reach certain materiality (Moszoro et al., 2016). American businesses were required to disclose this information starting from the year 1993 (Osheroff et al., 2006). Because only US companies and only publicly filing corporations must disclose contracts if these meet materiality standards, it is important to recognize potential sampling biases (Moszoro et al., 2016). Privately held firms are also required to report materially relevant transactions that occurred while private when they register to publicly list their stock. The contracts are attached as exhibits to Forms *10-K, 10-Q,* or *8-K* (Nikolaev, 2018) that can be extracted via the SEC's Edgar electronic filing system (Nini et al., 2008).

We searched via a scraping script (SEC API subscription) through forms 10-K, 10-Q, and 8-K for all possible R&D contracts with the relevant keywords: 'R&D agreement', 'Research agreement', 'Development agreement', and 'Collaboration agreement' following Ge, Ji, and Henock (2021). Due to limited reporting requirements in the early days of the SEC EDGAR

database and to recent changes in the SEC EDGAR information-sharing rules, we limited our final sample to alliances for the period 2014–2019[3]. The first step in our screening procedure was eliminating contracts that did not involve an active R&D component. Furthermore, we eliminated all the joint venture contracts in our dataset so we remained with the non-equity contracts. We retrieved 269 contracts and translated all files to a machine-readable ASCII text format.

3.2. Measures

3.2.1. Dependent variable: Contract Ambiguity

Ambiguity and vagueness are inherently subjective concepts, making it challenging to establish a precise, absolute measure. To measure ambiguity, we adopted the approach of Zheng et al. (2020), who conducted a thorough review of legal studies to identify terms commonly associated with ambiguity in contracts. We utilized the same list of ten key terms they identified (see Appendix, List 1, Zheng et al. 2020, p. 165). With the help of this dictionary, we measure the level of ambiguity in the contracts.

3.2.2. Independent variable: Joint Steering Committee

We classify non-equity R&D alliance governance structures into alliances with a JSC and alliances without. This classification is based on a dichotomous variable labeled "JSC". The variable is assigned a value of one if the alliance has a JSC, mentioned in the contract, and zero if this is not the case. To determine the appropriate category, we first examine the contract title provided by the partners.

3.2.3. Moderating variable: Breadth of the alliance

We consider whether the contract is exclusively focused on research and development (solely research or/and solely development) or whether it also includes additional activities such as licensing, commercialization, supply, and similar elements. This is represented using a dummy variable, where 1 indicates an alliance with activities besides R&D and 0 indicates contracts solely focused on R&D. This information is extracted from the contract title.

[3] Our dataset extends only until 2019 due to changes in SEC Edgar's information-sharing rules. More specifically, in 2019, the SEC amended Regulation S-K under the FAST Act, simplifying rules for redacting confidential information in filings. Companies can now exclude non-material and competitively sensitive information from most exhibits without submitting a confidential treatment request (CTR). They may also omit schedules and exhibits attached to those filings (Anthony, 2020).

3.2.4. Control variables

We account for several attributes of the alliance and its partners that can influence the relationship between the governance mechanism, the JSC, and associated contract design: industry, geographic scope, involvement of non-profit partners, year, and number of partners. We also incorporate other linguistic contractual aspects.

First, the design of the contract is likely influenced by the industry. To capture this, we use the first two digits of the Standard Industrial Classification Code (SIC) to identify the industry in which the alliance operates. These industries are then grouped into broader categories (SICCODE.com, 2008). To ensure sufficient observations within each category, we combine some categories[4] with similar activities, ultimately consolidating them into seven categories. Additionally, we control for the geographic scope of the alliance, distinguishing between domestic alliances (partners headquartered in the same country) and international alliances (partners from different countries). This is represented by a dummy variable, set to one for domestic partnerships and zero otherwise. We also consider the involvement of nonprofit partners, such as universities, in the alliance as the contracts developed in these cases are likely to adhere to very specific templates dictated by state and federal mandates (e.g., Lerner & Merges, 1998; Pattit & Deeds, 2021). To account for this, we include a dummy variable where one indicates the presence of a nonprofit partner and zero indicates otherwise. The variable year is also incorporated to control for temporal variations and changes in alliance patterns over time. Moreover, while most alliances consist of two partners, some involve multiple partners. Alliances with more than two partners tend to be more complex and challenging to monitor, introducing additional uncertainty. To address this, we include the number of partners as a control variable. Due to the skewed nature of the variable, with most alliances involving two partners, we transform it into a dummy variable. The reference category represents alliances with two partners, the second category includes alliances with 3 to 4 partners, and the final category covers alliances with 5 to 6 partners. The database contains no alliances with more than six partners.

Ambiguity is related to specificity, redundancy, and contract complexity. These measurements are also included in the analysis to filter out ambiguity. We measure specificity and redundancy with the MoreThanSentiment package in Python developed by Jiang and Srinivasan (2023), respectively indicating a "*measurement of the quality of relating uniquely to a particular subject*

[4] Agriculture, Forestry and Fishing; Mining are category 1, while Wholesale Trade; Retail Trade are category 5.

and a measurement of usefulness" (Jiang and Srinivasan, 2023, p.2). Furthermore, readability indicates the contract's complexity. We assess the readability of the text by using the established readability Gunning Fog Index, measured with the Textstat package in Python. The Gunning Fog Index estimates the number of years of formal education a reader would need to understand the text easily on the first reading (Ertugrul et al., 2017). Finally, we consider the number of words as an indicator of contract length and, ultimately, as an objective measure of contract complexity (Hagedoorn & Hesen, 2009). While other metrics, such as sentence count or file size in kilobytes, could also be used, we selected word count as our primary proxy since the alternative measures produced similar results. A table defining the various linguistic features can be found in the appendix (see Appendix, List 2).

3.3. Analysis and Results

3.3.1. Descriptive Statistics

Table 1 presents the summary statistics of the variables used in our analyses, while Table 2 provides the distribution counts of the dummy variables (except for the variables SIC and Year). The descriptive statistics provide valuable insights into the variables under analysis. First, ambiguity ranges from a minimum value of 0 to a maximum of 0.75, with a mean of 0.36 and a standard deviation (SD) of 0.12. The distribution of the readability measure demonstrates a mean of 14.55 and a SD of 2.12. This means that, on average, someone needs 14.55 years of formal education to comprehend contracts easily. Specificity has a mean of 0.042 and a SD of 0.0126, showing a relatively narrow distribution of specificity across the contracts analyzed. Redundancy has a mean of 0.087 and a SD of 0.085. Contract lengths can range from 397 to 118,528 words, with a mean of 24,956 words and a SD of 20,743 words. This wide range indicates significant variability in the complexity and detail of different contracts. Finally, the number of partners in the alliances ranges from 2 to 6, with a mean of 2.2, indicating that most alliances involve two partners, while a minority includes more than two. Afterward, we turned this variable into a dummy one.

From Table 2, we observe that a minority of alliances in this dataset do not have a JSC, with 35% of alliances having no JSC and 65% including one. Additionally, only 15% of the alliances involve a non-profit organization, such as a university, indicating that collaboration with such entities is relatively rare. In terms of breadth, the data show an almost even split between alliances with only R&D activities and alliances with more activities, with distributions of

48.3% and 51.7%, respectively. Similarly, the proportions of domestic versus non-domestic alliances are comparable, with 43.9% being domestic and 56.1% non-domestic.

Table 3 reports the correlation table. Specificity and ambiguity have a correlation of -0.39 (p <0.01), which confirms that they pick up something different and that they are not entirely the same. Alliance breadth demonstrates a moderate positive correlation with ambiguity (r = 0.36, p <0.01) and JSC (r = 0.45, p <0.01), indicating that alliances with more activities may be associated with greater ambiguity. Conversely, negative correlations are observed between non-profit partners and variables like ambiguity (r = -0.21, p <0.01) and Alliance breadth (r = -0.27, p <0.01), suggesting that non-profit partnerships are often associated with simpler agreements and pure R&D alliances. However, a positive correlation is observed with specificity (r = 0.30, p <0.01). Interestingly, JSC exhibits a moderate positive correlation with ambiguity (r = 0.39, p <0.01), suggesting that the presence of a JSC within non-equity R&D alliances may increase with the legal and structural intricacies of the agreements, which is in line with our expectations. However, JSC has weaker and negative relationships with other variables, such as a non-profit partner (r = -0.24, p <0.01), specificity (r = -0.21, p <0.01), readability (r = -0.21, p <0.01), and a domestic scope (r = -0.18, p <0.01), indicating limited associations with these aspects of the partnerships. The correlations already reveal relationships between our variables of interest and align with our expectations. We also checked for potential collinearity concerns by calculating the variance inflation factors (VIFs) for the different models[5] estimated. For models 1 and 2, the VIFs ranged between 1.04 and 2.59, except for higher VIF scores in the SIC categories[6]. For model 3, the VIFs ranged between 1.05 and 3.07, with the exception of the interaction effect, which had a VIF of 4.95, and again for some SIC categories. It is not a problem to observe a higher VIF for the interaction effect (Allison, 2012).

3.3.2. JSC and Contract Ambiguity

In this section, we investigate the relationship between the presence of a JSC in an alliance and the level of ambiguity designed into contracts. H1 predicts that the contract ambiguity level is associated with the presence of a JSC in the alliance. To test this hypothesis, we use a pooled

[5] Three models are presented: Model 1 includes linguistic features and year as variables, Model 2 incorporates all independent and control variables, and Model 3 includes the interaction effect. In all three models, ambiguity is the dependent variable.

[6] Specifically, category 3 had a VIF of 7.04 and category 7 had a VIF of 5.39. These higher VIFs can be explained by the low number of observations and their correlation with other categories. However, this is not problematic as these categories do not contain variables of interest (Allison, 2012).

cross-sectional research design and model ambiguity of contracts as a function of JSC and other control variables as outlined below:

$$\text{Ambiguity} = \alpha_1 \text{JSC} + \alpha_2 \text{Domestic} + \alpha_3 \text{Number of Partners} + \alpha_4 \text{Non-Profit Partner} + \alpha_5 \text{Number of Words} + \alpha_6 \text{Alliance Breadth} + \alpha_7 \text{Readability} + \alpha_8 \text{Specificity} + \alpha_9 \text{Redundancy} + \alpha_{10} \text{SIC code} + \alpha_{11} \text{Year} + \epsilon$$

Table 4 represents the results for the effect of JSC on ambiguity. Three models are presented: Model 1 includes linguistic features and year as variables, Model 2 incorporates all independent and control variables, and Model 3 includes the interaction effect. In all three models, ambiguity is the dependent variable. The second model (column 2) is significant (R^2= 0.36, p <0,001). The findings support our first hypothesis as it shows that JSC has a positive and significant coefficient (b= 0.076, p <0.01). This indicates that when partners decide to include a JSC, contracts are likely to be written with greater ambiguity. In addition, the alliance breadth has a positive and significant coefficient (b= 0.082, p <0.01) suggesting that contracts encompassing a broader range of activities exhibit higher levels of ambiguity compared to those limited to a single activity, such as R&D. We assume that when the contractual provisions have to capture a broader range of activities, they are naturally written down in more ambiguous and vague terms, but this assumption is subject to further investigation.

The variable representing alliances with 5 to 6 partners has a negative and significant coefficient (b = -0.086, p <0.001), indicating that alliances with more than four partners tend to execute more ambiguous contracts compared to alliances with only two partners. As for the impact of breadth, the reason could be that with an increasing number of partners, it becomes more difficult to draft contractual provisions in an unambiguous way, but again, further investigation is needed that is out of the scope of the current paper. Specificity and redundancy demonstrate a negative and significant effect on contract ambiguity, with respectively a coefficient of b = -2.79 (p <0.001) and b = -0.19 (p <0.001). However, readability does not show a significant effect on contract ambiguity. Besides, industry does not show a significant effect, and not all year-specific variables are statistically significant. In conclusion, the results provide strong support for H1, demonstrating that the presence of a JSC is positively associated with higher levels of contract ambiguity. These findings also highlight the significant roles of alliance breadth, partner count, and readability in influencing the ambiguity of contractual agreements.

3.3.3. The Moderating Impact of Alliance Breadth

To provide a more comprehensive analysis, we incorporate an interaction term between the presence of a JSC and alliance breadth in our model. Table 4 presents the results, showing that the model is statistically significant ($R^2 = 0.39$, $p < 0.001$). The coefficient for the interaction effect is negative but not significant ($b = -0.058$, $p > 0.05$). While we do not find a significant interaction effect as predicted in H2, the data hint at a negative association as expected. It means that the importance of the JSC for countering the risks of contractual ambiguity might be weaker when the breadth of the activities increases. Notably, the variables are also controlled for separately in the model. JSC maintains a positive and significant coefficient ($b = 0.09$, $p < 0.01$), indicating that its individual effect on contract ambiguity remains robust. Similarly, alliance breadth also shows a positive and significant coefficient ($b = 0.08$, $p < 0.01$). The interaction effect does not strengthen the individual effects but reduces them. Figure 1 illustrates the interaction effect.

4. Discussion

4.1. Conclusion

This paper provides insights into how R&D alliance contracts are designed: we investigated the linguistic ambiguity of the contracts, in conjunction with the presence of a Joint Steering Committee (JSC) and the breadth of the partnership. The study utilizes a custom-built dataset derived from the exhibits of SEC Edgar, where contracts were identified using specific keywords. This approach allowed us to include a diverse sample of large companies in our analysis. Our findings reveal that the presence of a JSC is associated with greater levels of ambiguity in contracts, all else being equal. Our analysis centers on how contracts are structured in the presence of a JSC, building on prior research that underscores the importance of linguistic features in contracts (e.g., Ariño & Reuer, 2004; Barthélemy & Quélin, 2006). The positive relationship between JSC and contract ambiguity may seem counterintuitive. However, there are reasons why we can expect a positive relationship. The intriguing link between JSCs and increased contract ambiguity can be attributed to the inherent adaptability they offer in alliance governance (Anesa, 2007; D. Malhotra & Lumineau, 2011; Zhao et al., 2022) as contracts can be seen as rigid tools (Fortes et al., 2023; Keller et al., 2021; Schilke & Lumineau, 2018). Rather

than resolving all uncertainties upfront, contracts often leave room for interpretation, allowing JSCs to dynamically address evolving conditions and unforeseen challenges (Reuer & Devarakonda, 2016). This intentional ambiguity is particularly valuable in complex alliances where defining roles, responsibilities, and scopes may not be feasible. Additionally, ambiguity may reflect trust-based governance, where parties rely on the JSC to resolve disputes and manage differences over time collaboratively. So, ambiguity serves as a strategic tool (Duhl, 2009), accommodating differing priorities or power dynamics among partners while preserving room for negotiation and reducing the need to explicitly resolve them in the initial contract. The trade-off between crafting detailed and unambiguous contracts for every potential hazard and opting for more flexible agreements is a critical consideration in alliance governance. While highly specific contracts can be costly and rigid, more adaptable contracts may lead to opportunistic behavior. In this context, introducing a JSC offers a viable solution, particularly for non-equity alliances (Reuer & Devarakonda, 2016). JSCs can address contractual gaps as a relational control mechanism while simultaneously facilitating resource allocation, information exchange, and conflict resolution within the alliance (Devarakonda et al., 2018; Reuer & Devarakonda, 2016).

The results further demonstrate that an alliance with more activities presents additional challenges in drafting contracts, resulting in higher levels of ambiguity. In this context, more activities are perceived as more complex and difficult to address in contract design. Hence, our study shows that the ambiguity level depends not solely on strategic contract design choices, but also on the alliance activities. Finally, our findings highlight no significant moderating effect of alliance breadth on the association between the presence of a JSC and contract ambiguity. We expected in our second hypothesis that alliances encompassing more than R&D activities would render the presence of a JSC less important to handle contractual ambiguity risks, like interpretational disputes, opportunistic behavior or enforcement challenges. Although the individual effects of JSC and the breadth on contractual ambiguity are significant, the coefficient of the moderator is insignificant, but the direction of the effect is in line with our expectation.

Some variables were not significant in our models. Contrary to prior literature (Choi & Contractor, 2016; Zeng et al., 2022), our study shows that country-level differences between the partners do not influence ambiguity. However, our database comprises large companies with numerous offices across various countries. Due to the internationalization of business, country differences pose less of a challenge in today's business environment (Schmid, 2018).

Additionally, the industry does not influence contract design, likely because our focus is solely on R&D alliances. Consequently, the type of alliance is already specific, making the breadth of the alliance a more critical feature.

In addition, we expected that ambiguity would be higher for alliances with more than 4 partners in comparison to alliances with 2 partners, as prior research suggests that multi-partner alliances are characterized by increased uncertainty and complexity (Mishra et al., 2015). Still, the effect was not significant. Furthermore, we looked at other linguistic features and their association with ambiguity, as prior literature shows that the linguistic concepts are related, yet distinguishable (Zheng et al., 2020). This is also what we find, with specificity and redundancy both having a high negative effect on ambiguity. However, readability has no effect on ambiguity. This can be explained by the fact that we have only legal contracts in our database, so the readability is not that different across the contracts analyzed. Besides, readability is a measure of overall complexity while the other linguistic features indicate more content and word specific measurements.

This study is novel and relevant because it provides new insights into the governance of non-equity R&D. More specifically, we contribute to the literature both empirically and theoretically. First, we make a significant theoretical contribution by bridging a crucial gap between equity and non-equity alliances. There is a prevailing misconception in the literature that contractual (non-equity) alliances lack additional control mechanisms beyond the contract, thereby making coordinated adjustments less apparent (Devarakonda & Reuer, 2018). We provide a more nuanced understanding by examining one of the possible mechanisms in non-equity alliances and demonstrating its interplay with the contract itself. We thereby contribute to the existing literature of relational and contractual governance. This is essential as non-equity alliances have become more prominent and are diverse in terms of governance with JSC broadening the governance continuum (Frankort & Hagedoorn, 2019; Reuer & Devarakonda, 2016). Our paper responds to Devarakonda and Reuer's (2016) call to examine the relationship between steering committees and specific contract features in greater detail.

While prior literature has primarily focused on other contractual features, such as complexity and detail (Hagedoorn & Hesen, 2009; Reuer & Ariño, 2007; Vanneste & Puranam, 2010; Xing et al., 2021), contract ambiguity has often been overlooked despite being a well-established and widely studied concept in legal scholarship (Anesa, 2007; Zhao et al., 2022; Zheng et al., 2020). Due to its strong managerial and strategic nature, ambiguity is a particularly interesting contract

feature. The interplay between contractual ambiguity and JSC is interesting because it indicates a dual governance perspective whereby JSC functions as a relational control mechanism and ambiguity as a contractual control mechanism. When both are implemented well in the alliance, the dual goals of adaptability and coordination can be provided. In addition, our analysis of contract ambiguity contributes to the limited empirical literature on contract features by utilizing a sample of contracts instead of survey data (Schwartz & Scott, 2009). Historically, contract literature has been predominantly theoretical, focusing on a particular range of features such as contract completeness and complexity (Moszoro et al., 2016; Schwartz & Scott, 2003; Shavell, 2006).

4.2. Managerial implications

For executives crafting governance mechanisms in alliances, it is crucial to consider whether a non-equity alliance supported by a JSC is sufficient to address the corresponding contract and facilitate coordinated adaptation. (Reuer & Devarakonda, 2016). While literature often categorizes alliances as equity or non-equity structures, firms can customize alliances in various ways, offering managers considerable degrees of freedom in collaborative agreements (Reuer & Ariño, 2007). Effective governance design is critical, as misaligned governance incurs significant managerial and organizational costs (Mooi & Ghosh, 2010).

Our research emphasizes the importance of the JSC as a governance mechanism. With 65% of alliances in our dataset utilizing a JSC, this practice highlights the diminishing relevance of the traditional equity versus non-equity dichotomy. Instead, interorganizational governance should focus on integrating contractual design aspects, like ambiguity, with noncontractual elements like the JSC, to better capture current trends in practice. Ambiguity, while often unconsciously embedded in contract design, can act as a strategic tool if properly understood and managed (Zheng et al., 2020). It is relevant and valuable for practitioners to get better insights into the implications of contractual ambiguity, especially in conjunction with other management tools, to apply them in a proper way. Besides, our paper does also incorporate more frequently studied linguistic contract features. As decisions in terms of JSC and contract design are interconnected and made holistically, understanding these relationships is crucial for both theory and practice.

4.3. Limitations and Future Research

This research is subject to several limitations. First, we rely exclusively on publicly available data concerning the partners and the contracts, which means we lack insight into the nature of the relationships between the parties involved (Pattit & Deeds, 2021; Torbert, 2014). Additionally, our analysis is narrowly focused on language-related aspects of contract design, and we do not consider relational dynamics within the alliances (Torbert, 2014). Furthermore, ambiguity is identified using a dictionary-based method, rather than employing more advanced machine learning techniques that could provide deeper insights. Future research could address this limitation by leveraging growing techniques to analyze language-related concepts across large volumes of documents (e.g., Zhang et al., 2023; Zhang & Ma, 2023).

The fact that our data are derived from SEC filings implies that there is a sample selection bias towards significant contracts from larger U.S. companies due to SEC materiality thresholds (Moszoro et al., 2016). This limits the generalizability of our findings to smaller firms and non-U.S. contexts but offers valuable insights into high-stakes business deals (Ryall & Sampson, 2009). Moreover, differences in legal frameworks, such as contract law, regulatory standards, and alliance practices across countries, further affect how alliances are structured, negotiated, and enforced, and therefore, the applicability of our findings. To enhance the generalizability, future studies can incorporate a more diverse sample, including smaller firms and international contexts, to account for variations in legal and organizational environments.

Lastly, it is worth noting that we address one possible instrument to counterbalance the implications of contractual ambiguity: we focused on the role of JSC as relational mechanisms, while we do not offer an all-inclusive overview of all possible control mechanisms that could apply. Future research can find a way to provide additional mechanisms, for example, the way in which contractual amendments play a role to safeguard the success of R&D alliances.

It is worth repeating, as highlighted in previous literature, that ambiguity is not inherently negative (e.g., Choi & Triantis, 2010; Zheng et al., 2020). Future studies could investigate the contexts in which ambiguity has detrimental effects and those in which it may be beneficial, offering a more nuanced understanding of its role in contract design and alliance performance.

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6. Appendix: Tables

List 1: Dictionary for Measuring Ambiguity (Zheng et al. 2020, p. 165)

1. Reasonable/unreasonable, reasonably/unreasonably
2. Best efforts
3. Good faith/bad faith
4. Fair/unfair, fairly/unfairly
5. Satisfaction/unsatisfaction, satisfactory/unsatisfactory
6. Adequate/inadequate
7. Equitable/inequitable
8. Sufficient/insufficient
9. Appropriate/inappropriate
10. Significant/insignificant, significantly/insignificantly

List 2: List of Definitions of Linguistic Features

Concepts (linguistic features)	Definitions
Contract ambiguity	Ambiguity typically arises not from a lack of information but from interpretation issues because of vocabulary carrying unclear or multiple meanings. Ambiguity arises when contractual terms can be interpreted in more than one way (Zhao et al., 2022).
Contract specificity	*"Contract specificity is defined as the extent to which the contract states elements, such as implementation procedures, technical specifications, and resolution of problems*" (Dean et al., 2016; Mooi & Ghosh, 2010; Ouchi, 1980; Zheng et al., 2020, p.148).
Contract complexity	"*Contracts that contain many elements (clauses) with a relatively large number of interdependencies that also impose a significant cognitive load on contract parties.*" (Hagedoorn & Hesen, 2009, p.818)
Contract completeness	*"Contract completeness is defined as the extent to which relevant clauses are codified in a contract ex ante and in subsequent ex post governance efforts"* (e.g., Kashyap, Antia, and Frazier 2012; Zheng et al., 2020, p.148)
Contract detail	"*The extent to which relevant clauses are specified in contracts"* (Vanneste & Puranam, 2010, p.186)
Readability	Readability is "*the ease of understanding or comprehension influenced by the style of writing.*" (Klare, 1963; Loughran & McDonald, 2014, p.1649)
Redundancy	Redundancy *indicates how useful a corpus is. It shows how much of the information is duplicated* (Jiang & Srinivasan, 2023, p.2).

Table 1: Descriptive Statistics

VARIABLES	(1) Mean	(2) Min	(3) Max	(4) Sd	(5) N
Number of partners	2.197	2	6	0.575	269
Number of words	24,956	397	118,528	20,743	269
Ambiguity	0.362	0	0.753	0.119	269
Readability	14.55	8.220	25.30	2.120	269
Redundancy	0.0868	0	0.636	0.0845	269
Specificity	0.0417	0.0179	0.0953	0.0126	269

Table 2: Distribution Summary

	Summary
N	269
JSC	
0	94 (34.9%)
1	175 (65.1%)
Non-profit partner	
0	229 (85.1%)
1	40 (14.9%)
Domestic	
0	118 (43.9%)
1	151 (56.1%)
Breadth	
0	130 (48.3%)
1	139 (51.7%)

Table 3: Correlation Table

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ambiguity	1.000									
Readability	0.105	1.000								
	(0.086)									
Breadth	0.364*	-0.078	1.000							
	(0.000)	(0.203)								
Nonprofit	-0.208*	-0.001	-0.265*	1.000						
	(0.001)	(0.981)	(0.000)							
Partners	-0.016	-0.050	0.083	0.028	1.000					
	(0.794)	(0.412)	(0.172)	(0.642)						
Domestic	-0.061	0.053	-0.180*	0.201*	-0.242*	1.000				
	(0.316)	(0.388)	(0.003)	(0.001)	(0.000)					
JSC	0.399*	-0.208*	0.446*	-0.242*	0.060	-0.177*	1.000			
	(0.000)	(0.001)	(0.000)	(0.000)	(0.326)	(0.004)				
Specificity	-0.389*	-0.381*	-0.184*	0.295*	0.028	0.018	-0.209*	1.000		
	(0.000)	(0.000)	(0.002)	(0.000)	(0.650)	(0.771)	(0.001)			
Redundancy	0.053	-0.269*	0.132*	-0.031	0.095	-0.105	0.371*	-0.031	1.000	
	(0.387)	(0.000)	(0.031)	(0.612)	(0.120)	(0.087)	(0.000)	(0.614)		
Words	0.302*	-0.242*	0.494*	-0.302*	0.093	-0.210*	0.602*	-0.210*	0.624*	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.127)	(0.001)	(0.000)	(0.001)	(0.000)	

Robust standard errors in parentheses

* $p<0.05$

Graph 1: The Moderating Impact of Alliance Breadth

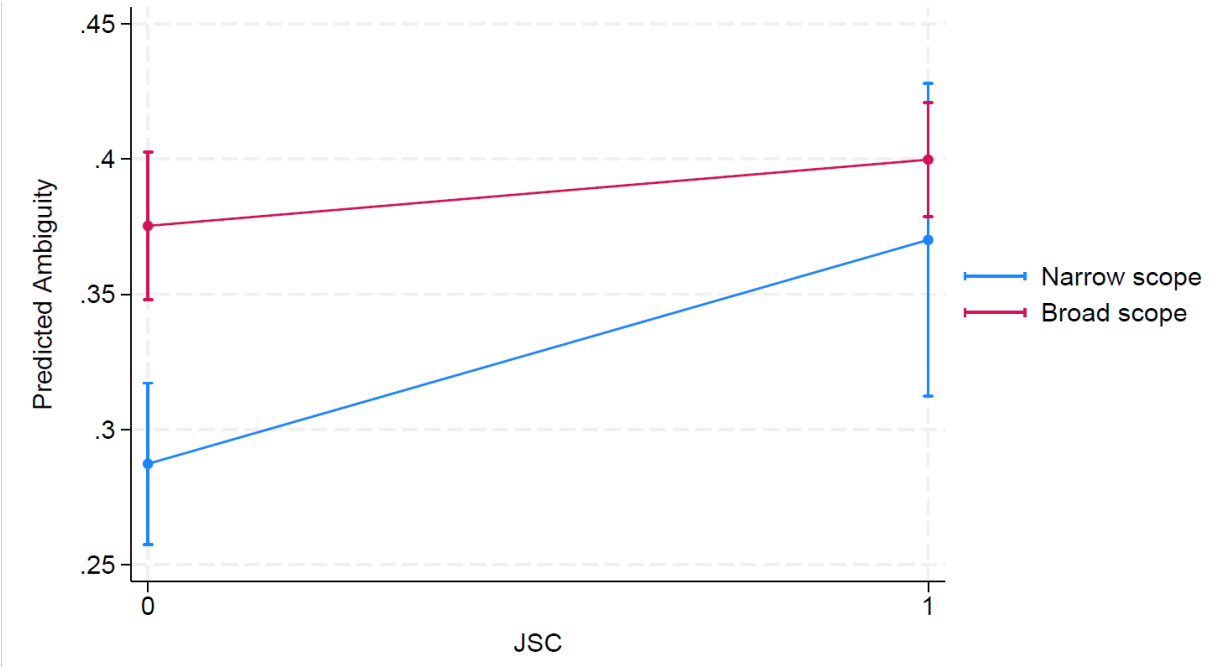


Table 4: Analyses (Model 1, Model 2 and Model 3) of variables impacting contract ambiguity

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
Readability	0.00160	0.00332	0.00310
	(0.00371)	(0.00385)	(0.00365)
Specificity	-3.185***	-2.790***	-2.668***
	(0.584)	(0.616)	(0.595)
Redundancy	-0.184**	-0.196***	-0.162*
	(0.0865)	(0.0749)	(0.0837)
Number of words	1.76e-06***	8.22e-07**	4.61e-07
	(3.96e-07)	(3.99e-07)	(4.49e-07)
Year== 1.0000 = 1	-0.0209	-0.0381*	-0.0384*
	(0.0196)	(0.0200)	(0.0213)
Year== 2.0000 = 1	0.0301	0.00595	-0.000608
	(0.0233)	(0.0238)	(0.0230)
Year== 3.0000 = 1	-0.0670***	-0.0660***	-0.0731***
	(0.0223)	(0.0216)	(0.0223)
Year== 4.0000 = 1	0.00113	-0.000954	-0.00139
	(0.0208)	(0.0191)	(0.0187)
Year== 5.0000 = 1	-0.0817***	-0.0937***	-0.0941***
	(0.0256)	(0.0250)	(0.0244)
Year== 6.0000 = 1	-0.0395**	-0.0348*	-0.0327*
	(0.0194)	(0.0180)	(0.0172)
Year== 8.0000 = 1, omitted	-	-	-
JSC = 1		0.0764***	0.0880***
		(0.0192)	(0.0216)
Domestic = 1		-0.00241	-0.00352
		(0.0128)	(0.0129)
Numberpart_cat = 2		0.00793	0.00271
		(0.0181)	(0.0183)
Numberpart_cat = 3		-0.0861***	-0.0929***
		(0.0116)	(0.0119)
Non-profit partner = 1		0.00120	0.0138
		(0.0231)	(0.0231)
Alliance breadth = 1			0.0828**
			(0.0326)
1.Alliance breadth *1.JSC			-0.0583
			(0.0373)
Sic_cat = 3		-0.0104	-0.0313
		(0.0332)	(0.0330)
Sic_cat = 4		0.0578	0.0366
		(0.0566)	(0.0516)
Sic_cat = 5		-0.00223	-0.0166
		(0.0862)	(0.0914)
Sic_cat = 6		-0.0888**	-0.109**
		(0.0432)	(0.0490)
Sic_cat = 7		-0.0300	-0.0426
		(0.0389)	(0.0387)
Constant	0.463***	0.414***	0.413***
	(0.0700)	(0.0803)	(0.0777)

Observations	269	269	269
R-squared	0.288	0.364	0.393

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

2025 Accounting Research Day

Dwight Waeye

Sophie Maussen

A proposal for an experimental study

Deterring Employee Misreporting: The Role of Whistleblowers' and Internal Recipients' Perceived Motives

January 2025

ABSTRACT

This study examines how internal recipients' perceived motives, shaped by their role responsibilities and constrained by employee whistleblowers' perceived motives, affect employee misreporting. Specifically, we focus on whether internal recipients have dual role responsibilities, in which they act as business partners and internal recipients, or a single role responsibility, in which they act as internal recipients. We also examine whether employee whistleblowers are perceived to act based on internal (prosocial preferences) or external (financial whistleblowing rewards) motives. We draw on Perceptual Deterrence Theory and hypothesize an interaction such that when internal recipients have dual role responsibilities, the presence of financial rewards, compared to their absence, increases misreporting. Conversely, when internal recipients have a single role responsibility, we expect the presence of financial rewards to decrease misreporting. We test these predictions using a three-stage participative budgeting experiment. Our study has important practical implications as recent evidence suggests that many internal whistleblowing tips do not result in the expected outcome. Therefore, we propose that organizations should consider the crucial role that internal recipients play in addition to, and in interaction with, employee whistleblowers and the spillover effect thereof on employees' misreporting behavior.

Keywords

Employee misreporting; Financial whistleblowing rewards; Internal recipient; Internal whistleblowing program; Perceptual deterrence theory; Role responsibilities

1. Introduction

Effective whistleblowing involves a process that begins with an observer of misreporting blowing the whistle and ends with the organization taking corrective action (Near and Miceli [1995]). While organizations are under increasing pressure to implement effective internal whistleblowing programs (Chen, Nichol and Zhou [2017]), many whistleblowing tips do not, or are not perceived to, result in the expected outcome (Soltes [2020], Stubben and Welch [2020], Vandekerckhove and Phillips [2019]). Remarkably, 74% of whistleblowers feel that nothing is done to address their concerns, and an additional 10% have low expectations of an ongoing investigation (Vandekerckhove and Phillips [2019]), demonstrating the negative perceptions employees have about follow-through procedures. This hinders the deterrence objective of internal whistleblowing programs, as both the perceived risk of whistleblowing and the perceived risk of organizations taking corrective action after receiving a whistleblowing tip (i.e., follow-through) significantly impact individuals' likelihood of misreporting (cf. Perceptual Deterrence Theory, PDT; Nagin [2013]). The magnitude of these risks depends on the potential whistleblowers' behavior and subsequent actions of the internal recipient of the whistleblowing tip. However, given that these behaviors are typically unobservable (Smaili, Vandekerckhove and Arroyo [2023], Soltes [2020], Treviño et al. [2014]), we argue that employees infer their deterrence perceptions from whistleblowers' and internal recipients' perceived motives. Specifically, we examine how internal recipients' perceived motives, shaped by their role responsibilities and constrained by whistleblowers' perceived motives, affect employee misreporting.

While handling whistleblowing tips is regarded as a complex task (Smaili et al. [2023]), the majority of organizations assigns this task to direct or line managers, to whom we refer as

business partners (Association of Certified Fraud Examiners [2024], Donkin, Smith and Brown [2008], Hassink, de Vries and Bollen [2007], Vandekerckhove and Phillips [2019]). Although low social distance is beneficial for conflict management in general (Detert and Treviño [2010], Teague and Roche [2012]) and whistleblowing in particular (Near and Miceli [1985]), having business partners act as internal recipients can limit the program's (perceived) effectiveness. While business partners' role is to maximize firm value by using resources as effectively as possible (e.g., Bouwens and Van Lent [2007]), addressing misreporting typically challenges business continuity (Hersel et al. [2019]). Hence, combining both roles results in dual responsibilities that are not necessarily aligned and, in turn, gives rise to role conflict and job-related tension (Senatra [1980]).

Alternatively, organizations can appoint an independent oversight committee, such as an Audit Committee (Beasley et al. [2009]), to oversee the internal whistleblowing program. This ensures that internal recipients have only a single responsibility towards the whistleblowing program and increases their credibility (Treviño et al. [2014]). This study sheds light on the importance of internal recipients' role responsibilities (i.e., single versus dual) by investigating their impact on employee misreporting.

In an effort to reduce the role conflict internal recipients with dual responsibilities face, they seek (biased) justifications or a moral license to avoid the task that causes the role conflict (i.e., following through on whistleblowing tipsBazerman and Tenbrunsel [2011], Kunda [1990], Maas and Matějka [2009], Morales and Lambert [2013]). We argue that whistleblowers' perceived motives can serve as the basis of this moral license. Previous research has distinguished between whistleblowers' internal motives, such as personal moral standards (Smaili and Arroyo [2019]) or prosocial preferences (Bereskin, Campbell and Kedia [2020]) and whistleblowers' external motives, such as financial rewards (e.g., Berger and Lee [2022], Butler,

Serra and Spagnolo [2020], Chen et al. [2017], Stikeleather [2016]). While whistleblowers' behavior driven by internal motives is often perceived to be positively associated with the perceived seriousness of misreporting (Andon et al. [2018], Feldman and Lobel [2010]), the relationship between whistleblowers' external motives and the perceived seriousness of misreporting is more ambiguous (Andon et al. [2018], Nan, Tang and Zhang [2024]). Consequently, whistleblowers' credibility may depend on whether they are perceived to act based on internal or external motives (Near and Miceli [1995]).

By relying on whistleblowers' perceived motives as a proxy for their credibility, internal recipients may question whether whistleblowers act as good organizational citizens or merely pursue financial rewards. In turn, they may use the presence of external motives for whistleblowing as a moral license and thus do not feel the need to investigate whistleblowing tips to which a reward is attached. Simultaneously, reduced expectations of follow-through by internal recipients also decrease the likelihood of employee whistleblowing (Trevino and Weaver [2001]). Taken together, we predict that when internal recipients balance dual responsibilities (i.e., simultaneously act as business partners and internal recipients), offering financial whistleblowing rewards to employees will reduce perceptions of deterrence due to a decreased risk of follow-through. This, in turn, increases employee misreporting.

When internal recipients have only a single role responsibility, we do not expect them to be concerned about disrupting business continuity and, as a result, are less likely to encounter role conflict and more likely to be perceived to operate based on an accuracy goal (i.e., to detect as much misreporting as possible). When motivated by an accuracy goal, internal recipients act more objectively (Kunda [1990]). We expect that this accuracy goal for internal recipients is present regardless of employee whistleblowers' perceived motives. Simultaneously, this accuracy goal strengthens internal recipients' credibility, which stimulates whistleblowing (Trevino and

Weaver [2001]). In this setting, we expect that, in addition to the positive effect of higher expectations of follow-through, financial rewards will further stimulate whistleblowing (e.g., Butler et al. [2020], Stikeleather [2016]). As a result, we hypothesize that, when internal recipients have a single role responsibility, the presence of financial whistleblowing rewards will drive stronger perceptions of deterrence and, in turn, decrease employee misreporting.

We study the effect of whistleblowers' and internal recipients' perceived motives on employee misreporting in a participative budgeting setting. We run a three-stage experiment with a 2 (*Whistleblowing Program*) × 2 (*Role Responsibility*) between-subjects design using z-Tree (Fischbacher [2007]). *Whistleblowing Program* is manipulated on two levels: No Incentive or Financial Reward. *Role Responsibility* is manipulated by having an internal recipient who balances Dual Role responsibilities (i.e., business partner and internal recipient) or has only a Single Role responsibility (i.e., internal recipient). The business partner role entails that these managers are responsible to maximize firm value. They can accomplish this by executing as many projects as possible with as few resources as possible (i.e., low costs). To make this salient, we provide all participants with organizational performance metrics at the end of the experiment.

Each experimental session includes one Internal Recipient and up to eight subordinate-dyads. Each dyad consists of one subordinate who has the opportunity to misreport private cost information in the first stage, and one subordinate who observes the reported cost in the second stage. The latter receives an indicative, but not conclusive, signal of whether the former's reported cost equals the actual cost and bases their whistleblowing decision on this inference. When whistleblowing occurs, the Internal Recipient has discretion over whether or not to follow through on the whistleblowing tip in the third stage. While following through on a whistleblowing tip is costly for the organization and therefore decreases organizational

performance in the short term (Hersel et al. [2019]), it does not directly impact the Internal Recipient's payoff.

Our study makes two important contributions to the accounting literature on whistleblowing. First, while prior literature on internal whistleblowing has predominantly focused on how to increase the perceived risk of whistleblowing (e.g., Andon et al. [2018], Butler et al. [2020], Chen et al. [2017], Feldman and Lobel [2010], Stikeleather [2016], Trevino and Weaver [2001]), we provide a more holistic view by investigating the contingencies of multiple control aspects of the internal whistleblowing program (Bedford [2020], Grabner and Moers [2013]). In particular, drawing on PDT, we emphasize that individuals' likelihood of misreporting depends on both the perceived risk of whistleblowing and the perceived risk of the internal recipient taking corrective actions after receiving a whistleblowing tip (i.e., follow-through). Accounting for both the risk of whistleblowing and the risk of follow-through, as well as their interaction, is crucial for obtaining a better understanding of how internal whistleblowing programs can deter employee misreporting (e.g., Soltes [2020], Stubben and Welch [2020]). Contrary to a recent study by Lowe and Reckers [2024], which highlights that financial whistleblowing incentives (i.e., rewards and penalties) always increase the perceived risk of detection and, in turn, reduce intentions to misreport, we argue that this depends on the internal recipient's perceived motives. Hence, our focus on whistleblowers' and internal recipients' interactive behaviors and the spillover effect thereof on employee misreporting contributes to the debate on how whistleblowing programs can achieve the dual objectives of detecting misreporting in a timely fashion ex-post and deterring future misreporting ex-ante (Walter [2009]).

Second, we add to the literature on whistleblowers' (perceived) motives for acting and, more specifically, the impact thereof on their credibility. While prior literature has highlighted

that financial rewards incentivize employee whistleblowing compared to situations where there are no financial rewards (e.g., Butler et al. [2020], Stikeleather [2016]), the presence of a stigma around financial whistleblowing rewards (Feldman and Lobel [2010]) may limit the usefulness of such whistleblowing tips. From a theoretical perspective, we contribute to the literature by integrating Role Conflict Theory (Senatra [1980]) and Theory of Motived Reasoning (Kunda [1990]) into the framework of Perceptual Deterrence Theory (Nagin [2013]), which allows us to study more in-depth how changes to the internal whistleblowing program impact employees' whistleblowing and misreporting behaviors. From a practical perspective, this highlights the trade-off organizations have to make between reducing social distance to encourage whistleblowing (Detert and Treviño [2010], Near and Miceli [1985], Teague and Roche [2012]) and increasing the perceived objectiveness of the internal recipient (Barr-Pulliam [2019], Maas and Matějka [2009], Treviño et al. [2014]).

Finally, this study offers important insights for policymakers and organizations. Prior literature has shown that perceptions of ineffective internal whistleblowing programs incentivize employees to raise their concerns outside the organization (Vandekerckhove [2018]). In particular, the widely documented effectiveness of external whistleblowing programs (e.g., Berger and Lee [2022], Gao and Brink [2017], Wiedman and Zhu [2023], Wilde [2017]) incentivizes employees to divert reporting away from management directly to external agencies (i.e., the S.E.C.; Call et al. [2018], Stubben and Welch [2020]). The large reputational damages that accompany these external whistleblowing allegations (Barnett [1992], Berry [2004], Davidson III, Worrell and Garrison [1988], Laczniak and Murphy [1991]) show the importance for organizations to invest in effective internal whistleblowing programs, which may prevent external whistleblowing (Brink, Lowe and Victoravich [2013]). In this study, we propose

investing in the appointment of an independent in-house internal recipient responsible only for the internal whistleblowing program combined with a financial whistleblowing reward.

2. Theory and background literature

2.1 THEORETICAL MODEL AND BACKGROUND

To understand how internal whistleblowing programs can succeed in their objective of deterring employee misreporting ex ante, we rely on Perceptual Deterrence Theory (PDT; Nagin [2013]). According to PDT, employees' perceptions of the certainty of punishment are an important driver of their misreporting behavior. The certainty of punishment is influenced by both the perceived risk of whistleblowing and the perceived risk of the organization (i.e., internal recipient) taking action to deal with misreporting after receiving a whistleblowing tip (i.e., follow-through).[1]

Prior literature confirms that high expectations of how well a whistleblowing tip will be handled by the internal recipient are important for both the behavior of whistleblowers (Near et al. [2004], Seifert et al. [2010], Trevino and Weaver [2001]), and the behavior of misreporters (Trevino and Weaver [2001]). However, recent findings have indicated significant barriers to the effectiveness of internal whistleblowing programs. From the internal recipient's perspective, Soltes [2020] shows that up to 20% of organizations have impediments that hinder whistleblowing, and approximately 10% of firms do not respond in a timely manner. Stubben and Welch [2020] add that in their sample of nearly two million internal whistleblowing tips only

[1] Nagin [2013] formalizes an offender's (i.e., an individual who would want to engage in a form of misreporting) choice model as a trade-off between the potential pains of punishment (i.e., costs) and the pleasure of the offense (i.e., benefits). The costs include Commission Costs, Apprehension Costs and Sanction Costs. We focus specifically on perceptions of the Apprehension Cost and Sanction Cost. The Apprehension Cost is influenced by the perceived risk to be apprehended, which relates to the perceived risk of whistleblowing in our setting. The Sanction Cost refers to the perceived risk to be convicted conditional upon apprehension, which relates to the perceived risk of the organization taking actions to deal with misreporting after receiving a whistleblowing tip in our setting (i.e., follow-through).

21.20% could be categorized as substantiated.[2] From the whistleblower's perspective, Vandekerckhove and Phillips [2019] use secondary data from an independent advice line in the UK (Public Concern at Work [2013]) and observe that 74% of whistleblowers feel that nothing is done to address their concerns and an additional 10% only have low expectations of an ongoing investigation. Even when whistleblowing ultimately results in the expected outcome, Stolowy et al. [2019] reported strong perceptions that poorly developed systems for investigating whistleblowing tips are substantial barriers to whistleblowers' success. These findings highlight the need for additional research to better understand the role of internal recipients in facilitating or hampering the deterrence objective of internal whistleblowing programs.

Relying on PDT, we examine how internal recipients' perceived motives, shaped by their role responsibilities and constrained by employee whistleblowers' perceived motives, influence perceptions of deterrence, and in turn, employee misreporting. We focus on whistleblowers' and internal recipients' perceived motives for acting rather than their actual behavior, because in the context of internal whistleblowing programs, others' behavior is typically difficult to observe. This is due to organizations' reluctance to communicate about the investigation process and/or the outcomes of such processes (Smaili et al. [2023], Soltes [2020], Treviño et al. [2014]). The low visibility of their actual behavior increases the importance of whistleblowers' and internal recipients' perceived motives as a proxy for their credibility (Near and Miceli [1995]).

In line with our theoretical argument, we first focus on how internal recipients' role responsibilities shape their perceived motives. Next, we explore employee whistleblowers' perceived motives. In Section 3, we develop our hypotheses by predicting how internal

[2] The other 79% were marked as either "insufficient evidence", "pending further review" or "N/A (i.e., the report was a question or hypothetical situation)".

recipients' and employee whistleblowers' perceived motives interact and drive perceptions of deterrence.

2.2 INTERNAL RECIPIENTS' PERCEIVED MOTIVES

Related to internal recipients' perceived motives, Smaili et al. [2023] emphasized that while handling whistleblowing tips is already a complex task, internal recipients' role (i.e., position) in the organization and their multitude of responsibilities towards the whistleblower, misreporter, and organization as a whole can further increase this complexity. From this point of view, it is important to highlight that internal recipients are often internal managers, to whom we refer as business partners, such as direct or line managers (Association of Certified Fraud Examiners [2024], Donkin et al. [2008], Hassink et al. [2007], Vandekerckhove and Phillips [2019]). Although low social distance between whistleblowers and internal recipients encourages whistleblowing (Detert and Treviño [2010], Near and Miceli [1985], Teague and Roche [2012]), findings from literature in related fields, such as the internal audit literature (Barr-Pulliam [2019], Roussy [2013], [2015]) and management accounting literature (Goretzki and Messner [2019], Maas and Matějka [2009], Morales and Lambert [2013]), suggest that having business partners act as internal recipients can give rise to role conflict and job-related tension (Senatra [1980]). In particular, while business partners' primary role is to add to firm value by using organizational resources as effectively as possible (e.g., Bouwens and Van Lent [2007]), following through on whistleblowing tips and taking corrective action typically challenges the business continuity of an organization (Hersel et al. [2019], Near and Miceli [1985]), and may result in employee dissatisfaction (Eberl, Geiger and Aßländer [2015]). The increase in role conflict due to these conflicting tasks can, in turn, decrease the objectivity of the internal recipient (e.g., Barr-Pulliam

[2019]) and result in dysfunctional behaviors such as tolerance for misreporting (Maas and Matějka [2009]).

Alternatively, it has been suggested that internal whistleblowing programs (including the internal recipient role) should be overseen by independent in-house personnel (Smaili et al. [2023], Vandekerckhove et al. [2016], Vandekerckhove and Phillips [2019]). While Treviño et al. [2014] show that the involvement of the Audit Committee in the internal compliance program is needed to convey a credible signal of protection to employees, Beasley et al. ([2009]) show that only some Audit Committees, but certainly not all, take up this role.[3]

Taken together, prior literature shows advantages of both internal recipients with dual roles (i.e., business partner and internal recipient) or a single role (i.e., only internal recipient). While dual roles reduce social distance, which encourages employee whistleblowing, it also creates role conflict and may result in tolerance for misreporting. In contrast, whereas internal recipients with a single role are perceived as more independent and objective, social distance between them and whistleblowers is larger. We argue that the extent to which these advantages impact perceptions of deterrence depends on whistleblowers' perceived motives.

2.3 WHISTLEBLOWERS' PERCEIVED MOTIVES

Related to whistleblowers' perceived motives, prior literature has categorized whistleblowers' behavior as driven by either internal or external motives. While internal motives originate from individuals' personal beliefs and preferences, external motives originate from outside individuals. Internal motives for whistleblowing include, among others, personal moral standards (Bouville [2008], Dungan, Young and Waytz [2019], Smaili and Arroyo [2019]) and

[3] Related to this, Gallo, Lynch and Tomy [2023] find that the appointment of an external (i.e., independent) firm monitor is associated with an 18%-25% reduction in violations, but only for the period when the monitor is on site. These results align with findings from related literature (e.g., Barr-Pulliam [2019], Maas and Matějka [2009]) that internal recipients' degree of independence is an important signal of their credibility.

prosocial preferences (Bereskin et al. [2020], Dozier and Miceli [1985], Feldman and Lobel [2010], Seifert et al. [2010]). First, Dungan et al. [2019] show that moral concerns consistently predict whistleblowing decisions above and beyond other organizational and situational factors. Second, Bereskin et al. [2020] show that having more prosocial employees and directors is associated with an increase in whistleblowing and a reduced likelihood of misreporting.

Despite the important role that (prosocial) employee whistleblowers can thus play in deterring misreporting (Bereskin et al. [2020]), many observers of misreporting remain reluctant to blow the whistle due to long-term economic and psychological costs (Dey, Heese and Pérez- Cavazos [2021], Heese and Pérez-Cavazos [2021], Kenny and Fotaki [2023], MacGregor and Stuebs [2014], Spoelma, Chawla and Ellis [2021], Van Dyne, Ang and Botero [2003]). In response, organizations are increasingly focusing on control practices, such as financial whistleblowing rewards, to incentivize employee whistleblowing (e.g., Butler et al. [2020], Chen et al. [2017], Stikeleather [2016]).

While both stronger internal and external motives are considered to increase employee whistleblowing (Feldman and Lobel [2010]), distinguishing between them is important. In a broader context, Murphy et al. [2020] shed light on this distinction and show that internal motives capture the desire to be honest, whereas external motives capture only the desire to appear honest. Accordingly, prior whistleblowing literature has found a positive association between whistleblowers' internal motives for acting and the perceived seriousness of misreporting (Andon et al. [2018], Feldman and Lobel [2010]). Conversely, stronger external motives, such as larger financial rewards, are considered to decrease the materiality threshold for individuals to blow the whistle, and as a result, reduce their informativeness about the perceived seriousness of

misreporting (Nan et al. [2024]).[4] Similarly, Andon et al.'s ([2018]) findings suggest that financial rewards mainly incentivize whistleblowing on acts of misreporting that are perceived as less serious. Taken together, these studies confirm earlier findings by Feldman and Lobel [2010], who reported the presence of stigma surrounding financial whistleblowing rewards. To summarize, to the extent that whistleblowers' behavior is perceived to be driven by internal or external motives, their credibility may be perceived differently (Near and Miceli [1995]).

3. Hypotheses

In line with PDT, we hypothesize that employees' likelihood of misreporting is influenced by the trade-off between the expected benefits and expected costs from misreporting (Nagin [2013]). Internal whistleblowing programs can successfully deter employee misreporting only when the expected costs outweigh expected benefits.

In terms of the expected benefits, and similar to prior literature on employee misreporting, we develop our hypotheses in a participative budgeting setting where employees' rent extraction is an increasing function of their misreporting levels (e.g., Cardinaels and Yin [2015], Hannan, Rankin and Towry [2010], Maussen, Cardinaels and Hoozée [2024]). Previous research has shown that many individuals produce partially dishonest reports in this setting (Evans et al. [2001], Rankin, Schwartz and Young [2008]), and that changes in the control environment can

[4] In their study, Nan et al. [2024] develop an analytical model which shows that the use of larger whistleblowing rewards reduces the quality of information about the presence of misreporting, whereas a lack of whistleblowing in this context increases the quality of information about the absence of misreporting. As a result, they suggest that organizations' wealth-maximizing choice is to reduce their investigative effort as financial whistleblowing rewards get larger. In a similar vein, Stikeleather [2016] shows that, as the pre-existing rate of whistleblowing goes up, the incremental expected cost of offering a whistleblowing reward increases relative to the incremental expected benefit. Finally, Cheynel, Cianciaruso and Zhou [2023] show that, in a broader monitoring context, it is not in an organization's best interest to pursue a zero-tolerance policy. More specifically, they argue that a necessary condition for preventing high-impact fraud is to tolerate low-impact fraud below a certain materiality threshold, meaning they should go undetected. Hence, together, these studies suggest that organizations may want to limit their investigative effort when the perceived seriousness (or materiality) of the alleged misreporting decreases.

both increase or decrease employee misreporting (e.g., Cardinaels and Yin [2015]), making this a relevant setting to test our hypotheses and underlying theory.

In terms of expected costs, PDT highlights that employees' misreporting behavior is driven by the perceived risk of whistleblowing and the perceived risk of the internal recipient taking actions to deal with misreporting after receiving a whistleblowing tip (Nagin [2013]). We argue that employees' perceptions of deterrence hinge on internal recipients' perceived motives, which are shaped by their role responsibilities and constrained by whistleblowers' perceived motives. In particular, we posit that combining the roles of acting as a business partner and internal recipient gives rise to role conflict in a similar way as what is observed for internal auditors (Barr-Pulliam [2019], Roussy [2013], [2015]) and management accountants who combine assurance and consulting activities (Goretzki and Messner [2019], Maas and Matějka [2009], Morales and Lambert [2013]). To reduce the degree of role conflict, internal recipients seek to avoid tasks that cause role conflict (Morales and Lambert [2013]). However, this search is constrained by the extent to which internal recipients can find a (biased) justification for the desired goal that could persuade a dispassionate observer to arrive at the same conclusion (Kunda [1990]).[5] In other words, we expect that internal recipients with dual roles will be perceived as less likely to follow through on received tips, and hence weaken perceptions of deterrence, but only to the extent that there is a moral license (i.e., biased justification) available which would justify this action.

[5] In Kunda's ([1990, 480]) case for Motived Reasoning, it is argued that "there is considerable evidence that people are more likely to arrive at conclusions that they want to arrive at, but their ability to do so is constrained by their ability to construct seemingly reasonable justifications for these conclusions." In a similar vein, Bazerman and Tenbrunsel's ([2011, 79]) explanation of Motivated Blindness indicates that individuals have "a tendency to overlook the unethical behavior of others when it is not in their best interest to notice the infraction".

In an internal whistleblowing setting, we argue that whistleblowers' perceived motives for acting can serve as this moral license. In particular, whistleblowing originating from internal motives is often interpreted as a strong signal of the perceived seriousness of misreporting (Andon et al. [2018], Feldman and Lobel [2010]), whereas whistleblowing originating from external motives, such as financial rewards, is less indicative of the seriousness of misreporting (Nan et al. [2024]). Consequently, the presence of an external motive allows the internal recipient to question whether whistleblowers act as good organizational citizens or merely pursue financial rewards. By contrast, when there are no financial rewards, whistleblowers' internal motives are dominant, and hence, the moral license to abstain from following through is absent. Taken together, this results in a reduced expectation of follow-through by an internal recipient with a dual role when financial rewards for whistleblowers are present. In this context, the impact of financial rewards on the perceived risk of whistleblowing remains unclear. Compared with a situation with no incentives, while the presence of financial whistleblowing rewards can incentivize whistleblowing by some individuals, reduced expectations of follow-through can disincentivize whistleblowing by others.

Taken together, we predict that when internal recipients balance dual role responsibilities, the use of financial whistleblowing rewards, compared to when these are absent, decreases perceptions of deterrence and, as a result, increases employee misreporting. This results in the following formal hypothesis, which is shown in FIG. 1.

> ***H1a (Dual Role).*** The presence of financial whistleblowing rewards, compared to whistleblowing programs with no incentive, increases employee misreporting when the internal recipient has a dual role.

When the internal recipient has only a single role in developing and maintaining the internal whistleblowing program, we expect that financial rewards are an effective deterrent for employee misreporting. In line with their primary role, these internal recipients are motivated by

accuracy goals, which imply that they want to detect as much misreporting as possible. To accomplish this objective, they base their decisions on objective elements, such as the evidence provided, rather than subjective elements, such as whistleblowers' perceived motives (Kunda [1990]). Accordingly, we expect that financial rewards will have no impact on the perceived risk of follow-through. At the same time, however, the use of financial rewards increases the perceived risk of whistleblowing (e.g., Butler et al. [2020]). This aligns with the findings of Feldman and Lobel [2010], who showed that individuals perceive others' behavior as primarily driven by external rather than internal motives. Taken together, financial whistleblowing rewards increase perceptions of deterrence, and in turn, decrease employee misreporting when internal recipients have only a single role. This results in the following formal hypothesis, which is visualized in FIG. 1.

> ***H1b (Single Role).*** The presence of financial whistleblowing rewards, compared to whistleblowing programs with no incentive, decreases employee misreporting when the internal recipient has a single role.

[INSERT FIG. 1]

4. Method

4.1 EXPERIMENTAL DESIGN

We run a three-stage experiment wherein all three actors of the whistleblowing process interact (i.e., misreporter, whistleblower and internal recipient; Near and Miceli [1995]). We manipulate the type of whistleblowing program (i.e., No Incentive or Financial Reward) and internal recipients' role responsibilities (i.e., Single Role or Dual Role) between-subjects. We design the 2 (*Whistleblowing Program*) × 2 (*Role Responsibility*) between-subjects experiment using z-Tree (Fischbacher [2007]).

We use a participative budgeting game in which participants receive a monetary payoff that increases with increasing levels of cost misreporting (e.g., Cardinaels and Yin [2015], Hannan et al. [2010], Maussen et al. [2024]). Each experimental session includes one Internal Recipient and up to eight subordinate-dyads. At the start of the experiment, we randomly assign one participant to the role of Internal Recipient, while the other participants are assigned to one of two subordinate roles: Subordinates_MR (i.e., potential misreporter) or Subordinates_WB (i.e., potential whistleblower). Participants remain in this role throughout the experiment. The experiment includes six periods, which means that participants execute the experimental task six times. In each period, Subordinates_MR are rematched with new Subordinates_WB to avoid spillover effects from one period to another. Appendix 1 provides an example of one period.

4.2 EXPERIMENTAL TASK

The experimental task consists of three stages. In the first stage, Subordinates_MR submit budget requests that state their project costs. All participants know that the actual cost is within the range of [10 ; 100]. Subordinates_MR receive two pieces of information related to their project cost: (1) a cost distribution and (2) a perfect estimation of the actual cost (cf. Appendix 1 – Stage 1). Based on this information, Subordinates_MR report their project cost while facing a financial incentive to overstate this cost. Subordinates_MR can report any cost between the actual cost and the maximum cost of 100 (i.e., the reported cost can be any number within the range of [actual cost, actual cost + 1, … 98, 99, 100]). In line with prior budgeting experiments, Subordinates_MR cannot underreport their cost and are provided with payoff tables for all potential cost reports they can submit (cf. Cardinaels and Yin [2015]). Similar to Maussen et al. [2024], we randomly generate one set of six actual cost draws such that all participants act on the

same cost information. Likewise, we generate one set of six cost distributions, one for each actual cost. All Subordinates_MR receive each cost once but in a randomized order.

In the second stage, Subordinates_WB observe the reported cost by Subordinates_MR and receive an indicative, but not conclusive, signal of the actual cost.[6] In particular, Subordinates_WB receive the exact same cost distribution as Subordinates_MR, but they do not observe the actual cost (cf. Appendix 1 – Stage 2). The information provided in this cost distribution allows Subordinates_WB to infer whether the reported cost by their matched peer is honest or not. Based on this inference, Subordinates_WB must decide whether to blow the whistle on their matched peer. Importantly, when Subordinates_WB blow the whistle, they incur a monetary cost to proxy the costs whistleblowers encounter in practice (i.e., external validity; Dey et al. [2021], Heese and Pérez-Cavazos [2021], Kenny and Fotaki [2023], Spoelma et al. [2021]). Whistleblowing tips are submitted to the designated Internal Recipient. A whistleblowing tip entails a fixed message in which Subordinates_WB must fill out two pieces of information as underlying evidence for their tip: a cost range and the corresponding probability. We provide a number of examples for this in Appendix 1 – Stage 2.

In the third stage, Internal Recipients have discretion over the decision to follow through on the received whistleblowing tip. If Internal Recipients decide to follow through on a whistleblowing tip, it is categorized as accurate or inaccurate depending on whether misreporting is present or absent. While following through on whistleblowing tips is costly for the organization as a whole, it does not have an impact on the Internal Recipient's payoff. We return to this design choice in the next section, where we explain our manipulations.

[6] Brunner and Ostermaier [2019] report that, while subordinates often have good information about their peers' (dis)honest reporting behavior, they still obtain more often indicative than conclusive signals on misreporting. Hence, this design choice strengthens the external validity of our study.

Similar to ultimatum games (e.g., Douthit and Stevens [2015], Maussen et al. [2024], Rankin et al. [2008]), Subordinates_MR receive their payoff for misreporting only when their budget is accepted. Budgets are always accepted unless: (1) Subordinates_WB blow the whistle and (2) this whistleblowing tip is categorized as accurate after follow-through by the Internal Recipient. We communicate the outcomes of all six periods after participants complete the Post Experimental Questionnaire (PEQ). This is to ensure that all participants' behavior is driven by their anticipation of others' behavior and not by observed behavior in prior periods.

4.3 EXPERIMENTAL MANIPULATION

We run a 2 (*Whistleblowing Program*) × 2 (*Role Responsibility*) between-subjects experiment. All information regarding the manipulations is communicated to all participants at the start of the experiment. Our first manipulated factor is the type of *Whistleblowing Program*. Either the whistleblowing program includes No Incentive or a Financial Reward. In the No Incentive *Whistleblowing Program* condition, participants read a code of conduct that specifies what the whistleblowing program entails. Furthermore, the whistleblowing program outlines who the internal recipient is within the organization (cf. Hassink et al. [2007]). In the Financial Reward *Whistleblowing Program* condition, subordinates read the exact same text, but are also notified that they can receive a financial reward if their whistleblowing tip results in the discovery of misreporting. This financial reward amounts to 30% of the misreported amount.

Our second manipulated variable relates to internal recipients' roles in the organization and, more specifically, their role responsibilities. In the Single *Role Responsibility* condition, the Internal Recipient is part of an independent in-house oversight committee. This committee reports directly to the Audit Committee and is responsible for developing and maintaining an effective internal whistleblowing program. In the Dual *Role Responsibility* condition, the Internal

Recipient is the subordinates' direct manager. In this condition, Internal Recipients have dual role responsibilities in the sense that, on the one hand, they are responsible for maximizing firm value and, on the other hand, they also have responsibilities with respect to the internal whistleblowing program. In this situation, developing and maintaining an effective internal whistleblowing program is the shared responsibility of all managers with supervisory duties. This manager reports directly to the CEO.

To make both responsibilities salient, we inform participants that they will receive a number of organizational performance metrics at the end of the experiment. Organizational performance is (positively) [negatively] influenced by the following factors: (1) the number of projects executed, [2] misreporting by Subordinates_MR, [3] the number of follow-through procedures executed by the Internal Recipient, and [4] if applicable, financial rewards for employee whistleblowers. As a result, and similar to other budgeting experiments (e.g., Brüggen and Luft [2016], Cardinaels and Yin [2015], Maussen et al. [2024], Rankin et al. [2008]), executing a given project always has a non-negative impact on organizational performance, but the added value decreases as misreporting increases. Appendix 2 presents a flowchart, including a hypothetical example, of how misreporting, whistleblowing, and follow-through impact organizational performance. The hypothetical example clarifies that organizational performance is maximized when misreporting is absent. However, when misreporting is present, organizational performance is still maximized, at least in the short term, by executing the project. This is in line with the findings of Hersel et al. [2019] that addressing misreporting typically challenges business continuity, thereby reducing firm value in the short term. If organizational performance falls below a certain threshold, Internal Recipients in the Dual *Role Responsibility* condition must write a short memo to the CEO explaining what went wrong within their team. This threshold will be decided upon by executing a pre-test.

4.4 PAYOFFS

Internal Recipients, Subordinates_MR and Subordinates_WB all face different incentives, and hence, their payoff is calculated in a different way. First, Internal Recipients' payoff is fixed, regardless of the experimental condition to which they are assigned. Hence, although Internal Recipients with a dual role are responsible for organizational performance, this does not influence their payoff.

Next, Subordinates_MR's payoff is based on their level of misreporting in one randomly chosen period. Subordinates_MR's payoff is calculated using the following formula:

$$Payoff_{Subordinates\_MR} = (Reported\_Cost - Actual\_Cost) * Budget\_Funding$$

Importantly, Subordinates_MR only receive the misreported amount when their budget request receives funding. The variable *Budget_Funding* equals zero if a submitted whistleblowing tip results in successful discovery of misreporting and one otherwise.

Third and finally, Subordinates_WB's payoff is based on one randomly chosen period. Subordinates_WB's payoff function is as follows:

$$Payoff_{Subordinates\_WB} = (Misreporting * Whistleblowing\_Program * Whistleblowing\_Tip * Whistleblowing\_Outcome) - (Whistleblowing\_Tip * Whistleblowing\_Cost)$$

Subordinates_WB's payoff is influenced by (1) Subordinates_MR's cost report, (2) the type of *Whistleblowing Program*, (3) their own choice of whether to submit a whistleblowing tip, and (4) the Internal Recipient's decision of whether to follow through on the received whistleblowing tip. In the No Incentive *Whistleblowing Program* condition, the variable *Whistleblowing_Program* equals zero and hence, Subordinates_WB only bear the full cost of submitting a whistleblowing tip. This cost proxies for the costs whistleblowers encounter in practice (Dey et al. [2021], Heese and Pérez-Cavazos [2021], Kenny and Fotaki [2023], Spoelma

et al. [2021]). When there is a Financial Reward, Subordinates_WB receive 30% of the misreported amount (i.e., *Misreporting*) if their whistleblowing tip results in the discovery of misreporting (i.e., *Whistleblowing_Outcome* equals 1).

4.5 EXPERIMENTAL PROCEDURES

We conduct a total of sixteen sessions, four per experimental condition. We recruit approximately 272 students from a large university in Western Europe.[7] This ensures that we have approximately 30 Subordinates_MR per experimental condition.[8] At the start of each experimental session, one participant is randomly assigned to the role of Internal Recipient and all other participants assume the role of subordinates. Participants first receive detailed information about the participative budgeting task and their payoff structure. Furthermore, participants are informed of the type of *Whistleblowing Program* and the internal recipient's *Role Responsibility*. To ensure that all participants understand everything correctly, we administer one practice period and a short quiz. They can proceed only when they have answered all questions correctly.

Subordinates are (re-)matched into dyads each period and perform the experimental task six times. After executing the experimental task six times, participants fill out an exit questionnaire (PEQ) that contains several items such as manipulation checks, questions on task

[7] If we recruit approximately 272 students across sixteen experimental sessions, this results in having sixteen participants taking the role of Internal Recipient, 128 participants taking the role of Subordinates_WB and 128 participants taking the role of Subordinates_MR.

[8] We do not perform a power analysis to estimate the optimal number of participants per experimental condition. While we acknowledge that power analysis is a best practice to calculate an appropriate sample size, this requires prior research with similar independent and dependent variables, which is not available due to the novelty of our research, or pilot testing (Bentley [2021]). Pilot testing, however, often requires almost as much effort and expense as conducting the main experiment (Bentley [2021]). As a result, we use a rule of thumb and aim for approximately 30 Subordinates_MR per condition. This is in line with, or even exceeds, the lowest number of participants per experimental condition in other experimental studies in the broad area of misreporting (e.g., Cardinaels and Yin [2015], Elliott, Krische and Peecher [2010], Maas and Van Rinsum [2013]) or broad area of experimental accounting research (e.g., Griffin [2014], Knechel and Leiby [2016], Libby and Rennekamp [2012]).

understanding, control variables, process variables and demographic questions (cf. **TABLE 1**). All variables are measured using a seven-point Likert scale, except for manipulation checks, questions on task understanding, and demographics. Control variables include *Preferences for Honesty* and *Wealth*, *Protected Values* (Gibson, Tanner and Wagner [2013]) and *Dark Triad of Personalities* (including Psychopathy, Narcissism and Machiavellianism; Jonason and Webster [2010]). The key process variable for this study concerns *Perceptions of Deterrence*, which includes both the perceived risk of whistleblowing and the perceived risk of the internal recipient taking corrective action after receiving a whistleblowing tip. Once participants have completed the PEQ, they are notified of the outcome of each of the six periods, organizational performance during the session, and their final payoff.

[INSERT **TABLE 1**]

4.6 DEPENDENT VARIABLE

Our main variable of interest is Subordinates_MR's mean level of misreporting. As in prior budgeting experiments (e.g., Cardinaels and Yin [2015], Evans et al. [2001], Maussen et al. [2024]), we measure the mean level of misreporting as follows:

$$Misreporting = \frac{1}{6}\sum_{i=1}^{6}\frac{Reported\_Cost_i - Actual\_Cost_i}{Maximum\_Cost_i - Actual\_Cost_i}$$

As an alternative way to test our hypotheses, we conduct a Repeated Measures ANOVA (RM-ANOVA), in which we include *Period* as a within-subjects factor. In this analysis, *Misreporting* equals the misreported amount divided by the maximum possible amount of misreporting in any given period.

5. *Planned analyses*

We perform our analyses on the data generated by those participants assigned to the role of Subordinates_MR (expected $N = 128$). As a result, the analyses discussed in subsection 5.1 up to subsection 5.6 relate to the behavior of Subordinates_MR. However, because we also gather a substantial number of observations from Subordinates_WB (expected $N = 128$) and a limited number of observations from participants taking the role of Internal Recipient (expected $N = 16$), we also perform additional analyses based on these data, which we discuss in subsection 5.7.

5.1 FACTOR ANALYSIS

In the first step, we perform exploratory (EFA) and confirmatory (CFA) factor analyses on all control and process variables composed of multiple items (i.e., questions). These variables include (1) *Protected Values* (Gibson et al. [2013]), (2) *Dark Triad of Personalities* (Jonason and Webster [2010]), and (3) *Perceptions of Deterrence* (cf. **TABLE 1**).

The EFA allows us to see how many constructs should be created for our item questions. Based on the factor loadings, we can identify whether the requirements of convergent and discriminant validity are met. Based on a combination of theoretical insights, particularly for validated scales such as *Protected Values* and *Dark Triad of Personalities*, and statistical inferences, items with a standardized factor loading below < 0.400 on the construct of interest (i.e., convergent validity) should be interpreted with caution or removed. Likewise, items with a standardized factor loading of > 0.400 on constructs that are not related to the item (i.e., discriminant validity) should be interpreted with caution or removed. Furthermore, only those constructs for which the Cronbach's alpha amounts to at least 0.600 are considered reliable. The EFA is especially insightful when developing a new scale, such as our measure of *Perceptions of Deterrence*.

After performing the EFA, we follow up with a CFA in which we define which items belong to each construct (latent variable). In the CFA, only the factor loadings that we define are estimated. For established scales such as *Protected Values* (Gibson et al. [2013]) and *Dark Triad of Personalities* (Jonason and Webster [2010]), we combine theoretical insights from prior literature as well as the results from our EFA to define these relationships. For our self-developed measure of *Perceptions of Deterrence*, we define these relationships based on the EFA. We calculate fit indices such as χ^2 and *p*-value ($p \geq 0.100$), Comparative Fit Index (CFI ≥ 0.900), Tucker-Lewis Index (TLI ≥ 0.900), Root Mean Square Error of Approximation (RMSEA ≤ 0.100) and Standard Root Mean Square Residual (SRMR ≤ 0.100) to infer whether our data are a good fit for the specified model. Only the constructs for which the combination of these indices indicates a good fit are used in the analyses.

5.2 MANIPULATION AND RANDOMIZATION CHECKS

We include three manipulation checks in the PEQ to ensure that participants understand the manipulations (cf. **TABLE 1**). In an additional analysis (i.e., robustness check), we conduct all tests again, excluding those participants who fail at least one manipulation check to ensure that those, potentially inattentive, participants do not influence our results. Furthermore, to check whether our random assignment to experimental conditions is successful, we perform a χ^2 test on *Gender* and items related to *Task Understanding* and one-way ANOVA's on variables that we expect to be similar across conditions. These include (1) *Age*, (2) *Work Experience*, (3) *Preferences for Honesty*, (4) *Preferences for Wealth*, (5) *Protected Values*, and (6) *Dark Triad of Personalities*. If we find significant differences ($p \leq 0.100$) across conditions for one of these variables, we include them as covariates in a robustness check.

5.3 DESCRIPTIVES

To provide descriptive insights into our dataset, and especially into our dependent variable *Misreporting*, we report the mean and standard deviation of Subordinates_MR their average misreported amounts in **TABLE 2**. We also provide a hypothetical simulation of the average level of *Misreporting* per experimental condition for each of the six periods in FIG. 2. This hypothetical simulation is based on our hypotheses.

[INSERT **TABLE 2**]

[INSERT FIG. 2]

5.4 *HYPOTHESES TESTING*

To test our hypotheses, we perform a Two-Way ANOVA in which we include *Whistleblowing Program* and *Role Responsibility* as independent variables and *Misreporting* as the dependent variable (cf. **TABLE 3**). In Panel A of **TABLE 3**, we expect a significant interaction effect between *Whistleblowing Program* and *Role Responsibility* ($p \leq 0.100$). Conditional on a significant interaction effect, we follow up with simple effect tests, as shown in Panel B of **TABLE 3**. A significant positive effect of *Whistleblowing Program* given Dual Role provides evidence that the presence of a financial whistleblowing reward, compared to a whistleblowing program with no incentive, increases employee misreporting when the internal recipient has dual role responsibilities (i.e., H1a). A significant negative effect of *Whistleblowing Program* given Single Role provides evidence that the presence of a financial whistleblowing reward, compared to a whistleblowing program with no incentive, decreases employee misreporting when the internal recipient has a single role responsibility (i.e., H1b).

[INSERT **TABLE 3**]

To provide further evidence of our hypotheses, we perform a Repeated Measures ANOVA (RM-ANOVA) with *Whistleblowing Program*, *Role Responsibility* and *Period* as independent variables (cf. **TABLE 4**). In this analysis, our dependent variable, *Misreporting*, equals the participants' misreported amount divided by the maximum possible amount of misreporting in any given period. Hence, unlike our main analysis, this is not the average of all six periods and provides insights into how participants' misreporting behavior changes from one period to another. Importantly, we do not expect to observe a learning effect from one period to another. This means that we do not expect a significant three-way interaction between *Period* and our manipulated variables (i.e., *Whistleblowing Program* and *Role Responsibility*), nor do we expect any of the two-way interactions with *Period* to be significant (cf. **TABLE 4**, Panel A). Following a backward elimination process, we remove the expected non-significant ($p > 0.100$) three-way interaction term (i.e., *Whistleblowing Program* × *Role Responsibility* × *Period*) and, subsequently, the two-way interaction terms with *Period* (i.e., *Whistleblowing Program* × *Period* and *Role Responsibility* × *Period*). This results in the model depicted in **TABLE 4**, Panel B. Conditional on a significant two-way interaction between *Whistleblowing Program* and *Role Responsibility* ($p \leq 0.100$), we follow up with simple effect tests in Panel C of **TABLE 4**. The interpretation of simple effects is identical to that provided in **TABLE 3**, Panel B.

[INSERT **TABLE 4**]

5.5 PROCESS EVIDENCE

We provide process evidence by testing the causal model depicted in FIG. 3. We use structural equations-based path analysis to estimate the causal model with R (Lavaan). To capture participants' perceptions of deterrence, we use the measure developed in section *5.1 Factor Analysis*.

We test whether the structural model depicted in FIG. 3 shows a good fit for the data by calculating fit indices such as χ^2 and *p*-value ($p \geq 0.100$), Comparative Fit Index (CFI ≥ 0.900), Tucker-Lewis Index (TLI ≥ 0.900), Root Mean Square Error of Approximation (RMSEA ≤ 0.100) and Standard Root Mean Square Residual (SRMR ≤ 0.100). The model in FIG. 3, which shows moderated mediation, has *Whistleblowing Program* as an independent variable, *Role Responsibility* as a moderator, *Perceptions of Deterrence* as a mediator, and *Misreporting* as the dependent variable. We estimate both the indirect effect of *Whistleblowing Program* through *Perceptions of Deterrence* on *Misreporting* as well as the direct effect of *Whistleblowing Program* on *Misreporting* (**TABLE 5**, Panel A). Evidence for our underlying process is found when the effect of *Whistleblowing Program* on *Perceptions of Deterrence* is significant and negative when Internal Recipients have a Dual Role [a1], and significant and positive when Internal Recipients have a Single Role [a2]. Second, our hypotheses predict a significant negative effect of *Perceptions of Deterrence* on *Misreporting* [b], such that stronger perceptions of deterrence result in less misreporting. To provide strong evidence of this interaction, we follow Rigdon, Schumacker and Wothke [1998] and compare an unrestricted model, where the paths from *Whistleblowing Program* to *Perceptions of Deterrence* [a1, a2] and from *Whistleblowing Program* to *Misreporting* [c1, c2] can vary across the different levels of *Role Responsibility*, with a restricted model, where the unstandardized paths are restricted to be the same under both levels of *Role Responsibility*. There is evidence that the interaction is significant and support for our underlying theory only if the unrestricted model shows a significantly better fit for the data than does the restricted model ($p \leq 0.100$). Finally, Panel B of **TABLE 5** shows the total effect of *Whistleblowing Program* on *Misreporting*.

5.6 ROBUSTNESS CHECKS

If randomization with regard to one of our control variables is not successful, we include these variables as covariates in an ANCOVA and test the hypotheses again. The interpretation of the results remains identical as explained in section *5.4 HYPOTHESES TESTING*.

5.7 WHISTLEBLOWERS AND INTERNAL RECIPIENTS

In addition to our main analyses, we collect data on approximately 128 Subordinates_WB their whistleblowing behavior and sixteen Internal Recipients' behavior. While it is not the objective of this study to make predictions of their actual behavior, but rather the effect of their perceived motives on Subordinates_MR's misreporting behavior, analyzing these data provides insights into whether their perceived motives are a correct anticipation of their actual behavior. In particular, Feldman and Lobel [2010] reported that participants predicted that others would behave according to their self-interest and be primarily incentivized by external motives. At the same time however, these participants expected their own behavior to be primarily driven by internal motives. This assumption can be tested by analyzing Subordinates_WB and Internal Recipients their actual behavior.

A second additional set of tests we perform uses *Organizational Performance* as the dependent variable. For this, we have sixteen observations, one per experimental session. Although the power of this analysis is low, it can provide insights into the impact of different internal whistleblowing programs on organizational performance. Alternatively, we can examine organizational performance at the subordinate level, which substantially increases the number of observations.

6. Implications and risks

We believe that our planned experiment will generate much needed insight that will contribute to the development of more effective internal whistleblowing programs. Since the behavior of whistleblowers and internal recipients is typically difficult to observe (Smaili et al. [2023], Treviño et al. [2014]), our lab experiment adds to the findings of recent field experiments on internal whistleblowing programs (e.g., Soltes [2020]). A major advantage of our lab experiment is that we can observe individuals' misreporting behavior instead of relying on a proxy, such as the commonly used *F-score* (e.g., Berger and Lee [2022]), or on detected misreporting (e.g., Bereskin et al. [2020]). A second advantage is that our setting allows us to study whether anticipation of employee whistleblowers' or internal recipients' behavior has the strongest effect on individuals' misreporting behavior. The results of this study will allow us to generate insights into which of the two actors, whistleblowers or internal recipients, serve as the bottleneck for effective internal whistleblowing programs.

Our study is not without limitations and risks. First, as with most lab experiments, our tightly controlled setting limits the external validity. While we acknowledge that individuals' misreporting behavior is likely to be driven by other factors in their environment, the great care we take in removing the impact of these factors in our experimental setting is necessary to provide a clean test of our underlying theory. Second, our hypotheses, strongly developed through Perceptual Deterrence Theory (Nagin [2013]), imply that individuals anticipate not only whistleblowers' behavior but also internal recipients' behavior, and more importantly, the interaction between their behaviors. This requires participants to have an exceptionally good understanding of the experimental design. To control for this, we employ strategies such as having a practice period and quiz prior to starting the experimental task. However, even when

participants understand the experimental design perfectly, we are not aware of any prior literature that assures that individuals' misreporting behavior is reflective of the interactive behaviors of others in their environment.

Appendices

APPENDIX 1

Below, we provide an example of one period including the three stages. The numbers in ***[brackets]*** show a hypothetical example.

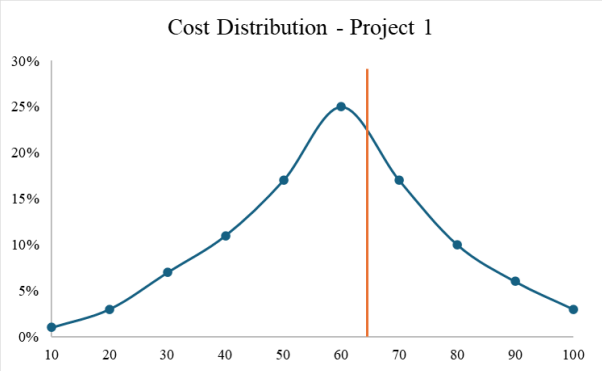
Stage 1 – Budgeting Stage (Information for Subordinates_MR)

Below, you can find the cost distribution for your specific project. Furthermore, you know that the actual cost of your project equals: 65 .

Cost Distribution - Project 1

Probability (%)	1	3	7	11	17	25	17	10	6	3
Cost	10	20	30	40	50	60	70	80	90	100

Actual cost	65



Action required	
Please submit your budget request by filling in your project cost:	***[90]***
This results in the following payoff: ***[90 – 65]***	***[25]***

Stage 2 – Whistleblowing Stage (Information for Subordinates_WB)

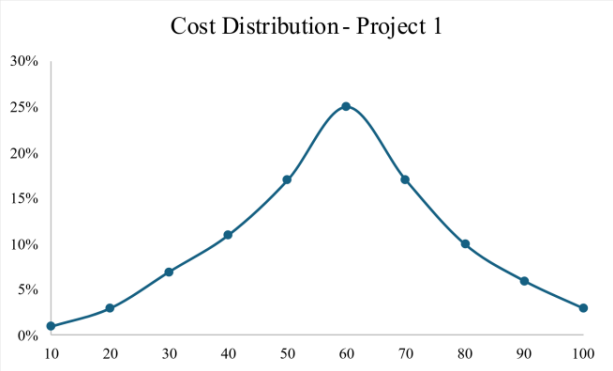
Your matched peer has submitted a budget request including the following project cost: ***[90]***

The following information is available for this project.

Cost Distribution - Project 1

Probability (%)	1	3	7	11	17	25	17	10	6	3
Cost	10	20	30	40	50	60	70	80	90	100

Reported cost	90



Action required	
I believe the reported cost by my peer is correct.	○
I believe the reported cost by my peer is not correct. I wish to submit a whistleblowing tip. I have gathered the following information: *The actual cost ranges between […] and […] with a […%] probability.*	○

The orange brackets '*[…]*' must be completed by Subordinates_WB. Subordinates_WB can, for example, provide the following information to the Internal Recipient when blowing the whistle:

The actual cost ranges between [50] and [60] with a [42%] probability.
The actual cost ranges between [50] and [70] with a [59%] probability.
The actual cost ranges between [40] and [80] with a [80%] probability.
The actual cost ranges between [10] and [80] with a [91%] probability.

Stage 3 – Follow-through – Only if whistleblowing is present in stage 2 (Information for the Internal Recipient)

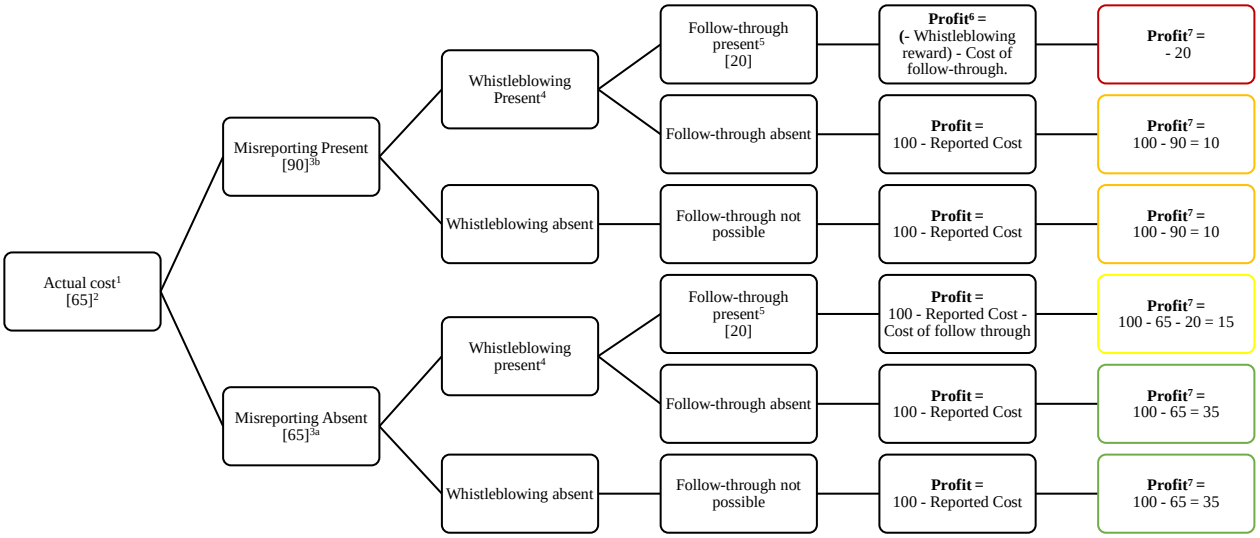
You have received a whistleblowing tip from one of your subordinates. This is related to Project 1. You have received the following information:

Whistleblowing tip	I believe the reported cost by my peer is not correct. I wish to submit a whistleblowing tip. I have gathered the following information: *The actual cost ranges between [...] and [...] with a [...%] probability.*
Reported cost	90

Action required	
I do not wish to follow through on this submitted tip. The requested resources can be provided and the project can be executed.	○
I wish to follow through on this submitted tip.	○

Outcome of projects

The outcome of each project, including whether a whistleblowing tip was submitted and whether there was follow through on a given whistleblowing tip, is communicated only after participants have completed the PEQ. Together with this, participants learn their final payoff.



APPENDIX 2

This appendix provides a hypothetical example of how Subordinates_MR, Subordinates_WB, and Internal Recipients their choices affect organizational performance. The numbers between [brackets] show a hypothetical example. All numbers between brackets refer to costs. [1]The actual cost ranges from 10 to 100. [2]In this specific example, the actual cost is [65]. Subordinates_MR choose to either [3a]report honestly [65] or [3b]overstate the project cost [90]. In Stage 2, [4]Subordinates_WB observe the reported cost and decide to blow the whistle or agree with the reported cost. Whistleblowing is costly for the employee who blows the whistle, not for the organization as a whole. [5]If whistleblowing is present, the Internal Recipient has the choice to follow through on the whistleblowing tip or not. Following through on tips is costly for the organization as a whole [20]. Depending on the outcome of the follow-through procedure, that is, misreporting is present or absent, project funding is denied or provided, respectively. [6]After stage 3 has been completed, the organization's profit is calculated as follows:

Project funding denied: - Whistleblowing reward (if present) – Cost of follow-through

Project funding provided: 100 – Reported Cost – Cost of follow-through (if present)

[7]The example clarifies that the highest value is generated by projects in which misreporting is absent. However, if misreporting is present, it is still possible for the organization to create value. This requires that the internal recipient does not follow through on a given whistleblowing tip. Hence, while following

through on whistleblowing tips is likely profitable in the long run (i.e., by creating a stronger culture of deterrence), this is not necessarily the case in the short run.

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Figures

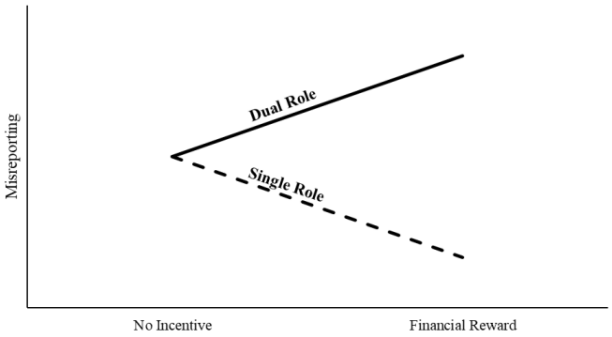

FIG. 1.–This figure shows the formal hypotheses with *Misreporting* (cf. Section 4.6) as the dependent variable. H1a relates to the upward slope Dual Role and H1b relates to the downward slope Single Role.

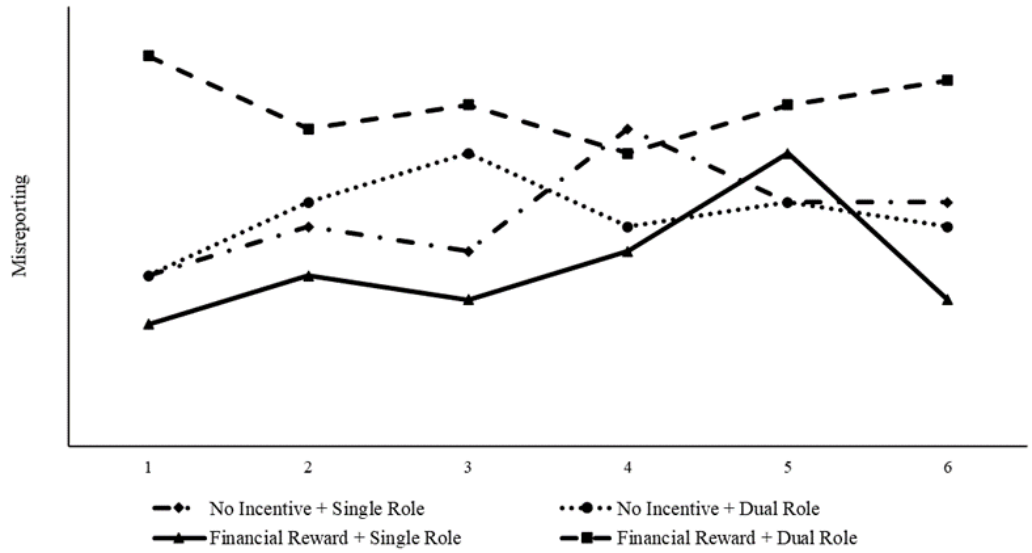

FIG. 2.–This figure shows a hypothetical simulation of the expected average amount of *Misreporting* per experimental condition across the six periods. This hypothetical simulation is in line with our hypotheses.

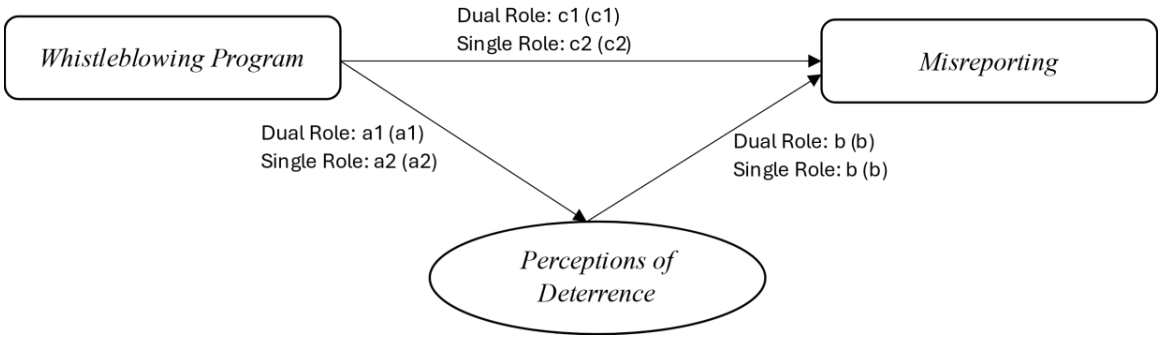

FIG. 3.–This figure shows the causal model underlying our hypotheses. We expect that the unconstrained model (where paths 'a' and 'c' are free) will result in a significantly better model ($p \leq 0.100$) than the constrained model, where paths 'a' and 'c' are restricted to be the same across different levels of *Role Responsibility*. This figure reports the unstandardized (standardized) path coefficients resulting from structural equation modeling in R (Lavaan). *, **, *** indicate significance at the 10%, 5% and 1% level respectively (two-tailed). The overall goodness of fit is assessed using the following fit indices: χ^2 and *p*-value ($p > 0.100$), Comparative Fit Index (CFI ≥ 0.900), Tucker-Lewis index (TLI ≥ 0.900), Root Mean Square Error of Approximation (RMSEA ≤ 0.100) and Standard Root Mean Square Residual (SRMR ≤ 0.100). We find evidence for our hypotheses when the effect of *Whistleblowing Program* through *Perceptions of Deterrence* on *Misreporting* is significant and positive when internal recipients have a dual role (H1a: a1*b), but significant and negative when internal recipients have a single role (H1b: a2*b; cf. **TABLE 5**).

Tables

TABLE 1
Post Experimental Questionnaire (PEQ) items

Manipulation checks	Statement (0 = False, 1 = True)
Item 1	In my organization, whistleblowers receive a financial reward if their whistleblowing tip results in the successful discovery of misreporting.
Item 2	In my organization, employees are expected to submit their whistleblowing tips to their direct manager.
Item 3	In my organization, there is an independent in-house oversight committee which receives and handles whistleblowing tips.
Task understanding	Statement (0 = False, 1 = True)
Item 1	If I misreported my project cost, my payoff could increase.
Item 2	My matched peer was obliged to blow the whistle on me for misreporting.
Item 3	The Internal Recipient was obliged to follow through on whistleblowing tips.
Realism and Instructions	Statement (0 = Completely disagree, 7 = Completely agree)
Item 1	The task was realistic.
Item 2	The instructions were clearly formulated.
Item 3	I thought the budgeting task was fun to perform.
Perceptions of Deterrence	Statement (0 = Completely disagree, 7 = Completely agree)
Item 1 (Whistleblowing)	My matched peer was motivated to blow the whistle.
Item 2 (Whistleblowing)	I expected my matched peer to blow the whistle when observing a misreported cost.
Item 3 (Follow-through)	The internal recipient was motivated to follow through on received tips.
Item 4 (Follow-through)	I expected the internal recipient to follow through on received tips.
Item 5 (Credibility)	If my matched peer blew the whistle on me, his/her whistleblowing tip sends a credible signal of whether I actually misreported.
Preferences for Honesty	Statement (0 = Completely disagree, 7 = Completely agree)
Item 1	I found budgeting honestly important.
Item 2	My preference to be honest was influenced by the presence of my matched peer.
Item 3	My preference to be honest was influenced by the presence of the internal recipient in the organization.
Preferences for Wealth	Statement (0 = Completely disagree, 7 = Completely agree)
Item 1	I wanted to maximize my own wealth.

Item 2	I found the distribution of wealth between the organization and me fair.
Protected Values	Statement (0 = Completely disagree, 7 = Completely agree)
Item 1 (Direct)	Misreporting a project cost is immoral.
Item 2 (Direct)	Misreporting a project cost is praiseworthy.
Item 3 (Direct)	Misreporting a project cost is blameworthy.
Item 4 (Direct)	Misreporting a project cost is outrageous.
Item 5 (Direct)	Misreporting a project cost is acceptable.
Item 6 (Indirect)	Truthfulness is something that one should not sacrifice, no matter what the (material or other) benefits are.
Item 7 (Indirect)	Truthfulness is something for which I think it is right to make a cost-benefit analysis.
Item 8 (Indirect)	Truthfulness is something that cannot be measured in monetary terms.
Item 9 (Indirect)	Truthfulness is something about which I can be flexible if the situation demands it.
Dark Triad of personalities	Statement (0 = Completely disagree, 7 = Completely agree)
Item 1 (Machiavellianism)	I tend to manipulate others to get my way.
Item 2 (Machiavellianism)	I have used deceit or lied to get my way.
Item 3 (Machiavellianism)	I have used flattery to get my way.
Item 4 (Machiavellianism)	I tend to exploit others towards my own end.
Item 5 (Psychopathy)	I tend to lack remorse.
Item 6 (Psychopathy)	I tend to be unconcerned with the morality of my actions.
Item 7 (Psychopathy)	I tend to be callous or insensitive.
Item 8 (Psychopathy)	I tend to be cynical.
Item 9 (Narcissism)	I tend to want others to admire me.
Item 10 (Narcissism)	I tend to want others to pay attention to me.
Item 11 (Narcissism)	I tend to seek prestige or status.
Item 12 (Narcissism)	I tend to expect special favors from others.
Demographics	
Age	What is your birthyear?
Gender	Male / Female / X
Work Experience	How many years of (part time) work experience (e.g. student jobs, internships, …) do you have (in months)?
Accounting Courses	How many accounting courses did you already take?

This table presents an overview of the items included in the Post Experimental Questionnaire.

TABLE 2

Descriptive Statistics of *Misreporting*

	Dual Role	Single Role	Total
No Incentive	M (s.d.) *N*	M (s.d.) *N*	M (s.d.) *N*
Financial Reward	M (s.d.) *N*	M (s.d.) *N*	M (s.d.) *N*
Total	M (s.d.) *N*	M (s.d.) *N*	M (s.d.) *N*

This table reports the descriptive statistics per experimental condition as well as for the overall sample. Each cell first reports the average amount of *Misreporting*. The numbers in parentheses refer to the corresponding standard deviation. Finally, '*N*' represents the number of participants in each cell. *Misreporting* is calculated as the average misreported amount divided by the maximum possible amount of misreporting across the six periods (cf. section 4.6).

TABLE 3

Hypotheses testing

Panel A: Two-Way ANOVA: $F_{(n-1,\ df)}$ = , $p \leq 0.100$				
Factor	SS	*F*-value	df	*p*-value
Whistleblowing Program			1	
Role Responsibility			1	
Whistleblowing Program × *Role Responsibility*			1	≤ 0.100
Error				

Panel B: Follow-up simple effect tests			
Simple effects	*F*-value	df	*p*-value
Effect of *Whistleblowing Program* given Dual Role		1	≤ 0.100
Effect of *Whistleblowing Program* given Single Role		1	≤ 0.100
Effect of *Role Responsibility* given No Incentive		1	?
Effect of *Role Responsibility* given Financial Reward		1	≤ 0.100

Panel A of this table reports the results of an ANOVA with our manipulated variables, *Whistleblowing Program* and *Role Responsibility*, as well as their interaction as independent variables, and *Misreporting* as the dependent variable. In this table, we test H1a and H1b. *, **, *** indicate significance at the 10%, 5%, and 1% levels respectively (two-tailed). All *p*-values in this table are hypothetical and do not reflect actual data collection. To find evidence for our hypotheses, the interaction effect between *Whistleblowing Program* and *Role Responsibility* should be significant ($p \leq 0.100$). Conditional on this significant interaction effect, we can follow up with the simple effect tests displayed in Panel B. A significant positive simple effect of *Whistleblowing Program* given Dual Role provides evidence for H1a: "The presence of financial whistleblowing rewards, compared to whistleblowing programs with no incentive, increases employee misreporting when the internal recipient has dual responsibilities.". A significant negative simple effect of *Whistleblowing Program* given Single Role provides evidence for H1b: "The presence of financial whistleblowing rewards, compared to whistleblowing programs with no incentive, decreases employee misreporting when the internal recipient has a single responsibility.". While we do not develop formal hypotheses for the simple effect of *Role Responsibility* given either No Incentive or Financial Reward, as a consequence of H1a and H1b, we expect a significant simple effect of *Role Responsibility* given Financial Reward. The simple effect of *Role Responsibility* given No Incentive is ex ante unclear.

TABLE 4

Hypotheses testing with the alternative measure of *Misreporting*

Panel A: Repeated Measures ANOVA: $F_{(n-1,\ df)}$ = , p =				
Factor	SS	*F*-value	df	*p*-value
Whistleblowing Program			1	
Role Responsibility			1	
Period			5	
Whistleblowing Program × *Role Responsibility*			1	≤ 0.100
Whistleblowing Program × *Period*			5	≥ 0.100
Role Responsibility × *Period*			5	≥ 0.100
Whistleblowing Program × *Role Responsibility* × *Period*			5	≥ 0.100
Error				
Panel B: Repeated Measures ANOVA: $F_{(n-1,\ df)}$ = , $p \leq 0.100$				
Factor	SS	*F*-value	df	*p*-value
Whistleblowing Program			1	
Role Responsibility			1	
Period			5	
Whistleblowing Program × *Role Responsibility*			1	≤ 0.100
Error				
Panel C: Follow-up simple effect tests				
Simple effects			*F*-value	df	*p*-value
Effect of *Whistleblowing Program* given Dual Role			1	≤ 0.100
Effect of *Whistleblowing Program* given Single Role			1	≤ 0.100
Effect of *Role Responsibility* given No Incentive			1	?
Effect of *Role Responsibility* given Financial Reward			1	≤ 0.100

Panel A of this table reports the results of a Repeated Measures ANOVA (RM-ANOVA) with our manipulated variables *Whistleblowing Program* and *Role Responsibility* as well as *Period* as independent variables and *Misreporting* as the dependent variable. We include all possible two-way and three-way interactions in Panel A. In this table, we test both H1a and H1b using the alternative measure of *Misreporting* as outlined in section 4.6. *, **, *** indicate significance at the 10%, 5%, and 1% levels respectively (two-tailed). All *p*-values in this table are hypothetical and do not reflect any actual data collection. We perform a backward elimination process. We do not expect the three-way interaction term to be significant (i.e., $p \geq 0.100$). In a second untabulated step, we run the model again excluding the three-way interaction but still including all three two-way interaction terms.

Again, we do not expect any significant interactions between *Period* and either *Whistleblowing Program* or *Role Responsibility* (i.e., $p \geq 0.100$). In step three, we come to the model presented in Panel B, which is largely similar to the model in Panel A of **TABLE 3**, however, in **TABLE 4**, we use the alternative measure of *Misreporting*. In Panel B, we expect a significant interaction between *Whistleblowing Program* and *Role Responsibility*. Conditional on this significant interaction effect, we follow up with the simple effect tests displayed in Panel C. The interpretation of simple effects is identical to that given in **TABLE 3**. In particular, a significant positive simple effect of *Whistleblowing Program* given Dual Role provides evidence for H1a: "The presence of financial whistleblowing rewards, compared to whistleblowing programs with no incentive, increases employee misreporting when the internal recipient has dual responsibilities.". A significant negative simple effect of *Whistleblowing Program* given Single Role provides evidence for H1b: "The presence of financial whistleblowing rewards, compared to whistleblowing programs with no incentive, decreases employee misreporting when the internal recipient has a single responsibility.". While we do not develop formal hypotheses for the simple effect of *Role Responsibility* given either No Incentive or Financial Reward, as a consequence of H1a and H1b, we expect a significant simple effect of *Role Responsibility* given Financial Reward. The simple effect of *Role Responsibility* given No Incentive is ex ante not clear.

TABLE 5

Indirect and total effects causal model

Panel A: Indirect effects			
	Estimate	Std. Estimate	*p*-value
Dual Role: a1*b	Positive	Positive	≤ 0.100
Single Role: a2*b	Negative	Negative	≤ 0.100
Panel B: Total effects			
	Estimate	Std. Estimate	*p*-value
Dual Role: c1 + (a1*b)	Positive	Positive	≤ 0.100
Single Role: c2 + (a2*b)	Negative	Negative	≤ 0.100

This table must be interpreted together with FIG. 3. The table presents the indirect effect and total effect of *Whistleblowing Program* through *Perceptions of Deterrence* on *Misreporting*. *, **, ***, indicate significance at the 10%, 5%, and 1% levels respectively (two-tailed). To find evidence for our underlying theory, the indirect effect of *Whistleblowing Program* through *Perceptions of Deterrence* on *Misreporting* should be significant and positive when *Role Responsibility* is Dual Role (i.e., $p \leq 0.100$) and significant and negative when *Role Responsibility* is Single Role (i.e., $p \leq 0.100$).

sustainability reporting

The Impact of Overlap between the CSR and Compensation Committee on CSR Contracting Quality

Abstract

Previous research identifies determinants of CSR contracting quality, such as financial, sustainability, and board composition characteristics. However, these studies often overlook the dynamics between different governance mechanisms involved in such contracting. The board of directors distributes responsibilities across various committees, with the compensation committee (CC) setting CEO compensation and the CSR committee (CSRC) fulfilling an important advisory role about a firm's CSR strategy. This study examines the effects of having directors that serve both the CSR committee and the compensation committee on CSR contracting quality in CEO's compensation package. Consistent with the knowledge spillover theory, we expect directors serving both committees to be better informed about a firm's CSR strategy, allowing them to implement CSR contracting in a more substantive and qualitative way. Using a US sample of 2,097 firm-year observations from 2003-2021 with a CSR committee, we find that CC-CSRC overlap is positively associated with the quality of CSR contracting, supporting the knowledge spillover theory. These results are robust to several sensitivity tests, as well as falsification tests to rule out alternative explanations. Further, while our CSR contracting quality measure consists of different quality factors, we find in additional analyses that our results are mainly driven by the consideration of more diverse stakeholder interests.

Keywords CSR contracting quality – committee overlap – compensation committee – CSR committee – CEO compensation – corporate governance

1. Introduction

Due to growing demands from customers, employees, shareholders, and stricter regulations on CSR (e.g., CSRD, California's S.B. 253 and 261 and the SEC climate-related disclosure rule), firms increasingly emphasize corporate social responsibility (CSR), prioritizing their employees, the environment, product quality, and the broader community. To reinforce this commitment, many firms are exploring ways to directly incentivize CEOs on these matters. One increasingly popular method is the inclusion of CSR criteria in compensation packages, a practice known as CSR contracting. For instance, S&P500 companies such as Apple, Chipotle, McDonald's, and National Grid link CSR metrics to executive compensation (Trellis, 2022). While this pay structure is set up to incentivize the CEO, Bebchuck and Tallarita (2022) point out that there are two structural problems with CSR contracting. Namely, (1) CSR contracting is often only linked to a limited amount of CSR dimensions, and (2) the metrics are often not transparent, which can lead to agency problems. Therefore, it is crucial to gain more clarity on how to effectively set-up high-quality CSR contracting, rather than implementing it without careful consideration. In addition to blind implementation, anecdotical evidence also highlights instances of blind attribution. For instance, Marathon Petroleum's CEO received a large bonus for reaching an environmental goal, despite the company spilling hundreds of barrels of oil (The Washington Post, 2021).

Even though CEO compensation contracts have long been a focal point in both practice and research, integrating CSR criteria has only attracted significant interest in the last decade. Anecdotical evidence posits that incorporating CSR criteria into CEO compensation packages is challenging due to the difficulty in accurately measuring CSR impact, aligning long-term CSR goals with short-term financial performance, and balancing expectations of different stakeholders (PWC, 2021; Washington and Spierings, 2023). Nonetheless, prior research has mainly focused on the mere presence of CSR criteria in executive compensation, rather than

their substantive quality (Velte, 2024; Flammer et al., 2019; Yang, 2023). High-quality CSR contracting should address diverse stakeholder interests (Freeman, 1984), include verifiable and quantitative measures (Kolk and Perego, 2014), and provide clear weights for transparency (Flammer et al., 2019). Moreover, while prior studies have identified several governance mechanisms as determinants of CSR contracting (Ikram et al. 2023; Velte, 2024), most of these studies fail to account for synergies that might arise between these mechanisms. Nonetheless, the board is characterized by a very specific structure, with most of the board's decision-making taking place in board committees (Kesner, 1988). The two committees that have a significant stake in the implementation of high-quality CSR contracting are the mandatory compensation committee, which designs the CEO's compensation package (Wachtell et al., 2023), and the voluntary CSR committee, which addresses CSR-oriented issues, policies, and reporting (Deloitte, 2020; Biswas et al., 2018) and may thus want the CEO to be incentivized accordingly. While the decision to incorporate CSR metrics in CEO's compensation plan ultimately lies with the compensation committee, these directors might not have sufficient knowledge about CSR in general and the firm's CSR strategy to do so in a substantive way. Thus, having overlapping directors who also sit on the CSR committee might be a prerequisite for designing high-quality CSR metrics. As such, in line with the knowledge spillover theory (e.g., Brandes et al., 2016), one might argue that the knowledge of CSR committee members who also serve on the compensation committee can aid in integrating CSR perspectives into executive compensation packages in a meaningful way. However, other studies find that board committee overlaps can lead to diminished monitoring due to overburdened directors (Biswas et al., 2018). It therefore remains an open question whether director overlap between the compensation and CSR committee (CC-CSRC overlap) enhances CSR contracting quality. As such, this will be the focus of this paper.

Following Yang (2023), we measure CSR contracting quality by performing a principal component analysis using four dimensions: the number of CSR dimensions, the relative concentration of these dimensions, the quantitative verifiability of the metrics, and whether there are clear weights attached to the CSR contracts. Since we are interested in the effects of CC-CSRC overlap, we focus on a sample of firms with both committees present. While the compensation committee is obligatory for the companies in our sample of large US-listed firms, a CSR committee is not. This sample restriction leaves us with a final sample of 2,097 firm-year observations from 2003-2021 that have a CSR committee.[1] We find that greater CC-CSRC overlap, i.e., a higher proportion of compensation committee directors also serving on the CSR committee, is positively associated with CSR contracting quality. In additional analyses, we find that this positive association is mainly driven by the consideration of diverse stakeholder interests, as illustrated by the inclusion of more CSR dimensions. Directors serving on both the compensation and CSR committee likely have a more holistic understanding of the company's CSR priorities and strategies. This dual perspective enables them to incorporate a broader range of CSR dimensions into CEO compensation packages because they are familiar with the company's goals across all dimensions of CSR. Additionally, marginally by whether there is a clear weight attached. Further, we find CC-CSRC overlap does not necessarily lead to CSR contracting being implemented more often, but rather to its implementation being of higher quality. With insights from the CSR committee, overlapping directors may push for the inclusion of diverse and verifiable metrics, ensuring that CSR metrics are implemented in a robust and credible manner rather than in a superficial or tokenistic way. Moreover, we run some falsification and sensitivity tests to test for robustness and to rule out potential alternative explanations.

[1] As an alternative specification, we use the full sample while employing entropy balancing and propensity score matching to remove fundamental differences between firms with and without a CSR committee as a sensitivity test. These tests illustrate the robustness of our findings.

With these findings, we contribute to the literature in several ways. First, we enhance the CEO compensation literature by focusing on CSR contracting quality. In line with Antoons, Cardinaels, and Bruynseels (2024), we focus on social dynamics that impact CSR contracting rather than the large literature that looks at economic determinants of CEO compensation. However, where they focus on external social ties, we look at inside-the-board social dynamics driven by internal knowledge spillovers. Examining the quality of CSR contracts in CEO compensation packages is crucial because it goes beyond mere implementation, which could be just symbolic (Flammer et al., 2019). Second, we contribute to the literature on director overlap. While this stream of literature mainly focuses on the overlap between audit committee (AC) and CC members (e.g., Carter et al., 2022), we focus on the overlap between the CSRC and CC. Audit committees and CSR committees are fundamentally different, making it difficult to generalize the effects of AC-CC overlaps on earnings-based metrics in compensation contracts to our setting. The audit committee focuses on standardized, quantifiable financial metrics and primarily serves shareholders and regulators, while the CSR committee deals with complex, subjective CSR metrics and a broader range of stakeholders. Additionally, CSR oversight is voluntary and less regulated, with more flexibility in committee composition, which complicates the potential impact of overlapping directors on CSR contracts. In other words, the nature of this overlap is different and therefore deserves additional focus. We find evidence that CC-CSRC overlaps enhance CSR contracting quality, suggesting that there are important knowledge spillovers from such overlaps. As such, we contribute to the board literature on overlaps by suggesting that committee overlap matters – even if it is an overlap between a voluntary and mandatory committee (Lee, 2020). Next, this provides indirect insights into the benefits of establishing a voluntary committee, such as the CSR committee. While existing literature presents mixed views on the usefulness of CSR committees (e.g. Berrone and Gomez-Mejia, 2009; Hussain et al., 2018), our findings indicate that having a CSR committee

can be beneficial. Specifically, if members of the CSR committee also serve on the compensation committee, they can transfer valuable information to the compensation committee, enhancing the effectiveness of CSR contracting decisions.[2] Last, we contribute to the CSR expertise literature by demonstrating that inside knowledge gained from serving on the firm's CSR committee is highly relevant. While Yang (2023) finds that CSR expertise of compensation committee members enhances CSR contracting quality, our results indicate that this CSR expertise effect seems to be driven by the overlap of compensation and CSR committee members. Our findings therefore seem to suggest that the internal information CSR committee members bring to the compensation committee is of great importance. As such, we extend the findings of Yang (2023) and Antoons et al. (2024) by demonstrating that CSR expertise on compensation committees is important, especially gained through internal director overlaps between the compensation and CSR committee in addition to CSR expertise at the compensation committee in general or through interlocks. While Yang (2023) also focuses on CSR expertise gained through external factors—such as experience in polluting industries, serving on CSR committees at other firms, or implementing CSR pay at other companies—we argue that the internal knowledge spillovers from directors who serve on both the compensation and CSR committees within the same firm are even more crucial.

The remainder of the paper is structured as follows. First, we discuss the existing literature and develop our hypothesis. Second, we explain the methodology used to test our hypothesis. Next, we discuss the results from the analyses and draw the conclusion.

[2] However, it is important to note that more in-depth analysis is required before definitive conclusions can be drawn regarding the effectiveness of the CSR committee.

2. Literature and hypothesis development

CSR Contracting

CEO compensation has long been a focal point in both practice and research. Recently, alongside traditional salary and standard incentive plans, the inclusion of CSR criteria in compensation packages has gained particular attention. This approach directly ties executive compensation to social and environmental benchmarks, such as lowering emissions, adhering to ethical standards, enhancing diversity, and improving employee health and safety (Flammer et al., 2019). The ultimate goal of CSR contracting is to improve the firm's CSR position. However, not only achieving targeted CSR performance, but also responding to investor expectations, regulations, and signaling the importance of CSR are drivers in implementing CSR contracting (The Harvard Law School Forum on Corporate Governance, 2022).

It is widely documented that organizational outcomes are significantly influenced by the characteristics, values, experiences, and cognitive processes of top executives, especially CEOs (Hambrick and Mason, 1984). Therefore, CEOs play a crucial role in determining the extent to which a firm focuses on CSR (Smeets et al., 2024). However, when CEOs are not correctly incentivized, they may forego investments in CSR, as this type of investments often takes time to create value (Flammer et al., 2019) and represents a longer-term investment (Nguyen., 2019). Moreover, if not incentivized correctly, agency problems may arise due to self-servant actions (Bebchuck and Tallarita, 2022). Therefore, explicitly tying CEO's compensation to certain CSR metrics can help shift the CEO's focus to CSR. This idea is supported by prior research which finds a positive association between CSR contracting and CSR performance (e.g., Flammer et al., 2019).

Determinants of CSR Contracting

While the above studies have focused on the consequences of CSR contracting, another stream of research has concentrated on its determinants, ranging from firm financial and sustainability

related factors, such as return on assets and CSR performance (Cohen et al., 2023), to governance mechanisms (Velte, 2024). The latter literature mainly focuses on board characteristics. For instance, board independence (Cohen et al., 2023), board size, gender diversity (Liu et al., 2023), and the existence of CSR committees (Al-Shaer and Zaman, 2019) are all positively related to the adoption of CSR contracting, while board cooption and CEO duality are negatively associated to CSR contracting (Ikram, 2023).

Most of the aforementioned studies focus solely on the inclusion of CSR criteria in CEO compensation, overlooking the nuances of its implementation. This raises questions about whether such inclusion is merely symbolic or substantive (Velte, 2024). Consequently, researchers have started to advocate for a more thorough examination of these CSR metrics, urging investigations into the quality aspects of CSR contracting beyond its mere presence (Flammer et al., 2019; Maas, 2018; Qin and Yang, 2022; Yang, 2023, Antoons et al., 2024). For instance, Qin and Yang (2022) and Yang (2023) identify three aspects that high-quality CSR contracting should adhere to. First, according to the stakeholder theory (Freeman 1984), firms carry the responsibility to meet the demands of multiple stakeholders. High-quality CSR contracting should therefore reflect these diverse interests (e.g., community, environment, and employees) by including a *broad range of measures* in the contracts. This addresses the concerns expressed by Bebchuck and Tallarita (2022) that when CSR contracting is only linked to limited dimensions, this practice could harm rather than benefit overall stakeholder welfare, as prioritizing one type of stakeholder may leave the others feeling left out. Second, CSR contracting should include *verifiable and quantitative measures* to establish clear benchmarks for granting the respective compensation to the CEO (Kolk and Perego, 2014). Currently, many companies still lack clarity in setting measurable CSR targets (Sustainalytics, 2024). While CEO compensation in general was finally getting more transparent using clear accounting measures, the rather vague CSR measures are hindering transparency and accountability

resulting in agency problems (Bebchuck and Tallarita, 2022). Third, within the non-financial compensation metrics, CSR metrics are the most used (Deloitte, 2023). However, the exact weight attached to them is not always clear and compensation contracts with minimal or unclear weights tied to CSR metrics may be largely symbolic (Flammer et al., 2019). Therefore, high-quality CSR contracts should include *clear weights* for optimal transparency (Antoons, Cardinaels and Bruynseels, 2024). These last two aspects address the agency problem in CSR contracting by increasing transparency in CEO compensation contracts through the use of clearly defined and quantitative metrics. Effectively adopting CSR contracting is thus no easy feat for a compensation committee. The compensation committee directors need to be well-informed about the firm's CSR strategy to implement CSR contracting in a meaningful way. Therefore, they might benefit from the inside knowledge of CSR committee members to avoid falling into a 'check-the-box' approach to CSR contracting. A firm can decide to voluntarily adopt a CSR committee to tackle CSR-oriented issues, policies, and reporting (Biswas et al., 2018). Consequently, this committee is likely to have the necessary information to assist the compensation committee in designing substantive CSR metrics. To facilitate information sharing between the two committees, it may be advantageous for the compensation committee to include directors who also serve on the CSR committee. In the literature, this practice of having directors serving two committees is known as 'director overlap'.

Director Overlaps

While little is known about overlap between the compensation and CSR committee, there is a literature on committee overlaps more generally. This literature has mainly focused on overlap between the audit and compensation committee (e.g., Carter et al., 2022; Brandes et al., 2016). These prior studies can be categorized into two contrasting streams. The first stream of studies suggests that director overlap may be considered as bad practice. For instance, Liao et al. (2014) and Laux and Laux (2009) find that directors serving multiple committees may be too busy to

exercise their monitoring duties effectively. In other words, committee overlaps can lead to diminished monitoring due to overburdened directors (Biswas et al., 2018). Faleye et al. (2011) take a more nuanced stance, suggesting that while directors' monitoring capabilities improve with overlap, their advisory capabilities decrease, leading to lower firm value when the board monitors intensely. The second line of studies finds that director overlap can be beneficial. For instance, Brandes et al. (2016) argue that director overlap between the audit and compensation committee allows for a better transfer of tacit knowledge between the board's monitoring and incentive alignment functions. Specifically, they reason that board members possess firm-specific tacit knowledge acquired through committee-specific discussions about management's financial assumptions and practices. This knowledge can significantly reduce information asymmetry by offering the compensation committee a more comprehensive understanding of the firm's risks and performance through overlap with the audit committee. Consistent with their expectations, they find that this knowledge spillover leads to improved monitoring effectiveness and the establishment of more appropriate executive compensation. Similarly, Carter et al. (2022) find that increased director overlap between the audit and compensation committee is not necessarily associated with a different level of performance-contingent compensation, but it does affect its composition. Specifically, their findings indicate that when there is greater overlap between the audit and compensation committee, CEO incentive compensation is less based on easily manipulated earnings-based performance measures, but without changing the overall level of performance-contingent cash bonuses. This finding suggests that such overlaps contribute to improved pay quality, leading to reduced monitoring costs for the audit committee. When the CEO's compensation package excludes measures that incentivize earnings manipulation, the audit committee's task becomes easier. Therefore, these overlaps can alleviate some of the committee's burdens by fostering collaborative efforts.

Nonetheless, it is unclear whether these findings related to audit and compensation committee overlap can be extrapolated to our setting. After all, audit and CSR committees differ significantly in the scope and nature of challenges they face. First, the AC and CSRC have different objectives.[3] Where the AC's primary responsibility is mandatory, namely financial oversight (SEC), the CSRC is *voluntary* and should focus on the CSR policies of the firm, which is more of a strategic choice (Deloitte, 2020). The CSRC is thus likely to be better informed about how to design CSR metrics in a more qualitative way.~~.~~ Research on director overlaps between mandatory and voluntary committees is limited, and the dynamics of such overlaps may differ from those between mandatory committees. Mandatory committees tend to have standardized tasks, while voluntary committees typically have fewer or no strict requirements. Lee (2020) suggests that mandatory committees serve more of a monitoring role, whereas voluntary committees focus on advising. Directors serving on both types of committees therefore take on both roles which might complement each other. This assertion is in line with Peters and Romi (2014), who explore the value of director overlap between environmental and audit committees, and find that such overlaps enhance sustainability awareness through complementary knowledge. Second, because of the voluntary nature of the CSRC, this committee has limited requirements, allowing for the inclusion of executive directors. Although executive directors on the CSRC cannot serve on the compensation committee due to independence requirements, this flexibility creates a unique opportunity for private (CSR-related) information to flow from executives to independent directors, which, in turn, could affect the substantiveness of CSR contracting. This opportunity does not arise with director

[3] We do acknowledge that the audit committee may potentially be involved in CSR reporting. However, as our focus is director overlap when there is a CSR committee, we assume that the primary responsibilities of a CSRC and AC are different. Later in this paper, we also perform a falsification test looking at the overlap between the audit committee and the compensation committee and find that this type of director overlap does not affect CSR contracting quality.

overlaps between the AC and CC as these committees are subject to full independence requirements (Nasdaq Listing Center, n.d.). Third, the nature of CSR measures compared to financial measures is substantially different. Where financial metrics monitored by the AC are more established, standardized, clear and quantifiable, CSR contracting is still in its infancy, often complex, subjective and may vary considerably between firms (Cohen, Holder-Webb and Zamora 2015; Ilhan, Krueger, Sautner, and Starks 2021). Additionally, the AC and CC's primary concern are investors and regulators (KPMG, 2015). However, the CC-CSRC setting involves a wider array of stakeholders, ranging from the broader community to employees and the environment (KPMG, 2023). This comes with a broader set of responsibilities compared to the financial setting where the different aspects fit under the same umbrella and where metrics are better established and more transparent, making it more difficult to standardize these CSR metrics. Moreover, different stakeholders may be in contrast with each other, while financial investors are likely more to be on the same page. As such, it is unclear whether CC-AC and CC-CSRC overlaps will function in the same way.

The study of Gai et al. (2021) is – to the best of our knowledge – one of the few studies that investigates director overlaps involving other committees than the audit and compensation committee, providing evidence that the knowledge spillover theory might hold more universally. Specifically, they investigate overlapping memberships between the nominating and audit committee and find that when a firm's peer faces a financial restatement, firms with NC-AC overlaps are more likely to take meaningful action by appointing new directors with the right expertise to mitigate their own restatement risks. In addition to impacting CEO compensation, director overlaps between two committees may thus enable better decision making that integrates different committees' priorities. This observation suggests that director overlaps provide substantive rather than symbolic actions

Consistent with the knowledge spillover argument (Chandar et al., 2008; Brandes et al., 2016; Carter et al., 2022), we argue that directors with overlapping membership between the CC and CSRC will facilitate the exchange of crucial information necessary to design CSR contracting in a meaningful way. The CC-CSRC overlap can improve the quality of CSR contracting by designing comprehensive CSR metrics based on transferred inside knowledge. For instance, directors on the CSR committee are directly involved in setting (advising) and evaluating the firm's CSR objectives (Deloitte, 2020). Therefore, CSRC directors are expected to be able to identify objective and quantifiable measures for the firm's CSR goals. If these CSRC directors also serve the compensation committee, they can help in aligning the CEO's compensation contract with accurate and quantifiable CSR metrics. Further, their awareness may help in advocating for a clear weight attached to CSR metrics in the CSR contracts. Last, CSRC directors are aware of the diverse range of stakeholder demands that need to be met and may therefore want to focus on multiple CSR dimensions.

Further, we believe that, in alignment with the critical mass theory (Granovetter, 1978; Kanter, 1977), having just one overlapping director may not be enough to drive substantial changes in how CSR considerations are integrated into CSR contracting. However, when a critical mass of directors with overlapping roles exists, they can collectively leverage their knowledge and perspectives to shape discussions, build consensus, and ensure that CSR objectives are meaningfully reflected in the compensation structures.

The above discussion leads us to the following hypothesis:

H: Greater director overlap between the compensation and CSR committee is positively associated CSR contracting quality.

3. Methodology

Sample Selection

We start with collecting CEO compensation data from ISS incentive lab. We complement this data with firm and financial data from Compustat, detailed information on CEOs and directors from BoardEx, and CSR-related data from Refinitiv Eikon. After merging these datasets, our dataset contains 9,379 firm-year observations from 2003-2021.[4] We recognize that companies that do not have a CSRC (due to its voluntary nature), inherently cannot have any CC-CSRC overlaps. Consequently, all observations from this group will consistently show a value of zero for the overlap variables. This raises the possibility that having a CSRC itself, rather than having director overlaps drives our results. We therefore decide to restrict our sample to companies with a CSRC on the board, resulting in a final dataset of 2,097 firm-year observations.[5] This means that 22.6 percent of our full sample has established a CSR committee. This number is in line with recent studies (Eberhardt-Toth, 2019, Fu, Tang and Chen, 2020; Dixon et al., 2017; Derchi et al., 2021).

Empirical Measures

Dependent Variable

To test our hypothesis, we follow the methodology outlined by Yang (2023) in calculating CSR contracting quality (*CQ*), with some slight modification as we use data from ISS incentive lab rather than hand-collected data from proxy statements. Specifically, we obtain a factor score (*CQ)* using principal component analysis on four aspects related to CSR contracting quality. The first aspect considers whether the CSR metrics are quantitative and verifiable. We construct *QUANT*, which equals 1 if more than half of the CSR metrics included in CEO's compensation

[4] SOX requires US publicly listed firms since 2003 to have an audit, compensation, and nomination committee. However, since it took some firms a bit longer to fully comply, we follow Lee (2020) and rerun our analyses starting from 2005. Our inferences remain robust.
[5] In sensitivity analyses, we relax this sample restriction and find consistent results.

contract are quantifiable, 0.5 if less than half are quantifiable, and 0 if there is no CSR contracting. Secondly, we consider whether CSR contracting is adopted in a transparent way by assessing whether clear weights are assigned to the CSR metrics. *WEIGHTS* is assigned a value of 1 if more than half of the CSR metrics have a clear weight attached, 0.5 if less than half have a clear weight, and 0 if there is no CSR contracting[6]. Third, high-quality CSR contracting should address diverse stakeholder interests (Freeman, 1984). Therefore, we consider the number of different CSR dimensions[7][8] (*NUMBDIMENSIONS)* that are included in the CEO's pay package. Lastly, we assess the relative impact of CSR-based performance metrics, thereby offering additional insights into CSR contracting that are not provided by other measures. We do this by obtaining the relative concentration of these dimensions (*RELCONC*) by scaling the number of CSR dimensions by the total number of dimensions in the CEO's absolute performance measures.[9] For a more comprehensive explanation of the approach in constructing *CQ*, see Appendix A.

Variables of Interest

The main interest of this study is to investigate whether CC-CSRC overlaps affect CSR contracting quality. Note that for an overlap between the compensation and CSR committee to exist, firms must have both committees installed. Prior research has often relied on the CSR committee indicator variable in Refinitiv Eikon. However, this variable is not restricted to board committees and might therefore also include executive-level CSR committees. Since the focus of our study is on board-level CSR committees, we use the Committee Details data in BoardEx

[6] In sensitivity tests, we perform an analysis in a subset of our sample including only observations that have CSR contracting.
[7] These different dimensions are based on the GRI dimensions, namely community, business ethics, customer product, employees, and environment.
[8] We make a distinction between five different categories: environment, employees, customer product, business ethics and community.
[9] For instance, if a firm in a year uses ROA, EBITDA and workforce diversity as performance measures in the CEO's incentive contracts, there is only one CSR dimension (NUMBDIMENSIONS) and two other dimensions. This results in RELCONC being equal to 1/3.

to identify CSR Committees. We classify committees as a CSR committee based on a list of keywords (Burke et al., 2019). The complete list of keywords can be found in Appendix B. Once we have identified which firms have installed a CSR committee, we restrict our sample to these firms to calculate our committee overlap measures in a meaningful way. Next, we use a similar approach for identifying directors who serve on the compensation committee, although this keyword list is much more standardized.[10] Overlapping directors are directors who simultaneously serve on the CC and CSRC at a focal firm in a given year. Consistent with Carter et al. (2022), we construct two overlap measures. First, we create a dummy overlap variable whether there is a CC-CSRC overlap (*DO*). Our second overlap measure *PO* reflects the proportion of compensation committee directors that also serve on the CSR committee.[11]

Control Variables

Yang (2023) finds that CSR expertise of compensation committee members is positively associated with CSR contracting quality. To rule out that our results are driven by the CSR expertise of compensation committee members rather than by their overlap, we control for compensation committee members CSR expertise. We largely follow Yang's (2023) methodology to construct the average compensation committee director CSR expertise *CC_CSREXP*. More specifically, for each compensation committee member, we gather information about (1) whether they have (prior) board experience at a firm active in a polluting industry,[12] (2) whether they have board experience at another firm where CSR contracting is implemented, and (3) whether they serve as a CSR committee member at another firm.[13] We

[10] We search for the word 'compensation' or 'remuneration' in the Committee Name variable in BoardEx.
[11] Note the difference with a computation of the proportion of CSRC members that also serve the CC. We opt for the proportion of CC directors that also serve on the CSRC because the CC members are the directors in charge of setting the compensation packages.
[12] The following industries are defined as polluting: mining, transportation, and public utilities.
[13] An important deviation from Yang's (2023) CSR expertise measure is that she also considers whether compensation committee members serve on the focal firm's CSR committee. This would, however, correspond with our overlap measure. To avoid a mechanical relationship between our overlap and CSR expertise measure, we only consider compensation committee members' expertise serving on CSR committees outside the focal firm.

compute the CSR expertise per CC member in a given year by summing these three indicators. Consistent with Yang (2023), we consider the CC member's expertise in the three preceding years, but multiply prior expertise in years *t*–1, *t*–2, and *t*–3, by factors of 1, 2/3, and 1/3, respectively, as more recent experience may be more relevant (Zhu and Chen, 2015). *CC_CSREXP* is the average of all CC directors CSR-related expertise. In line with prior research, we further control for several firm and corporate governance characteristics that may be associated with CSR contracting (quality) (Flammer et al., 2019; Yang, 2023). The firm characteristics include return on assets (*ROA*), the logarithm of total assets (*FIRMSIZE*), research and development expenses scaled by sales (*RD*), advertising expenses scaled by sales (*AD*), the yearly *STOCKRETURN*, and standard deviation of the ROA industry average over the past three years (*STDINDROA*). Further, the corporate governance controls include the number of directors on the board (*BOARDSIZE*), the proportion of independent directors on the board (*PROPINDEP*), the average tenure of directors on the board (*AVGBOARDTEN*), whether the CEO is also the chairperson of the board (*CEOCHAIR*), and the busyness (i.e., whether they are active on three or more public boards in a given year) of the CC directors (*CCBUSYNESS)*. Last, we control for the number of years the firm may have implemented CSR contracting (*CUMULYRCSRCONTR*), the percentage of industry peers that have adopted CSR contracting (*PROPINDCSRCONTR*), whether there is CSR contracting implemented for the CEO (*CSRCONTR*) and the CSR performance of the firm (*CSRPERF*). CSR performance is measured as the firm's average environmental and social pillar score from Refinitiv Eikon (Bae, El Ghoul, Gong, & Guedhami, 2021). Definitions and data sources of all variables can be found in Appendix C.

Moreover, Yang (2023) also considers whether compensation committee members are members of NGOs, but due to data limitations we are unable to include this aspect of CSR expertise.

Empirical Model

To test our hypothesis, we estimate an empirical model relating our overlap measures to our measure of a firm's CSR contracting quality by ordinary least squares (OLS) estimation. To minimize the impact of outliers, we winsorize all continuous variables at the top and bottom 1 percent level. The independent variables are lagged by one year to reduce simultaneity or reverse-causality concerns.[14] We include year fixed effects to control for unobserved, time-specific factors that could influence the quality of CSR contracting across all firms such as economic conditions and regulatory changes. Further, we also include firm fixed effects to control for any time-invariant characteristics specific to each firm, and cluster standard errors at the industry level to address potential dependencies among firms within the same industry. The general outline of our model is as follows:

$$CQ_{i,t} = \beta_0 + \beta_1 Overlap_{i,t-1} + \gamma' X_{i,t-1} + year\ fixed\ effects + firm\ fixed\ effects + \varepsilon_{i,t}$$

Where i indexes firms, t indexes years; CQ proxies a firm's CSR contracting quality; $Overlap$ is one our overlap measures: *DO, PO*; X is the vector of control variables; ε is the error term.

4. Results

Descriptive Statistics

Summary Statistics

The summary statistics for our sample are reported in Table 2 (Panel A). On average, 26.8 percent of firms have adopted CSR contracting for the CEO. This is in line with the 28 percent found by Yang (2023). Related to our overlap measures, we find that 83.5 percent of our sample

[14] Except for CC_CSREXP, as this measure is by default measured in *t*–1 to *t*–3.

firms have at least one director that serves both the CC and CSRC. The average proportion of compensation committee members that also serve the CSR committee is 36.7 percent.

To provide more insights into our CSR contracting quality measure, we show the summary statistics of *CQ* and its lower-order variables for only those firms (563 firm-year observations) that have adopted CSR contracting in Panel B of Table 2. Additionally, we report the number of years since implementation (*CUMULYRSCSRCONTR*) and the proportion of industry peers that uses CSR contracting (*PROPINDCSRCONTR*) for these firms. For those firms with CSR contracting, the average value of *CQ* is 2.375. The minimum value of -0.369 and maximum value of 5.029 illustrates that there exists considerable variation in firm's CSR contracting quality. These contracts exist of, on average, 1.56 different CSR dimensions. In 48.7 percent of these contracts mainly quantitative CSR measures are used, whereas 76.4 percent attaches mainly clear weights to the CSR metrics. Further, these firms have, on average, CSR contracting in place for over five years and 18.4 percent of industry peers have also installed CSR contracting.

Correlation Matrix

An untabulated correlation matrix shows that the correlation between CSR contracting quality (*CQ*) and the percentage CC-CSRC overlap is 0.061 and significant at the 5 percent level, while the correlation between *CQ* and the CC-CSRC overlap indicator is insignificant. This may suggest that a certain proportion of overlap is required in order to substantially impact CSR contracting quality. Further, we see that the number of years the company already has been implementing CSR contracts in the CEO's compensation package (*CUMULYRSCSRCONTR*) is positively related with CSR contracting quality (corr. = 0.664). The same holds for the correlation between the proportion of industry peers that use CSR contracting (*PROPINDCSRCONTR*) and CSR contracting quality (corr. = 0.442). These correlations seem

to indicate that firms learn over time and from their industry peers to install CSR contracting in a more meaningful way.

Main Analyses

The test results of our hypothesis are reported in Table 4. We use the proportion overlap variable *PO* and the overlap indicator measure *DO* in Model 1 and 2, respectively. In Model 1, our results indicate that greater overlap between the compensation and CSR committee is associated with higher CSR contracting quality ($\beta = 0.308, p = 0.075$), supporting our hypothesis. In Model 2, we find no evidence that CC-CSR overlap (*DO*) is significantly related to CSR contracting quality. Combined, these findings suggest that just having one member to transfer the knowledge between the two committees is not enough. Rather, in line with the critical mass theory (Granovetter, 1978; Kanter, 1977), there might need to be a sufficient proportion of overlapping directors to meaningfully affect the decision-making within the compensation committee. In contrast to Yang (2023), we find no evidence that compensation committee members' CSR expertise is associated with CSR contracting quality. We will discuss the discrepancy in our findings in detail in the sensitivity analyses.

Selection Models

Since we restrict our sample to firms with a CSR committee, our results may be biased to some extent as firms with a CSR committee might differ significantly from firms without a CSR committee.[15] Therefore, we try to minimize the impact of confounding variables on CSR contracting quality by using alternative model specifications. First, we use propensity score matching (PSM). Specifically, we match observations within a given fiscal year that have a CSR committee (treatment group) with an observation within that fiscal year that has no CSR

[15] Note however, that although we try to alleviate the concerns of the unbalanced sample by implementing both propensity score matching as well as entropy balancing, our variable of interest *PO* remains without variance in the control groups. Therefore, the selection bias should not affect our variable of interest. For this reason, we decide to just look at the subsample of observations with a CSR committee in our main analyses.

committee (control group), using PSM without replacement and a 0.01 caliper width. These design choices mean that each control observation can only be matched to one treated unit and cannot be used to match to another treatment observation. The match will only be assigned if the difference between their propensity scores is 0.01 or less. Using a stricter procedure[16] like this one results in better and unique matches, but also in a drop of observations when no good match has been found. In our case, after matching the treatment group, we have 1,648 out of 2,097 treatment observations with a CSR committee left. When we run the analysis on the sample with both matched treated and control observations, we find consistent results to our main analysis as illustrated in Model 1 of Table 5 ($\beta = 0.356$, $p = 0.034$).

Second, we rerun our model specification using entropy-balanced samples. This method has the advantage, compared to PSM, that there is no loss of observations, and we can run the analyses on the full sample. Specifically, using entropy-balanced samples we try to eliminate fundamental differences between firms that have a CSR committee and those that do not by reweighting observations based on all covariates (Hainmueller, 2011). We achieve sample balance on key firm- and board-level characteristics by using the covariate means of all control variables in the model. This procedure creates weights that adjust the covariate distributions, ensuring balanced means in the treatment and control groups. Subsequently, we rerun our main analysis using the weighted covariates. The results obtained using this method are presented in Model 2 of Table 5 and are consistent with those from our main analyses, further supporting our hypothesis ($\beta = 0.274$, $p = 0.072$).

[16] A less strict PSM procedure could for instance be with replacement, where control observations can be matched multiple times, or by relaxing the propensity score condition.

Additional Analyses

CSR Contracting Quality Dimensions

In the main analyses, we look at CSR contracting quality, measured as a composite score obtained by performing a factor analysis using the variables *NUMBDIMENSIONS*, *RELCONC*, *QUANT* and *WEIGHT*. To gain some further insight into which dimension of CSR contracting quality is driving our results, we use the four components separately as our dependent variables. First, we find that *PO* is positively associated with *NUMBDIMENSIONS* ($\beta = 0.232$, $p = 0.013$) and *RELCONC* ($\beta = 0.029$, $p = 0.099$). These findings imply that a greater director overlap between the CSR and compensation committee is associated with more diverse CSR dimensions in the CSR contracts, also relative to other incentive pay metrics. Next, as *QUANT* and *WEIGHT* can have ordered values (0, 0.5 and 1), we perform an ordered logit for the last two regressions. Model (3) tests whether *PO* is associated with *QUANT,* but we do not find a significant relationship ($p = 0.357$). This finding suggests that a greater CC-CSRC overlap is not significantly associated with having more quantitative CSR measures. Last, we look at whether greater overlap is associated with *WEIGHT*. We find a positive association, suggesting that greater CC-CSRC overlap is associated with clearer weight attachments to CSR metrics. However, the relationship is borderline insignificant ($\beta = 1.197$, $p = 0.107$). Altogether, this additional analysis seems to suggest that our results are driven mainly by the inclusion of more diverse CSR dimensions in CSR contracting.

Presence of CSR Contracting

This study focuses on CSR contracting *quality*. However, instead of increasing CSR contracting quality, CC-CSRC overlap might also help to adopt CSR contracting if the firm has not already done so before.[17] Therefore, we now use an indicator variable *CSRCONTR* as an alternative

[17] Note that *CQ* already captures whether there is CSR contracting present or not. However, here we want to focus more on the mere presence of it.

dependent variable and re-run our analysis.[18] The untabulated results indicate that both overlap measures are not significantly related to the adoption of CSR contracting, albeit the result being borderline insignificant for *PO* ($\beta = 0.093$, $p = 0.107$). This might imply that CC-CSRC director overlap does not necessarily help adopt CSR contracting, but it does help implementing it in a more meaningful way (as indicated by our main results).

Exploratory Insights on CC-CSRC Overlap

Further, we investigate the determinants of CC-CSRC overlap to get a deeper understanding of why this type of committee overlap occurs. For this, we follow Carter et al. (2022) who focus on CC-AC overlap. Specifically, we run a regression analysis to investigate the determinants of director overlaps between the compensation and CSR committee. The untabulated illustrate that the size of the compensation (*CC_SIZE*: $\beta = 0.077$, $p = 0.000$) and CSR committee (*CSRC_SIZE*: $\beta = 0.017$, $p = 0.008$) are positively associated with *PO*.[19] The size of the board as a whole, on the other hand, is negatively associated with *PO* (*BOARSIZE*: $\beta = -0.035$, $p = 0.000$). This follows logically as larger committees need more members, and therefore, an overlap is more likely, while larger boards have more members to distribute among different committees, leading to fewer overlapping directors. Next, compensation committee members' CSR expertise gained at other firms does not seem to explain the overlaps (*CC_CSREXP*: $p = 0.976$). This provides some additional support for our findings concerning inside expertise (i.e. CSR-related knowledge about the focal firm) compared to outside expertise (i.e. general CSR knowledge). Further, the proportion of independent directors is negatively associated with *PO* (*PROPINDEP*: $\beta = -0.253$, $p = 0.100$). Since compensation committees are required to be

[18] Note that since we use firm and year fixed effects, it is not ideal to use a logistical model, even though the dependent variable is an indicator variable**.** Therefore, we first run the model using a linear regression with fixed effects, followed by a logistical model (untabulated) without fixed effects. The results remain consistent in both cases.

[19] We also performed this analysis with *DO* as dependent variable and find consistent results.

independent, having a larger pool of independent directors available allows for an easier distribution of them across the various board committees.

Director-level determinants for overlap

Further, as an extension to the company-level insights on overlaps, we univariately look at the director-level to find out which directors are both serving the compensation and CSR committee. This untabulated test indicates that older, female, independent, more tenured and more CSR-experienced directors seem to be the directors that are more likely to be the overlapping directors. However, the company-level correlation between CSR-experienced compensation committees and CC-CSRC overlap is rather low (0.047).

Sensitivity Tests

Falsification: Director Overlaps with the Audit Committee

To rule out alternative explanations such as general overlap effects or the effect of director overlaps between the audit committee and compensation committee (as the audit committee is perceived to take on a similar role as the CSRC, but in the financial area) or between the audit committee and the CSR committee (as the monitoring role of the AC may influence CSR practices), we also test our analyses substituting *PO* for overlaps between other committees, i.e., AC-CC overlap and AC-CSRC overlap. For our falsification test to work, these types of overlap should be irrelevant for CSR contracting quality. First, we look at the overlap between the audit committee and the compensation committee and test whether this explains CSR contracting quality. We do not find any evidence that indicates that AC-CC overlap explains CSR contracting quality ($p = 0.784$). Similarly, AC-CSRC overlap is not associated with higher quality CSR contracting ($p = 0.950$). Additionally, we verify whether the effects of AC-CC overlap stay absent when there is no CSRC present. Note that in absence of the CSR committee, the audit committee may be likely to take on the risk monitoring role of CSR. Untabulated

results show that even in this case, overlap between the audit committee and the compensation committee seems not to significantly influence CSR contracting quality (p = 0.869).

These falsification tests illustrate that our results are not driven by committee overlap in general or substituting overlaps in the absence of a CSR committee. Rather, information must really flow between the two relevant committees (i.e., CC and CSRC) to increase CSR contracting quality.

Alternative Measures CSR Expertise

In our main analysis in Table 4, we found no evidence that compensation committee members' CSR expertise is associated with a firm's CSR contracting quality. This is in contrast with recent findings by Yang (2023). Note, however, that we deviate in one important way from Yang's (2023) CSR expertise measure. As discussed in footnote 11, Yang (2023) includes CC-CSRC overlaps in her CSR expertise measure, as these overlaps are not the focus of her paper and can be seen as an alternative source of CC member's CSR expertise. Since we aim to disentangle the effect of committee overlaps and CSR expertise, we include the two separately in our model.[20] To check whether the discrepancy in our findings can be attributed to our alternative specification of CC members' CSR expertise, we follow Yang (2023) more closely and include CC-CSRC overlap at the focal firm in our CSR expertise measure (*CC_CSREXP_Y*). The untabulated findings of this sensitivity test illustrate that CC members' CSR expertise, using *CC_CSREXP_Y* as the proxy, is now – in line with Yang (2023) – significantly associated with higher CSR contracting quality (β = 0.143, p = 0.024). Both our overlap measures are now, not surprisingly, no longer significantly related with CSR contracting quality. These findings suggest that the discrepancy between Yang's (2023) and our findings can be attributed to our alternative specification of CC members' CSR expertise. Moreover, these results seem to

[20] Note that we also deviate from Yang (2023) as we are unable to identify compensation committee members with NGO experience due to data limitations.

suggest that Yang's (2023) results may be driven by the overlap in CC and CSRC members, which we decouple from the expertise measure and view as internal knowledge spillovers. Hence, we extend Yang's (2023) findings in an important way.

Alternative Measure CSR Contracting Quality

As a sensitivity test, we use the CSR contracting quality measure from Qin and Yang (2022) as an alternative dependent variable. In contrast with our original measure based on Yang (2023), this measure does not include the relative concentration of CSR dimensions (*RELCONC*) but does include the presence of CSR metrics. Our results are robust to this alternative specification. More specifically, we find that the proportion of overlap between the CC and CSRC is positively associated with CSR contracting quality measured alternatively (β = 0.313, p = 0.081), and the overlap indicator (*DO*) is not significantly associated with CSR contracting quality (p = 0.451).

CSR Contracting Subsample

To rule out that our findings on CSR contracting quality are driven by the mere presence of CSR contracting, we focus on a subsample consisting solely of observations where CSR contracting is already in place. In this untabulated analysis, we find that CC-CSRC overlap continues to enhance CSR contracting quality, even when CSR contracting is already established. This sensitivity test confirms that our results are not mainly being driven by firms that have installed CSR contracting quality. Rather, even when firms have already adopted CSR contracting, CC-CSRC overlap helps to install CSR contracting in a more substantive way.

Test Non-Linear Relationship *PO* and *CQ*

Since we find that greater overlap between the CC and CSRC is positively associated with CSR contracting quality, we also perform a quadratic analysis to investigate whether there is a turning point when committee overlap becomes less effective in enhancing CSR contracting

quality. As such, we add the quadratic term of *PO* to our model and rerun our analysis. The untabulated results show no evidence of a quadratic relationship, indicating that the relationship with CC-CSRC might be linear.

CSR Committee Independence

Additionally, we try to rule out the alternative explanation that the overlap between CC and CSRC members captures a more independent CSR committee. In fact, there are no regulations in our setting related to how the CSR committee should be composed. Since CC members are mandated to be independent, a higher overlap between the two committees might point towards the inclusion of more independent directors on the CSRC. To rule out that this alternative explanation is driving our results, we substitute our overlap measure with the percentage of independent directors on the CSRC and rerun our analysis. The untabulated test reveals no significant relationship between CSRC independence and CSR contracting quality (β = -0.521, p = 0.191) – ruling out that our findings are driven by CSRC independence.

Contextual Difference

Lastly, we check whether there is a contextual difference between companies active in high and low polluting industries. For this, we split our sample into heavy and regular/low polluting firms, based on their industry (high-polluting industries: mining, transportation, and public utilities). The untabulated results show that the impact of CC-CSRC overlap on CSR contracting quality is more pronounced when firms are active in regular/low polluting industries, but not when the industry is active in a heavy polluting industry. A potential explanation could be that the inherent CSR (environmental) challenges in polluting industries are so substantial that focusing on these challenges themselves instead of focusing on how to incentivize the CEO may be more important. Creating overlaps between the CSR and compensation committee seems thus no one-size-fits-all approach and may differ between contexts.

5. Conclusion

We argue in our study that while it is the CC's responsibility to adopt CSR contracting in the CEO's compensation contract, these directors might lack the necessary information to do so in a substantive way. Having a greater proportion of overlapping directors between the CC and CSRC may therefore be an effective way to facilitate such information sharing. Indeed, results using a sample of 2,097 firm-year observations of publicly listed US firms from 2003-2021 demonstrate that greater overlap between the compensation and CSR committees significantly enhances CSR contracting quality, supporting the knowledge sharing hypothesis. Moreover, our results seem to indicate that inside knowledge about the focal firm's CSR strategy is more important than externally acquired CSR expertise of compensation committee members. These insights underline the importance of strategic committee compositions and highlight the nuanced roles of directors serving two committees, here the mandatory compensation committee and the voluntary CSR committee. Further, we also investigate which components of CSR contracting quality are driving these results. We find that CC-CSRC overlaps especially have their stakes in implementing multiple CSR dimensions in CSR contracting. Falsification and sensitivity tests help to rule out alternative explanations and show the robustness of our results.

This study is subject to some limitations. First, as having a CSRC is a prerequisite for an CC-CSRC overlap to exist, this prevents us from generalizing results to a broader sample. We try to address this issue by using propensity score matching and entropy balancing as alternative model specifications and find consistent results. In addition, as the CSRC is a voluntary committee, further investigation on this committee's substantive impact would be desirable for clear policy implications, which are not currently evident. Notwithstanding, there are implications that firms should provide a structure for a good information flow between committees. In our setting, this means that CC members need to be well-informed about the

firm's CSR strategy. CC-CSRC overlaps are maybe just one way to facilitate the internal information flow. Next, CC-CSRC overlap shows no significant effect on the quantifiable verifiability of CSR contracting metrics (*QUANT*) and the weights attached to them (*WEIGHT*). This raises the question of whether quantifying and weighing CSR contracting improves quality. From a practical perspective, it is possible that because of the contemporary difficulty of incorporating quantifiable and weighted CSR metrics, currently the focus still lays on targeting multiple dimensions, as this is something that companies already can address. Given the evolving nature of these matters, more challenging targets may be introduced in the future, as the process is still unfolding step by step. Future research could explore whether the development of such targets indeed occurs in distinct stages. Further, CSR contracts may just be a fraction of a CEO's incentive contract. While we take the relative concentration of CSR metrics (*RELCONC*) into account, further investigation could benefit from looking into the actual monetary fraction compared to other incentives and total compensation. Similarly, as we look into the number of dimensions that are adopted in CSR contracting, we have no certainty that these dimensions are truly corresponding with real CSR concerns of the firm in question. Last, future research would benefit from looking into more profound contextual factors that could influence and maybe even hamper CSR contracting design decisions.

6. Appendices

APPENDIX A: CSR contracting quality

In order to obtain our CSR contracting quality measure, we follow the reasoning of Qin and Yang (2022) and Yang (2023). Specifically, we perform a factor analysis based on several CSR contracting quality indicators in order to obtain one quality measure. To construct these CSR quality contracting indicators, we use data on absolute performance measures from ISS incentive lab and worked as follows: First, we uncover the CEOs in the data, as we are interested in CEO CSR contracting. For this, we check in the *Participantfy* datasheet which *participantid*s in a certain company in a certain fiscal year have *currentceo* equal to one and keep those observations. Second, we link this to the *gpbagrant* datasheet, which provides general details on each compensation grant. This way, we obtain the absolute performance measure data for all CEOs, and we can define the different aspects of our CSR contracting quality measure. Furthermore, we include only grants with a short-term cash payout (variable awardType equals "cashShort") and exclude all other types from our sample. This approach ensures that our analysis focuses solely on contracts tied to cash compensation with a maximum horizon of one year.

To start, we first need to know whether a certain metric is CSR related or not. The variable metricOther holds the specific metric as outlined in the proxy statement. This information is utilized to ascertain whether the metric pertains to CSR, employing a set of keywords derived from previous research (Bebchuk and Tallarita 2022; Ikram et al. 2019; Flammer et al. 2019; Maas, 2018). These keywords are attributable to a certain subdimension, we rely on the five GRI dimensions (environment, employees, customer product, business ethics and community. Based on this, we count how many different CSR dimensions are used in a CEO's pay package (*NUMBDIMENSIONS*). To be clear, one CEO can have multiple performance measures in his or her pay package. As we now know how many CSR dimensions and how many non-CSR

dimensions are used in the CEO contracts, we can also calculate the second aspect: the relative presence of these CSR dimensions by dividing the number of CSR dimensions by the total number of different dimensions (*RELCONC)*. Third, we check whether more than half of the metrics have a clear weight assigned (*WEIGHT*)., based on the ISS variable *percentvest*. And last, we do the same for the quantitative verifiability of the performance measures (*QUANT*), based on the ISS variable (*metrictargetvalue*).

Keywords: air; repair; waste; environment; emission; ghg; greenhouse gas; green house gas; energy efficiency; energy intensity reduction; energy efficency; energy effciency; water management; wastewater; hazardous; spill; renewable; recycling; co2; climate; reducing waste; environmental leadership; enivornment; energy policy; planet; carbon; employee; emplyee; empowered; hires; hiring; talent management; learning and people; people; personnel; talent; career development; developing our staff; staff development; staff professional development; development of the management; management development; team development; development of a strong team; human capital; workforce development; engagement; recruit; attrition; regrettable turnover; retention; lease retention; customer retention; client retention; retension; data retention; employer of choice; attractiveness as an employer; key people; voluntary turnover; physician satisfaction; franchisee satisfaction; franchise satisfaction; emplyee satisfaction; workplace satisfaction; team member satisfaction; associate satisfaction; employee satisfaction; community; stewardship activities; citizenship; stakeholder; public relations; safety; safetyosha; accidents recordable frequency rate; recordable rate; non-fatal days; non fatal days; osha; ground damage; health; injury; injuries; incident; incidence; hes; hse; ehs; eh&s; trir; dart; iir; total recordable incident rate; fatal; employee health and wellness; healthy workforce; safety and health; compliance; social responsibility; ethic; anti corruption; anti-corruption; sustainability; sustainable; sustainable growth; ethical standard; social development; governance; financial governance; diversity; diverse; minority; inclusion; women; female; people of color; product design; focus on quality; quality goal; quality targets; product quality; quality of product; quality of care; quality of service; quality of the company's product; warranty spend; things-gone-wrong; defective parts; external customer claims; internal rejection; internal retreat; things gone wrong; quality improvement; credit quality; clinical quality; emphasis on quality; manufacturing quality; improving quality; manufacturing and quality; improve our quality; quality standards; quality leadership; quality & operational excellence; quality; quality compliance; quality improvment; quality control; quality component; quality measures; quality objective; quality-related factors; six sigma quality; customer; client; shareholder; performance; productivity; turnover; non-employee; reduce; reduction; violation; impact; business; competitive; control environment; contol environment; controls environment; external environment; operating environment; collaborative environment; economic environment; park environment; market environment; growth environment; positive environment; price environment; work environment; employee head count; volunteer; communicat; full time; full time; fulltime; full-time; align; interest; objective; headcount; cost per employee; sales; sales per; cyber; security; lifecycle; supply chain; cost; hess; saving

APPENDIX B: CSR Committee (*CSRCOM*)

To uncover whether a certain company has a committee installed especially for the purposes of CSR, we use the Committee Details – Board and Director Committees datasheet provided by BoardEx. Following Burke et al. (2019), we start with running a list of keywords on the information provided in the CommitteeName column. We use the keywords these authors provide in their study as a starting point and then extend it by manually verifying all different CommitteeNames in BoardEx. Note that, because we focus on pure CSR committees, we correct for ambiguous committees which seem to be the audit, compensation or nomination committee that also take up a CSR role. Additionally, it is possible that a company has multiple committeenames that meet the requirements of being a CSR committee. As CSR committee is an indicator variable, these are thus seen as one CSR committee, however, this rarely occurs.

Keywords: public interest; public issues; community and external relations; civic and charitable affairs; charitable contributions; public policy; corporate social responsibility; ethics compliance and sustainability; occupational safety and environmental protection; operational safety; employee development and retention; employee and public responsibility; public affairs; diversity review; corporate responsibility; environmental health safety and public policy; environmental and safety; environmental and corporate responsibility; environment; quality; best practices; nuclear; clinical quality; safety; community; compliance; ethics; sustainability; governance; corporate; social responsibility; environmental; human resources; health; diversity; inclusion; equity; culture; technology; risk; medical; operations; stakeholder; nominating; personnel; employee benefits; retirement; oversight; workplace; development; management; innovation; ESG; health benefits; labour relations; employee relations; environmental impact; philanthropy; employment practices; consumer relationships; regulation; customer services; shareholder engagement; advocacy; risk oversight; talent management; energy; clean energy; human rights; indigenous issues.

APPENDIX C: Variable Definitions

Variable	Definition
CQ	CSR Contracting Quality measured using PCA on the aspects *WEIGHTS QUANT NUMBDIMENSIONS* and *RELCONC*.
WEIGHTS	1 if for more than half of the CSR measures have clear weights attached, 0.5 if for less than half and 0 if no CSR contracting.
QUANT	1 if more than half of the CSR measures are verifiable, 0.5 if for less than half and 0 if no CSR contracting.
NUMBDIMENSIONS	Number of different CSR dimensions (five different categories: environment, employees, customer product, business ethics and communit).
RELCONC	*NUMBDIMENSIONS* divided by the total number of different incentive compensation dimensions
CSRCONTR	Indicator variable equal to one if the company uses CSR contracting in a given year.
PO	Proportion of compensation committee members that also serve the CSR committee
DO	1 if there is at least one compensation committee director that also serves the CSR committee.
CC_CSREXP	The average compensation committee director CSR expertise which is calculated as follows per compensation committee director: the sum of (1) prior board experience in a polluting industry, (2) board experience at a firm with CSR contracting, and (3) CSR committee membership at another firm. Next, this experience is weighted for the preceding past 3 years with factors of 1, 2/3, and 1/3 for years t–1, t–2, and t–3, respectively.
CC_CSREXP_Y	*CC_CSREXP,* but also taking CSR committee memberships at the focal firm into account.
FIRMSIZE	Ln of total assets
ROA	Net income divided by total assets
RD	R&D expenses divdided by sales
AD	Advertising expenses divided by sales
STDINDROA	Standard deviation of the average ROA in the industry in t, t-1 and t-2
STOCKRETURN	Closing price minus opening price, divided by the opening price
BOARDSIZE	Number of directors on the board
PROPINDEP	Proportion of directors on the board that is independent
ACGBOARDTEN	Average years directors served the board
CEOCHAIR	Indicator variable equaling 1 if the CEO is also the chairperson of the board, and 0 otherwise
CCBUSYNESS	Proportion of the compensation committee directors that serves more than 3 boards
CUMULYRSCSRCONTR	The number of years the company already includes CSR contracting in the CEO's compensation package
PROPINDCSRCONTR	The percentage of industry peers that implement CSR contracting.
CSRPERF	The average of the social pillar score scaled by 100 and the environmental score divided by 100.

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8. Tables

Table 1 Factor Analysis for computing CQ

Factor Analysis

Factor	Eigenvalue	Proportion	Cumulative
Factor1	3.697	0.924	0.924
Factor2	0.165	0.041	0.966
Factor3	0.076	0.019	0.984
Factor4	0.062	0.016	1.000

Factor Loading and Unique Variances

Variables	Factor 1	Uniqueness
NUMBDIMENSIONS	0.955	0.089
RELCONC	0.968	0.062
QUANT	0.960	0.079
WEIGHT	0.963	0.074

The unobserved common factor is CSR contracting quality (CQ). Only factor 1 has an eigenvalue larger than 1. Consequently, this is our single factor for which the factor loadings and unique variances are also presented.
The Cronbach's alpha of 0.882 (untabulated) suggests that the four variables have good internal consistency and are likely measuring the same underlying construct reliably.

Table 2 Summary Statistics

Panel A – Final Sample

	Obs	Mean	Std. Dev.	Min	Max
CQ	2,097	.527	1.448	-.369	5.029
CSRCONTR	2,097	.268	.443	0	1
PO	2,097	.367	.242	0	.833
DO	2,097	.835	.372	0	1
CC CSREXP	2,097	.951	.926	0	3
FIRMSIZE	2,097	9.544	1.298	5.253	12.032
ROA	2,097	.05	.077	-.595	.289
RD	2,097	.029	.076	0	1.188
AD	2,097	.013	.029	0	.162
STDINDROA	2,097	.021	.031	.001	.174
STOCKRETURN	2,097	9.753	40.849	-78.075	278.39
BOARDSIZE	2,097	11.888	2.319	5	17
PROPINDEP	2,097	.88	.06	.545	.941
AVGBOARDTEN	2,097	7.823	3.068	.5	19.418
CEOCHAIR	2,097	.593	.491	0	1
CCBUSYNESS	2,097	.165	.184	0	.714
CUMULYRSCSRCONTR	2,097	1.898	3.013	0	11
PROPINDCSRCONTR	2,097	.119	.094	0	.377
CSRPERF	2,097	.491	.245	.037	.887
NUMBDIMENSIONS	2,097	.419	.771	0	4
RELCONC	2,097	.089	.161	0	.75
QUANT	2,097	.2	.354	0	1
WEIGHT	2,097	.237	.406	0	1

Panel B – CSR Contracting Descriptives

CQ	563	2.375	1.251	-0.369	5.029
NUMBDIMENSIONS	563	1.56	.66	1	4
RELCONC	563	.33	.132	0	.75
QUANT_ADJ	563	.487	.5	0	1
WEIGHT_ADJ	563	.764	.425	0	1
CUMULYRSCSRCONTR	563	5.49	3.352	1	11
PROPINDCSRCONTR	563	.184	.108	.018	.377

Table 3 Main Results - CSR Contracting Quality

	(1) CQ	(2) CQ
PO	0.308*	
	(0.169)	
DO		0.031
		(0.079)
CC_CSREXP	0.070	0.069
	(0.074)	(0.075)
FIRMSIZE	0.128	0.118
	(0.086)	(0.090)
ROA	0.352	0.382
	(0.492)	(0.488)
RD	-0.718	-0.648
	(0.506)	(0.482)
AD	-9.797***	-9.103***
	(3.241)	(3.281)
STDINDROA	-1.635	-1.563
	(1.781)	(1.787)
STOCKRETURN	-0.001	-0.001
	(0.001)	(0.001)
BOARDSIZE	0.033*	0.032*
	(0.016)	(0.016)
PROPINDEP	-0.067	-0.080
	(0.695)	(0.677)
AVGBOARDTEN	-0.036**	-0.035*
	(0.017)	(0.017)
CEOCHAIR	-0.105*	-0.104*
	(0.060)	(0.059)
CCBUSYNESS	-0.405**	-0.400**
	(0.181)	(0.182)
CUMULYRSCSRCONTR	0.120***	0.122***
	(0.019)	(0.020)
PROPINDUSTRYCSRCONT	3.590***	3.504***
	(1.260)	(1.285)
CSRPERF	-0.540***	-0.534***
	(0.193)	(0.190)
Constant	-1.008	-0.830
	(0.969)	(0.989)
Observations	2,097	2,097
Adjusted R-squared	0.634	0.638
Firm FE	YES	YES
Year FE	YES	YES
Cluster SE	industry	industry

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 Selection Models

	CQ	CQ
	PSM	Entropy Balance
PO	0.356**	0.274*
	(0.164)	(0.149)
CC_CSREXP	0.005	-0.019
	(0.062)	(0.059)
FIRMSIZE	0.054	0.106**
	(0.056)	(0.049)
ROA	0.233	-0.045
	(0.361)	(0.233)
RD	-0.957***	-0.489
	(0.247)	(0.313)
AD	-0.703	-0.183
	(3.077)	(3.266)
STDINDROA	-0.827	-0.006
	(1.210)	(1.125)
STOCKRETURN	-0.001	-0.001
	(0.001)	(0.000)
BOARDSIZE	-0.018	-0.006
	(0.015)	(0.010)
PROPINDEP	0.085	0.185
	(0.363)	(0.319)
AVGBOARDTENURE	-0.034**	-0.035***
	(0.015)	(0.012)
CEOCHAIR	-0.116**	-0.085
	(0.050)	(0.059)
CCBUSYNESS	-0.134	-0.170
	(0.150)	(0.113)
CUMULYRSCSRCONTR	0.109***	0.112***
	(0.015)	(0.017)
PROPINDCSRCONTR	4.063***	4.294***
	(0.892)	(1.021)
CSRPERF	-0.088	0.030
	(0.202)	(0.160)
Constant	-0.301	-1.072**
	(0.616)	(0.524)
Observations	3,121	9,379
Adjusted R-squared	0.555	0.632
Firm FE	Yes	Yes
Year FE	Yes	Yes
Cluster	industry	industry

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The Determinants and Short-Term Consequences of Banks' Pledges to Disclose Financed Carbon Emissions

ABSTRACT

We examine the determinants and short-term consequences of banks' commitment to disclose harmonized financed carbon emissions. Using an international sample of publicly listed banks from 2014 to 2022, we find that larger banks, as well as those that are "doing good", are more likely to commit to such disclosures. Furthermore, we document that smaller banks announcing this commitment experience a negative stock market reaction. This reaction likely reflects the anticipated costly operational adjustments toward greener trajectories that we detect surrounding banks' commitment. Finally, stakeholder sentiment toward climate-related risks improves for these smaller banks around the commitment, consistent with the trajectory of their financed carbon emissions. Overall, our evidence suggests that smaller banks "walk the talk" when adopting environmental initiatives, while larger banks—despite being positioned as key players in the green transition—show no significant market response or operational changes. Our findings indicate that without properly enforced mandatory carbon disclosure regulations, the banking sector may fall short of achieving policy objectives aimed at effectively managing financed carbon emissions.

Keywords: PCAF; Financed Carbon Emissions; Banks; Voluntary Disclosure; ESG

> Financial institutions are the vital link in enabling the rapid and unprecedented economic transformation needed to meet the goals of the Paris Agreement. Through their lending and investing, financial institutions have the power to redirect capital to the sustainable technologies and solutions of the future and to the companies doing the most to prepare for a net-zero emissions economy.
> —Science Based Target, 2020

1. Introduction

In recent years, the role of banks in mitigating climate risk and global warming has been stressed by regulators, environmental advocates, investors, and market pundits. Large banks, in particular, are at the center of this critical discourse. Since the Paris Agreement, these institutions have channeled significant financing—totaling $6.9 trillion—into fossil fuel companies, with nearly half of this capital allocated to firms engaged in expansion within the sector (Rainforest Action Network et al., 2024). Critics have described banks as "the biggest laggards on climate action".[1] The 2022 European Central Bank (ECB) climate risk stress test revealed that more than 21% of European banks' interest income is derived from *highly* greenhouse gas (GHG)-intensive industries, underscoring the material transition risk these banks face (ECB, 2022a). Disclosures of financed carbon emissions are therefore essential, not only for banks to effectively manage climate risks but also for regulators and external stakeholders to assess the extent of banks' progress toward a net-zero economy.[2] In this context, our study examines one key environmental initiative—the Partnership for Carbon Accounting Financials (PCAF)—to analyze the determinants and short-term consequences of banks' decisions to commit to disclosing harmonized financed carbon emissions.

[1] https://www.responsible-investor.com/global-banks-are-the-biggest-laggards-on-climate-action-ri-survey-suggests/
[2] Descriptive evidence suggests that banks do not adequately disclose whether climate and environmental risks materially affect their risk profile (ECB, 2022b)

In 2015, PCAF was established at the Paris Climate Summit as a global initiative within the financial sector to develop and implement a standardized methodology for measuring, disclosing, and assessing GHG emissions associated with loans and investments.[3] This harmonized accounting approach aims to provide financial institutions with a science-based framework for reducing carbon emissions and aligning their portfolios with the goals of the Paris Agreement. By signing the PCAF commitment letter, institutions pledge to address the pressing challenge of climate change and decarbonize the economy, a call to action reflected in their commitment statement.[4] Mark Carney, former Governor of the Bank of Canada and the Bank of England, and U.N. Special Envoy on Climate Action and Finance, emphasized that "PCAF's work to standardize the approach to measuring financed carbon emissions is an important step to ensuring that every financial decision takes climate change into account."[5] Building on this context, our study investigates the factors influencing a bank's decision to commit to disclosing financed carbon emissions and analyzes the short-term implications of such commitments.[6]

The voluntary nature of joining PCAF implies that a bank's decision to participate may reflect its inherent characteristics regarding the perceived costs and benefits of disclosing financed

[3] Financed carbon emissions are considered as indirect GHG emissions (i.e., Scope 3 emissions). Direct GHG emissions are emissions from sources that are owned or controlled by the reporting company, which are also known as Scope 1 emissions. Indirect GHG emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company are known as Scope 2 emissions. All other indirect GHG emissions (not in Scope 2) that occur in the value chain of the reporting company are Scope 3 emissions (see https://ghgprotocol.org/corporate-standard-frequently-asked-questions)

[4] By signing the commitment PCAF letter, financial institutions commit to adhere to this statement: "addressing the urgent challenge of climate change, and decarbonizing our economy, is more pressing now than ever". https://bankonourfuture.org/banks-sec-climate/

[5] https://carbonaccountingfinancials.com/newsitem/partnership-for-carbon-accounting-financials-pcaf-launches-uk-coalition

[6] While the PCAF methodology applies to all types of financial institutions (e.g., banks, insurance companies, asset managers), we focus on banks for three reasons. First, a significant portion of signatories are banks. Second, heterogeneity in business activities is likely to influence firms' perceived costs and benefits of joining PCAF in ways that we are unable to empirically model this heterogeneity efficiently (i.e., our tests using a more homogeneous sample are likely to be better specified and more powerful). Third, the role of banks in mitigating climate change is of particular interest to regulators and investors.

carbon emissions (Christensen et al., 2021). First, disclosure theory suggests that better-performing firms are more likely to disclose their performance to stakeholders, while underperforming firms may seek to conceal unfavorable outcomes. Second, socio-political theories propose that poor performers may use positive disclosures to address legitimacy threats stemming from poor underlying performance (i.e., greenwashing). Third, agency theory posits that CEOs may pursue such initiatives to enhance their personal reputations, potentially at shareholders' expense. Ultimately, the determinants of banks' decisions to join PCAF remain an empirical question upon which our study sheds some light.

The expected short-term capital market response to PCAF announcements remains ambiguous. A commitment to disclose financed carbon emissions could align with shareholder wealth maximization, indicating a potential positive stock market reaction. However, equity markets may also react negatively. For instance, capital markets may perceive PCAF participation as entailing significant disclosure and operational costs. Conversely, the announcement to join PCAF may have little market impact if investors already view banks as engaging in responsible practices, or if the commitment to emissions disclosure is perceived as mere "cheap talk". Ultimately, the market's assessment of banks' decisions to join PCAF is an empirical question that our study seeks to explore.

The international nature of the PCAF initiative allows for an examination of both country-level attributes and firm-specific factors that motivate banks to commit to financed carbon emissions disclosures. Using an international sample of publicly listed banks, we find, first, that larger banks are more likely to join PCAF. Second, we observe that banks already disclosing Scope 3 emissions and those that are signatories of the Carbon Disclosure Project (CDP) are more inclined to adopt the initiative, supporting the notion that banks engaged in responsible practices

are more likely to signal their commitment. Third, PCAF adopters are more likely to be headquartered in countries with higher levels of institutional development.

Our second set of analyses employs an event study methodology to assess the short-term economic implications of PCAF commitment on bank shareholders. Under the efficient market hypothesis, the market reaction reflects the net assessment of potential benefits versus costs associated with joining PCAF. The event study results show a negative market response, primarily driven by small and midsize banks. For large banks, the lack of a significant reaction aligns with the view that their actions may not reflect their public commitments to reduce GHG emissions (Rainforest Action Network et al., 2024). In contrast, the negative market reaction observed for smaller banks may suggest that these institutions are either genuinely "walking the talk" by implementing substantive structural changes or facing heightened agency costs or future costs related to the disclosure of financed carbon emissions. We also apply a difference-in-differences methodology to examine the effect of PCAF commitment on banks' cost of equity capital. The results are consistent with the event study, indicating that the market perceives costs associated with joining PCAF primarily for small and midsize banks.

Our third set of analyses reveals that PCAF commitment is associated with operational adjustments, but only for small and midsize banks. These institutions exhibit lower financed carbon emissions, lower loan growth, and diminished profitability post-PCAF commitment compared to the control group. Moreover, for these banks, attention to climate-related issues during earnings calls increases post-PCAF commitment. Nonetheless, the tone of discussions on climate topics during these calls becomes significantly more positive. Sautner et al. (2023) provide evidence that a positive tone in such communications is linked to tangible outcomes in the context of the net-zero transition.

Although the PCAF initiative is an important step to reach net-zero carbon by allowing banks to monitor financed carbon emission in an harmonized way —thereby enabling them to rapidly align their portfolio with the Paris Agreement—, the voluntary and self-regulated nature of such initiative is unlikely to make this goal possible on global scale as "bad banks" in that area are unlikely to adhere to such initiative or "walk the talk".

This paper makes several contributions to the literature. First, we add to the scarce literature related to voluntary disclosures of non-financial information by banks (e.g., Caby et al., 2022; Cornett et al., 2016). Although the financed carbon emissions of banks are currently under heightened regulatory and public scrutiny, relatively little is known about bank practices in this domain. To our knowledge, this is the first study to examine banks' decisions to commit to financed carbon emissions disclosures, and the associated management of climate-related risks, within the high-profile PCAF initiative or similar frameworks. Our findings suggest that larger banks and those with better environmental policies are more likely to commit to disclosing financed carbon emissions.

Second, our study contributes to the literature on climate risk pricing by examining whether banks' commitments to disclose—and implicitly manage—climate risk exposures are reflected in market returns. Bolton and Kacperczyk (2021) provide evidence that investors demand a carbon risk premium, implying that the market may respond not only to the costs of disclosures but also to whether banks are perceived as genuinely addressing climate risks. Prior research indicates that socially responsible disclosures may affect the cost of capital (e.g., Dhaliwal et al., 2011; El Ghoul et al., 2011). Distinct from broader socially responsible disclosures, our study focuses specifically on environment-related disclosures, particularly carbon emissions, within the context of the PCAF initiative. Our findings reveal no significant market reaction to large banks' commitments to

disclose financed carbon emissions, while the market views this commitment as costly for smaller banks.

Third, our paper contributes to the literature on the economic impact of banks' voluntary environmental commitments. Hasan et al. (2023) find that Task Force on Climate-Related Financial Disclosures (TCFD)-member banks reduce their aggregate loan supply to polluters, and their clients improve environmental performance post-TCFD. However, Berg et al., (2024) find no evidence that voluntary green pledges under the Equator Principles lead to greener credit allocation. Similarly, Sastry et al. (2024) report no association between banks' net-zero commitments and reductions in financed emissions. Consistent with these later findings, our results suggest that voluntary commitments by banks are unlikely to accelerate the transition away from carbon-intensive production.

The remainder of the paper is organized as follows. Section 2 provides further background information related to PCAF. Section 3 reviews the literature. In Section 4, we describe the data and research design. Section 5 and 6 present the empirical results. Section 7 concludes the paper.

2. Background

PCAF was established in 2015 at the Paris climate summit to help financial institutions measure and disclose the GHG emissions associated with their investments and loans. Initially launched by Dutch institutions, PCAF quickly expanded globally as interest in assessing financed emissions within the financial sector grew. It reached North America in 2018 and became a global initiative by 2019.As of July 31, 2023, 470 financial institutions have joined PCAF.

PCAF published the Global GHG Accounting and Reporting Standard (GHG Standard) in November 2020. The GHG Standard is based on the GHG Protocol and was developed through a collaboration between the PCAF and public consultation. The GHG Standard specifically targets

at financial institutions and proposed a harmonized accounting methodology of measuring financed carbon emissions, ensuring comparability, transparency, and consistency. PCAF requires its members to assess and disclose the GHG emissions associated with their portfolio of loans and investments within a period of three years.[7]

The GHG Standard has garnered industry recognition for increasing the harmonization of financed carbon emissions reporting (Spittle and Dietrich Brauch, 2021). The European Financial Reporting Advisory Group (EFRAG) recommends the GHG Standard to financial institutions for disclosing Scope 3 emissions (EFRAG, 2022), a view shared by the European Banking Authority (EBA, 2022).

PCAF's framework is endorsed by other major climate initiatives and frameworks, underscoring its importance for measuring and disclosing financed emissions. For example, the TCFD advises banks to use PCAF's methodology for reporting financed carbon emissions. PCAF also complements the Paris Agreement Capital Transition Assessment by including a broader range of financial assets (PCAF, 2021). The Science Based Targets initiative (SBTI) recommends that banks use PCAF's methods to measure progress toward carbon reduction goals aligned with the Paris Agreement (SBTI, 2024). Additionally, the CDP, which sends climate surveys to firms annually, incorporates PCAF commitment into its scoring system (PCAF, 2021).

3. Literature Review

We review the literature according to our primary research questions: (1) the determinants of voluntary disclosures of corporate socially responsible (CSR)-related information; and (2) the pricing of carbon emission disclosures.

3.1. The determinants of voluntary disclosures of CSR-related information

[7] Of the 470 Financial institutions that became PCAF signatories by July 31, 2023, 89 have begun disclosing their financed carbon emissions (details in Panel B of Appendix B).

3.1.1. Firm-level characteristics

Prior research identifies several firm-level characteristics influencing CSR disclosure decisions. First, firm size consistently emerges as a key determinant (e.g., Hahn and Kühnen, 2013; Matsumura et al., 2014). The literature provides two main rationales for this relationship: larger firms face greater public scrutiny and regulatory pressure to disclose CSR information (e.g., Cormier and Magnan, 2003), and they experience lower relative disclosure costs due to greater resources (e.g., Udayasankar, 2008). However, larger firms may also be more susceptible to greenwashing, driven by heightened investor pressure and the relatively higher costs of implementing CSR policies (Delmas et al., 2013; Wickert et al., 2016).

Second, a large body of the literature examines the relationship between firms socially responsible behaviors and CSR-related disclosures. However, the direction of this association remains ambiguous and not necessarily causal (e.g., Clarkson et al., 2008; Hummel and Schlick, 2016; Margolis et al., 2009; Waddock and Graves, 1997). Economics-based disclosure theories suggest that more socially responsible firms have greater incentives to report their performance to signal their CSR commitment, while poor performers are less inclined to disclose. Conversely, legitimacy theory posits that firms with poor ESG performance may disclose CSR information to improve their reputation, regain legitimacy, or divert attention from other underperforming areas.

Finally, a broad range of other firm-level determinants have been explored in the literature. For example, several studies report a positive relationship between financial performance and the extent of CSR reporting (e.g., Jizi et al., 2014; Ott et al., 2017), consistent with the view that financially successful firms are better positioned to absorb the costs of non-financial disclosures, and are thus more likely to voluntarily disclose such information. Other studies examine the impact of firm risk on CSR disclosures, showing that firms with lower systematic risk are more inclined

to engage in socially responsible disclosures (e.g., Meier et al., 2021; Moore, 2001; Roberts, 1992). These studies suggest that lower-risk firms tend to have more stable stock and economic performance, which arguably increases their likelihood of making CSR disclosures. Furthermore, other studies have investigated the relationship between CSR disclosures and corporate governance structures. For instance, Jizi et al. (2014) argue that the workload of individual board members can constrain the board's monitoring capacity, a challenge particularly salient in the complex and highly regulated banking sector. Consequently, larger boards are expected to exert greater pressure on banks to disclose CSR information, a prediction supported by their empirical findings.

3.1.2. External stakeholder and societal pressure

Several studies examine the impact of institutional investors and analysts—two critical external stakeholders—on firms' CSR disclosures. Evidence indicates that institutional investors positively influence firms' climate risk disclosures (e.g, Dyck et al., 2019; Ilhan et al., 2023). Analysts also affect the extent to which firms engage in CSR activities. Adhikari (2016) reports that U.S. firms with greater analyst coverage tend to be less socially responsible, while Hu et al. (2021) report the opposite relationship in China. These differing results is likely to be attributed to the distinct motivations driving CSR engagement. In the U.S., Adhikari (2016) argues that CSR spending reflects an agency problem, with financial analysts curbing discretionary expenditures. In contrast, Hu et al. (2021) suggest that, in China, where discretionary CSR spending faces significant constraints, analysts influence firms to engage in CSR activities based on the belief that doing good is beneficial for business. Recent evidence suggests increasing attention from analysts to climate-related issues. Sautner et al. (2023) document a growing prevalence of climate-related

discussions during earnings calls since the early 2000s, while Ben-Amar et al. (2024) report that analysts recognize the value of climate risk disclosures.

Broader societal pressures may further shape voluntary CSR disclosures. Firms may pre-emptively disclose non-financial information to mitigate regulatory scrutiny and societal pressure (e.g., Hillman and Keim, 2001; Innes and Sam, 2008). Recent descriptive evidence indicates that more institutionally developed countries have implemented stricter climate change policies compared to less developed nations (Block et al., 2024). As a result, firms operating in jurisdictions with heightened regulatory scrutiny over financed carbon emissions are likely to have stronger incentives to disclose their GHG emissions. Conversely, the prospect of litigation risk may deter voluntary disclosures (e.g., Healy and Palepu, 2001). Consequently, in countries with better regulatory environment (e.g., more institutionally developed countries), managers may be less inclined to provide CSR-related disclosures.

3.2. The pricing of carbon emission disclosures

Empirical evidence on the pricing of carbon emission disclosures are mixed. Carbon emissions disclosures can enhance market valuation for at least two reasons. First, these disclosures may mitigate the information asymmetry between firms and investors (e.g., Schiemann and Sakhel, 2019), which can then lower the cost of capital and boost firm valuation (e.g., Lang et al., 2012). Second, as a credible signal of CSR commitment, voluntary carbon emission disclosures can drive premium-priced sales (e.g., Mohr and Webb, 2005), attract talented employees (e.g., Bhattacharya et al., 2007) as well as a larger base of socially responsible investors (e.g., Chava, 2014), and improve access to financial resources and cheaper capital (e.g., Kölbel and Lambillon, 2022). Consistent with the notion that voluntary carbon emission disclosures may convey a

positive signal, Matsumura et al., (2014) provide evidence that firms failing to disclose carbon emissions face greater market penalties compared to those that do.

Conversely, carbon emissions disclosures may prompt negative market reactions First, such disclosures can impose proprietary costs (Li et al., 1997). Second, voluntary disclosures can increase litigation risks (Johnson et al., 2001), which can adversely affect firm value (Gande and Lewis, 2009). Jouvenot and Krueger (2019) outline two additional reasons for this relationship. First, increased regulatory scrutiny over carbon emissions may signal higher regulatory costs, such as carbon taxes. Consequently, if market participants perceive voluntary carbon emission disclosures as indicative of expected regulatory pressures (e.g., carbon taxes), they may react negatively. Second, disclosing GHG emissions can incur real costs associated with transitioning from high to low carbon-intensive investments through operational adjustments. Supporting the idea that the market may penalize firms for climate-related disclosures, Bratten and Cheng (2022) report negative market reactions to voluntary climate risk disclosures during conference calls of U.S. firms.

Moreover, voluntary climate-related disclosures may elicit no market reactions. One contributing factor is that current disclosures may be perceived as uninformative and imprecise (Ilhan et al., 2023), particularly regarding Scope 3 emissions, which involve greater discretion and estimation errors compared to Scopes 1 and 2 (Raghunandan and Rajgopal, 2023). Echoing the notion that reported GHG emissions may lack relevance, Aswani et al. (2024) show that disclosed GHG emissions reported by the firm is not associated with sock returns. Furthermore, the prevalence of greenwashing may undermine the credibility of climate disclosures. Supporting this perspective, Bingler et al. (2022) provide evidence that TCFD-related disclosures are mostly "cheap talk", with firms primarily reporting non-material climate risk information. Several studies

shows that banks' green pledges are not associated with a shift from brown to green lending consistent with voluntary commitments for decarbonization being "cheap talks" (e.g., Berg et al., 2024; Giannetti et al., 2024; Sastry et al., 2024).

4. Data and Research Design

4.1. Data and Sample

We collect data from two primary sources. Accounting data and stock price information, denominated in U.S. dollars (USD), are obtained from S&P Global Market Intelligence (S&P GMI), while ESG scores, GHG emissions, and board information are retrieved from Refinitiv ESG.

We start our sample selection with listed banks headquartered in OECD countries, identified in the S S&P GMI database. We restrict our sample to OECD countries for two reasons. First, these advanced economies have historically contributed the most to GHG emissions (Dhakal et al., 2023) and, therefore, bear a moral obligation to lead in mitigating climate change. Second, the OECD actively supports climate action aligned with the Paris Agreement's collective goals.[8] As a result, public and regulatory scrutiny of GHG emissions is heightened in OECD countries, and these economies possess more substantial resources to address and manage climate risk.

From the 417 PCAF signatories, we identify 106 banks that meet our core screening criteria. We further exclude banks that were not listed before joining PCAF, those with missing data from S&P GMI, and those with thinly traded stocks. We define thinly traded stocks as those with more than 50 missing stock prices or 50 zero returns during the year preceding their PCAF commitment (Kajüter et al., 2019). The final sample consists of 93 PCAF banks. We apply the same screening criteria to our control group of non-PCAF banks, yielding a sample of 763 banks. Table 1 outlines the sample selection criteria.

[8] See https://www.oecd.org/en/topics/policy-areas/climate-change.html

[Insert Table 1]

Table 2 presents the distribution of PCAF and non-PCAF banks across 35 OECD countries, highlighting significant cross-country heterogeneity. In several jurisdictions, such as Canada and Korea, the proportion of PCAF banks is notably high. However, in other advanced economies, including Greece and Turkey, none of the listed banks have yet joined PCAF.

[Insert Table 2]

4.2. Determinant analysis

As outlined in Section 3.1, we draw on prior literature and employ economic and institutional rationales to identify potential determinants influencing banks' decisions to join PCAF. Our model follows previous research on the determinants of accounting and regulatory choices (e.g., Bischof et al., 2022; Dong and Oberson, 2022; Fiechter et al., 2018).

$$\begin{aligned} PCAF_{it} = {} & \beta_0 + \beta_1 ROA_{it} + b_2 LOANS_{it} + b_3 NPL_{it} + b_4 CAPITAL\ RATIO_{it} \\ & + b_5 SIZE_{it} + b_6 Log\ BTM_{it} + b_7 BETA_{it} + b_8 ESGD_{it} + b_9 CDP_{it} \\ & + b_{10} ANALYST_{it} + b_{11} INST\ OWN_{it} + b_{12} CCH\ 2022_{it} \\ & + b_{13} INST\ DEV_{it} + b_{14} GDP\ GROWTH_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Where i denotes bank and t denotes years. We use a *dynamic* probit model (Fiechter et al., 2018). The dependent variable, $PCAF$, equals one in the year prior a bank's announcement to join PCAF and is missing in years before and after. For non-PCAF banks, $PCAF$ is equal to 0 through the whole sample period.[9]

4.2.1. *Firm-level variables*

[9] The dynamic probit model makes use of longitudinal data, which can allow us to capture the unobserved heterogeneity, dynamic relations, and even causal effects (although our paper does not intend to claim any causal effect). In our setting, the dynamic model can guarantee the lagged response among the covariates.

In line with prior banking literature (e.g., Bischof et al., 2022; Cornett et al., 2016; Dong and Oberson, 2022; Jizi et al., 2014), we measure banks' financial performance using earnings before taxes over total assets in percentage (ROA), banks' business model using the ratio of gross loans to total assets ($LOANS$), asset quality using the ratio of non-performing loans to total gross (NPL), banks' capitalization using the total regulatory ratio in percentage ($CAPITAL\ RATIO$), banks' size as the natural logarithm of total assets ($SIZE$), growth prospect using the natural logarithm of the book to market ratio (BTM), and bank's exposure to systematic risk using banks' market beta ($BETA$).

With respect to banks' attitude towards social responsibility, we first consider whether the bank is ESG-rated using an indicator variable that equals one if the bank has an ESG score in Refinitiv, and 0 otherwise ($ESGD$). Sastry et al. (2024) suggest that banks with ESG ratings may enjoy reputational and financial benefits from engaging in climate-related commitments. Second, we include an indicator variable that equals one if the bank participated in the CDP prior to joining PCAF, and zero otherwise (CDP). This is motivated by the CDP's influence on PCAF commitment through its scoring framework (PCAF, 2021)

In additional analyses, we further assess the influence of socially responsible performance by including the bank's ESG score from obtained from Refinitiv ESG (ESG), as well as its individual components: environmental (E), social (S), and governance (G) scores. Additionally, we include $SCOPE3D$, an indicator variable that equals one if the bank disclosed Scope 3 emissions before joining PCAF, and 0 otherwise. Lastly, include the number of directors on the board ($BOARD\ SIZE$) as a proxy for good corporate governance practices in terms of voluntary CSR disclosure

4.2.2. *External Stakeholder and societal pressure variables*

We measure analyst coverage as the natural logarithm of one plus the number of analysts covering the bank ($ANANLYST$), setting missing values to zero (Brennan and Subrahmanyam, 1995). We include $INST\ OWN$, representing the percentage of common equity owned by institutional investors, to evaluate their influence on banks' green commitments.

To assess regulatory and institutional pressures related to climate issues, we employ two proxies. First, we use the climate change index obtained from the Yale Center for Environmental Law (Yale University) and Center for International Earth Science Information Network (Columbia University) for the year 2022 ($CCH\ 2022$). This index ranks countries based on their responses to climate change, with higher values indicating poorer country-level climate change mitigation performance. Second, we use $INST\ DEV$, which captures the overall level of institutional development using indices from Kaufmann et al. (2011). Following Beck et al. (2006), we use the first principal component of six country governance variables.[10] Lastly, $GDP\ GROWTH$ is the real GDP growth rate. Further details on the variable definitions are available in Appendix A.

4.3. Event Study

We conduct a short-window event study to examine the immediate stock market reaction to banks' announcements regarding their commitment to disclose financed carbon emissions through the PCAF initiative. More specifically, this technique estimates (cumulative) abnormal returns surrounding banks' announcements to join PCAF ($t = 0$). We base our tests on three windows ([0], [-1, +1], [-3,+3], and [-5, +5]) (e.g., Loipersberger, 2018). The announcement dates were retrieved from Factiva, Refinitiv (i.e., using the News and Research or the Fillings search engine), the bank website or the PCAF LinkedIn. Notably, among the 93 PCAF banks, eight have not publicly announced their participation.

[10] These six country governance variables are voice and accountability, government effectiveness, political stability, regulatory quality, rule of law, and control of corrupt.

Cumulative abnormal returns are calculated as the difference between the realized stock returns of bank *i* on day *t* and the expected returns that the bank would have shown in the absence of the event. To compute stock returns, we collect daily stock price information from Capital IQ. Expected returns are estimated using first the Fama-French three-factor model and alternatively with the Fama-French five-factor model plus momentum (e.g., Ramelli et al., 2021). The factors are obtained from the Kenneth R. French Data Library. We use the Fama/French North America factors to match the stocks of banks listed in North America and the Fama/French Developed ex US Factors to match the stocks of the remaining banks (e.g., Deng et al., 2022). The factor models are estimated using an estimation window that ranges from -272 days to -21 days prior to a bank's announcement date.

5. Empirical Results

5.1. Descriptive Statistics

The descriptive statistics for the 2014–2022 period are presented in Panel A of Table 3. To mitigate the influence of extreme values, all continuous variables have been winsorized at the 1st and 99th percentiles.

On average, the banks in our sample are profitable over the sample period, with a mean return on assets (ROA) of 1.1%. They hold 67.1% of their balance sheets in loans ($LOANS$), reinforcing that lending constitutes a significant portion of their activities, which implies that the disclosure of financed carbon emissions likely covers a large share of their assets. The average capital ratio ($CAPITAL\ RATIO$) of 15.6% indicates strong capitalization. The average bank size ($SIZE$) is 9.05, corresponding to approximately USD 98.4 billion in total assets (not tabulated). Additionally, 49.1% of bank-year observations have an ESG score ($ESGD$), with a mean ESG score (ESG) of 45, and a relatively large standard deviation of 20.9. On average, banks have 12

board directors ($BOARD\ SIZE$), and institutional investors hold 36.4% of common equity ($INST\ OWN$). The mean number of analysts following each bank ($ANALYST\ RAW$) is 4.

Panel B of Table 3 compares the means of the variables used in the determinant analysis for PCAF and non-PCAF banks. Significant structural differences emerge between the two groups. PCAF banks exhibit higher capital ratios, greater book-to-market values, higher exposure to systematic risk, stronger ESG scores, larger boards, and a higher proportion of institutional ownership. They are also more frequently covered by analysts and tend to be larger in size. In contrast, non-PCAF banks display a greater focus on traditional banking activities, with a higher proportion of loans on their balance sheets, and perform financially better. Additionally, PCAF banks are headquartered in countries with higher levels of institutional development and superior climate change mitigation performance. Notably, PCAF banks are more likely than non-PCAF banks to have committed to CDP prior to joining PCAF. Furthermore, among PCAF banks with an ESG score ($ESGD$=1), which covers 78% of bank-year observations, a larger proportion were already disclosing Scope 3 emissions before joining PCAF compared to their non-PCAF counterparts. These findings indicate that PCAF banks were already engaged in disclosing GHG emissions, particularly indirect emissions, before joining PCAF. Thus, their membership likely reflects a commitment to harmonize the measurement of financed carbon emissions rather than a new effort to disclose indirect emissions.

[Insert Table 3]

Table 4 presents descriptive evidence that banks previously committed to voluntary green pledges are more likely to disclose financed carbon emissions. We leverage two voluntary climate-risk disclosure initiatives not specifically targeted at financial institutions. First, we examine the CDP, which encourages voluntary disclosure of environmental impact, particularly carbon

emissions, providing investors and stakeholders with key information for firm valuation and portfolio decisions. Second, among CDP respondents, we identify whether banks also report to the TCFD. The TCFD framework structures climate-related disclosures around governance, strategy, risk management, and metrics and targets. While both initiatives promote climate transparency, CDP is broader in scope, covering environmental impact, while TCFD focuses on strengthening internal risk management and enabling more effective risk assessments for investors and financial institutions.

Our findings align with the view that PCAF banks were already committed to climate-related disclosures before joining PCAF. PCAF banks are more likely to be CDP respondents than non-PCAF banks (Table 4, Column 1), with the majority of PCAF banks being CDP respondents prior to joining PCAF (Table 4, Column 2), and exhibiting slightly higher CDP ratings (Table 4, Column 3). Additionally, most PCAF banks that are CDP respondents also report according to the TCFD recommendations (Table 4, Column 4). Finally, the majority of these banks were TCFD reporters before joining PCAF (Table 4, Column 5) and disclosing financed carbon emissions under the PCAF framework (Table 4, Column 6).

[Insert Table 4]

5.2. The Determinants for Joining PCAF—Results

Table 5 presents the results of estimating Eq. (1). In Column 1, we use all available bank-year observations. In Column 2, we further saturate the estimation model with year- and country-fixed effects to control for a PCAF adoption trend over time and to address concerns related to unobserved heterogeneity at the country level.[11]

[11] Note that $CCH\ 2022$ is not included in the estimation of Eq. (1) that includes year- and country-fixed effects with year as this variable is perfectly colinear with the fixed effect structure.

The findings in both columns consistently indicate that larger banks and CDP respondents are more likely to join PCAF, as evidenced by the positive and significant coefficients on $SIZE$ and CDP. In Column 1, we also observe that PCAF banks are more likely to be headquartered in countries with higher institutional development, indicated by the positive coefficient on $INST\ DEV$. The insignificant coefficient on $INST\ DEV$ in Column 2 likely reflects the reduced within-group variation after including the fixed effects.[12] Additionally, the positive and significant coefficient on $LOANS$ in Column 2 suggests that banks more focused on lending within a country are more inclined to join PCAF.

In columns 3 to 10, we narrow our focus to ESG-rated banks by replacing $ESGD$ with the ESG score (ESG) and its subcategory scores: environmental (E), social (S), and governance (G). We also include $SCOPE3D$ and $BOARD\ SIZE$, as these variables are also retrieved from Refinitiv ESG data. Even columns incorporate year- and country-fixed effects. The results indicate that banks disclosing Scope 3 emissions prior to joining PCAF are more likely to commit to disclosing financed carbon emissions under a standardized framework, as suggested by the positive coefficient on $SCOPE3D$.

In summary, our findings align with the literature on voluntary disclosure, revealing that larger banks are more likely to join PCAF. Furthermore, banks already engaged in climate-related voluntary disclosures, such as being CDP respondents or disclosing Scope 3 GHG emissions prior to joining PCAF, demonstrate a greater propensity to adopt PCAF. This suggests that the signaling costs associated with adopting a standardized approach to measuring financed carbon emissions are lower for these banks. Finally, we present evidence that the institutional context may influence

[12] In fact, the fixed effect structure (i.e., year and countries dummies) explain 98.1% of the observed variation in $INST\ DEV$ (not tabulated)

banks' decisions to join PCAF, as evidenced by the greater likelihood of PCAF adopters being headquartered in more institutionally developed countries.

[Insert Table 5]

5.3. Event Study—Results

Panel A of Table 6 reveals that announcing to join PCAF has a negative effect 0.34% for the 0-day window using the Fama-French five-factor model plus momentum. This impact is significant at the 10% level. The effect turns insignificant for larger windows, suggesting that there is not too much over- and undershooting of stock prices.

In Panel B, we analyze whether market reactions to banks' announcements of joining PCAF vary based on bank size. The sample is divided into two groups: small and midsize banks, which fall within the bottom and middle terciles of $SIZE$ in the year prior to their PCAF announcements, and large banks, defined as those in the top tercile. We focus on bank size due to descriptive evidence indicating that the largest banks are deeply involved in financing fossil fuel companies (Rainforest Action Network et al., 2024). While larger banks may face higher costs from committing to carbon emissions disclosures, they may also have stronger incentives to publicly commit to green initiatives without necessarily waling the talk (e.g., Sastry et al., 2024). Our findings indicate that the market reaction is concentrated among small and midsize banks, with no significant response observed for large banks.

Overall, our results suggest that commitments to harmonized GHG emissions disclosures are perceived by the stock market as signaling higher future costs for small and midsize banks. In contrast, large banks show no significant market reaction to such commitments. This lack of response implies that investors either do not view these banks as fully committed to their climate pledges, or that large banks are perceived to have already incorporated a carbon neutrality

trajectory, making the costs of disclosing financed emissions relatively minimal. However, this latter interpretation is inconsistent with recent descriptive and empirical evidence (e.g., Berg et al., 2024; Rainforest Action Network et al., 2024; Sastry et al., 2024).

[Insert Table 6]

5.4. *Cost of Capital*

Using a difference-in-differences (DID) methodology, we assess the effect of a bank's PCAF commitment on its cost of equity, serving as an alternative specification to evaluate the stock market's reaction to this announcement. Prior literature suggests that ESG concerns, including environmental issues, are linked to a higher cost of capital (e.g., Chava, 2014). As discussed in Section 3.2, mitigating these concerns through green pledges may help reduce uncertainty and offer clearer guidance to investors and other stakeholders, potentially attracting a larger base of socially responsible investors or reducing information asymmetry. However, addressing ESG issues may entail significant costs, potentially increasing a firm's cost of capital. Consequently, unless the commitment to disclose financed emissions is perceived as effectively addressing climate-related risks, PCAF commitment is unlikely to exert a significant influence on a bank's capital costs.

We test for changes in banks' cost of equity post-PCAF announcement using the following equation:

$$COE_{it} = b_0 + b_1 PCAF\_TREAT_{it} + CONTROLS + FIXED\ EFFECTS + \varepsilon_{it} \qquad (2)$$

COE is the cost of equity derived from the Capital Asset Pricing Model (CAPM) model. Appendix D details the construction of the cost of equity variable. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF commitment, and zero otherwise. We follow Fu et al. (2012) and control ($CONTROLS$) for $SIZE\ LAGGED$ (the natural

logarithm of total assets at the beginning of the year in USD millions), $BETA\ LAGGED$ (the lagged value of a bank's market beta), and $Log\ BTM$ (the natural logarithm of the book to market ratio). Additional controls include $LOANS$ (the proportion of loans) to account for the bank's business model, and $CAPITAL\ RATIO$ (the total regulatory capital ratio) to account for regulatory capital levels. Finally, to alleviate concerns that macro environment and innate bank-level characteristics affect our results, we include bank and year fixed effects ($FIXED\ EFFECTS$).

Table 7 presents the results of estimating Eq. (2). In Column 1, the coefficient on $PCAF\_TREAT$ is positive and statistically significant at the 10% level, indicating an increase in the cost of equity following PCAF adoption. Columns 2 and 3 reveal that this effect is primarily driven by small and midsize banks, which experience a significant rise in the cost of equity post-commitment, while large banks show no notable change. These findings align with our event study results.

[Insert Table 7]

6. Discussion: Why Do Small Banks Experience a Negative Market Reaction?

So far, our findings indicate that larger banks and banks that are doing good are more likely to commit to disclosing financed carbon emissions in a harmonized manner. Additionally, we have shown that this commitment triggers a negative market reaction, but only for small and midsize banks. In this section, we examine potential drivers behind the adverse stock market reaction among small and midsize banks. We posit that this reaction is more likely attributed to anticipated real operational adjustments rather than proprietary costs, increased litigation risks, or stricter climate-related regulation, for four interrelated reasons. First, committing to disclose financed carbon emissions is not equivalent to actual disclosure. During our sample period, most banks had not yet disclosed their financed carbon emissions according to the PCAF standard (see Appendix

D). Second, banks have the flexibility to time their first disclosure within three years. Third, disclosure does not need to cover the entire portfolio, as the scope is at the discretion of the institution.[13] Fourth, there are no stringent enforcement mechanisms, and banks can withdraw from the PCAF initiative at any time.[14] Additionally, there is little reason to expect stricter climate-related regulation, to systematically affect more smaller banks, especially since larger banks are typically more involved in financing fossil fuel-heavy industries (Rainforest Action Network et al., 2024).[15] Overall, the voluntary nature of these disclosures and the lack of enforcement suggest that unless market participants expect banks to make substantive operational changes, a negative market reaction to such commitments is unlikely.

6.1. Does the PCAF commitment lead to a reduction in bank-level financed carbon emissions?

First, we examine whether the commitment to disclose financed carbon emissions is associated with a real intent to decarbonize the portfolio.[16] In fact, this commitment to disclosure presumably implies that banks also signal their ambitious level of tracking, measurement, understanding, and management of climate related risks. To test this conjecture, we estimate the following DID regression model:

[13] As of 2022, The 1in1000 programme of 2° Investing Initiative Germany reports that PCAF signatories do not comply with PCAF disclosures requirements. https://2degrees-investing.org/resource/0-of-pcaf-signatories-currently-comply-with-the-pcaf-standard/

[14] A recent example of such withdrawal involves the Equator Principles. In 2024, JP Morgan, Bank of America, Citi, and Wells Fargo exited this initiative. https://www.reuters.com/business/finance/jpmorgan-citi-wells-boa-are-no-longer-signatories-equator-principles-website-2024-03-05/

[15] Consistent with this argument, our analysis reveals that, over the sample period, large banks have significantly higher average total estimated downstream Scope 3 emissions ($SCOPE3\ DOWN$) compared to small and midsize banks. Furthermore, the average downstream Scope 3 emission intensity ($SCOPE3\ DOWN\ INT$) does not differ significantly between the two groups. (not tabulated)

[16] The PCAF list the following benefit on their website for companies that commit: "The harmonized accounting approach provides financial institutions with the starting point required to set science-based targets and align their portfolio with the Paris Climate Agreement." https://carbonaccountingfinancials.com/en/about

$$DV_{it} = b_0 + b_1 PCAF\_TREAT_{it} + b_2 ROA_{it} + b_3 Log\ BTM_{it} + b_4 LOANS_{it} \quad (3)$$
$$+ b_5 SIZE\ LAGGED_{it} + b_6 CAPITAL\ RATIO_{it} + b_7 GDP\ GROWTH_{it}$$
$$+ FIXED\ EFFECTS + \varepsilon_{it}$$

The dependent variable is either the firm's total estimated downstream Scope 3 emissions intensity ($SCOPE3\ DOWN\ INT$), which we measure as the ratio between total downstream Scope 3 emission in tonnes and the enterprise value including cash and short term investments in million US dollars, or the natural logarithm of the firm's total estimated downstream Scope 3 emissions measured in tCO2e ($SCOPE3\ DOWN$).[17] We focus on Refinitiv-estimated emissions rather than bank-disclosed figures for several reasons. First, only a limited number of banks disclose these emissions. Second, such disclosures may not encompass the entire portfolio. These limitations raise concerns about statistical power and the potential for changes in emissions to reflect shifts in coverage. Moreover, while estimated emissions may exhibit some bias, our primary interest lies in analyzing changes in emissions trajectories between large banks and other institutions. Thus, any potential bias is unlikely to significantly influence our inferences. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF commitment, and zero otherwise. We control for the following which were defined earlier and in Appendix A: ROA, $Log\ BTM$, $LOANS$, $SIZE\ LAGGED$, $CAPITAL\ RATIO$, and $GDP\ GROWTH$. We include year and bank fixed effects ($FIXED\ EFFECTS$).

[17] The estimation of total downstream Scope 3 emissions is available starting from 2016. We focus on estimated total downstream Scope 3 emissions as a proxy for financed carbon emissions (Scope 3 – category 15), as financed carbon emissions are not (yet) available. However, financed carbon emissions (Scope 3 – category 15) are expected to constitute the bulk of total downstream Scope 3 emissions for commercial banks. Downstream Scope 3 emissions include transportation and distribution (Scope 3 – category 9), processing of sold products (Scope 3 – category 10), use of sold products (Scope 3 – category 11), end-of-life treatment of sold products (Scope 3 – category 12), downstream leased assets (Scope 3 – category 13), franchises (Scope 3 – category 14), and investments (Scope 3 – category 15).

Table 8 presents the results of estimating Eq. (3). In columns 1 and 4, the coefficient on $PCAF\_TREAT$ is negative and statistically significant, indicating a reduction in both the intensity and total volume of downstream Scope 3 emissions following PCAF adoption. Columns 2, 3, 5, and 6 show that this effect is predominantly driven by small and midsize banks. These findings align with the interpretation of the event study results, suggesting that market participants expected smaller banks to "walk the talk", whereas larger banks may have been perceived as engaging in "cheap talk".

[Insert Table 8]

6.2. How does small banks reduce their financed carbon emissions?

The previous analyses suggest that market participants view "walking the talk" as costly, with small and midsize banks demonstrating a reduction in financed carbon emissions. As a result, we expect these banks to implement *costly* operational adjustments. To test this hypothesis, we first examine changes in loan growth and subsequently assess shifts in financial performance.

To examine whether loan growth changes with the decision to join PCAF, we estimate the following DID regression model:

$$\begin{aligned} LOAN\ GROWTH_{it} &= b_0 + b_1 PCAF\_TREAT_{it} + b_2 DEPOSIT\ LAGGED_{it} \\ &+ b_3 SIZE\ LAGGED_{it} + b_4 CASH\ FLOW\ LAGGED_{it} \\ &+ b_5 EQUITY\ LAGGED_{it} + b_6 NPL\ LAGGED_{it} + b_7 GDP\ GROWTH_{it} \\ &+ FIXED\ EFFECTS + \varepsilon_{it} \end{aligned} \tag{4}$$

$LOAN\ GROWTH$ is the yearly change in total loans divided by total loans at the beginning of the year. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF commitment, and zero otherwise. Following Bhat et al. (2019), we control for

$DEPOSIT\ LAGGED$ (total deposits over total assets, at the beginning of the year), $SIZE\ LAGGED$ (the natural logarithm of total assets at the beginning of the year in USD millions), $CASH\ FLOW\ LAGGED$ (earnings before taxes and loan loss provisions to total assets, at the beginning of the year), $EQUITY\ LAGGED$ (total equity over total assets, at the beginning of the year). $NPL\ LAGGED$ (nonperforming loans over total loans, at the beginning of the year). We further control for GDP growth ($GDP\ GROWTH$) which were defined earlier and in Appendix A. We include year and bank fixed effects ($FIXED\ EFFECTS$).

To examine whether financial performance changes with the decision to join PCAF, we estimate the following DID regression model:

$$\begin{aligned} ROA_{it} = {} & b_0 + b_1 PCAF\_TREAT_{it} + b_2 DEPOSIT\ LAGGED_{it} + b_3 SIZE\ LAGGED_{it} \\ & + b_4 LOANS\ LAGGED_{it} + b_5 EQUITY\ LAGGED_{it} \\ & + b_6 NPL\ LAGGED_{it} + b_7 GDP\ GROWTH_{it} + FIXED\ EFFECTS \\ & + \varepsilon_{it} \end{aligned} \quad (5)$$

ROA is earnings before taxes to total assets. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF adoption, and zero otherwise. $LOANS\ LAGGED$ is the ratio of gross loans to total assets, at the beginning of the year. We control for the following which were defined above: $DEPOSIT\ LAGGED$, $SIZE\ LAGGED$, $EQUITY\ LAGGED$, $NPL\ LAGGED$, and $GDP\ GROWTH$. We include year and bank fixed effects ($FIXED\ EFFECTS$).

Table 9 presents the results of estimating Eq. (4). In Panel A, we report the analysis for loan growth. In Columns 1, the coefficient on $PCAF\_TREAT$ is negative and statistically significant, indicating a decrease in loan growth following PCAF adoption. Columns 2 and 3 show that this effect is predominantly driven by smaller banks. In Panel B, we report the analysis that

focuses on financial performance. While in Column 1, the coefficient on $PCAF\_TREAT$ is insignificant, the statistically negative coefficient on $PCAF\_TREAT$ in Column 2 and insignificant coefficient on $PCAF\_TREAT$ in Column 3 indicates that smaller banks exhibit lower financial performance after the decision to join PCAF than other banks. These findings align with the interpretation that smaller banks undertake operational adjustments following the decision to join PCAF, while larger banks mostly engaged in "cheap talk".

[Insert Table 9]

6.3. Investors attention and GHG emissions

An important follow-up question is how attention devoted to climate change topics by managers and market participants has evolved around PCAF adoption. To answer this question, we use the following equation:

$$DV_{it} = b_0 + b_1 PCAF\_TREAT_{it} + b_2 ROA_{it} + b_3 BETA_{it} + b_4 LOANS_{it} + b_5 SIZE\ LAGGED_{it} + b_6 CAPITAL\ RATIO_{it} + FIXED\ EFFECTS + \varepsilon_{it} \quad (2)$$

For this analysis, we use data from Sautner et al. (2022), which identifies from earnings conference calls the demand side (analysts) and the supply side (management) of a firms' climate change exposures. We use the ISIN code to link their measures with our sample of listed banks. Specifically, we focus on two climate risk measures as dependent variable (DV): $CCExp$ and $CCExpSent$. $CCExp$ captures exposures to climate change. $CCExpSent$ denotes the overall banks' sentiment towards climate change. $PCAF\_TREAT$ is a binary indicator set to one for bank-year observations following a bank's PCAF commitment, and zero otherwise. We control for the following which were defined earlier and in Appendix A: ROA , $BETA$, $LOANS$,

$CAPITAL\ RATIO$, and $SIZE\ LAGGED$. We include year and bank fixed effects ($FIXED\ EFFECTS$).

Table 10 presents the results of estimating Eq. (5). In Column 1, we find that the coefficient on $PCAF\_TREAT$ is positive and significant with $CCExp$ as dependent variable. These results indicates that the attention paid by analysts to firm-level climate change exposure or manager discussion of that topic increases following PCAF adoption. In other words, following the decision to join PCAF, climate-related issues are more discussed during earning calls. Columns 2 and 3 suggest the this result primarily driven by small and midsize banks. The results in Column 4 suggest that banks' sentiment towards climate issues are relatively more positive since banks joined PCAF. Again, the results presented in columns 5 and 6 indicates that banks' sentiment towards climate risk is incrementally more positive after joining PCAF for small and midsize banks.

[Insert Table 10]

To sum up, we find that small and mid-sized banks' decision to join PCAF is linked to a shift toward greener trajectories through tangible operational adjustments, while no detectable changes are observed for large banks. Although we do not assert causal identification—that the decision to join PCAF directly drives these outcomes—our results offer valuable insights into the divergent paths of green pledges between small and mid-sized versus large banks.

7. Conclusion and Discussion

We examine the determinants and short-term consequences of banks voluntarily committing to harmonized disclosure of financed carbon emissions. This study is both timely and relevant in light of increasing public scrutiny of carbon emissions and the growing need to assess the environmental impact of bank portfolios.

Using an international sample of banks from 2014 to 2022, our findings reveal that larger banks and those already engaged in carbon disclosure (i.e., reporting Scope 3 emissions and responding to the CDP) are more likely to join PCAF. An event study reveals a negative market reaction to PCAF announcements for small and midsize banks, whereas large banks experience no significant market response.

We explore potential drivers of these market reactions and find that for small and mid-sized banks, the decision to join PCAF is associated with a shift toward greener trajectories. These banks experience slower loan growth, weaker financial performance, and a reduction in financed carbon emissions, reflecting tangible operational adjustments. In contrast, no such changes are observed for large banks. Taken together with the event study results, we interpret this as the market expecting small and midsize banks to make substantive efforts ("walking the talk"), while large banks are anticipated to engage in symbolic gestures ("cheap talk").

Our results suggest that without mandatory financed carbon emissions disclosures and effective enforcement mechanisms, the financial sector is unlikely to address climate change in a timely manner. Larger banks, which play a key role in financing high-polluting industries, appear to be perceived as engaging in green pledges symbolically. Harmonized financed carbon emissions reporting could be instrumental in evaluating their progress toward a net-zero economy. Moreover, our findings indicate that banks already "doing good" are more likely to commit to emissions disclosure, depriving stakeholders of critical information from less environmentally proactive institutions.

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Appendix A
Variable descriptions.

Variable	Description	Source
PCAF DYN	For PCAF banks, PCAF DYN equals one in the year prior to the announcement of joining the PCAF and is missing in the years before and after. For non-PCAF banks, PCAF DYN equals zero for the whole sample period.	PCAF website
PCAF_TREAT	An indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise.	PCAF website
ROA	Earnings before taxes to total assets.	S&P GMI
LOANS	The ratio of total gross loans to total assets.	S&P GMI
CAPITAL RATIO	The total regulatory capital ratio. (in%)	S&P GMI
SIZE	The natural logarithm of total assets in USD millions.	S&P GMI
Log BTM	The natural logarithm of the book to market ratio.	S&P GMI
BETA	The coefficient of the market return calculated from the the Capital Asset Pricing Model with prior one year daily data. We use the Fama-French North America factors to match the stocks from North America and the Fama-French Developed ex US Factors to match the stocks from elswhere. Stock returns are in excess of the risk-free rate. The risk-free rate is the U.S. one month T-bill rate.	S&P GMI, Kenneth R. French Data Library
ESGD	An indicator variable that takes the value 1 if the bank has an ESG score, and zero otherwise.	Refinitiv ESG
ESG	ESG Score.	Refinitiv ESG
E	The environmental pillar 'E' score	Refinitiv ESG
S	The social pillar 'S' score	Refinitiv ESG
G	The governance pillar 'G' score	Refinitiv ESG
SCOPE3D	An indicator variable that takes the value 1 if the bank has Scope 3 emissions disclosed in Refinitiv ESG prior to joining PCAF, and zero otherwise. We use data marked as *reported* by the firm and not *estimated* by Refinitiv.	Refinitiv ESG
BOARD SIZE	The number of directors on the board	Refinitiv ESG
CDP	An indicator variable that takes the value 1 if the bank has joined CDP prior to joining PCAF, and zero otherwise.	
ANALYST RAW	Number of analysts	S&P GMI
ANALYST	The natural logarithm of one plus the number of analysts.	S&P GMI

(continued on next page)

Appendix A
(continued)

Variable	Description	Source
INST OWN	Institutional ownership in %	S&P GMI
CCH 2022	Climate change index that ranks countries according to their response to climate change, obtained from the Yale Center for Environmental Law (Yale University) and Center for International Earth Science Information Network (Columbia University) for the year 2022.	epi.yale.edu
INST DEV	Index of the overall level of institutional development averaged over the sample period The underlying indicators are voice and accountability, government effectiveness, political stability, regulatory quality, rule of law, and control of corruption. We use the first principal component indicator of these variables.	Kaufman, et al. (1999)
GDP GROWTH	The real GDP growth. (in%)	S&P GMI
COE	We use the CAPM model. Our regression model is specified as $r_t - r_{F,t} = \alpha + \beta_1(r_{M,t} - r_{F,t}) + \varepsilon_t$, where r_t indicates the stock return and $r_{M,t}$ indicates the market return. We use the above model to estimate the factor loadings, α and β_1, using daily data in the past year. After estimating parameters, we follow García and Steele (2022) and plug in a constant market risk premium, $r_{M,t} - r_{F,t}$, of 8% to obtain the estimated expected return ($\widetilde{r_t}$). We use the Fama-French North America factors to match the stocks from North America and the Fama-French Developed ex US Factors to match the stocks from elsewhere. The risk-free rate ($r_{F,t}$) is the U.S. one month T-bill rate.	S&P GMI, Kenneth R. French Data Library
LOAN GROWTH	The yearly change in total loans divided by total loans at the beginning of the year.	S&P GMI
DEPOSIT	Total deposits over total assets.	S&P GMI
CASH FLOW	Earnings before taxes and loan loss provisions to total assets	S&P GMI
EQUITY	Total equity over total assets.	S&P GMI
NPL	Nonperforming loans over total loans	S&P GMI
SCOPE3 DOWN	The natural logarithm of total estimated downstream Scope 3 emissions measured in tCO2e	Refinitiv ESG
SCOPE3 DOWN INT	The ratio between total downstream Scope 3 emission in tonnes and the enterprise value including cash and short term investments in million US dollars	Refinitiv ESG
CC Exp	Score capturing exposure to climate change extracted from earnings calls – general score. (in ‰)	Sautner et al. (2022)
CCExpSent	Score capturing exposure to climate change extracted from earnings calls –overall sentiment. (in ‰)	Sautner et al. (2022)

Appendix B:
Distribution of PCAF signatories across years.

Panel A: Announcement								
	2015	2018	2019	2020	2021	2022	2023[a]	Total
# FIs joining PCAF each year	16	0	43	33	102	158	65	417
# Banks	6	0	16	19	59	63	27	190
# Banks included in the sample	0	0	2	12	34	37	8	93
Panel B: First disclosure								
	2015	2018	2019	2020	2021	2022	2023[a]	Total
# FIs providing first disclosures each year	0	3	7	13	25	26	15	89
# Banks	0	2	3	6	13	19	7	50
# Banks included in the sample	0	0	0	2	8	23	9	42

[a]Includes data until July 31st 2023

Appendix C

List of PCAF banks.

Name	Country	Joined	First Disclosure
AB Siauliu Bankas*	Lithuania	2022	2023
Aareal Bank AG	Germany	2021	.
Addiko Bank AG	Austria	2022	.
Aozora Bank, Ltd.	Japan	2022	2023
Arion banki hf.	Iceland	2021	2022
BAWAG Group AG*	Austria	2023	.
BKS Bank AG	Austria	2021	.
BNK Financial Group Inc.	South Korea	2022	.
BNP Paribas SA	France	2022	.
Banco Bilbao Vizcaya Argentaria, S.A.	Spain	2021	.
Banco Davivienda S.A.	Colombia	2022	.
Banco Santander, S.A.	Spain	2021	2022
Banco de Sabadell, S.A.	Spain	2022	2023
Bancolombia S.A.	Colombia	2020	.
Bank of America Corporation	United States of America	2020	.
Bank of Ireland Group plc	Ireland	2021	.
Bank of Montreal	Canada	2021	2022
Banque Cantonale Vaudoise	Switzerland	2023	.
Barclays PLC	United Kingdom	2020	.
Basler Kantonalbank	Switzerland	2021	.
Berner Kantonalbank AG	Switzerland	2020	2023
CaixaBank, S.A.	Spain	2021	2021
Canadian Imperial Bank of Commerce	Canada	2021	2022
Capital One Financial Corporation*	United States of America	2023	.
Citigroup Inc.	United States of America	2020	2022
Citizens Financial Group, Inc.	United States of America	2022	.
Close Brothers Group plc	United Kingdom	2022	.
Comerica Incorporated	United States of America	2020	2023
Commerzbank AG*	Germany	2023	.
Commonwealth Bank of Australia	Australia	2022	2022
Concordia Financial Group, Ltd.	Japan	2022	.
Coop Pank AS	Estonia	2022	2022
Crédit Agricole S.A.	France	2022	.
DGB Financial Group Co., Ltd.	South Korea	2021	2023
Danske Bank A/S	Denmark	2020	2021
Deutsche Bank Aktiengesellschaft	Germany	2021	2022
Erste Group Bank AG	Austria	2021	2022
Fifth Third Bancorp	United States of America	2021	.
Grupo Financiero Banorte, S.A.B. de C.V.	Mexico	2022	.
HSBC Holdings plc	United Kingdom	2021	2022
Hana Financial Group Inc.	South Korea	2021	.
Industrial Bank of Korea	South Korea	2021	2023
JAPAN POST BANK Co.,Ltd.	Japan	2022	.
JB Financial Group Co., Ltd.	South Korea	2021	2021
Julius Bär Gruppe AG	Switzerland	2022	2022
Juroku Financial Group,Inc.	Japan	2023	.
KB Financial Group Inc.	South Korea	2021	2021
KBC Group NV	Belgium	2019	2020
KeyCorp	United States of America	2022	.
Kvika banki hf.*	Iceland	2022	.
Kyushu Financial Group, Inc.	Japan	2022	.
Laurentian Bank of Canada	Canada	2022	.
Lloyds Banking Group plc	United Kingdom	2020	2021
Mediobanca Banca di Credito Finanziario S.p.A.	Italy	2022	2022
Metro Bank PLC	United Kingdom	2022	.
Mitsubishi UFJ Financial Group, Inc.	Japan	2021	2022

Appendix C
(continued)

Mizuho Financial Group, Inc.	Japan	2021		2021
National Bank of Canada	Canada	2021		2023
Nordea Bank Abp	Finland	2020		2022
OSB Group Plc	United Kingdom	2022	.	
OTP Bank Nyrt.*	Hungary	2023	.	
ProCredit Holding AG & Co. KGaA	Germany	2021		2022
Raiffeisen Bank International AG	Austria	2022		2022
Regions Financial Corporation	United States of America	2022	.	
Royal Bank of Canada	Canada	2021		2022
Shinhan Financial Group Co., Ltd.	South Korea	2020		2022
Shinsei Bank, Limited*	Japan	2022		2022
SpareBank 1 Helgeland	Norway	2023	.	
SpareBank 1 Nord-Norge	Norway	2022	.	
SpareBank 1 Nordmøre*	Norway	2022	.	
SpareBank 1 SMN	Norway	2021	.	
SpareBank 1 SR-Bank ASA	Norway	2021		2022
SpareBank 1 Østlandet	Norway	2020		2021
Sparebanken Sør	Norway	2021	.	
Sparebanken Vest	Norway	2022	.	
Sparebanken Øst	Norway	2022	.	
Standard Chartered PLC	United Kingdom	2022	.	
Sumitomo Mitsui Financial Group, Inc.	Japan	2021	.	
Sumitomo Mitsui Trust Holdings, Inc.	Japan	2022		2022
Svenska Handelsbanken AB (publ)	Sweden	2021		2021
Swedbank AB (publ)	Sweden	2022		2023
The Bank of Nova Scotia	Canada	2021		2022
The Chiba Bank, Ltd.	Japan	2022	.	
The Hachijuni Bank, Ltd.	Japan	2023	.	
The PNC Financial Services Group, Inc.	United States of America	2021	.	
The San-in Godo Bank, Ltd.	Japan	2022	.	
The Shizuoka Bank, Ltd.	Japan	2022	.	
The Toronto-Dominion Bank	Canada	2020		2022
Thurgauer Kantonalbank	Switzerland	2022	.	
Truist Financial Corporation	United States of America	2021	.	
U.S. Bancorp	United States of America	2021	.	
UmweltBank AG	Germany	2019		2020
Woori Financial Group Inc.	South Korea	2021	.	

This table presents the names of the 93 banks participating in the PCAF, along with their respective headquarters' countries. An asterisk (*) indicates banks that have not publicly communicated their participation in PCAF and are therefore excluded from the event study. The column labeled "Joined" specifies the year in which each bank formally joined PCAF, while the column titled "First Disclosure" indicates the year in which the bank first reported its financed carbon emissions.

Appendix D: Measure of Cost of Equity Capital

COE	The expected returns based on the CAPM model by running the following regression $r_t - r_{F,t} = \alpha + \beta(r_{M,t} - r_{F,t}) + \varepsilon_t$, where r_t is the stock return computed using stock prices denominated in USD and obtained from Capital IQ, $r_{F,t}$ is the risk-free rate and, $r_{M,t}$ is the market return. The factors are obtained from the Kenneth R. French Data Library. We use the Fama/French North America factors to match the stocks of banks listed in North America and the Fama/French Developed ex US Factors to match the stocks of the remaining banks. For each bank-year observation, the parameters of the model α and β are estimated using daily data in the past year. After the parameters are estimated, we follow García and Steele (2022) and plug in a constant market risk premium, $r_{M,t} - r_{F,t}$, of 8% to obtain the estimated expected return r_t, which is our cost of equity estimate.

Table 1
Sample selection.

Panel A: Sample selection for PCAF banks	
PCAF signatories as of July 31, 2023	417
Minus: non-banks	-134
Minus: banks headquartered in non-OECD countries	-69
Minus: non-listed banks	-108
Universe of listed OECD PCAF banks in S&P GMI	106
Minus: thinly traded stocks or banks with less than 50 valid trading days during the year	-2
Minus: banks whose date of joining PCAF is before their IPO	-3
Minus: banks with missing financial data	-8
Total number of PCAF banks in the initial sample	93
Panel B: Sample selection for non-PCAF banks	
Universe of listed OECD non-PCAF banks in S&P GMI	1118
Minus: thinly traded stocks or banks with less than 50 valid trading days during the year	-21
Minus: banks with missing financial data	-334
Total number of non-PCAF banks in the initial sample	763

This table presents the sample selection. Panel A shows the sample selection process for PCAF banks. Panel B shows the sample selection process for non-PCAF.

Table 2
Sample description.

Countries	Bank-year observations	# banks	# PCAF	Country Institutional Features	
				CCH 2022	*INST DEV*
Australia	85	10	1	71	2.21
Austria	40	6	5	46	1.45
Belgium	17	3	1	58	0.39
Canada	92	11	7	142	2.41
Chile	35	4	0	107	-1.56
Colombia	35	5	2	129	-7.91
Czechia	15	2	0	39	-1.20
Denmark	83	12	1	1	3.13
Estonia	9	2	1	42	0.62
Finland	34	5	1	3	3.52
France	148	18	2	51	-0.37
Germany	59	11	5	60	1.80
Greece	44	5	0	45	-5.16
Hungary	9	1	1	58	-4.22
Iceland	7	2	2	27	2.01
Ireland	23	3	1	56	1.48
Israel	68	8	0	93	-2.42
Italy	147	21	1	56	-3.77
Japan	765	93	14	85	0.93
Korea	86	11	8	126	-1.70
Lithuania	9	1	1	61	-1.31
Mexico	31	5	1	95	-9.21
Netherlands	12	2	0	32	2.86
New Zealand	9	1	0	88	3.42
Norway	201	28	9	70	3.42
Poland	91	11	0	96	-3.04
Portugal	12	2	0	100	-1.02
Slovakia	2	1	0	37	-3.18
Slovenia	5	2	0	19	-1.46
Spain	50	6	4	83	-2.05
Sweden	36	6	2	6	2.91
Switzerland	191	24	5	23	3.38
Turkey	98	13	0	166	-9.27
United Kingdom	76	11	7	2	1.29
United States of America	3551	510	11	101	-0.03
Total	6175	856	93		

This table presents country-level statistics. The first column shows the number of bank-year observations. The second column shows the number of banks within a country. The third shows the number of PCAF banks within a country. $CCH\ 2022$ is the climate change index that ranks countries according to their response to climate change, obtained from the Yale Center for Environmental Law (Yale University) and Center for International Earth Science Information Network (Columbia University) for the year 2022. $INST\ DEV$ is an index of the overall level of institutional development averaged over the sample period. The underlying indicators are voice and accountability, government effectiveness, political stability, regulatory quality, rule of law, and control of corruption (Kaufmann et al., 2011). We use the first principal component indicator of these variables.

Table 3
Descriptive statistics.

Panel A: Descriptive statistics						
Variables	N	Mean	StdDev	Q1	Median	Q3
PCAF	6175	0.122	0.327	0.000	0.000	0.000
ROA	6175	1.075	0.689	0.579	1.097	1.477
LOANS	6175	0.669	0.143	0.599	0.691	0.770
NPL	6175	0.019	0.030	0.005	0.011	0.022
CAPITAL RATIO	6175	15.596	4.158	12.980	14.740	17.450
SIZE	6175	9.050	2.148	7.324	8.877	10.460
Log BTM	6175	0.137	0.650	-0.286	-0.019	0.477
BETA	6175	0.708	0.524	0.240	0.711	1.077
ESGD	6175	0.491	0.500	0.000	0.000	1.000
SCOPE3D	3032	0.398	0.490	0.000	0.000	1.000
ESG	3032	44.969	20.863	29.264	40.176	60.582
E	3032	30.063	33.644	0.000	18.282	60.764
S	3032	44.518	23.761	26.382	38.924	63.392
G	3032	53.109	21.310	36.967	54.053	69.866
BOARD SIZE	3032	11.772	3.307	9.000	11.000	13.000
CDP	6175	0.124	0.329	0.000	0.000	0.000
ANALYST RAW	6175	3.979	5.501	0.000	2.000	5.000
ANALYST	6175	1.066	1.027	0.000	1.099	1.792
INST OWN	6175	36.347	28.298	11.614	30.256	57.843
CCH 2022	6175	88.987	28.459	85.000	101.000	101.000
INST DEV	6175	0.011	2.151	-0.698	0.440	0.782
GDP GROWTH	6175	1.927	2.449	1.590	2.240	2.820
COE	6175	0.057	0.042	0.020	0.057	0.087
LOAN GROWTH	6095	0.085	0.150	0.003	0.061	0.129
DEPOSIT	6095	0.746	0.152	0.682	0.795	0.852
CASH FLOW	6095	1.257	0.737	0.741	1.242	1.622
EQUITY	6095	0.097	0.032	0.074	0.097	0.117
SCOPE3 DOWN	2712	14.879	1.863	13.382	14.571	16.154
SCOPE3 DOWN INT	2712	794.825	420.212	540.655	738.667	950.986
CC Exp	2018	0.372	0.548	0.044	0.200	0.432
CCExpSent	2018	0.044	0.225	0.000	0.000	0.101

Table 3
(continued)

Panel B: Difference in means between PCAF banks and non-PCAF banks

	PCAF		non-PCAF		Difference in means
Variables	Mean	StdDev	Mean	StdDev	
ROA	0.938	0.621	1.094	0.696	-0.156***
LOANS	0.607	0.152	0.678	0.140	-0.071***
NPL	0.020	0.024	0.019	0.031	0.001
CAPITAL RATIO	16.683	3.611	15.445	4.207	1.238***
SIZE	11.896	1.802	8.654	1.877	3.242***
Log BTM	0.380	0.674	0.103	0.639	0.276***
BETA	1.018	0.444	0.665	0.520	0.353***
ESGD	0.782	0.413	0.450	0.498	0.332***
SCOPE 3D	0.942	0.233	0.267	0.442	0.675***
ESG	65.608	16.737	39.982	18.575	25.626***
E	67.639	24.746	20.984	28.880	46.655***
S	66.418	19.726	39.227	21.523	27.190***
G	65.438	20.546	50.131	20.406	15.307***
BOARD SIZE	12.908	4.055	11.498	3.038	1.411***
CDP	0.545	0.498	0.065	0.247	0.480***
ANALYST RAW	11.731	7.167	2.901	4.221	8.829***
ANALYST	2.257	0.910	0.900	0.928	1.357***
INST OWN	46.277	25.477	34.965	28.396	11.311***
CCH 2022	76.072	40.772	90.783	25.792	-14.711***
INST DEV	0.615	2.522	-0.073	2.081	0.688***
GDP GROWTH	1.733	2.767	1.954	2.400	-0.221*

Panel A reports descriptive statistics of the main variables used in the main analysis over the 2014 to 2022 period. We report the number of observations (N), the mean (Mean), the median (Median), the standard deviation (StdDev), the first quartile (Q1), the third quartile (Q3), the minimum (Min), and the maximum (Max). Panel B reports descriptive statistics for the variables used in the determinant analysis by PCAF and non-PCAF Banks. We report the mean (Mean), the standard deviation (StdDev), as well as the statistical significance of the difference of means (Difference in means) is based on the parametric *t*-test. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01, respectively. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%.

Table 4
CDP respondent

		PCAF adopters and CDP respondents	CDP respondents		PCAF adopters and CDP Respondents	
		CDP respondents prior to joining PCAF	CDP rating	TCFD	TCFD respondents prior to joining PCAF	TCFD respondents prior to disclosing financed carbon emissions
	(1)	(2)	(3)	(4)	(5)	(6)
PCAF	76.3%	90.1%	72.5%	94.4%	80.3%	90.1%
non-PCAF	9.6%	NA	68.5%	87.7%	NA	NA

This table provides descriptive information about banks committing to CDP and TCFD. In Column 1, the sample includes up to 93 PCAF banks and 763 non-PCAF banks. Column 1 shows the proportion of banks that are CDP respondent. In Column 2, the sample includes 71 PCAF banks that also commit to CDP. Column 2 shows the percentage of PCAF banks that are CDP respondents and that join the CDP initiative prior to PCAF. In Column 3, the sample includes 71 PCAF banks and 70 non-PCAF banks for which CDP ratings are not missing. CDP ratings are transformed into numerical values and range from 0 to 8, with 0 indicating the lowest rating and 8 indicating the highest rating. Ratings are normalized to take a value between 0 and 1 by subtracting the mean rating from the raw rating, and by dividing then this difference by the range of rating (i.e., difference between the highest and the lowest rating). Column 3 shows the average CDP rating in %. In Column 4, the sample includes 71 PCAF banks and 73 non-PCAF banks. Column 4 shows the percentage of TCFD and CDP respondents that join both initiatives prior to PCAF. Column 5 shows the percentage of PCAF banks that are TCFD respondents prior to the first disclosure of financed carbon emissions.

Table 5
Determinant analysis.

Dependent Variable: *PCAF*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ROA	0.21*	0.13	0.17	0.17	0.17	0.18	0.18	0.11	0.17	0.19
	(1.65)	(0.74)	(1.10)	(0.62)	(1.08)	(0.70)	(1.19)	(0.41)	(1.07)	(0.75)
LOANS	0.48	2.05**	1.01	2.58***	1.07	2.52**	0.99	2.97***	1.01	2.25**
	(0.98)	(2.53)	(1.53)	(2.64)	(1.63)	(2.57)	(1.50)	(2.86)	(1.58)	(2.36)
NPL	-5.29*	-5.03	-6.37	3.46	-6.49	3.51	-6.45	4.11	-6.39	3.71
	(-1.93)	(-1.12)	(-1.55)	(0.64)	(-1.54)	(0.64)	(-1.53)	(0.83)	(-1.57)	(0.67)
CAPITAL RATIO	0.06***	-0.00	0.06**	0.03	0.06**	0.03	0.05**	0.03	0.06***	0.03
	(4.12)	(-0.08)	(2.32)	(0.56)	(2.48)	(0.72)	(2.22)	(0.56)	(2.66)	(0.54)
SIZE	0.19***	0.55***	0.15	0.43**	0.16	0.49**	0.16	0.33	0.20*	0.53***
	(3.18)	(4.49)	(1.36)	(2.22)	(1.38)	(2.57)	(1.46)	(1.64)	(1.86)	(2.77)
Log BTM	0.69***	0.13	1.01***	0.15	0.98***	0.11	1.02***	0.19	0.97***	0.09
	(4.28)	(0.49)	(4.67)	(0.36)	(4.49)	(0.25)	(4.66)	(0.46)	(4.41)	(0.21)
BETA	0.04	0.05	-0.36*	0.02	-0.33*	0.09	-0.34*	0.08	-0.30	0.10
	(0.23)	(0.15)	(-1.86)	(0.05)	(-1.71)	(0.20)	(-1.77)	(0.17)	(-1.59)	(0.21)
ESGD	0.21	0.21								
	(1.14)	(0.73)								
SCOPE3D			1.06***	1.07**	1.05***	1.03**	1.06***	1.14**	1.15***	1.11**
			(3.70)	(2.32)	(3.64)	(2.31)	(3.63)	(2.38)	(4.09)	(2.51)
ESG			0.01	0.02						
			(1.48)	(1.55)						
E					0.01	0.01				
					(1.48)	(0.91)				
S							0.01	0.04**		
							(1.31)	(2.47)		
G									0.00	0.00
									(0.51)	(0.09)
BOARD SIZE			-0.01	0.01	-0.01	0.00	-0.01	0.02	-0.01	0.00
			(-0.21)	(0.23)	(-0.22)	(0.04)	(-0.30)	(0.43)	(-0.29)	(0.02)
CDP	0.74***	0.92***	0.41*	0.42	0.39*	0.45	0.43**	0.44	0.48**	0.54
	(4.01)	(2.87)	(1.90)	(1.08)	(1.85)	(1.13)	(1.99)	(1.14)	(2.28)	(1.48)
ANALYST	0.18	0.18	0.12	0.32	0.15	0.38	0.13	0.31	0.15	0.37
	(1.56)	(0.78)	(0.71)	(0.81)	(0.89)	(0.97)	(0.80)	(0.80)	(0.84)	(0.92)
INST OWN	0.00	-0.01	0.01***	-0.01	0.01***	-0.01	0.01***	-0.01	0.01***	-0.01
	(0.88)	(-1.16)	(2.68)	(-1.41)	(2.77)	(-1.23)	(2.73)	(-1.31)	(2.66)	(-1.05)
CCH 2022	0.00		0.01**		0.01**		0.01*		0.01**	
	(0.40)		(1.98)		(1.98)		(1.81)		(2.00)	
INST DEV	0.09**	-0.12	0.13***	-0.03	0.12**	-0.04	0.13***	0.06	0.12**	-0.02
	(2.36)	(-0.33)	(2.62)	(-0.06)	(2.56)	(-0.07)	(2.59)	(0.12)	(2.45)	(-0.04)
GDP GROWTH	-0.01	0.03	-0.03	0.04	-0.03	0.04	-0.03	0.04	-0.03	0.03
	(-0.58)	(0.60)	(-1.32)	(0.65)	(-1.35)	(0.79)	(-1.36)	(0.64)	(-1.25)	(0.60)
Constant	-6.51***	-1.19	-7.55***	-12.31***	-7.49***	-12.43***	-7.48***	-12.88***	-7.85***	-12.28***
	(-5.94)	(-0.62)	(-4.74)	(-4.16)	(-4.59)	(-4.14)	(-4.63)	(-4.27)	(-5.01)	(-4.02)
Year Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Country Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Pseudo R^2	0.36	0.63	0.44	0.64	0.44	0.63	0.44	0.65	0.43	0.63
N	5514	2904	2519	1249	2519	1249	2519	1249	2519	1249

Table 5
(continued)
This table presents coefficient estimates from probit regressions predicting bank to join PCAF. The depend variable $PCAF$ equals one in the year prior to the announcement of joining the PCAF and is missing in the years before and after. For non-PCAF banks, $PCAF$ equals zero for the whole sample period. Columns 1 and 2 includes all available bank-year observations. Columns 3 to 10 includes bank-year observations for which ESG scores are available through Refinitiv. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%.*, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses

Table 6
Reaction around the announcement.

Panel A: Stock market reaction

	Fama-French three-factor model		Fama-French five-factor model plus momentum	
Window	CAR	t-stat	CAR	t-stat
[0]	-0.414**	(-2.26)	-0.342*	(-1.82)
[-1.+1]	0.073	(0.29)	0.134	(0.51)
[-3.+3]	-0.021	(-0.06)	-0.060	(-0.17)
[-5.+5]	-0.040	(-0.08)	0.098	(0.20)

Panel B: Stock market reaction conditional on bank size

	Fama-French three-factor model				Fama-French five-factor model plus momentum			
	Small and Midsize Banks		Large Banks		Small and Midsize Banks		Large Banks	
Window	CAR	t-stat	CAR	t-stat	AR	t-stat	AR	t-stat
[0]	-0.616**	(-2.44)	-0.086	(-0.28)	-0.563**	(-2.26)	0.042	(0.12)
[-1.+1]	-0.311	(-1.09)	0.290	(0.58)	-0.264	(-0.94)	0.396	(0.76)
[-3.+3]	-0.223	(-0.50)	0.335	(0.58)	-0.359	(-0.78)	0.442	(0.78)
[-5.+5]	-0.041	(-0.07)	0.048	(0.08)	-0.060	(-0.10)	0.541	(0.88)

This table presents market reactions to banks' announcements to join PCAF around the announcement date. In Panels A and B, CAR is the cumulative abnormal return in stock markets using either the Fama-French three-factors model or the Fama-French five-factor model plus momentum (indicated at the top of each column). The estimation period starts 21 trading days prior the announcement day and ends 272 trading days prior the announcement day. In Panel B, we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$ in the year prior of banks' announcements to join PCAF. Large banks are defined as those in the top tercile of $SIZE$ in the year prior of banks' announcements to join PCAF. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics are shown in parentheses.

Table 7
Cost of Equity Capital and the Decision to Join PCAF

		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)
Dependent Variable: *COE*			
PCAF_TREAT	0.003*	0.006**	0.001
	(1.70)	(2.14)	(0.32)
BETA LAGGED	0.000	0.005***	-0.007***
	(0.22)	(3.19)	(-3.56)
Log BTM	-0.007***	-0.007***	-0.007**
	(-4.03)	(-3.50)	(-1.99)
LOANS	0.010	0.013	-0.009
	(1.17)	(1.26)	(-0.58)
SIZE LAGGED	0.019***	0.017***	0.018***
	(8.84)	(6.48)	(4.70)
CAPITAL RATIO	0.001***	0.001***	0.001***
	(3.90)	(2.82)	(3.24)
GDP GROWTH	-0.002***	-0.002***	-0.003***
	(-5.16)	(-3.40)	(-5.96)
Constant	-0.132***	-0.108***	-0.122**
	(-6.21)	(-4.68)	(-2.59)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.74	0.75	0.62
N	6175	4118	2057

This table presents coefficient estimates and from OLS regressions examining the effect of joining PCAF on banks' cost of equity capital over 2014-2022. The dependent variable COE measures bank cost of equity capital based on the capital asset pricing model. Details for the computation COE are provided in Appendix D. The independent variable $PCAF\_TREAT$ is an indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise. In columns 2 and 3, we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$. Large banks are defined as those in the top tercile of $SIZE$. The terciles are computed separately for PCAF and non-PCAF banks. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses.

Table 8
Downstream Scope 3 Emission and the Decision to Join PCAF

		Small and Midsize Banks	Large Banks		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	*SCOPE3 DOWN INT*	*SCOPE3 DOWN INT*	*SCOPE3 DOWN INT*	*SCOPE3 DOWN*	*SCOPE3 DOWN*	*SCOPE3 DOWN*
PCAF_TREAT	-0.053**	-0.101***	0.023	-77.837***	-147.314***	30.514
	(-2.36)	(-3.47)	(0.55)	(-2.91)	(-4.97)	(0.62)
ROA	-0.068***	-0.077***	-0.067**	-24.567	-7.189	-96.562**
	(-3.51)	(-3.08)	(-2.59)	(-1.44)	(-0.49)	(-2.47)
Log BTM	-0.049	-0.038	-0.063	262.263***	351.539***	131.497
	(-1.17)	(-0.62)	(-1.52)	(5.76)	(8.46)	(1.55)
LOANS	0.572***	0.613***	0.487**	544.709***	521.848***	474.235
	(4.50)	(4.53)	(2.25)	(3.17)	(3.78)	(1.45)
SIZE LAGGED	0.734***	0.706***	0.720***	44.721	-8.256	-63.618
	(26.28)	(21.89)	(9.61)	(1.09)	(-0.23)	(-0.58)
CAPITAL RATIO	-0.011***	-0.014***	-0.003	-0.775	-8.140*	17.874
	(-3.45)	(-3.49)	(-0.53)	(-0.14)	(-1.92)	(1.47)
GDP GROWTH	0.008	0.022	-0.000	4.741	18.608***	-0.613
	(1.01)	(1.28)	(-0.01)	(0.74)	(3.05)	(-0.06)
Constant	7.530***	7.599***	7.989***	36.814	667.854*	1020.604
	(26.35)	(25.67)	(9.15)	(0.08)	(1.82)	(0.79)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.99	0.99	0.98	0.75	0.76	0.77
N	2698	1782	916	2698	1782	916

This table presents coefficient estimates and from OLS regressions examining the effect of joining PCAF on banks' GHG Scope 3 downstream emissions over 2016-2022. $SCOPE3\ DOWN\ INT$ is the Scope 3 downstream CO2 equivalents emission in tonnes scaled by the enterprise value including cash and short term investments USD in million. $SCOPE3\ DOWN$ is the logarithm of Scope 3 downstream CO2 equivalents emission in tonnes. $PCAF\_TREAT$ is an indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise. In columns 2, 3, 5 and 6 we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$. Large banks are defined as those in the top tercile of $SIZE$. The terciles are computed separately for PCAF and non-PCAF banks. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses.

Table 9
Operational Adjustments and the Decision to Join PCAF.

Panel A: Loan growth

		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)
Dependent Variable: *LOAN GROWTH*			
PCAF_TREAT	-0.034***	-0.062***	-0.003
	(-3.14)	(-4.47)	(-0.16)
DEPOSIT LAGGED	0.061	0.080	0.032
	(1.05)	(0.99)	(0.37)
SIZE LAGGED	-0.216***	-0.232***	-0.191***
	(-15.48)	(-12.84)	(-7.10)
CASH FLOW LAGGED	-0.008	-0.017*	0.011
	(-1.12)	(-1.83)	(1.24)
EQUITY LAGGED	0.311	0.580**	-0.952**
	(1.49)	(2.42)	(-2.36)
NPL LAGGED	-0.655***	-0.894***	-0.496***
	(-4.19)	(-3.64)	(-2.89)
GDP GROWTH	-0.003**	-0.002	-0.005**
	(-2.06)	(-0.82)	(-1.98)
Constant	1.973***	1.852***	2.239***
	(14.13)	(11.18)	(6.97)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.35	0.34	0.34
N	6095	4062	2033

Panel B: Bank profitability

		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)
Dependent Variable: *ROA*			
PCAF_TREAT	-0.036	-0.093**	0.040
	(-1.14)	(-2.24)	(0.79)
DEPOSIT LAGGED	0.504**	0.461	0.456*
	(2.40)	(1.56)	(1.68)
LOANS LAGGED	0.669***	0.946***	-0.358
	(3.24)	(3.72)	(-1.23)
SIZE LAGGED	0.074*	0.077	-0.113
	(1.73)	(1.46)	(-1.46)
EQUITY LAGGED	0.420	-0.145	1.560
	(0.47)	(-0.14)	(0.99)
NPL LAGGED	-4.510***	-5.351***	-3.544***
	(-5.90)	(-4.25)	(-4.24)
GDP GROWTH	0.045***	0.053***	0.037***
	(6.35)	(4.08)	(4.68)
Constant	-0.437	-0.422	1.932**
	(-0.91)	(-0.74)	(2.02)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Adjusted R^2	0.74	0.69	0.79
N	6095	4062	2033

This table presents coefficient estimates and from OLS regressions examining the effect of joining PCAF on banks' acitivites over 2014-2022. In Panel A, the dependent variable $LOAN\ GROWTH$ is the yearly change in total loans divided by total loans at the beginning of the year. In Panel B, $PROFITABILITY$ is earnings before to total assets. The independent variable $PCAF\_TREAT$ is an indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise. In columns 2 and 3 we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$. Large banks are defined as those in the top tercile of $SIZE$. The terciles are computed separately for PCAF and non-PCAF banks. Variable definitions can be found in Appendix A. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses.

Table 10
Attention Devoted to Climate Change Topics and the Decision to Join PCAF.

		Small and Midsize Banks	Large Banks		Small and Midsize Banks	Large Banks
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	*CCExp*	*CCExp*	*CCExp*	*CCExpSent*	*CCExpSent*	*CCExpSent*
PCAF_TREAT	0.237**	0.364***	0.064	0.125***	0.162**	0.078
	(2.41)	(2.62)	(0.53)	(2.66)	(2.36)	(1.29)
ROA	0.008	-0.019	0.052	0.004	0.011	-0.012
	(0.22)	(-0.48)	(0.71)	(0.28)	(0.77)	(-0.44)
Log BTM	0.112	0.106	0.099	0.018	0.013	0.019
	(1.59)	(1.45)	(0.67)	(0.69)	(0.39)	(0.46)
LOANS	-0.229	0.209	-0.483	-0.079	-0.073	-0.026
	(-1.00)	(0.78)	(-1.02)	(-0.79)	(-0.69)	(-0.11)
SIZE LAGGED	-0.294***	-0.100	-0.470***	-0.092***	-0.066**	-0.093
	(-3.19)	(-0.82)	(-3.19)	(-3.63)	(-2.55)	(-1.14)
CAPITAL RATIO	0.020**	0.013	0.025	0.005	0.002	0.008
	(2.23)	(1.29)	(1.45)	(1.39)	(0.65)	(1.05)
GDP GROWTH	-0.010	-0.005	-0.026**	0.005	0.001	0.002
	(-1.08)	(-0.29)	(-2.08)	(1.10)	(0.13)	(0.36)
Constant	3.312***	0.974	6.079***	0.971***	0.661**	1.085
	(3.26)	(0.80)	(3.21)	(3.34)	(2.46)	(1.03)
Country-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.41	0.39	0.46	0.17	0.15	0.21
N	2018	1321	697	2018	1321	697

This table presents coefficient estimates and from OLS regressions examining the effect of joining PCAF on bank's climate change exposure over 2014-2022. The dependent variable $CCExp$ measures firm-specific exposure to climate change extracted from discussion between managers and investors during earning calls (Sautner et al., 2023). $PCAF\_TREAT$ is an indicator variable that equals one from the year of a bank's PCAF adoption, and zero otherwise In columns 2, 3, 5 and 6, we partition banks into two groups. Small and midsize banks are defined as those in the bottom and middle terciles of $SIZE$. Large banks are defined as those in the top tercile of $SIZE$. The terciles are computed separately for PCAF and non-PCAF banks. Variable definitions can be found in Appendix A. All continuous variables are winsorized at 1% and 99%. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 (two-tailed), respectively. Robust *t*-statistics clustered by bank are shown in parentheses.

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