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Edited by
Rania Mousa

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Advances in Accounting & Auditing Research

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Guest Editor
Rania Mousa



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About the Editor

Rania Mousa

Prof. Dr. Rania Mousa is professor of accounting at the University of Evansville and Mead Johnson Nutrition Endowed Chair in Business. She earned her PhD in accounting from the University of Birmingham, UK (2010) and her BA in accounting from the American University in Cairo, Egypt (2000). She received an MBA degree from the Illinois Institute of Technology (2002). Since 2002, Rania worked as a financial analyst in several financial service companies in Chicago (USA), Cairo (Egypt), and Kuwait. She also completed a number of short-term appointments at some universities in Egypt, achieving the level of assistant lecturer. While pursuing her PhD in the UK, Rania worked as a visiting accounting lecturer at Birmingham Business School (University of Birmingham). Dr. Mousa's main research interests include accounting information systems, financial and non-financial reporting, XBRL reporting, forensic accounting, and accounting education.

Preface

This Special Issue of *Advances in Accounting and Auditing Research* delves into the rapidly evolving landscape of accounting and auditing, examining the latest advancements, theoretical considerations, and practical implications which are reshaping our understanding of these dynamic fields. By bringing together a diverse collection of perspectives from leading researchers, we aim to illuminate critical frontiers, identify emerging challenges, and stimulate further dialogue within the academic community.

The articles presented here explore a range of themes, including loan loss provisions, earnings management, risks, financial instruments, accounting standards integration, auditor independence, IT governance, audit quality and methodologies, and disclosure tone in financial reporting. The articles provide thoughtful insights into the impact of AI disclosure on financial reporting and performance and highlight the potential for examining the impact of remote audit quality on the quality of audit work.

We are particularly grateful to our contributors for their insightful contributions, which collectively offer a nuanced and comprehensive analysis of the current state of research in accounting and auditing. Last but not least, it has been an honor to work with the exceptional Editorial and Reviewer Board Members.

Rania Mousa

Guest Editor

Article

Executive Religiosity and Disclosure Tone Ambiguity of Annual Reports

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Abstract: This paper examines the effect of C-suite executive religiosity on the disclosure tone ambiguity of corporate annual reports. The paper utilizes executive-level religiosity, disclosure tone, and financial data from a sample of 2515 publicly listed U.S. corporations. It applies fixed-effect regression analysis to show that the presence of religious executives within the C-suite team reduces the disclosure tone ambiguity of annual reports, as evidenced by a reduction in the number of negative and uncertain words within corporate annual reports. Subsample analyses show that religious CEOs and CFOs in the C-suite primarily drive the main findings, which is consistent with their heightened control over corporate annual report preparation processes post-SOX. The main finding holds across multiple robustness tests and suggests that the individual religiosity of C-suite executives can be an important determinant of a company's disclosure tone-related choices. By utilizing the measure of executive-level religiosity, this study directly addresses recent calls for further research to examine additional personal and psychological factors beyond executive-level narcissism and political ideology that can influence top management personnel's corporate disclosure tone-related choices. This study contributes to the literature by examining the influence of individual executive-level religiosity on the tonal sentiment of corporate communications, as represented by corporate annual reports.

Keywords: disclosure tone ambiguity; CEO religiosity; CFO religiosity; negative tone; uncertain tone

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1. Introduction

Within the social sciences, religiosity has always been a prominent topic of multidisciplinary academic interest. This interest primarily stems from the historical influence of religiosity on human rationale (Anderson, 1988). This influence generates a wide array of ethical, moral, political, psychological, and socio-economic implications for how modern-day social systems, and the individual components within those social systems, function (White et al., 2019). Hence, in the corporate world, religiosity can be an important factor affecting corporate decision-making, risk-taking, and choices. Prior research in various subdisciplines of the business literature has documented religiosity's influence on overall corporate practices. In light of religiosity's influence on human rationale and corporate practices, our study examines how the individual religiosity of C-suite executives affects corporate disclosure tone ambiguity.

The extant literature on disclosure tone has shown that the tone of corporate disclosures has important capital market implications for corporate stock performance, operating performance, and corporate risk-taking (Loughran & McDonald, 2011, 2016;

Davis & Tama-Sweet, 2012; Bassyouny et al., 2022). This has created a substream of research that examines the various managerial characteristics affecting corporate disclosure tone beyond the traditional firm- and industry-level variables (Luo & Zhou, 2020; Bassyouny et al., 2022). Most of these studies focus on demographic, physical, and psychological managerial characteristics such as age, gender, narcissism, political ideology, etc., which affect corporate disclosure tone (Bochkay et al., 2019; Marquez-Illescas et al., 2019; Luo & Zhou, 2020; Arikan et al., 2023). Even though religiosity has been recognized as a credible psychological factor with a plethora of ethical, moral, and socioeconomic implications for corporate practices, research examining the impact of C-suite religiosity on any disclosure tone attribute is lacking. As a result, this research attempts to fill this gap. In the process, it addresses the findings of Bassyouny et al. (2022), who call for further research into additional personal and psychological factors of C-suite leaders, beyond the factors of narcissism and political ideology, which can influence their disclosure tone-related choices.

Our study's main findings suggest that the individual religiosity of C-suite executives has important implications for a firm's disclosure tone. Specifically, the presence of religious executives within the C-suite reduces the ambiguity levels of disclosure tone sentiment in corporate annual reports, as evidenced by a reduction in the number of negative and uncertain tonal sentiment-bearing words in corporate annual reports (10-K Reports). Additional subsample analysis shows that our main findings are primarily driven by the presence of religious CEOs and CFOs in the C-suite team. This is consistent with the central role of CEOs and CFOs in the post-SOX financial reporting and certification processes. The findings hold across multiple robustness tests involving entropy-balanced regressions. Overall, the results show that the religiosity of C-suite executives can have important implications for corporate decision-making and risk-taking in terms of how the tone of information appears in corporate annual reports.

This study contributes to the literature by expanding the extant corporate disclosure literature and by exploring a unique dimension within the broader financial accounting and corporate finance literature. Specifically, we show that the individual religiosity of C-suite executives can be an important determinant of the disclosure tone and tone ambiguity in corporate annual reports. This novel contribution expands the scope of the extant disclosure tone literature and creates a meaningful connection with the extant religiosity literature in business. Our study also addresses previous calls for further research to examine new additional psychological factors, such as executive-level religiosity, which can influence corporate disclosure tone choices beyond factors like executive-level narcissism and political ideology (Bassyouny et al., 2020; Luo & Zhou, 2020; Bassyouny et al., 2022; Arikan et al., 2023).

Additionally, our study contributes to the recent stream of literature on religiosity in business that studies the impact of individual religiosity within the C-suite on corporate decision-making and risk-taking. These studies narrow down a relatively broad location-based religiosity perspective to a more focused individual religiosity-based perspective (Baxamusa & Jalal, 2016; Nazrul et al., 2022). This approach helps address the direct effect of C-suite executives' religiosity on corporate decision-making, as opposed to examining the religiosity-based effect indirectly with a local community-based lens (Baxamusa & Jalal, 2016; Chen et al., 2022; Nazrul et al., 2022). Additionally, the findings of prior location-based religiosity research tend to be primarily driven by the majority religious denomination within a local vicinity. This can create some noisy proxies, particularly in corporate organizations led by executives who belong to a minority religious denomination or executives who are not affiliated with any religious group. Hence, drawing interpretations that do not factor in the presence of individual-level religiosity within C-suite teams can create potential misclassification issues (Baxamusa & Jalal, 2016; Nazrul et al., 2022).

Therefore, by examining the impact of direct and “cleaner” individual-based measures of religiosity on corporate decision-making and the disclosure tone in annual reports, this study contributes to emerging research within the broader religiosity-related literature in business. Also, by using the subset of BoardEx data containing publicly available information on executive-level religiosity and religious affiliations, our study expands the scope of use and interpretation of this unique data stream.

The remainder of the paper is organized as follows: Section 2 presents the background literature and hypothesis. Section 3 presents the materials and methods used. Section 4 discusses the research results. Section 5 presents our conclusions, study limitations, and future research.

2. Background Literature and Hypothesis

2.1. Religiosity Literature in Business

Most papers within the field of religiosity literature in business are typically clustered within the accounting and finance domain, and utilize location-based religiosity measures rather than individual ones (Nazrul et al., 2022). The overarching theme of prior research focuses on the existence of a positive association between religiosity and firm-level metrics of performance, value, and corporate quality practice (Nazrul et al., 2022). Firms operating in highly religious communities tend to have lower debt-financing costs, higher-quality accruals, less opportunistic earnings management, lower litigation risk, reduced audit fees, and less frequency of receiving going concern audit opinions (Grullon et al., 2009; Leventis et al., 2018; McGuire et al., 2012; Jiang et al., 2018; Omer et al., 2018). Firms operating in highly religious communities are less risk-centric and are likely to maintain long-term firm value while maximizing shareholder wealth (Hilary & Hui, 2009; Al Rahahleh et al., 2019). Similar positive findings have been reported in studies that examine the effect of C-suite executive religiosity on corporate decision-making, risk-taking, financial reporting quality, conservatism, disclosure readability, and overall corporate practice quality (Brenner, 2015; Baxamusa & Jalal, 2016; Cai et al., 2019; Iguchi et al., 2021; Chen et al., 2022; Nazrul et al., 2022; Zuo et al., 2022).

Cumulatively, the overwhelmingly positive findings of the location-religiosity-based and individual religiosity-based extant papers can be attributed to a broader reflection of the intrinsic dimension viewpoint of religiosity, which serves as our grand theory. The community-level social pressures that encourage firms to engage in value-enhancing corporate practices can be attributed to a form of herding behavior that the religiousness of their local communities creates (Cialdini & Goldstein, 2004). In other words, this represents the effect of the symbolization aspect of religious moral identity that the intrinsic dimension viewpoint of religiosity elucidates, encouraging the organizations within the community to be more socially responsible (Vitell et al., 2009). On the other hand, the value-enhancing and transparent corporate actions stemming from the individual religiosity of C-suite executives represent the internalization aspect of religious moral identity, as per the intrinsic dimension viewpoint of religiosity (Vitell et al., 2009). In other words, this highlights the sense of moral dedication and accountability that religiosity creates for humans at an individual level.

2.2. Disclosure Tone Research

The standard approach in the accounting and finance literature to measure the tonal sentiment of any document is to utilize word lists or dictionaries, where words representing a specific type of tonal sentiment are compared to the overall count of words within that document (Loughran & McDonald, 2011, 2014, 2016). Prior literature in the tonal analysis domain focuses on the tonal sentiment of mandatory and voluntary disclosures embedded in the annual reports or specific subsections of the reports, such as the MD&A

section, the chairman's statement or the president's letter to shareholders, or other relevant sources of corporate information such as conference call scripts, press releases, news articles, and corporate announcements (Tetlock, 2007; Loughran & McDonald, 2011, 2020; Schleicher & Walker, 2010; Bassyouny et al., 2022; Alam et al., 2023).

The tone of corporate disclosures has been documented as having important, albeit mixed, capital market implications. A higher negative tonal sentiment in annual reports is generally associated with lower stock trading volumes, lower abnormal returns, higher stock volatility, higher analyst forecast dispersions, higher bankruptcy risk, and poor subsequent operating performance (Kothari et al., 2009; Loughran & McDonald, 2011, 2016; Davis & Tama-Sweet, 2012; Del Gaudio et al., 2020; Bassyouny et al., 2022). Conversely, a more optimistic tonal sentiment in annual reports is associated with higher stock trading volumes, higher stock returns, lower stock volatility, and lower analyst forecast dispersion (Kothari et al., 2009; Feldman et al., 2010; Loughran & McDonald, 2011, 2016; Davis & Tama-Sweet, 2012; Bassyouny et al., 2022). However, an abnormally positive tone and a higher amount of tonal uncertainty have been associated with greater corporate obfuscation and the use of impression management tactics (e.g., earnings management and positive framing), which increase the likelihood of litigation, fraud, and the issuance of going concern modified audit opinions (Rogers et al., 2011; Hossain et al., 2020; Bassyouny et al., 2022; S. Li et al., 2022; J. Li et al., 2024; Rezaee et al., 2024). Similarly, an abnormally negative tone has been used to deflate expectations, particularly in highly labor-unionized industries (Arslan-Ayaydin et al., 2021). Also, management could use such an abnormally negative tone to manipulate stock prices and engage in insider trading behavior on the purchasing side (Sandulescu, 2015; Choi, 2020; Xu & Qi, 2022; Cheng et al., 2023).

Several firm-level, industry-level, and managerial characteristic-based factors affect the disclosure tone of corporate annual reports. Firm-level factors include past performance, firm size, growth, volatility, CEO tenure length, and the degree of stock-based compensation, while industry-level factors include the affiliation of a firm with a known sin industry¹, as well as the degree of labor unionization of the firm's industry (Arslan-Ayaydin et al., 2016, 2021; Bochkay et al., 2019; Marquez-Illescas et al., 2019; Luo & Zhou, 2020; Bassyouny et al., 2022). From a managerial perspective, notable determinants of disclosure tone include managerial ability, age, gender, narcissism, and political ideology (Bochkay et al., 2019; Marquez-Illescas et al., 2019; Luo & Zhou, 2020; Yan et al., 2021; Arikan et al., 2023). In the specific psychological context, the religiosity of individual C-suite executives is mostly overlooked, yet it is a credible psychological trait that can influence the managerial decision-making process. Our study aims to address this gap, particularly given that a negative tone (barring abnormalities) and uncertain tone set forth by upper-level corporate leadership can have vastly unfavorable future corporate implications. Given the overwhelmingly positive implications of religiosity documented in the extant business religiosity literature, examining the prominent role played by individual C-suite religiosity in mitigating the level of negative and uncertain tone to manage future unfavorable corporate practice outcomes is the focus and motivation of this study.

2.3. Hypotheses

The extant theology and psychology literature often utilize the intrinsic dimension viewpoint of religiosity as a common way to explain how religious identities transform into life actions on an individual level (Donahue, 1985; Salsman et al., 2005; Vitell et al., 2009). This is attributable to the intrinsic dimension viewpoint of religiosity's dual focus on internalization and the symbolization aspects of religion's direct impact on moral identity, which is often overlooked by other religiosity-related theories (Vitell et al., 2009). The central argument of the intrinsic dimension viewpoint of religiosity underscores the role of religion

in steering individuals to embrace a time-invariant form of morality that is not driven by extrinsic needs or opportunities (Middleton & Putney, 1962; Salsman et al., 2005; Hardy, 2006; Vitell et al., 2009). This time-invariant form of morality is intrinsically driven by an individual's strict adherence to their religion's core teachings, which are often viewed as sacred tenets (Middleton & Putney, 1962; Salsman et al., 2005; Hardy, 2006; Vitell et al., 2009). As the social impact of individual-level decisions and actions is a core focus of most religious teachings, the intrinsic dimension viewpoint argues that religious individuals are more socially conscious of the impact of their actions and decisions on their communities (Watson et al., 1984; Roccas, 2005; Salsman et al., 2005; Vitell et al., 2009; White et al., 2019). Given its robustness and prevalence as a theory, the intrinsic dimension viewpoint of religiosity has been mostly used in prior business research to examine the community-level or individual-level impact of religiosity on business decisions (Omer et al., 2018; Nazrul et al., 2022; Heubeck, 2024). Hence, we follow a similar approach by utilizing the intrinsic dimension viewpoint of religiosity as our grand theory.

According to the intrinsic dimension viewpoint, as community value maximization is at the forefront of most religious teachings (Johnson, 1959; Geyer & Baumeister, 2005; Salsman et al., 2005; Roccas, 2005; Vitell et al., 2009), the presence of individual religiosity in corporate leadership positions is likely to be associated with positive firm value outcomes and value-maximizing corporate practices. For instance, the prior literature reports a negative association between executive religiosity and lower financial reporting quality indicators (e.g., earnings management and fraud) in companies led by religious executives (Cai et al., 2019; Chen et al., 2022; Zuo et al., 2022). Also, a negative association can be found between executive religiosity and corporate risk aversion (Brenner, 2015; Baxamusa & Jalal, 2016). In contrast, positive associations have been reported between executive religiosity and annual report readability (Nazrul et al., 2022) and between executive religiosity and CSR activities (Iguchi et al., 2021).

Given the positive relationship between executive religiosity and firms' value-maximizing corporate practice outcomes in the context of the tonal sentiment of corporate annual reports, we anticipate two broad outcomes. First, the presence of religious executives within the C-suite team is likely to reduce the number of negative tonal sentiment-bearing words in annual reports. This is because a high negative tonal sentiment in corporate documents has detrimental capital-market implications and adverse firm value outcomes (Kothari et al., 2009; Loughran & McDonald, 2011, 2016; Davis & Tama-Sweet, 2012; Del Gaudio et al., 2020; Bassyouny et al., 2022). Given the adverse long-term firm value implications, religious executives will likely put considerable effort into mitigating the negative tonal sentiment of the disclosures embedded within annual reports. This leads to our first hypothesis:

H1. *Executive religiosity reduces the negative tonal sentiments of corporate annual reports.*

The presence of religious executives within the C-suite is also likely to reduce the number of uncertain tonal sentiment-bearing words in annual reports. This is likely to be influenced by religious individuals' social consciousness and their mindfulness of the impact of their actions on their communities, as emphasized by the intrinsic dimension viewpoint of religiosity. Driven by heightened levels of social consciousness and duty of care, religious individuals are more likely to undertake actions and make decisions, similar to the example of honorable merchants in ancient societies (Bott & Milkau, 2018). According to the intrinsic dimension viewpoint, this high duty of care that religious individuals are likely to display would, therefore, result in actions that are highly transparent, community-value-maximizing, and not purposefully ambiguous (Johnson, 1959; Geyer & Baumeister, 2005; Salsman et al., 2005; Roccas, 2005; Vitell et al., 2009; Bott & Milkau, 2018). A highly uncertain

tonal sentiment in corporate documents has been associated with a higher likelihood of manipulative earnings management, earnings persistence issues, and fraud probes (F. Li, 2008; S. Li et al., 2022), along with a higher post-IPO volatility (Loughran & McDonald, 2013). Given that the collective impact of such tactics adversely affects a firm's value, religious executives are likely to mitigate the uncertain tonal sentiment of the disclosures embedded in corporate annual reports. This leads to our second hypothesis:

H2. *Executive religiosity reduces the uncertain tonal sentiments of corporate annual reports.*

3. Materials and Method

3.1. Sample Selection

For this study, data were collected from publicly available sources, covering a sample period from 1999 to 2020. Individual religiosity data were collected from BoardEx. For the social organization memberships listed under individual BoardEx profiles, we only focused on the current or former religious organization memberships of C-Suite executives, as reported by Nazrul et al. (2022). Identifying religious organization memberships can be challenging because not all entities with religious-sounding names require their membership to have faith-based affiliations². To address this issue, we used the GuideStar directory³, which provides a comprehensive list of religious organizations across prominent faiths, to manually collect keyword terms matching the religious social organizations listed in BoardEx. Then, using text-based machine learning and filtering algorithms, we refined the dataset to exclude religious-neutral organizations with religious-sounding names. After completing the data validation step, we ensured that our BoardEx data were cleaned to only select C-suite executives⁴. We then merged our cleaned BoardEx data with our 10-K disclosure tone and document characteristic control data, firm-level financial data, and location-based religiosity data. Disclosure tone and document characteristic-related controls were obtained from Loughran and McDonald's website, which contains a summarized 10-K datasheet⁵. Firm-level financial data were obtained from Compustat, while location-based religiosity data were obtained from the Association of Religion Data Archives (ARDA)⁶.

Table 1's Panel A shows our sampling table. In total, 12,736 firm-year observations, 2515 firms, and 7409 C-suite executives are covered in this study, as shown in Panel B. CEOs (CFOs) constitute 6409 (470) of the executives in our sample. Of the 7409 C-suite executives, 552 have identifiable/disclosed religious affiliations, of whom 494 are CEOs and 20 are CFOs.

Table 1's Panel B shows that within our sample population of 10-K words, on average, 1.6 percent have a negative tonal sentiment, and 1.2 percent have an uncertain tonal sentiment, which is similar to the figures reported by Loughran and McDonald (2011). Panel B also shows that 6.8 percent of firm-year observations have disclosed religiosity at the C-suite level, which is close to the 6.6 percent figure reported by Nazrul et al. (2022).

The Pearson correlations from Table 1's Panel C show that both negative and uncertain disclosure tones have a significant negative correlation with executive-level religiosity, supporting the subsequent findings within this study. While location religiosity has a significant positive correlation with C-suite religiosity, similar to that reported by Nazrul et al. (2022), the coefficient is only 7.10 percent, which is relatively modest. This modest correlation validates the argument that individual C-suite executives may act based on personal values stemming from the core themes of their religious teachings, which are not influenced by their community's religiosity, as predicted by Hambrick and Mason (1984) and validated by Baxamusa and Jalal (2016) and Nazrul et al. (2022).

Table 1. Sampling table, summary statistics, and Pearson correlations.

Panel A: Sampling Table		Count	
C-Suite Executives With Disclosed Religiosity		552	
Total No. of C-Suite Executives		7409	
CEOs With Disclosed Religiosity		494	
Total No. of CEOs		6489	
CFOs With Disclosed Religiosity		20	
Total No. of CFOs		470	
Total No. of Firm-Year Observations (n)		12,736	
Total No. of Firms		2515	

Panel B: Summary Statistics		No. of Firm Year Observations (n)	Mean	SD	p25	Median	p75
Negative Tone	12,736	0.016	0.003	0.014	0.016	0.019	
Uncertain Tone	12,736	0.012	0.002	0.010	0.012	0.014	
Disclosed Religiosity	12,736	0.068	0.252	0	0	0	
Gross File Size	12,736	14,978	1,463	13,906	14,722	16,382	
No. of Exhibits in 10-K	12,736	10,705	5,071	7	11	14	
Tangibility	12,736	0.269	0.237	0.085	0.187	0.392	
Profitability	12,736	0.073	0.257	0.063	0.115	0.166	
Size	12,736	6,904	2,092	5,422	6,968	8,289	
Firm Age	12,736	24,346	17,086	10	20	36	
Cash Flow Volatility	12,736	0.065	0.107	0.023	0.039	0.07	
Book Leverage	12,736	0.252	0.282	0.065	0.219	0.367	
Debt Issue	12,736	0.32	0.466	0	0	1	
Capital Expenditure	12,736	0.048	0.058	0.016	0.031	0.058	
SGA Expense	12,736	0.277	0.301	0.1	0.2	0.353	
Location Religiosity	12,736	0.587	0.159	0.461	0.584	0.671	

Panel C: Pearson Correlations		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Negative Tone (1)		0.727													
Uncertain Tone (2)		-0.027	-0.042												
Disclosed Religiosity (3)		0.363	0.555	-0.012											
Gross File Size (4)		0.514	0.493	0.003	0.648										
No. of Exhibits in 10-K (5)		-0.039	-0.042	0.01	-0.014	0.07									
Tangibility (6)		-0.063	-0.089	0.046	-0.014	0.011	0.132								
Profitability (7)		0.262	0.301	0.038	0.328	0.341	0.17	0.37							
Size (8)		0.003	-0.032	0.047	0.234	0.21	0.066	0.179	0.419						
Firm Age (9)		0.002	-0.005	-0.04	-0.093	-0.097	-0.162	-0.598	-0.389	-0.189					
Cash Flow Volatility (10)		0.162	0.154	0.036	0.16	0.14	0.194	-0.111	0.202	0.03	0.011				
Book Leverage (11)		0.038	0.052	0.013	0.066	0.069	0.101	0.034	0.177	-0.06	0.226				
Debt Issue (12)		-0.054	-0.018	-0.011	-0.035	-0.017	0.594	0.075	0.046	-0.049	0.08	0.133			
Capital Expenditure (13)		-0.097	-0.147	0.001	-0.13	-0.125	-0.239	-0.461	-0.416	-0.168	-0.016	-0.117	-0.075		
SGA Expense (14)		-0.049	-0.076	0.071	-0.04	-0.003	0.018	0.04	0.076	0.071	-0.03	0.037	-0.016	-0.007	
Location Religiosity (15)															

(Source: Authors). Bolded values represent statistical significance at the 1% level.

3.2. Methodology

We utilized the following baseline regression model:

$$\text{Disclosure Tone} = \beta_1 \text{ Disclosed Religiosity} + \beta_2 \text{ Document Characteristic Controls} + \beta_3 \text{ Firm-Level Controls} + \beta_4 \text{ Location Religiosity} + \varepsilon.$$

Disclosed Religiosity is an indicator variable that equals 1 if a firm is led by one or more religious C-suite executives in a certain year, as supported by their publicly identifiable religious organization affiliation data in BoardEx. The *Document Characteristic Controls* vector consists of the gross 10-K file size and a count for the number of exhibits within 10-Ks, which is used following the technique of Nazrul et al. (2022). The *Firm-Level Controls* vector includes standard measures for asset tangibility, profitability, firm size, firm age, cash flow volatility, book leverage, the new debt issuance dummy, capital expenditures, and SGA expenses, which were obtained based on other prior individual religiosity-based papers (Baxamusa & Jalal, 2016; Nazrul et al., 2022). *Location Religiosity* measures the overall number of religious individuals in a specific county relative to the total county population, based on the Association of Religion Data Archives (ARDA) data (Hilary & Hui, 2009). Detailed variable definitions are listed in Appendix A at the bottom. We added industry and year-fixed effects to all our regression specifications that follow the baseline regression specification.

4. Results

4.1. Overall Findings

Table 2 examines the effect of executive-level religiosity on disclosure tone ambiguity, as measured by the proportional word-list counts of negative and uncertain tonal sentiment-bearing words relative to the total number of words appearing in a firm's 10-K. Table 2 reports a highly significant and negative coefficient for *Disclosed Religiosity* for both the negative tone specification (coefficient = -0.021 ; t-statistic = -3.011) and the uncertain tone specification (coefficient = -0.017 ; t-statistic = -3.087). The coefficient from both specifications suggests that the presence of any C-suite executive with a disclosed religious identity reduces the corporate annual reports' negative (uncertain) tonal sentiment by 2.1 percent (1.7 percent). The findings from both specifications support Hypotheses 1 and 2. This shows that the presence of religious executives within the C-suite team leads to an active firm-level effort to reduce the magnitude of the negative and uncertain tonal sentiments of corporate annual reports. This, in turn, helps protect and maximize future firm value as it mitigates the future detrimental capital market outcomes resulting from negative and uncertain tonal sentiments in corporate annual reports. The results hold true while controlling for *Location Religiosity* within both specifications, the coefficients of which are negative but insignificant. This shows that the firm's headquarters location-based religiosity does not solely drive the impact of religion, which lends credence to the arguments presented by other individual religiosity-based papers in business (Brenner, 2015; Baxamusa & Jalal, 2016; Cai et al., 2019; Iguchi et al., 2021; Chen et al., 2022; Nazrul et al., 2022; Zuo et al., 2022). This also supports Hambrick and Mason's (1984) upper echelons theory, which explains how the executives' personal values and beliefs can predict their corporate actions and decisions. Our overall findings offer incremental evidence that the individual-level religiosity of executives affects corporate decision-making and mitigates the tonal sentiment ambiguity levels of corporate documents such as annual reports.

Table 2. Impact of Executive Religiosity on Disclosure Tone.

Variables	Negative Tone	Uncertain Tone
<i>Disclosed Religiosity</i>	−0.021 *** (−3.011)	−0.017 *** (−3.087)
<i>Gross File Size</i>	0.026 *** (8.695)	0.017 *** (12.129)
<i>No. of Exhibits in 10-K</i>	0.014 *** (29.129)	0.003 *** (9.461)
<i>Tangibility</i>	−0.019 (−1.315)	−0.013 ** (−2.019)
<i>Profitability</i>	−0.041 *** (−3.632)	−0.040 *** (−5.918)
<i>Size</i>	−0.003 (−0.984)	0.009 *** (13.070)
<i>Firm Age</i>	−0.010 (−1.460)	−0.001 *** (−13.207)
<i>Cash Flow Volatility</i>	0.079 *** (2.699)	0.076 *** (4.390)
<i>Book Leverage</i>	0.049 *** (5.607)	0.020 *** (4.663)
<i>Debt Issue</i>	−0.004 ** (−1.993)	−0.002 (−1.108)
<i>Capital Expenditure</i>	−0.088 *** (−2.877)	0.044 * (1.850)
<i>SGA Expense</i>	0.013 (1.291)	−0.005 (−1.315)
<i>Location Religiosity</i>	−0.016 (−0.839)	−0.004 (−0.697)
<i>Constant</i>	0.002 (0.014)	−0.134 *** (−6.460)
<i>Industry FE</i>	Y	Y
<i>Year FE</i>	Y	Y
<i>Observations</i>	12,736	12,736
<i>Adj. R-squared</i>	0.626	0.601

(Source: Authors). T-statistics are reported in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

4.2. Subsample Analysis—Individual Executive Groups

In Tables 3–5, we show three subsample analyses to examine which executive group within the management team drives the main results shown in Table 2. According to Section 906 of the Sarbanes–Oxley Act of 2002 (SOX), each corporate annual report containing periodic financial statements of public limited companies must accompany a written statement from their CEOs and CFOs certifying the content of the corporate annual report (Geiger & Taylor, 2003)⁷. Research has shown that CEOs have the most influence on corporate decision-making relative to other C-suite executives (Ke et al., 2019). However, in the context of financial reporting, CFOs also have an important oversight over the quality of earnings and financial data reported in corporate annual reports and the overall communication transparency of those numbers, particularly post-SOX (Bedard et al., 2014; Baker et al., 2019). Given the importance of CEOs and CFOs in the financial reporting and annual report certification processes mandated by the SEC (Geiger & Taylor, 2003), we gauged their individual religiosity’s impact on the disclosure tone of annual reports, as shown in Tables 3 and 4. The cumulative impact of the individual religiosity of any non-CEO and non-CFO executive is depicted in Table 5.

Table 3 focuses explicitly on the CEO sample and reports a highly significant and negative coefficient for *Disclosed Religiosity* for both the negative tone specification (coefficient = −0.024; t-statistic = −3.022) and the uncertain tone specification

(coefficient = -0.018 ; t-statistic = -3.268). The coefficients from both specifications suggest that the presence of any religious CEO with a disclosed religious identity reduces the negative (uncertain) tonal sentiment of corporate annual reports by 2.4 percent (1.8 percent). The findings from both specifications support Hypotheses 1 and 2. The findings also validate the extant findings of religious CEOs playing an influential central role in corporate decision-making and disclosure-related choices (Brenner, 2015; Baxamusa & Jalal, 2016; Cai et al., 2019; Iguchi et al., 2021; Chen et al., 2022; Nazrul et al., 2022).

Table 3. Impact of CEO Religiosity on Disclosure Tone.

Variables	Negative Tone	Uncertain Tone
<i>Disclosed Religiosity</i>	-0.024^{***} (-3.022)	-0.018^{***} (-3.268)
<i>Gross File Size</i>	0.026^{***} (8.627)	0.017^{***} (26.443)
<i>No. of Exhibits in 10-K</i>	0.014^{***} (29.215)	0.003^{***} (15.553)
<i>Tangibility</i>	-0.018 (-1.293)	-0.038^{***} (-10.978)
<i>Profitability</i>	-0.040^{***} (-3.613)	-0.056^{***} (-12.544)
<i>Size</i>	-0.003 (-0.989)	0.008^{***} (22.370)
<i>Firm Age</i>	-0.010 (-1.482)	-0.001^{***} (-24.393)
<i>Cash Flow Volatility</i>	0.073^{**} (2.407)	0.070^{***} (6.897)
<i>Book Leverage</i>	0.050^{***} (5.618)	0.016^{***} (6.387)
<i>Debt Issue</i>	-0.004^* (-1.949)	-0.005^{***} (-5.246)
<i>Capital Expenditure</i>	-0.089^{***} (-2.880)	0.106^{***} (7.241)
<i>SGA Expense</i>	0.011 (1.116)	-0.027^{***} (-9.517)
<i>Location Religiosity</i>	-0.019 (-1.004)	-0.003 (-0.704)
<i>Constant</i>	0.005 (0.030)	-0.104^{***} (-11.042)
<i>Industry FE</i>	Y	Y
<i>Year FE</i>	Y	Y
<i>Observations</i>	11,207	11,207
<i>Adj. R-squared</i>	0.624	0.543

(Source: Authors). T-statistics are reported in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4 focuses on the CFO sample. In comparison to the CEO sample, although the statistical significance of the coefficients is slightly weaker, the coefficients for *Disclosed Religiosity* are statistically significant and negative for both the negative tone specification (coefficient = -0.041 ; t-statistic = -1.947) and the uncertain tone specification (coefficient = -0.016 ; t-statistic = -2.247). The coefficients from both specifications suggest that the presence of any religious CFO with a disclosed religious identity reduces the negative (uncertain) tonal sentiment of corporate annual reports by 4.1 percent (1.6 percent). The findings from both specifications support Hypotheses 1 and 2. The findings also validate the extant findings of CFOs playing an influential role in corporate disclosures and broader financial-reporting-related choices post-SOX (Geiger & Taylor, 2003; Bedard et al., 2014;

Baker et al., 2019). They also show that CFOs' input in the broader financial reporting process is heightened, particularly when they are religious.

Table 4. Impact of CFO Religiosity on Disclosure Tone.

Variables	Negative Tone	Uncertain Tone
<i>Disclosed Religiosity</i>	−0.041 * (−1.947)	−0.016 ** (−2.247)
<i>Gross File Size</i>	0.034 *** (3.498)	0.004 (0.804)
<i>No. of Exhibits in 10-K</i>	0.012 *** (4.833)	0.004 *** (6.731)
<i>Tangibility</i>	−0.038 (−1.005)	−0.022 (−0.792)
<i>Profitability</i>	−0.066 * (−1.877)	−0.061 *** (−3.691)
<i>Size</i>	0.012 ** (2.327)	0.015 *** (4.049)
<i>Firm Age</i>	−0.001 (−1.048)	−0.001 ** (−2.670)
<i>Cash Flow Volatility</i>	0.069 (0.975)	0.058 (1.282)
<i>Book Leverage</i>	0.053 * (1.738)	−0.017 (−0.848)
<i>Debt Issue</i>	−0.010 (−0.962)	0.003 (0.476)
<i>Capital Expenditure</i>	0.091 (0.875)	0.100 ** (2.677)
<i>SGA Expense</i>	0.002 (0.081)	−0.015 (−1.523)
<i>Location Religiosity</i>	−0.004 (−0.076)	−0.003 (−0.149)
<i>Constant</i>	−0.427 *** (−3.779)	0.002 (0.035)
<i>Industry FE</i>	Y	Y
<i>Year FE</i>	Y	Y
<i>Observations</i>	623	623
<i>Adj. R-squared</i>	0.527	0.466

(Source: Authors). T-statistics are reported in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5 focuses on the non-CEO and non-CFO executive sample. Although the coefficient for *Disclosed Religiosity* remains negative for both the negative tone specification (coefficient = −0.007; t-statistic = −0.150) and the uncertain tone specification (coefficient = −0.012; t-statistic = −1.568), they are statistically insignificant, which contrasts with the overall sample and the CEO and CFO subsample of observations. This result reiterates the prominent roles of the CEO and CFOs in the financial reporting process (Geiger & Taylor, 2003). It revalidates the statistically significant results reported in Tables 3 and 4 for the CEO and CFO subsample.

Table 5. Impact of Non-CEO & Non-CFO Religiosity on Disclosure Tone.

Variables	Negative Tone	Uncertain Tone
<i>Disclosed Religiosity</i>	−0.007 (−0.150)	−0.012 (−1.568)
<i>Gross File Size</i>	0.051 *** (6.560)	0.019 *** (5.224)
<i>No. of Exhibits in 10-K</i>	0.010 *** (7.462)	0.002 *** (2.935)

Table 5. Cont.

Variables	Negative Tone	Uncertain Tone
<i>Tangibility</i>	−0.056 (−1.555)	0.017 (1.016)
<i>Profitability</i>	−0.075 *** (−2.889)	−0.061 *** (−5.168)
<i>Size</i>	0.008 ** (2.457)	0.011 *** (7.243)
<i>Firm Age</i>	−0.001 * (−1.824)	−0.001 *** (−3.688)
<i>Cash Flow Volatility</i>	0.008 (0.151)	0.001 (0.041)
<i>Book Leverage</i>	−0.048 * (−1.959)	−0.021 * (−1.922)
<i>Debt Issue</i>	0.024 ** (2.104)	0.007 (1.412)
<i>Capital Expenditure</i>	0.026 (0.256)	−0.067 (−1.426)
<i>SGA Expense</i>	−0.029 (−1.387)	−0.024 ** (−2.510)
<i>Location Religiosity</i>	−0.038 (−0.558)	−0.011 (−0.702)
<i>Constant</i>	−0.574 *** (−5.427)	−0.146 *** (−2.805)
<i>Industry FE</i>	Y	Y
<i>Year FE</i>	Y	Y
<i>Observations</i>	906	906
<i>Adj. R-squared</i>	0.624	0.494

(Source: Authors). T-statistics are reported in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

4.3. Robustness Tests

As shown in Tables 6–8, we used entropy balancing to validate our core findings from Tables 2–4. This robustness technique has been utilized in individual-religiosity-based accounting research, such as the work of Nazrul et al. (2022), and broader accounting and corporate finance-based research (Shroff et al., 2017; McMullin & Schonberger, 2020) to create a “balanced” comparison between the treatment and control groups. Entropy balancing achieves this by reweighting the observations in the control sample, such that the moments of the distributions of the matching variables for the reweighted control sample are indistinguishable from the moments of the distributions of these variables for the treatment sample (Hainmueller, 2012; Shroff et al., 2017). As the differences in covariates are adjusted before the regression analysis, the entropy-balanced regressions are, therefore, designed to attribute the observed differences in outcomes to the treatment or intervention rather than to the pre-existing differences among the groups (Hainmueller, 2012).

As shown in Table 6, we ran entropy-balanced regression on our overall sample, whereas we ran entropy-balanced regression specifications on our CEO and CFO samples, as shown in Tables 7 and 8, respectively. Consistent with our earlier findings, the coefficient on *Disclosed Religiosity* is negative and significant for both the negative and uncertain tone specifications in all three tables. Hence, these findings revalidate the role of individual, executive-level religiosity on firm disclosure practices that mitigate the tonal ambiguity of corporate annual reports.

Table 6. Impact of Executive Religiosity on Disclosure Tone (Entropy-Balanced Approach).

Variables	Negative Tone	Uncertain Tone
<i>Disclosed Religiosity</i>	−0.014 *** (−3.788)	−0.008 *** (−4.710)
<i>Gross File Size</i>	0.004 ** (2.037)	0.018 *** (23.203)
<i>No. of Exhibits in 10-K</i>	0.012 *** (15.002)	0.003 *** (10.162)
<i>Tangibility</i>	−0.007 (−0.596)	−0.020 *** (−4.155)
<i>Profitability</i>	−0.091 *** (−6.205)	−0.051 *** (−7.104)
<i>Size</i>	0.013 *** (8.821)	0.007 *** (10.032)
<i>Firm Age</i>	−0.001 *** (−9.442)	−0.001 *** (−13.591)
<i>Cash Flow Volatility</i>	0.284 *** (6.784)	0.096 *** (5.302)
<i>Book Leverage</i>	0.052 *** (5.035)	0.018 *** (3.838)
<i>Debt Issue</i>	−0.012 *** (−2.994)	−0.003 * (−1.918)
<i>Capital Expenditure</i>	−0.107 ** (−2.080)	0.045 * (1.861)
<i>SGA Expense</i>	−0.030 *** (−4.027)	−0.029 *** (−8.479)
<i>Location Religiosity</i>	0.015 (1.315)	−0.001 (−0.187)
<i>Constant</i>	0.005 (0.159)	−0.123 *** (−10.319)
<i>Observations</i>	12,736	12,736
<i>R-squared</i>	0.358	0.47

(Source: Authors). T-statistics are reported in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7. Impact of CEO Religiosity on Disclosure Tone (Entropy-Balanced Approach).

Variables	Negative Tone	Uncertain Tone
<i>Disclosed Religiosity</i>	−0.021 *** (−3.098)	−0.006 *** (−3.440)
<i>Gross File Size</i>	0.037 *** (8.339)	0.018 *** (22.455)
<i>No. of Exhibits in 10-K</i>	0.014 *** (15.547)	0.003 *** (9.820)
<i>Tangibility</i>	−0.002 (−0.044)	−0.025 *** (−4.859)
<i>Profitability</i>	−0.060 ** (−2.350)	−0.041 *** (−4.978)
<i>Size</i>	−0.016 *** (−2.736)	0.006 *** (7.967)
<i>Firm Age</i>	0.007 (0.696)	−0.001 *** (−13.932)
<i>Cash Flow Volatility</i>	0.124 * (1.922)	0.109 *** (5.550)
<i>Book Leverage</i>	0.015 (0.770)	0.022 *** (4.399)
<i>Debt Issue</i>	−0.001 (−0.213)	−0.005 ** (−2.523)
<i>Capital Expenditure</i>	−0.164 *** (−2.631)	0.055 ** (2.081)

Table 7. *Cont.*

Variables	Negative Tone	Uncertain Tone
SGA Expense	−0.047 ** (−2.197)	−0.029 *** (−8.273)
Location Religiosity	0.004 (0.117)	0.005 (0.845)
Constant	−0.506 (−1.633)	−0.125 *** (−10.002)
Observations	11,207	11,207
R-squared	0.336	0.468

(Source: Authors). T-statistics are reported in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8. Impact of CFO Religiosity on Disclosure Tone (Entropy-Balanced Approach).

Variables	Negative Tone	Uncertain Tone
Disclosed Religiosity	−0.053 * (−2.075)	−0.013 ** (−2.093)
Gross File Size	0.020 (1.626)	0.005 (0.852)
No. of Exhibits in 10-K	0.013 *** (8.586)	0.004 *** (6.221)
Tangibility	0.043 (0.749)	−0.008 (−0.320)
Profitability	−0.061 * (−1.830)	−0.052 *** (−3.515)
Size	0.014 * (1.779)	0.014 *** (3.860)
Firm Age	−0.002 * (−1.897)	−0.001 ** (−2.474)
Cash Flow Volatility	0.133 (1.250)	0.046 (1.267)
Book Leverage	−0.015 (−0.506)	−0.011 (−0.532)
Debt Issue	0.008 (0.432)	0.006 (0.828)
Capital Expenditure	−0.087 (−1.374)	0.034 (0.897)
SGA Expense	−0.004 (−0.125)	−0.010 (−1.093)
Location Religiosity	−0.037 (−0.484)	−0.048 (−1.398)
Constant	−0.214 (−1.442)	0.031 (0.408)
Observations	623	623
R-squared	0.323	0.455

(Source: Authors). T-statistics are reported in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

As shown in Table 9, we conducted a further robustness test to examine how individual religiosity in the C-suite affects abnormal negative tone (known as net negative tone from hereon). As net negative tone has been associated with impression management tactics designed to deflate expectations or is known as a tool for engaging in insider trading behavior, we conducted this additional robustness test to examine whether the presence of a religious executive in the C-suite reduces the magnitude of abnormal negative tone in 10-Ks. We constructed our net negative tone measure using a similar approach to the extant subliterature in this domain (Sandulescu, 2015; Choi, 2020; Arslan-Ayaydin et al., 2021; Xu & Qi, 2022; Cheng et al., 2023). Then, we repeated our analysis on the overall sample,

CEO subsample, and CFO subsample using net negative tone as our dependent variable. In line with our findings in Tables 2–4, the results show that the presence of religious executives within the C-suite significantly reduces the magnitude of net negative tone in corporate annual reports. This is consistent with the conjectures of the intrinsic dimension viewpoint of religiosity, which suggests that religious individuals are highly transparent and would not purposefully engage in the manipulative practices often associated with an abnormal or net negative tone.

Table 9. Impact of Executive Religiosity on Net-Negative Disclosure Tone.

	Overall Sample	CEO Sample	CFO Sample
Variables	Net Negative Tone	Net Negative Tone	Net Negative Tone
<i>Disclosed Religiosity</i>	−0.018 *** (−2.973)	−0.022 *** (−3.163)	−0.039 * (−1.919)
<i>Gross File Size</i>	0.021 *** (8.114)	0.021 *** (8.048)	0.027 *** (3.283)
<i>No. of Exhibits in 10-K</i>	0.012 *** (29.021)	0.012 *** (29.078)	0.010 *** (5.348)
<i>Tangibility</i>	−0.011 (−0.897)	−0.011 (−0.891)	−0.025 (−0.634)
<i>Profitability</i>	−0.037 *** (−3.796)	−0.036 *** (−3.747)	−0.042 (−1.228)
<i>Size</i>	−0.005 ** (−2.001)	−0.005 ** (−1.984)	0.008 (1.521)
<i>Firm Age</i>	−0.008 (−1.565)	−0.008 (−1.586)	−0.000 (−0.607)
<i>Cash Flow Volatility</i>	0.076 *** (3.109)	0.072 *** (2.816)	0.037 (0.438)
<i>Book Leverage</i>	0.047 *** (6.136)	0.048 *** (6.142)	0.045 (1.671)
<i>Debt Issue</i>	−0.004 ** (−2.313)	−0.004 ** (−2.296)	−0.012 (−1.300)
<i>Capital Expenditure</i>	−0.085 *** (−3.181)	−0.085 *** (−3.171)	0.057 (0.838)
<i>SGA Expense</i>	0.007 (0.829)	0.006 (0.730)	0.004 (0.217)
<i>Location Religiosity</i>	−0.005 (−0.343)	−0.008 (−0.536)	−0.013 (−0.172)
<i>Constant</i>	0.003 (0.023)	0.005 (0.034)	−0.362 *** (−3.763)
<i>Industry FE</i>	Y	Y	Y
<i>Year FE</i>	Y	Y	Y
<i>Observations</i>	12,736	11,207	623
<i>R-squared</i>	0.612	0.608	0.418

(Source: Authors). T-statistics are reported in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

5. Conclusions, Limitations, and Future Research

This study examines how individual religiosity within the C-suite team affects the disclosure tone ambiguity of corporate annual reports. It shows that the presence of individual religiosity has important implications for the disclosure tone ambiguity of corporate annual reports, as documented by a reduction in the level of negativity and uncertainty in those reports. Subsample analyses show that the religiosity of CEOs and CFOs tends to be the primary driver of the main effect documented in this study. By highlighting the impact of individual religiosity on disclosure-tone-related choices, this study extends the extant disclosure literature, particularly in the subdomain of psychological managerial traits affecting the tone of disclosures in corporate annual reports. Overall, the study

adds to the growing psychological-factor-based managerial traits research in accounting and finance and shows that individual executive-level religiosity has important corporate decision-making implications, as evidenced by how such religiosity affects the tonal sentiment of corporate communication.

This study has a few caveats. Data are limited to BoardEx’s sample availability, which limits the data availability pre-1999. Additionally, Loughran and McDonald’s tonal sentiment dictionary primarily covers the English language and U.S. firms, which is also the focus of our research. Hence, if the study’s scope were to be expanded to a cross-country or cross-language setting, Loughran and McDonald’s tonal sentiment dictionary would require quite a few modifications and adaptations, which could be cumbersome, especially if this is performed individually for each different language. However, this limitation provides a few avenues for future research. Given the advent of machine learning in the field of computer science, the natural language processing (NLP) techniques commonly seen in the field of computer science research can be used to batch process and adapt Loughran and McDonald’s dictionary or other similar tonal sentiment dictionaries to multiple other languages. This can be a feasible way to expand the cross-cultural adaptability of such tonal sentiment dictionaries. Modifying tonal sentiment dictionaries via NLP techniques could create new cross-country avenues of research involving religiosity and disclosure tone sentiments in corporate reports. Using NLP techniques to expand the range of words being analyzed can also improve our understanding of the tonal sentiment of alternative, social-media-based corporate communication channels such as Twitter, Instagram, or TikTok, the popularity of which has grown drastically since the advent of Loughran and McDonald’s tonal sentiment dictionary.

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Appendix A

Variable	Definition
<i>Negative Tone</i>	Word-list counts of negative words (<i>Fin-Neg</i> list) relative to the total number of words appearing in a firm’s 10-K (Loughran & McDonald, 2011).
<i>Uncertain Tone</i>	Word-list counts of uncertain words (<i>Fin-Unc</i> list) relative to the total number of words appearing in a firm’s 10-K (Loughran & McDonald, 2011)
<i>Disclosed Religiosity</i>	A dummy variable that equals 1 if a firm has one or more religious C-suite executives (Nazrul et al., 2022).
<i>Gross File Size</i>	Natural Log of 10-K file size (Nazrul et al., 2022).

Variable	Definition
No. of Exhibits in 10-K	Number of the firm's 10-K exhibits (Nazrul et al., 2022).
Tangibility	Net PPE/Total Assets (Nazrul et al., 2022).
Profitability	Operating Income Before Income Tax and Depreciation/Total Assets (Nazrul et al., 2022).
Size	Natural Log of Total Assets (Nazrul et al., 2022).
Firm Age	Age of Firm (Nazrul et al., 2022).
Cash Flow Volatility	Measured as the standard deviation of cash flows from operations scaled by total assets in 5-year rolling windows with a minimum of 5 observations and winsorized at percentiles 1 and 99 (Nazrul et al., 2022).
Book Leverage	Current Liabilities + Long-Term Debt/Total Assets (Nazrul et al., 2022).
Debt Issue	This dummy variable takes a value of 1 if long-term debt issuance, less long-term debt reduction, is more than 1% of the firm's total assets (Baxamusa & Jalal, 2016).
Capital Expenditure	Capital Expenditures/Total Assets (Nazrul et al., 2022).
SGA Expense	Selling, General and Administrative Expenses/Total Assets (Nazrul et al., 2022)
Location Religiosity	The overall religiosity of a county per 1000 members of the population, as reported by the ARDA (Hilary & Hui, 2009).

Notes

- ¹ Typically, tobacco, gambling, and alcohol, as well as industries with emerging environmental, social, and ethical issues (e.g., oil, firearms, etc.) are considered sin industries (Arslan-Ayaydin et al., 2021).
- ² A good example of this is Mount Sinai Hospital in New York (Nazrul et al., 2022).
- ³ The GuideStar directory can be found at: <https://www.guidestar.org/NonprofitDirectory.aspx> (accessed on 18 February 2022).
- ⁴ The CEO, CFO, CIO, COO, and CTO.
- ⁵ The Loughran and McDonald data are available at: https://sraf.nd.edu/sec-edgar-data/lm_10x_summaries/ (accessed on 27 March 2022).
- ⁶ ARDA data can be found at: <https://www.thearda.com/data-archive/browse-categories?cid=B-A#B-A> (accessed on 23 May 2022).
- ⁷ https://pcaobus.org/About/History/Documents/PDFs/Sarbanes_Oxley_Act_of_2002.pdf (accessed on 1 December 2024).

References

- Alam, M. A. U., Devos, E., & Feng, Z. (2023). Firm reaction to geopolitical crises: Evidence from the Russia-Ukraine conflict. *Journal of Financial Research*, 46, S163–S182. [CrossRef]
- Al Rahahleh, N., Ishaq Bhatti, M., & Najuna Misman, F. (2019). Developments in risk management in Islamic finance: A review. *Journal of Risk and Financial Management*, 12(1), 37. [CrossRef]
- Anderson, G. M. (1988). Mr. Smith and the preachers: The economics of religion in the wealth of nations. *Journal of Political Economy*, 96(5), 1066–1088. [CrossRef]
- Arikan, M., Kara, M., Masli, A., & Xi, Y. (2023). Political euphoria and corporate disclosures: An investigation of CEO partisan alignment with the president of the United States. *Journal of Accounting and Economics*, 75(2–3), 101552. [CrossRef]
- Arslan-Ayaydin, Ö., Boudt, K., & Thewissen, J. (2016). Managers set the tone: Equity incentives and the tone of earnings press releases. *Journal of Banking & Finance*, 72, S132–S147.
- Arslan-Ayaydin, Ö., Thewissen, J., & Torsin, W. (2021). Disclosure tone management and labor unions. *Journal of Business Finance & Accounting*, 48(1–2), 102–147.
- Baker, T. A., Lopez, T. J., Reitenga, A. L., & Ruch, G. W. (2019). The influence of CEO and CFO power on accruals and real earnings management. *Review of Quantitative Finance and Accounting*, 52, 325–345. [CrossRef]
- Bassyouny, H., Abdelfattah, T., & Tao, L. (2020). Beyond narrative disclosure tone: The upper echelons theory perspective. *International Review of Financial Analysis*, 70, 101499. [CrossRef]
- Bassyouny, H., Abdelfattah, T., & Tao, L. (2022). Narrative disclosure tone: A review and areas for future research. *Journal of International Accounting, Auditing and Taxation*, 49, 100511. [CrossRef]
- Baxamusa, M., & Jalal, A. (2016). CEO's religious affiliation and managerial conservatism. *Financial Management*, 45(1), 67–104. [CrossRef]

- Bedard, J. C., Hoitash, R., & Hoitash, U. (2014). Chief financial officers as inside directors. *Contemporary Accounting Research*, 31(3), 787–817. [CrossRef]
- Bochkay, K., Chychyla, R., & Nanda, D. (2019). Dynamics of CEO disclosure style. *The Accounting Review*, 94(4), 103–140. [CrossRef]
- Bott, J., & Milkau, U. (2018). Risk culture and the role model of the honorable merchant. *Journal of Risk and Financial Management*, 11(3), 40. [CrossRef]
- Brenner, S. (2015). The risk preferences of US executives. *Management Science*, 61(6), 1344–1361. [CrossRef]
- Cai, Y., Kim, Y., Li, S., & Pan, C. (2019). Tone at the top: CEOs' religious beliefs and earnings management. *Journal of Banking & Finance*, 106, 195–213.
- Chen, Y., Chu, X., Park, J. C., & Soileau, J. S. (2022). CEO religious university affiliation and financial reporting quality. *Accounting & Finance*, 62(1), 417–468.
- Cheng, L., Jin, Q., & Ma, H. (2023). Tone emphasis and insider trading. *Journal of Corporate Finance*, 80, 102419. [CrossRef]
- Choi, W. (2020). Disclosure tone of the spin-off prospectus and insider trading. *Journal of Accounting and Public Policy*, 39(1), 106692. [CrossRef]
- Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, 55(1), 591–621. [CrossRef]
- Davis, A. K., & Tama-Sweet, I. (2012). Managers' use of language across alternative disclosure outlets: Earnings press releases versus MD&A. *Contemporary Accounting Research*, 29(3), 804–837.
- Del Gaudio, B. L., Megaravalli, A. V., Sampagnaro, G., & Verdoliva, V. (2020). Mandatory disclosure tone and bank risk-taking: Evidence from Europe. *Economics Letters*, 186, 108531. [CrossRef]
- Donahue, M. J. (1985). Intrinsic and extrinsic religiousness: Review and meta-analysis. *Journal of Personality and Social Psychology*, 48(2), 400. [CrossRef]
- Feldman, R., Govindaraj, S., Livnat, J., & Segal, B. (2010). Management's tone change, post earnings announcement drift and accruals. *Review of Accounting Studies*, 15, 915–953. [CrossRef]
- Geiger, M. A., & Taylor, P. L., III. (2003). CEO and CFO certifications of financial information. *Accounting Horizons*, 17(4). [CrossRef]
- Geyer, A. L., & Baumeister, R. F. (2005). Religion, morality, and self-control: Values, virtues, and vices. In *Handbook of the psychology of religion and spirituality* (pp. 412–432). The Guilford Press.
- Grullon, G., Kanatas, G., & Weston, J. (2009). *Religion and corporate (mis) behavior*. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1472118 (accessed on 1 February 2022).
- Hainmueller, J. (2012). Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis*, 20(1), 25–46. [CrossRef]
- Hambrick, D. C., & Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review*, 9(2), 193–206. [CrossRef]
- Hardy, S. A. (2006). Identity, reasoning, and emotion: An empirical comparison of three sources of moral motivation. *Motivation and Emotion*, 30, 205–213. [CrossRef]
- Heubeck, T. (2024). Untangling the paradoxical relationship between religion and business: A systematic literature review of chief executive officer (CEO) religiosity research. *Journal of Business Ethics*, 195, 191–214. [CrossRef]
- Hilary, G., & Hui, K. W. (2009). Does religion matter in corporate decision making in America? *Journal of Financial Economics*, 93(3), 455–473. [CrossRef]
- Hossain, M., Raghunandan, K., & Rama, D. V. (2020). Abnormal disclosure tone and going concern modified audit reports. *Journal of Accounting and Public Policy*, 39(4), 106764. [CrossRef]
- Iguchi, H., Katayama, H., & Yamanoi, J. (2021). CEOs' religiosity and corporate green initiatives. *Small Business Economics*, 58, 497–522. [CrossRef]
- Jiang, F., John, K., Li, C. W., & Qian, Y. (2018). Earthly reward to the religious: Religiosity and the costs of public and private debt. *Journal of Financial and Quantitative Analysis*, 53(5), 2131–2160. [CrossRef]
- Johnson, P. E. (1959). *Psychology and religion*. Abington Press.
- Ke, R., Li, M., Ling, Z., & Zhang, Y. (2019). Social connections within executive teams and management forecasts. *Management Science*, 65(1), 439–457. [CrossRef]
- Kothari, S. P., Li, X., & Short, J. E. (2009). The effect of disclosures by management, analysts, and business press on cost of capital, return volatility, and analyst forecasts: A study using content analysis. *The Accounting Review*, 84(5), 1639–1670. [CrossRef]
- Leventis, S., Dedoulis, E., & Abdelsalam, O. (2018). The impact of religiosity on audit pricing. *Journal of Business Ethics*, 148(1), 53–78. [CrossRef]
- Li, F. (2008). Annual report readability, current earnings, and earnings persistence. *Journal of Accounting and Economics*, 45(2–3), 221–247. [CrossRef]
- Li, J., Guo, C., Lv, S., Xie, Q., & Zheng, X. (2024). Financial fraud detection for Chinese listed firms: Does managers' abnormal tone matter? *Emerging Markets Review*, 62, 101170. [CrossRef]

- Li, S., Wang, G., & Luo, Y. (2022). Tone of language, financial disclosure, and earnings management: A textual analysis of form 20-F. *Financial Innovation*, 8(1), 43. [CrossRef]
- Loughran, T., & McDonald, B. (2011). When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks. *The Journal of Finance*, 66(1), 35–65. [CrossRef]
- Loughran, T., & McDonald, B. (2013). IPO first-day returns, offer price revisions, volatility, and form S-1 language. *Journal of Financial Economics*, 109(2), 307–326. [CrossRef]
- Loughran, T., & McDonald, B. (2014). Measuring readability in financial disclosures. *The Journal of Finance*, 69(4), 1643–1671. [CrossRef]
- Loughran, T., & McDonald, B. (2016). Textual analysis in accounting and finance: A survey. *Journal of Accounting Research*, 54(4), 1187–1230. [CrossRef]
- Loughran, T., & McDonald, B. (2020). Textual analysis in finance. *Annual Review of Financial Economics*, 12(1), 357–375. [CrossRef]
- Luo, Y., & Zhou, L. (2020). Textual tone in corporate financial disclosures: A survey of the literature. *International Journal of Disclosure and Governance*, 17(2), 101–110. [CrossRef]
- Marquez-Illescas, G., Zebedee, A. A., & Zhou, L. (2019). Hear me write: Does CEO narcissism affect disclosure? *Journal of Business Ethics*, 159, 401–417. [CrossRef]
- McGuire, S. T., Omer, T. C., & Sharp, N. Y. (2012). The impact of religion on financial reporting irregularities. *The Accounting Review*, 87(2), 645–673. [CrossRef]
- McMullin, J. L., & Schonberger, B. (2020). Entropy-balanced accruals. *Review of Accounting Studies*, 25(1), 84–119. [CrossRef]
- Middleton, R., & Putney, S. (1962). Religion, normative standards, and behavior. *Sociometry*, 25, 141–52. [CrossRef]
- Nazrul, T., Esplin, A., Dow, K. E., & Folsom, D. M. (2022). Religiosity at the top and annual report readability. *Journal of Risk and Financial Management*, 15(10), 485. [CrossRef]
- Omer, T. C., Sharp, N. Y., & Wang, D. (2018). The impact of religion on the going concern reporting decisions of local audit offices. *Journal of Business Ethics*, 149, 811–831. [CrossRef]
- Rezaee, Z., Pouryousof, A., & Soleimani, A. (2024). An examination of management tone in the MD&A in the context of fraud pentagon. *Journal of Forensic Accounting Research*, 9(1), 167–193.
- Roccas, S. (2005). Religion and value systems. *Journal of Social Issues*, 61(4), 747–759. [CrossRef]
- Rogers, J. L., Van Buskirk, A., & Zechman, S. L. (2011). Disclosure tone and shareholder litigation. *The Accounting Review*, 86(6), 2155–2183. [CrossRef]
- Salsman, J. M., Brown, T. L., Brechting, E. H., & Carlson, C. R. (2005). The link between religion and spirituality and psychological adjustment: The mediating role of optimism and social support. *Personality and Social Psychology Bulletin*, 31(4), 522–535. [CrossRef] [PubMed]
- Sandulescu, P. M. (2015). Insiders' incentives of using a specific disclosure tone when trading. *Studies in Communication Sciences*, 15(1), 12–36. [CrossRef]
- Schleicher, T., & Walker, M. (2010). Bias in the tone of forward-looking narratives. *Accounting and Business Research*, 40(4), 371–390. [CrossRef]
- Shroff, N., Verdi, R. S., & Yost, B. P. (2017). When does the peer information environment matter? *Journal of Accounting and Economics*, 64(2–3), 183–214. [CrossRef]
- Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of Finance*, 62(3), 1139–1168. [CrossRef]
- Vitell, S. J., Bing, M. N., Davison, H. K., Ammeter, A. P., Garner, B. L., & Novicevic, M. M. (2009). Religiosity and moral identity: The mediating role of self-control. *Journal of Business Ethics*, 88(4), 601–613. [CrossRef]
- Watson, P. J., Hood, R. W., Jr., Morris, R. J., & Hall, J. R. (1984). Empathy, religious orientation, and social desirability. *The Journal of Psychology*, 117(2), 211–216. [CrossRef]
- White, C. J., Kelly, J. M., Shariff, A. F., & Norenzayan, A. (2019). Supernatural norm enforcement: Thinking about karma and God reduces selfishness among believers. *Journal of Experimental Social Psychology*, 84, 103797. [CrossRef]
- Xu, W., & Qi, D. (2022). Abnormal tone in management earnings forecast, media negative coverage, and insider trading. *Asia-Pacific Journal of Accounting & Economics*, 29(4), 939–963.
- Yan, B., Arslan-Ayaydin, Ö., Thewissen, J., & Torsin, W. (2021). Does managerial ability affect disclosure? Evidence from earnings press releases. *Asian Review of Accounting*, 29(2), 192–226.
- Zuo, Y., Xu, W., Li, D., Fu, W., & Lin, B. (2022). Individualism and excess perk consumption: Evidence from China. *Research in International Business and Finance*, 62, 101745. [CrossRef]

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Article

Do Firms' Characteristics Influence Their IT Strategies? A Study on the Driving Force behind Firms' Decisions to Appoint IT Expertise

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Abstract: The demand for information technology expertise has grown rapidly in the last few decades, signaling firms' commitment to integrating IT into core business strategies. Understanding the conditions under which firms appoint a chief information officer (CIO) can provide valuable insights into the evolving role of IT in corporate governance. This study addresses a crucial gap in the literature by exploring the determinants of a firm's decision to hire a CIO at the top management level. The study identifies several factors that influence a firm's decision to appoint a CIO, including the firm's size, its level of innovation, and its prior performance. The study examines these assertions by comparing the characteristics of firms that appoint a CIO at the top management level with those of similar firms in their industries that do not have a CIO position prior to the appointment. A logistic regression model that considers CIO firms and their matched firms indicates that firms that have larger capital expenditures, higher market value, or have experienced loss are more likely to hire a new CIO. Our study provides empirical evidence on why certain firms prioritize IT leadership at the executive level.

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Keywords: chief information officer; IT governance; intellectual capital; R&D investments; IT leadership; firm characteristics

1. Introduction

The increasing pace of change in business enterprise driven by innovation, deregulation, and competition has required a large investment in intangible assets, such as information technology (IT) and research and development (R&D). These investments, associated with changes in product and service offerings, have called for higher-skilled workers who have greater levels of cognitive skills and flexibility. In this "new economy", the demand is growing for workers with outstanding talent, training, and management ability (Krishnan et al. 2022; Evans et al. 2021; Autor et al. 1998). Accordingly, business enterprises today require not only traditional factors such as necessary capital and labor, but also new managerial skills such as "know-how information". Bresnahan et al. (2002) argue that a firm's ability to compete in the market depends not only on its technological capability, but also on its managers' abilities to respond rapidly to customer needs and market demands. CIO Dive notes a spike in technology leadership change to adjust for evolving economic and business changes. Executive Neal Sample became the CIO at Walgreens in November 2023. This leadership change followed broader shifts within the company; his role implies redirecting the company's attention to a new technology-driven transformation in the retail pharmacy sector, emphasizing the strategic importance of technology leadership (Torress 2023).

To effectively manage IT assets, modern organizations hire chief information officers (CIOs) at the top management level with the assumption that a CIO's personal skills add value to the business organization. A study by Zhang et al. (2023) highlights how rapid digital transformation across various industries has significantly shifted the responsibilities of CIOs. They are now expected to lead innovation and digital strategy, not just manage IT resources. This supports the assertion that firms need advanced managerial skills to navigate the complexities of the modern economy. Integrating a CIO position in the top management team enables a CIO to provide economic justification for IT projects to the rest of the top management team, convince them to allocate attention and resources to strategic IT projects, and make them aware of the potential of information systems that can enhance the firm's competitive advantage (Chau et al. 2020). Strengthening the CIO's leadership position throughout the organization is crucial for developing IT capabilities and strategic alignment in the digital era (Wunderlich and Beck 2017). Therefore, when firms take the advantage and make the first move, ahead of competitors, by setting up a CIO position in the top executive team, they convey to the market their ability to adapt rapidly to the ever-changing business environment.

Richardson and Zmud (2002) have shown that investors are likely to reward firms that have good governance structures with higher market value. Chatterjee et al. (2001) examine the shareholder wealth effects of announcements of newly created CIO positions during the 1987–1998 time period. They find that the market reaction to CIO announcements is more pronounced in firms that are newly integrating IT into their business strategy, so-called "IT transformation firms". In examining whether CIOs add long-term value to business enterprises, Khallaf and Skantz (2010) find that CIO firms outperform their industry average over two years following CIO appointments.

When appointed at the top management level, CIOs are pivotal in shaping IT governance, which involves aligning technology investments with the organization's strategic goals, managing IT-related risks, and developing policies that ensure accountability and transparency in the use of technology. CIOs help establish a framework that integrates IT governance with corporate governance, ensuring that technology decisions support overall business objectives and create value for the firm (Wu et al. 2015). Effective IT governance, driven by CIO leadership, enhances decision-making processes, optimizes resource allocation, mitigates IT risks, and protects intellectual assets, ultimately leading to better organizational performance and competitive advantage (Jones et al. 2020).

The above research represents an *ex post* analysis of a firm's decision to create a CIO position in the top management team, i.e., the act of hiring a new CIO. That is, prior research examines either the immediate market reaction to the announcement of hiring a new CIO or the long-term impact of a firm's decision to appoint a new CIO at the top management level. However, these analyses do not examine the question of which factors drive a firm to create a specialized managerial position, the chief information officer, who is responsible for implementing and coordinating IT projects. Therefore, the results obtained from these analyses do not explain the intuition or the rationale behind a firm's decision to have a new CIO position. In other words, which factors cause the demand for the CIO position *ex ante*? Determining the conditions under which firms appoint CIOs will help managers form realistic expectations about the benefits of having a CIO at the top management level.

To shed light on this question, this study analyzes the *ex ante* decision to hire a new CIO. The purpose of the current study, therefore, is to explain the rationale behind firms' decisions to hire a new CIO. Key drivers of appointing a CIO include financial reasons, such as firm prior performance and firm size. Technical reasons for CIO appointment include key drivers such as improving the quality of IS and gaining access to new expertise. External factors for appointing a new CIO include the desire to partake in a trend that has received wide coverage in the press. This study explores the differences in firm characteristics before the CIO appointment event between a sample of firms that have announced the appointment of a CIO, and closely matched firms that did not appoint a CIO during the entire sample period. Using a peer-design technique¹, firms in the CIO sample are

compared to a matched group that have not created a CIO position, with a similar SIC code and size. By using this peer-design technique, we control for variations in industry and size, which are important factors that could otherwise introduce bias in our analysis.

Unlike previous studies that have primarily focused on the ex post consequences of appointing a CIO, our study examines the ex ante decision-making processes and driving forces behind a firm's strategic choice to create a CIO position at the top management level. This novel approach provides valuable insights into the motivations and conditions that lead organizations to integrate IT leadership into their executive teams. By shedding light on these critical factors, our study offers a fresh perspective on the strategic integration of the CIO role within firms' top management structures. The motivation behind this research stems from the significant impact that IT can have on firm performance, innovation, and long-term sustainability.

The findings of this study are of particular interest to senior management, IT leaders (especially CIOs), investors, and business consultants. Senior management can gain a fresh perspective and insights on the key drivers behind appointing CIOs and the conditions that lead to the successful integration of IT leadership into executive teams and leverage these insights to make informed decisions about the integration of IT leadership into top management teams. CIOs and IT leaders will find value in learning how their role can extend beyond managing IT to shaping governance, fostering innovation, and enhancing long-term competitiveness. Investors may benefit by identifying firms that are likely to gain a competitive advantage through strategic IT leadership. Finally, business consultants can better understand the motivations and external conditions that prompt firms to establish a CIO position and contribute to business success. Overall, the study sheds light on the strategic importance of CIOs in the modern business landscape.

The paper is structured as follows. Section 2 develops the literature review and research hypotheses. Section 3 outlines the research methodology and sample selection procedure. Section 4 indicates the empirical results of the study and Section 5 presents the limitations and contributions. Section 6 includes a summary with conclusions.

2. Literature Review and Hypotheses Development

Firm characteristics are known to shape IT strategies in various ways. Specifically, we examine how firm characteristics such as size, industry type, financial performance, and capital expenditures influence IT strategies, particularly the decision to elevate IT leadership by creating a CIO position.

2.1. Firm Size

Kallmuenzer et al. (2024) argue that firms with greater resources are more likely to adopt new IT strategies. The authors use total sales as a proxy for firm resources and conclude that firms with greater sales levels adopt a just-in-time strategy. This is consistent with Gowen and Tallon (2003), who find that IT executives of "market-focused" organizations perceive higher levels of IT value throughout the value chain. The potential of scale and scope economies of large firms motivate these firms to take the initiative of creating new management positions. Furthermore, recent studies find that larger firms not only have more resources, but also face greater scrutiny from stakeholders, which increases their likelihood of appointing a CIO to ensure effective governance and strategic alignment (Chau et al. 2020; Banker et al. 2022). This indicates that larger firms are more likely to appoint a new CIO due to their capacity to leverage IT for competitive advantage.

Prior studies have examined the association between firm size and IT investment intensity. Their findings support the hypothesis that large firms experience greater opportunities to improve their financial performance than small firms (Gremillion 1984; Harris and Katz 1991).

Therefore, it is expected that firms with larger size will value the integration of the CIO position in the organization hierarchy more than small firms and are thus more likely to appoint a new CIO. Therefore, the following hypothesis is presented:

H1: *Large firms are more likely to appoint a new CIO than small firms.*

2.2. High-Tech Firms

The level of innovative activities of a firm can also drive the demand for a CIO position. That is, high-tech firms characterized by a greater level of R&D usually demand specific resources and skills to achieve a competitive advantage. Given the increasing pace of change in business enterprises driven by innovation, there is a call for skilled senior executives who can enable firms to rapidly adjust to the continuously changing business environment (Rajgopal et al. 2002). Prior studies argue that the dynamic nature of technology markets necessitates a strong IT leadership presence (Chau et al. 2020; Kettinger et al. (2021). Their findings suggest that high-tech firms with robust R&D investments are more likely to see a positive correlation between CIO appointments and improved market performance, thereby reinforcing the demand for CIOs in high-tech environments.

Kettinger et al. (1994) argue that the CIO's role in influencing a firm's future opportunities is more pronounced in a more dynamic environment. The hype around many high-tech firms and the publicity given to their web applications suggest that executives who do not act fast, relative to industry competitors, put their firms at risk (Ross and Feeny 2000). Advances in IT may require firms to better manage IT assets and model complex risks (Liebenberg and Hoyt 2003). Having a new CIO in a senior management team is crucial for high-tech firms due to the fact that most high-tech firms are building business strategies that have not previously existed in market industries. Accordingly, the following hypothesis is developed:

H2: *High-tech firms are more likely to appoint a new CIO than other firms.*

2.3. Prior Performance

Firm prior performance is another factor that may affect the demand for a CIO position. While the CIO role is becoming increasingly common in both profitable and non-profitable firms, there may be a greater demand for such positions in firms that have experienced loss. Since CIOs are touted by their ability to derive IT services at a lower cost level and higher quality (Bandodkar and Grover 2022), firms that experience loss are expected to have greater incentives to be among the first movers to create such a position in the top management team. Khallaf and Skantz (2010) find that the market reacts favorably to the strategic change implied by CIO appointment for firms performing poorly in the year prior to the announcement. A recent study (Chawla et al. 2023) supports the argument that firm performance impacts the demand for a CIO and highlights that the structural power of the CIO can enhance firm performance, particularly in firms that need strategic improvement or reorientation. The study indicates that the appointment of a CIO is seen more favorably by the market in firms that have underperformed, reinforcing the idea that unprofitable firms appoint CIOs to signal positive change to shareholders. Additionally, Chawla and Goyal (2021) indicate that digital transformation, often led by a CIO, is critical for firms seeking to improve efficiency and performance. These findings support the notion that unprofitable firms are more likely to appoint a CIO to leverage IT for competitive advantage and signal a strategic shift.

Accordingly, an inverse relation is expected between the demand for the CIO position and firm performance. Therefore, firms that experience loss are more likely to appoint a new CIO to signal a positive message to their shareholders. Hence, the following hypothesis is presented:

H3: *Unprofitable firms are more likely to appoint a new CIO than profitable firms.*

These hypotheses are not intended to be comprehensive and are limited by those driven factors that can be tested through publicly available financial data.

The framework described herein aims to identify the key factors or the driving forces influencing a firm’s decision to appoint a CIO at the top management level. These factors are driven by a combination of external and internal forces. The major external forces that drive firms to appoint a new CIO can arise from factors such as globalization and competition or the desire to follow a trend that has gained wide coverage in the popular press. Internal factors can include firm size, IT investment, level of innovation, and firm prior performance. Due to the difficulty of measuring the impact of external factors on the management decision to hire a new CIO, the current study assumes that the demand for the CIO position is a function of firm-specific characteristics that reflect greater resources, innovation activities, and firm performance.

Appointing a CIO holds significant theoretical importance as it directly impacts IT governance, innovation, and a firm’s competitive advantage. The CIO plays a crucial role in aligning IT investments with business strategies, ensuring that technological initiatives support organizational goals (Enns et al. 2003; Wu et al. 2015). Firm characteristics are also known to shape IT strategies in various ways and are likely to influence a firm’s decision to appoint a CIO. Figure 1 presents the conceptual framework for understanding the factors that drive a firm’s decision to appoint a chief information officer (CIO) at the top management level.

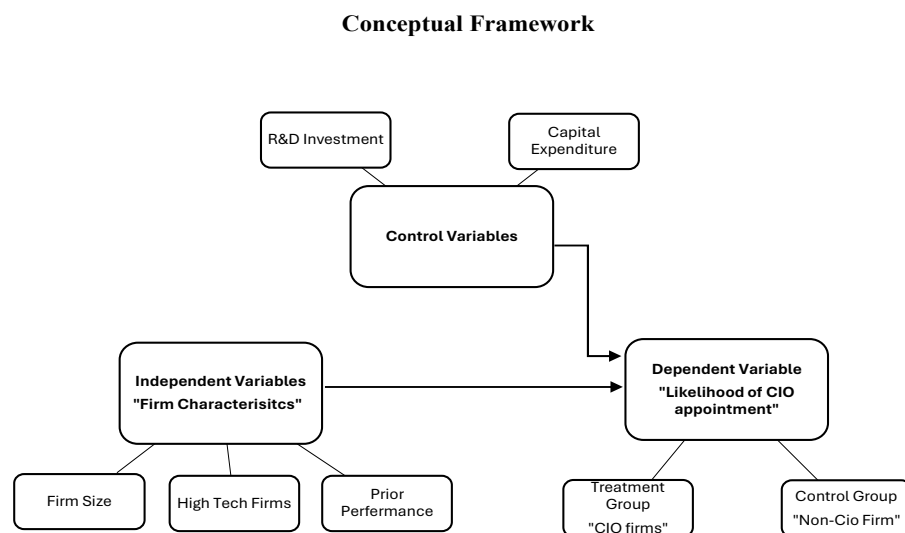


Figure 1. Conceptual framework of driving factors to nominate a CIO.

This figure presents the main factors that drive a firm’s decision to appoint a CIO.

3. Research Methodology

To explore the factors that drive firms’ decisions to create the CIO position at the top management level, a logistic regression model was estimated. The dependent variable (CIO firm) is stated as a dummy variable, and equals 1 for CIO firms and 0 for non-CIO firms. The independent variables include firm market value, R&D expenditures, advertising expenditures, capital expenditures, and prior performance. Hence, the empirical model of interest that examines the variables that drive the demand for the CIO position is as follows:

$$\ln [\text{prob. (CIO)}/1 - \text{prob. (CIO)}] = \alpha + \beta_1 \text{LOSS}_{it-1} + \beta_2 \text{Log MV}_{it-1} + \beta_3 \text{H-TEK} + \beta_4 \text{R\&D}_{it-1} + \beta_5 \text{CAPEX}_{it} + \varepsilon_{it} \quad (1)$$

where

Ln CIO (the dependent variable)	A dummy variable that takes a value of 1 if the firm hires a CIO, and 0 otherwise, where Ln refers to the likelihood or the marginal probability ratio in favor of creating a CIO position.
LOSS _{it-1}	A dummy variable that takes a value of 1 if the net income before extraordinary items (Compustat item #18) is negative, and 0 otherwise.
Log MV	The natural log of the firm’s market value at the end of the year. Market value is measured as a stock closing price multiplied by the number of common shares outstanding.
H-TEC ²	A dummy variable that takes a value of 1 if the firm reports Compustat SIC codes 2833-2836, 8731-8734, 7371-7379, 3570-3577, 3600-3674, or 3810-3845, namely drugs, R&D services, programming, computers, electronics, or precise measurement instruments, respectively, and 0 otherwise.
R&D _{it-1}	Research and development over sales (Compustat item # 46) to sales.
CAPEX	Capital expenditures (Compustat item # 30) scaled by total assets.

The dependent variable refers to the likelihood ratio in favor of creating a new CIO position. Since IT investments are not disclosed publicly, the model includes R&D and capital expenditures as a proxy for IT investments. The results obtained from the logistic regression model will shed light on whether CIO firms have unique characteristics compared to non-CIO firms that drive the demand for the CIO position.

Sample and Data Collection

CIO announcements were obtained from the Lexis-Nexis Wire Service for the period 1987 to 2006³. Each announcement was reviewed to differentiate between the creation of new CIO positions and new hires for existing roles. With the assistance of Lexis-Nexis Wire Service representatives, a search program using a variety of relevant keywords was developed. These keywords included job titles (such as chief information officer, chief technology officer, CIO, CTO, and vice president of information technology) and hiring actions (such as hire, promote, recruit, name, and appoint).

The research initially produced a total of 1306 CIO announcements (Table 1, Panel A). The first review of these announcements excluded 319 announcements that either represent a duplication of a CIO announcement or pointed to unrelated CIO hiring announcements.⁴ The remaining 987 announcements were checked carefully to assure the existence of the CIO position at the top management level. The firms with CIO announcements were then compared to a matched group of firms, similar in SIC code and size, that had not created a CIO position. To identify a firm as a non-CIO firm, this study used the following method: (1) initially, a firm was considered a non-CIO firm if it did not announce a CIO position during the study period (1987–2006); (2) the proxy statements of non-CIO firms were reviewed to ensure that these firms do not have a CIO position in the top management team.

Table 1. Sample selection.

Panel A: Sample Selection Screening Results	Number of Observations
Total CIO announcements	1306
Less: Duplicated and unrelated announcements	(340)
Less: Privately held companies	(397)
Number of firms considered in the analysis with available Compustat data	569

Two different sets of benchmarks were utilized in this study. In the first set, each CIO firm was matched to a non-CIO firm with the same four-digit SIC code and a similar size. In particular, a CIO firm was matched to a non-CIO firm with the same four-digit SIC code, and with year-end market values within 70–130% of the CIO’s firm in the year prior to the CIO announcement (Table 2).⁵ If no match was found within the specified limits of size and

with the same four-digit SIC code, a three-digit and then a two-digit SIC code were used to search for a matching firm. If a matched firm could not be specified, the third step was to find a firm with the closest market value to the CIO firm.

Table 2. CIO and matched firms—matching criteria. CIO firms are matched to non-CIO firms in terms of size and industry. Year-end market value is proxied for size. Panel A compares the market value and performance of CIO firms to non-CIO firms. Year-end market value is the stock close price multiplied by the number of common shares outstanding. Panel B show the number of firms with available matching based on the defined criteria. CIO firms are matched to non-CIO firms with the same SIC code. Non-CIO firms were between 70 and 130% of the CIO firm’s size in year t. In cases where firm’s market value is missing in Compustat files, total assets are used to find the closest match.

Panel A: Descriptive Statistics for Variables Used to Find the Matched Pairs						
Variable	Firms	N	Mean	Median	Min	Max
Market value	CIO	447	4621.57	564.66	−0.08900	162,789.88
	Non-CIO		2885.00	493.97	−0.42600	85,149.64
Panel B: Number of Firms with Available Matching Based on the Defined Criteria.						
				Total		
				218		
				69		
				204		
				491		
				78		
				569		

4. Empirical Results

Reviewing CIO announcements over the given period of time (1987–2006) reveals an increasing tendency among U.S. firms to appoint a new CIO at the top management level. The knowledge gathered from estimating the above model provides the foundation to better understand this recent trend. Panel A of Table 3 presents summary statistics for variables used in the regression analysis for the CIO sample and the control sample⁶. As predicted by the study hypotheses, Panel A shows that the median values for LOGMV, R&D, and CEXP are higher for the CIO sample than the control sample. A median HTEK variable of 0 for the CIO sample shows that there are more less-high-tech firms that announce the CIO position than high-tech firms.

Panel B of Table 3 reports Pearson correlations between pairs of key variables. The correlations present the unconditional relationship between the dummy variable CIO and the natural logarithm of market value, R&D expenses, capital expenditures, whether a firm is a high-tech firm, and firm performance prior to CIO appointment. Consistent with prior predications, the simple correlations in Table 3 (Panel B) indicate a significantly positive relation between the demand for the CIO position and firm capital expenditures and prior performance. However, one should interpret these correlations with caution because the correlations indicate that firm prior performance is associated with other variables in the study.

In order to explain the underlying characteristics that cause the demand for the CIO position ex ante, a logistic regression model is estimated to examine whether CIO firms have unique characteristics compared to non-CIO firms that drive the demand for the CIO position. The categorical dependent variable CIO assumes a value of one if a firm appointed a CIO and zero for control firms. The regression model estimates the impact of firm size, prior performance, level of innovation, and capital expenditures on the likelihood of appointing a CIO at the top management level.

Table 3. Descriptive statistics and Pearson correlations. Sample consists of 475 firm observations. CIO is a dummy variable that takes the value of 1 if a firms hires a CIO for the first time and 0 otherwise; log MV is log of market value, a proxy for firm size; R&D is research and development expenditures deflated by total sales; CEXP is the capital expenditures deflated by total assets; HTEK is a dummy variable which takes the value of 1 if a CIO firm is a high-tech firm and 0 otherwise; PERF is a dummy variable that takes a value of 1 if the net income before extraordinary items is negative and 0 otherwise.

Panel A: Descriptive Statistics						
Variable	CIO sample			Non-CIO sample		
	Mean	Median	Std.	Mean	Median	Std.
LOGMV	6.304	6.350	2.06	6.118	6.166	2.127
R&D	2.577	0.079	33.845	0.501	0.043	3.394
CEXP	0.079	0.055	0.09	0.065	0.044	0.070
HTEK	0.303	0.0	0.46	0.317	0.0	0.465
PERF	0.602	1.0	0.489	0.802	1.0	0.398

Panel B: Pearson Correlations					
	CIO	LOGMV	R&D	CEXP	HTEK
LOGMV	0.044 (0.195)				
R&D	0.042 (0.32)	−0.032 (0.49)			
CEXP	0.086 (0.008) ***	−0.005 (0.872)	0.104 (0.01) **		
HTEK	−0.014 (0.640)	−0.0390 (0.255)	0.056 (0.187)	−0.087 (0.00)	
PERF	−0.21 (0.000) ***	0.306 (0.000) ***	0.086 (0.04) **	0.09 (0.00) ***	−0.171 (0.00) ***

*, **, and *** represent the significance at levels 0.10, 0.05, and 0.01, respectively.

Table 4 reports significantly positive coefficients for firm characteristics that reflect an inferior financial performance, large capital expenditures, and high market value (the coefficients of loss and capital expenditures are significant at the 0.01 level, while that of market value is significant at the 0.10 level). These findings reveal that firms that have greater capital expenditure, experience a loss, or have a higher market value a year prior to appointing a new CIO are more likely to hire a new CIO. Finding a positive correlation between CIO firms and greater capital expenditure, as well as CIO firms and higher market value, is consistent with Kinney and Wempe (2002), who find that firms with greater resources are more likely to adopt new IT strategies. These findings are consistent with the hypothesis that firms appoint CIOs to reduce information asymmetry regarding the firm’s current and expected IT investment. Finding a negative correlation between a firm’s prior performance and its decision to hire a CIO reflects a positive expectation about the ability of the new CIO to improve firm performance. By appointing a CIO, management signals its commitment to take the steps needed to improve future performance. Contrary to this study’s hypothesis, the level of technology represented by high-tech firms is not driving the demand for the CIO position. The absence of a significant correlation between the likelihood of appointing a CIO and the HTEK variable may attribute to the explanation that the CIO position is deemed to be important to most business organizations regardless of their level of technology.

Table 4. Logistic analysis of the determinants of firms’ decisions to appoint a CIO at the top management level. Shown below are the coefficient estimates from the OLS regressions, specified as follows: $CIO_{it} = \alpha + \beta_1 \log MV_{it-1} + \beta_2 R\&D_{it-1} + \beta_3 CEXP_{it-1} + \beta_4 HTEK_{it-1} + \beta_5 PERF_{it-1} + e$, where CIO is a dummy variable that takes the value of 1 if a firms hires a CIO and 0 otherwise; log MV is log of market value, a proxy for firm size; R&D is research and development expenditures deflated by total sales; ADV is advertising expenditures deflated by total sales; HTEK is a dummy variable which takes the value of 1 if a CIO firm is a high-tech firm and 0 otherwise; and CEXP is capital expenditures deflated by total assets. The marginal probability of hiring a CIO is estimated using the LOGIT model.

Variables	Expected Sign	LOGIT Model
Intercept	+/-	-0.128
LOGMV _{it-1} p value	+	0.0893 (0.06) *
R&D _{it-1} p value	+	0.001 (0.85)
CEXP _{it-1} p value	+	5.86 (0.00) ***
HTEK _{it-1} p value	+	-0.06 (0.73)
PERF _{it-1} p value	-	-1.001 (0.00) ***
Number of observations = 475		

*, **, and *** indicate significance at 0.10, 0.05, and 0.01 levels, respectively.

5. Limitations and Contributions

The decision to limit our sample size for CIO announcements to the period from 1987 to 2006 is due to the following reasons: (1) The specificity of the research objective. The focus on first-time CIO appointments necessitates a clear boundary for the data collection period. By limiting the sample to 2006, we ensure that our findings are relevant to the emergence of the CIO role during a pivotal time in the evolution of information technology management. This period saw significant organizational changes and the formalization of the CIO position, making it a critical time for understanding its impact on firms (Ross and Feeny 2000; Broadbent and Kitzis 2005; McAfee 2006). (2) Technological evolution. The early 2000s marked a significant shift in how organizations approached information technology, particularly with the rise of the internet and digital transformation (Chatterjee et al. 2001; Enns et al. 2003; Khallaf and Skantz 2007). Accordingly, we capture the initial impacts of these changes on corporate governance and management structures, particularly the strategic importance of the CIO role as firms began to recognize the value of information technology in driving business success. (3) Newly created position. The study focuses exclusively on firms hiring a CIO for the first time, rather than promoting an existing position, ensuring that the data reflects the initial creation of the CIO role. (4) Consistency with prior studies. Our sample period coincides with the timeframe used in the studies by Khallaf and Skantz (2007, 2010) and Chatterjee et al. (2001), which also focused on market reaction to newly created CIO positions and firm performance. This alignment not only strengthens the credibility of our research, but also allows for comparative analysis with previous findings, enhancing the overall validity of our results. There are two more important limitations to this study that deserve to be noted. The first concerns the lack of available information about IT investments. The second limitation comes from the assumption that non-CIO firms are firms that never announce the appointment of a CIO. Although an announcement of a new CIO appointment signals that the firm is establishing such a position, firms without a CIO may in fact have a de facto CIO who goes by a different title from the key words used in the current study.

To our knowledge, this is the first study to investigate the ex ante decisions or driving forces behind firms’ choices to appoint a CIO at the top management level. Prior studies

have primarily examined the ex post impact of hiring a new CIO. Understanding these driving forces is strategically important as it sheds light on the motivations and conditions that lead firms to create a CIO position, providing valuable insights into the strategic integration of IT leadership within firms' top management teams.

6. Summary and Conclusions

Despite the growing recognition of IT as a strategic asset, there is limited understanding of the specific factors that influence a firm's decision to appoint a CIO at the top management level. This study provides an initial attempt to identify factors that drive firms' decisions to appoint a CIO at the top management level. As is suggested by the announcements extracted from the general trade press, firms appoint CIOs to manage IT assets and improve their performance and competitive advantage. Creating a CIO position at the top management level signals the importance of IT investments to an organization and would represent one way through which a firm could capture various benefits associated with managing IT investments. Our results reveal that firms are more inclined to appoint CIOs when they experience prior loss, have large capital expenditures, and have a higher market value. The findings of this study offer valuable practical implications. For practitioners, this means that appointing a CIO can be a strategic move to leverage IT resources more effectively, particularly in times of organizational change or financial pressure. By elevating the CIO to the top management team, firms can better align their IT investments with broader business objectives, driving innovation, improving competitive advantage, and enhancing governance. Understanding the conditions that prompt firms to make this decision can help business leaders proactively identify the right timing and circumstances to appoint a CIO, ensuring that IT leadership is integrated at a strategic level to support long-term success.

The focus on the antecedents of CIO appointments, rather than solely on their outcomes, represents a significant and a meaningful departure from the existing body of literature. Our examination of ex ante decision-making processes also allows us to better understand the specific drivers and considerations that shape a firm's decision to elevate the CIO to the top management level. This approach expands the theoretical framework around IT leadership by shedding light on the strategic factors influencing the creation of the CIO position, offering a new insight into organizational IT governance strategies. Overall, this research sheds light on the factors influencing the creation of a CIO position, offering both theoretical and practical insights that contribute to improved IT governance and competitive strategies.

While our research provides valuable insights into the factors driving firms to appoint CIOs at the top management level, there are several areas that warrant further exploration. First, future research may investigate the impact of additional factors that were not examined in this study but may play a crucial role in CIO appointments. These include the firm's IT budget, industry specification, competitive pressures, and organizational structure, all of which could affect the strategic importance of the CIO role. Understanding how these factors interact with the firm's decision-making process would offer a more comprehensive view of why firms elevate IT leadership. Second, the lack of detailed information on IT investments within the firms studied represents another important limitation. Future research could integrate these data to explore how specific IT investment levels or types influence the likelihood of a firm appointing a CIO. This could provide a better understanding of how financial and technological investments in IT infrastructure correlate with the appointment of top-level IT leadership. Third, the sample period of our study, from 1987 to 2006, limits the generalizability of our findings to the modern era of IT leadership, especially given the rapid technological advancements since then, including the rise of cloud computing, artificial intelligence, and data analytics. Future research could extend the time frame to explore whether these emerging technologies and digital transformation trends have influenced the decision to appoint a CIO at the top management level in recent years. By examining more recent data, researchers could determine whether the drivers for CIO appointments have

evolved in line with technological advancements and organizational changes. Additionally, our study assumes that firms without CIO announcements have not created a CIO position. However, there may be firms with de facto CIOs operating under different titles that our keyword search did not capture. Future studies could explore alternative methodologies for identifying these positions, such as manual reviews of leadership roles, or cross-referencing data with other sources like corporate filings, to provide a more accurate picture of firms' IT leadership structures.

Lastly, research could investigate how the long-term value added by CIOs evolves over time, particularly in firms that have sustained a CIO role for multiple years versus those that have recently appointed one. This would help deepen the understanding of how CIOs impact organizational performance in different phases of their tenure and whether their influence grows or diminishes as IT governance becomes more embedded within the firm's strategic framework. In conclusion, addressing these limitations through future research could provide a deeper understanding of the factors that drive CIO appointments, offering valuable insights into how firms can strategically leverage IT leadership to enhance their competitive advantage and long-term success.

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Notes

- ¹ The term “peer-design technique” refers to a method of comparing a group of firms to a carefully selected control group that shares key characteristics with the primary group to ensure a meaningful comparison (Stuart 2010).
- ² Consistent with Chen et al. (2002), the current study sets high-tech firms to these SIC codes.
- ³ Refer to the limitations section for an explanation of the chosen study's time period.
- ⁴ Unrelated CIO announcements include those announcements that declared actions taken by current CIOs to implement their IT strategies.
- ⁵ Barber and Lyon (1996) chose this size range as it yields test statistics that are well specified.
- ⁶ We used SAS 9.4. software for data analysis.

References

- Autor, David H., Lawrence F. Katz, and Alan B. Krueger. 1998. Computing Inequality: Have Computers Changed the Labor Market? *The Quarterly Journal of Economics* 113: 1169–213. [CrossRef]
- Bandodkar, Nikhil, and Varun Grover. 2022. Does it Pay to Have CIOs on the Board? Creating Value by Appointing C-Level IT Executives to the Board of Directors. *Journal of the Association for Information Systems* 23: 838–88.
- Banker, Rajiv D., Cecilia Feng, and Paul A. Pavlou. 2022. Businessperson or Technologist: Stock Market Reaction to the Alignment between CIO Background and Firm Strategy. *Journal of Management Information Systems* 39: 1006–36. [CrossRef]
- Barber, Brad M., and John D. Lyon. 1996. Detecting abnormal operating performance: The empirical power and specification of test statistics. *Journal of Financial Economics* 41: 359–99. [CrossRef]
- Bresnahan, Timothy F., Erik Brynjolfsson, and Lorin M. Hitt. 2002. Information Technology, Workplace Organization, and the Demand for Skilled Labor: Firm-Level Evidence. *The Quarterly Journal of Economics* 117: 339–76. [CrossRef]
- Broadbent, Marianne, and Ellen S. Kitzis. 2005. *The New CIO Leader: Setting the Agenda and Delivering Results*. Cambridge, MA: Harvard Business School Press.
- Chatterjee, Debabroto, Vernon J. Richardson, and Robert W. Zmud. 2001. Examining the shareholder wealth effects of announcements of newly created CIO positions. *MIS Quarterly* 25: 43–70. [CrossRef]

- Chau, Dorothy C. K., Eric W. T. Ngai, Jennifer E. Gerow, and Jason Bennett Thatcher. 2020. The Effects of Business-IT Strategic Alignment and IT Governance on Firm Performance: A Moderated Polynomial Regression Analysis. *MIS Quarterly* 44: 1679–703. [CrossRef]
- Chawla, Raghu Nandan, and Praveen Goyal. 2021. Emerging trends in digital transformation: A bibliometric analysis. *Benchmarking: An International Journal* 29: 1069–112. [CrossRef]
- Chawla, Raghu Nandan, Praveen Goyal, and Deepak Kumar Saxena. 2023. The role of CIO in digital transformation: An exploratory study. *Information Systems and e-Business Management* 21: 797–835. [CrossRef]
- Chen, Shuping, Mark L. DeFond, and Chul W. Park. 2002. Voluntary disclosure of balance sheet information in quarterly earnings announcements. *Journal of Accounting and Economics* 33: 229–51. [CrossRef]
- Enns, Harvey G., Sid L. Huff, and Christopher A. Higgins. 2003. CIO lateral influence behaviors: Gaining peers' commitment to strategic information systems. *MIS Quarterly* 27: 155–76. [CrossRef]
- Evans, Peter C., Geoffrey J. Parker, Marshall W. Van Alstyne, and Dyan Finkhousen. 2021. Platform Leadership: Staffing and Training the Inverted Firm. SSRN Working Paper. Available online: <https://ssrn.com/abstract=3871971> (accessed on 30 September 2024).
- Gowen, Charles R., and William J. Tallon. 2003. Enhancing supply chain practices through human resource management. *The Journal of Management Development* 22: 32–45. [CrossRef]
- Gremillion, Lee L. 1984. Organization size and information system use: An empirical study. *Journal of Management Information Systems* 1: 4–17. [CrossRef]
- Harris, Sidney E., and Joseph L. Katz. 1991. Organizational performance and information technology intensity in the insurance industry. *Organization Science* 2: 263–95. [CrossRef]
- Jones, Mary C., Leon Kappelman, Robert Pavur, Quynh N. Nguyen, and Vess L. Johnson. 2020. Pathways to being CIO: The role of background revisited. *Information & Management* 57: 103234.
- Kallmuenzer, Andreas, Alexey Mikhaylov, Mihaela Chelaru, and Wojciech Czakon. 2024. Adoption and performance outcome of digitalization in small and medium-sized enterprises. *Review of Managerial Science*. [CrossRef]
- Kettinger, William J., Sung Yul Ryoo, and Donald A. Marchand. 2021. We're engaged! Following the path to a successful information management capability. *The Journal of Strategic Information Systems* 30: 101681. [CrossRef]
- Kettinger, William J., Varun Grover, Subashish Guha, and Albert H. Segars. 1994. Strategic information systems revisited: A study in sustainability and performance. *MIS Quarterly* 18: 31–58. [CrossRef]
- Khallaf, Ashraf, and Terrance Skantz. 2007. The effects of Information technology expertise on the market value of firm. *Journal of Information Systems* 21: 83–105. [CrossRef]
- Khallaf, Ashraf, and Terrance Skantz. 2010. Does Long-Term Performance Improve Following the Appointment of a CIO? *International Journal of Accounting Information Systems* 12: 57–78. [CrossRef]
- Kinney, Michael R., and William F. Wempe. 2002. Further evidence on the extent and origins of JIT's profitability effects. *The Accounting Review* 77: 203–25. [CrossRef]
- Krishnan, Lata, Subictha Poorani, and Shanmuganathan Sawmya. 2022. Emerging Trends in Training Knowledge Workers; New Economy. *International Journal of Learning and Development* 12: 26–43. [CrossRef]
- Liebenberg, André P., and Robert E. Hoyt. 2003. The Determinants of enterprise risk management: Evidence from the appointment of chief risk officers. *Risk Management and Insurance Review* 6: 37–52. [CrossRef]
- McAfee, Andrew. 2006. Mastering the three worlds of information technology. *Harvard Business Review* 84: 141.
- Rajgopal, Shivaram, Suresh Kotha, and Mohan Venkatachalam. 2002. Managerial actions, stock returns and earnings: The case of business-to-business Internet firms. *Journal of Accounting Research* 40: 529–56. [CrossRef]
- Richardson, Vernon J., and R. W. Zmud. 2002. *Wealth Effects Accompanying Appointments of Outside Directors to the Boards of Internet Companies*. Working Paper. Lawrence: University of Kansas.
- Ross, Jeanne W., and David F. Feeny. 2000. The Evolving Role of the CIO, in framing the domains of IT management: Chapter 19. In *Projecting the Future through the Past*. Edited by Robert W. Zmud. Cincinnati: Pinnaflex Educational Resources Inc., pp. 385–402.
- Stuart, Elizabeth A. 2010. Matching methods for causal inference: A review and a look forward. *Statistical Science* 25: 1–21. [CrossRef]
- Torress, Roberto. 2023. 15 CIO Appointments That Shaped 2023. CIO Dive. Available online: <https://www.ciodive.com/news/biggest-CIO-appointments-2023/700927/> (accessed on 30 September 2024).
- Wu, Shelly Ping-Ju, Detmar W. Straub, and Ting-Peng Liang. 2015. How information technology governance mechanisms and strategic alignment influence organizational performance: Insights from a matched survey of business and IT managers. *MIS Quarterly* 39: 497–518. [CrossRef]
- Wunderlich, Nico, and Roman Beck. 2017. We've Got the Power—The Relevance of IT Leadership and Organizational IT Capabilities in the Fully Digitized Business Era. Paper presented at Twenty-Fifth European Conference on Information Systems (ECIS), Guimarães, Portugal, June 5–10.
- Zhang, Xin, Yaoyu Xu, and Liang Ma. 2023. Information technology investment and digital transformation: The roles of digital transformation strategy and top management. *Business Process Management Journal* 29: 528–49. [CrossRef]

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Article

Firm Complexity and the Accuracy of Auditors' Going Concern Opinions in Emerging Markets: Does Auditor Work Stress Matter?

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Abstract: This study examines the direct and indirect effects of firm complexity on the accuracy of auditors' going concern opinion (GCAO), and whether and how auditors' work stress (AWS) can serve as a mediating variable in such a relationship. We analyzed a sample of 705 firm-year observations from 105 non-financial firms listed on the Egyptian Stock Exchange between 2017 and 2023. Binary logistic regression, OLS regression, and path analysis were employed to test the study hypotheses. The results suggested that firm complexity is negatively associated with GCAO accuracy but positively associated with AWS. Furthermore, a negative relationship was observed between AWS and GCAO accuracy. Finally, the analysis revealed that AWS mediates the relationship between firm complexity and GCAO accuracy. The findings remained robust across various sensitivity tests. Policymakers, audit firms, and investors can benefit from the findings, which emphasize the necessity of AWS mitigation techniques to improve GCAO accuracy and ultimately contribute to transparent financial reporting. This study provides unique evidence from a developing country on how firm complexity can indirectly impact the quality of auditors' judgments.

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1. Introduction

Auditors are tasked with evaluating the risks that may jeopardize a client's continuity, determining necessary mitigation strategies, and expressing an informed opinion on its ongoing viability (Proho, 2023). However, audit clients are currently facing significant challenges, including rapid technological changes, intense competition, and shifting economic policies (Aschauer & Quick, 2024), which may threaten their continued existence. Firm complexity due to having many branches, products, or markets, and working in specialized sectors or within intricate international operations, make it difficult to track a client's activities and operations. This, in turn, requires increased effort from the auditor. Understanding the nature of these complexities and their impact on the audit process is crucial (Mohd Sanusi et al., 2018; Tiron-Tudor & Deliu, 2022). Hence, the role of auditors in assessing the appropriateness of management's application of the going concern assumption becomes increasingly critical.

The accuracy of the auditor's going concern opinion (GCAO) reflects the objectivity and professionalism of their assessment of an audit client's ability to continue operations

for at least 12 months from the financial statement issuance date. It gauges the soundness of the auditor's opinion by considering the potential for two types of errors: Type I error (Erroneous Rejection), where a modified opinion is issued on a client's continuity despite the company's viability for at least a fiscal year; and Type II error (Erroneous Acceptance), where an unmodified opinion is issued on a client's continuity, but the company subsequently goes bankrupt within a fiscal year (Yang et al., 2022).

In this regard, previous studies (e.g., Bahtiar et al., 2021; Hana & Triani, 2024; Handayani et al., 2023) have shown that GCAO is influenced by the complexity of a client's operations, where high firm complexity harms the accuracy of this opinion. This is because complex operations are often associated with significant economic, operational, and legal risks. These risks can hinder auditors' ability to obtain sufficient evidence, accurately assess a company's financial position, and anticipate future challenges. As firm complexity rises, so does the pressure on auditors, leading to a potential decrease in the accuracy of their work. Against the backdrop of this discussion, we are motivated to address the link between firm complexity and GCAO accuracy.

Additionally, it is widely noted that auditors today face significantly increased work stress arising from psychological pressures related to various workplace factors, including rapid economic changes, technological advancements, increased transaction volumes, pressures from clients, evolving regulations, insufficient resources, and the complexity of client operations (Afzali et al., 2024; Mannan & Darwis, 2023; Umar & Anandarajan, 2004). Numerous studies (e.g., Winoto & Harindahyani, 2021; Yan & Xie, 2016) have established a link between firm complexity and increased auditor work stress (AWS). Other studies (e.g., D. H. Pham, 2022; Suhardianto & Leung, 2020) have shown that AWS can negatively affect GCAO assessments. We extend these studies by investigating whether AWS may mediate the relationship between firm complexity and GCAO accuracy by bringing evidence from the Egyptian emerging audit market.

Our focus on the Egyptian context stems from three primary motivations. Firstly, the Egyptian market has a unique economic and regulatory landscape. Economically, Egypt has experienced rapid economic growth in recent years, coupled with periods of high inflation and currency devaluation. This dynamic economic environment creates unique challenges for businesses and auditors alike, particularly concerning going concern assessments. Furthermore, the regulatory landscape in Egypt has undergone significant changes recently, with the introduction of new accounting standards and increased emphasis on corporate governance. These regulatory developments have placed greater demands on auditors to ensure compliance and maintain audit quality (Eldyasty & Elamer, 2023). Secondly, the increasing complexity of Egyptian firms, driven by factors such as globalization and regulatory changes, requires a deeper understanding of its influence on AWS and GCAO accuracy. Lastly, the potential for AWS to mediate this relationship is particularly relevant in the Egyptian context as an emerging audit market with a lack of enforcement of and compliance with regulations (Amara et al., 2023; Gontara et al., 2023; Kamal Hassan, 2008; Khelil et al., 2023), where auditors may face significant pressures and challenges in fulfilling their duties.

This study addresses the research gap in understanding the indirect effects of firm complexity on the GCAO. While previous research has examined the direct relationship between these two variables, this study delves deeper by exploring the mediating role of AWS. Specifically, our study aims to answer the following research questions: (1) Is there a direct relationship between firm complexity and the GCAO? (2) Is there a direct relationship between firm complexity and AWS? (3) Is there a direct relationship between AWS and the GCAO? (4) Does AWS mediate the relationship between firm complexity and the GCAO? Accordingly, the primary objective of this study is to investigate the impact

of firm complexity on both GCAO and AWS. Additionally, the study aims to examine the effect of AWS on the GCAO. Furthermore, the research will explore the direct and indirect effects of firm complexity on the GCAO, with AWS serving as a mediating variable in this relationship.

By using binary logistic regression, OLS regression, and path analysis for a sample of non-financial companies listed on the Egyptian Stock Exchange, the results of our study suggest that firm complexity negatively affects GCAO accuracy. Furthermore, firm complexity is found to positively affect AWS. Moreover, AWS negatively influences GCAO accuracy. Finally, our findings revealed that AWS mediates the relationship between firm complexity and GCAO accuracy. Sensitivity analysis largely supported these findings.

This study contributes to the existing body of knowledge on the factors influencing GCAO (Yang et al., 2022). While previous research referred to the direct relationship between firm complexity and audit opinion accuracy (Khan et al., 2023), this study delves deeper into exploring the mediating role of AWS. Thus, this study extends our understanding of the relationship between firm complexity and GCAO accuracy by introducing AWS as a mediating factor. Also, by focusing on the Egyptian market, the study provides valuable empirical evidence from a unique economic and regulatory context. By doing so, this study clarifies the direct and indirect effects of firm complexity on GCAO accuracy.

In addition, given the importance of accurate going concern audit opinions in building stakeholders' confidence in the auditing profession, which is especially needed in emerging markets, this research provides valuable insights into the audit field. In particular, by identifying factors that influence GCAO accuracy, Egyptian regulatory bodies can develop regulations that promote higher accuracy, ultimately enhancing the reliability of financial reports and protecting investors' interests. Accurate going concern opinions serve as independent assessments of a company's short-term viability, making them crucial for informed decision-making by investors and the economy as a whole. Finally, the current findings emphasize to auditors and audit clients the importance of managing AWS to improve the quality of audit judgments and enhance the reliability of financial reporting.

The remainder of this study is structured as follows. Section 2 presents a background of the Egyptian context. Section 3 provides a literature review and hypotheses development. Section 4 details the research design. Section 5 discusses the findings. Finally, Section 6 concludes the paper.

2. Egyptian Context

The Egyptian Auditing Standard (EAS) No. 570, which corresponds to ISA 570, outlines auditors' responsibilities regarding the going concern assumption. According to this standard, the auditor must assess the appropriateness of management's application of this assumption and the adequacy of their disclosures in the financial statements. This responsibility includes subsequent events that may cast doubt on the entity's ability to continue as a going concern. Egyptian Auditing Standard (EAS) No. 570 is based on the internationally recognized ISA 570, which has been in place for approximately 10 years; its implementation in Egypt occurred more recently. The last update to ISA 570 (Going Concern) was in 2020. The standard has been amended to reflect changes in the business environment, particularly in light of the impacts of the COVID-19 pandemic on entities' ability to continue as a going concern.

Based on the assessment of management's application of the going concern assumption and the adequacy of their disclosures, the auditor should issue an unmodified opinion if management's application is appropriate and disclosures are adequate following ISA 700. He should include a separate paragraph on material uncertainty regarding going concern following the basis for the opinion paragraph. However, a modified opinion should

be issued if management's application is inappropriate, or disclosures are insufficient or absent. Then, auditors must modify their opinion (qualified or adverse) following ISA 705. They should explain the reasons for the modification as the basis of the opinion.

Regarding the issue of firm complexity, Egyptian auditing standards do not explicitly address it in detail. However, some standards, such as Egyptian Auditing Standard No. 315, require auditors to assess inherent risks in financial statements, including those associated with operational and system complexity. Furthermore, Egyptian Auditing Standard No. 330 emphasizes that audit procedures should be tailored to address identified risks, including those arising from operational complexity.

It is important to note that Egyptian auditing standards do not explicitly address auditor stress (AWS). However, certain standards, such as Egyptian Auditing Standards No. 300 and 315, may implicitly contribute to it. These standards emphasize the importance of thorough audit coverage and comprehensive risk assessments, which can increase workload and time pressure, potentially contributing to increased stress levels among auditors.

Beyond the specific requirements outlined in Egyptian auditing standards, the Egyptian economic and regulatory landscape presents a unique and complex environment for audit practitioners. The Egyptian economy has exhibited periods of rapid growth interspersed with episodes of economic shock, including currency fluctuations and inflationary pressures. This inherent volatility within the economic environment can significantly increase the complexity of assessing a company's going concern status, as businesses may be exposed to sudden and unforeseen disruptions to their operating environment. Furthermore, the regulatory landscape in Egypt is characterized by ongoing reform initiatives aimed at strengthening corporate governance and enhancing the quality of financial reporting. These ongoing regulatory changes present auditors with additional complexities as they strive to navigate the evolving regulatory framework and ensure compliance with the latest requirements (Ghattas et al., 2021).

The Egyptian audit market itself is characterized by a mix of large international firms and smaller local practices. This diversity can lead to variations in audit quality and resources, potentially influencing how auditors approach going concern assessments. Furthermore, the level of enforcement of auditing standards and regulations in Egypt is an important contextual factor. While efforts have been made to strengthen enforcement, challenges remain, which may impact auditor behavior and the perceived consequences of inaccurate going concern opinions. The interplay of these economic, regulatory, and market-specific factors creates a unique context for examining the relationship between firm complexity, auditor work stress, and the accuracy of going concern opinions in Egypt. Our study aims to contribute to a deeper understanding of these dynamics within this important emerging market (Ghattas et al., 2021).

3. Literature Review and Hypotheses Development

Firm complexity refers to the intricate nature of an audit client's operations and activities, which significantly affects the auditor's workload. This issue can be assessed by some factors, including the size of the entity, the technology used, the regulatory environment, and the structure of the entity (Khan et al., 2023; Tiron-Tudor & Deliu, 2022). The complexity of the audit client's operations can have serious implications for the audit process concerning the time required to conduct the audit process, the difficulty of obtaining sufficient evidence to support auditor opinion, and the risk of not discovering errors or fraud (Chen et al., 2024). These issues can reduce the quality of the audit report, which, in turn, reduces its usefulness to users. Hence, the existence of firm complexity raises doubts about the accuracy of GCAO.

GCAO is an independent professional assessment provided by auditors on the ability of the audit client to normally continue its operations in the future, i.e., within a period of at least one year from the financial statements' issuance date, without the need for liquidation or a significant reduction in its activity (Hutagalung et al., 2024; Polo et al., 2023). Such an assessment is subject to two types of error, where Type I error occurs when a modified opinion is issued for an entity that continues, and a Type II error occurs when an unmodified opinion is issued for an entity that subsequently fails. Firms, external stakeholders, and the whole economy are significantly affected by the accuracy of auditors' opinions by helping them better assess the existing risks. Accurate auditor opinion can also improve financial market efficiency and reduce the chance of business failure (Chu et al., 2024; Geiger et al., 2024; Wang et al., 2024).

To overcome such complexity and its anticipated effects on the accuracy of auditor opinion, the auditor should develop a detailed audit plan that takes into account the level of complexity, allocate the necessary human and financial resources to complete the audit process, and utilize recent information technology tools such as artificial intelligence to facilitate the audit process and maintain continuous communication with the firm's management to clarify any unclear issues. While developing a detailed plan, allocating resources, and maintaining communication can contribute to auditor workload, the effective use of AI and other technologies is expected to reduce work stress by automating routine tasks, improving efficiency, and enhancing audit quality (Fedyk et al., 2022).

AWS can be defined as a psychological and physical strain caused by work environment factors and task demands, which can negatively influence performance and overall well-being (Mannan & Darwis, 2023; Nelson & Smith, 2023). AWS can have some dimensions, such as workload pressure, task complexity, uncertainty, responsibility for accurate financial reporting and maintaining impartiality and ethical standards, the anxiety of making mistakes and potential legal repercussions, and, finally, the need to cope with the latest technological advances in the accounting and audit environments. Hence, it is crucial to address the influences of AWS because it might have several detrimental consequences on the quality of the audit process, representing increased errors, decreased productivity, increased tension, reduced teamwork, higher litigation risk, and compromised professional independence (Kesimli et al., 2018; Umar & Anandarajan, 2004; Van Hau et al., 2023).

3.1. Firm Complexity and GCAO Accuracy

According to the risk theory, it is based on the idea of understanding and evaluating uncertain events that may affect the targeted results of the audit client's entity. It expresses the possibility of a negative or undesirable event occurring, which may lead to financial, material, or moral losses for the audit client's entity (Ombati & Karuti, 2024). The risk theory is one of the foundations that auditors rely on to assess the continuity of the audit client's entity, as this theory includes analyzing the risks associated with the operations of the audit client's entity, which increase as the complexity of these operations increases. This theory assumes that the simpler the operations of the audit client's entity, the lower the risks, which makes it easier for auditors to accurately assess the continuity of the audit client's entity. Meanwhile, the increased complexity of these operations leads to increased risks, which requires auditors to conduct more in-depth assessments, which may affect the accuracy of their opinion regarding the continuity of the audit client's entity (Ombati & Karuti, 2024).

Additionally, from the information theory perspective, the accuracy of auditors' opinions hinges on the quantity and quality of information accessible to them about the audit client's firm. This becomes a crucial issue when dealing with complex operations. Such complexity can lead to challenges in data collection from multiple sources, and the infor-

mation derived may be inaccurate or unreliable, potentially negatively impacting auditors' opinions on the client firm's continuity (X. Li & Sun, 2024).

Thus, recent studies (e.g., Bahtiar et al., 2021; Hana & Triani, 2024; Handayani et al., 2023) have demonstrated that GCAO could be influenced by the complexity of a firm's operations. This is based on the view that complex operations often expose firms to heightened economic, operational, and legal risks, making it challenging for auditors to accurately assess the firm's financial health and anticipate future challenges. Moreover, complexity can hinder auditors' ability to obtain sufficient evidence to verify the accuracy of the financial information provided by the firm, increasing the likelihood of assessment errors. As firm complexity escalates, so does the pressure on auditors, potentially compromising the accuracy of their work.

Within the Egyptian professional business environment, the relationship between firm complexity and the accuracy of auditors' opinions on firm continuity is exacerbated by various factors. In particular, the existing heightened economic fluctuations, including inflation and currency instability, hinder accurate financial forecasting. Egypt has experienced consistently high inflation rates, averaging 12.1% over the past ten years (World Bank, 2023), and significant currency volatility, with the Egyptian pound experiencing over 50% devaluation against the US dollar in the past few years. Furthermore, the prevalent corruption and favoritism can distort financial information, obstructing auditors' ability to assess the firm's financial health. Reports from Transparency International (the 2022 Corruption Perceptions Index ranked Egypt 126th out of 180 countries) indicate that corruption in Egypt manifests in various forms, including bribery, nepotism, and cronyism. These practices can lead to the manipulation of financial records, the misrepresentation of assets and liabilities, and the concealment of related party transactions, making it difficult for auditors to obtain a true and fair view of a company's financial position. The prevalence of corruption and favoritism has several negative consequences for the Egyptian economy, including reduced foreign direct investment due to increased perceived risk, decreased investor confidence, and a weakening of the overall business environment. It also undermines fair competition and resource allocation, hindering economic growth. While weak oversight over auditing practices, as discussed by Awadallah and Elsaid (2020) and Saleh (2023), presents a challenge to data reliability, we have taken several steps to mitigate its potential impact on our study. First, we focused on objective financial data reported by the firms themselves (e.g., financial ratios, going concern opinions issued), rather than relying solely on subjective auditor assessments. Second, we used data from multiple years (2017–2023) to identify trends and patterns in the data, which can help to reduce the influence of any single year's reporting irregularities.

Considering the above discussion and as informed by the risk theory, the information theory, and the specificity of the Egyptian context, the first hypothesis of this study can be derived as follows:

H₁. *Firm complexity significantly affects GCAO accuracy.*

3.2. Firm Complexity and AWS

The expected association between firm complexity and AWS is based on several theories, perhaps the most important of which are the theory of tasks and the theory of uncertainty (e.g., De Brabander & Martens, 2014; Lim & Mali, 2024). The theory of tasks posits a direct correlation between the intricacy of an audit client's tasks and processes and the corresponding effort and time auditors must spend. In essence, more complex operations demand greater scrutiny and, consequently, more extensive audit work. This increased complexity can lead to a heavier workload and heightened pressure on auditors, as they are required to undertake a larger number of tasks (De Brabander & Martens, 2014).

The theory of uncertainty emphasizes the inherent unpredictability of future events. This theory suggests that as the complexity of an audit client's operations grows, so does the uncertainty on the accuracy of their financial information. To mitigate this risk, auditors must invest additional effort in verifying the accuracy of the data, leading to increased workload and pressure (Lim & Mali, 2024). In this regard, Yan and Xie (2016) noted that auditor workload exerts a more significant influence on audit quality in the context of new client audits. Furthermore, Winoto and Harindahyani (2021) highlighted the cognitive burden imposed on auditors due to reviewing complex operations. This is because complex processes necessitate a greater expenditure of cognitive resources on the part of auditors to fully understand and evaluate these processes, thereby directly increasing their workload.

In the Egyptian context, the relationship between firm complexity and AWS is influenced by several factors, as follows. The prevalence of large family businesses with less formal organizational structures and flexible operations can lead to less organized financial statements and increased error potential. The volatile Egyptian economic environment introduces uncertainty and requires auditors to exert more effort in assessing risks and applying appropriate audit procedures. Furthermore, the significant informal economy component poses challenges in obtaining accurate and reliable financial information. Additionally, the prevalence of foreign currency transactions in Egyptian firms adds complexity to auditing processes and necessitates knowledge of exchange rates and relevant accounting rules. Finally, the reliance of many Egyptian firms on outdated information systems can hinder data collection and analysis, further contributing to auditor stress (Farghaly et al., 2024). Based on the above discussion, the second hypothesis of this study can be set as follows:

H₂. *Firm complexity significantly affects AWS.*

3.3. AWS and GCAO Accuracy

The expected association between AWS and GCAO accuracy can be notably explained through cognitive evaluation, burnout, and goal theories (Peytcheva, 2014; Q. T. Pham et al., 2022; Salehi et al., 2020; Shi et al., 2017). The cognitive evaluation theory posits that elevated stress levels can impair human cognitive function. This diminished cognitive capacity can hinder individuals' (including auditors) ability to make sound judgments, potentially leading to errors in assessing an entity's financial health. When auditors are subjected to significant work pressure, they may struggle to accurately assess the risks associated with an audit client's continuance. This heightened pressure can result in auditors' ignorance of critical indicators of financial distress, ultimately compromising the accuracy of their opinion on the firm's going concern status (Peytcheva, 2014; Shi et al., 2017).

The theory of burnout posits that prolonged exposure to stress can lead to emotional, physical, and mental exhaustion. This state of burnout can impair auditors' focus and analytical abilities, increasing the risk of errors in assessing an audit client's financial health. Consequently, the accuracy of their opinion on the firm's going concern status may be compromised (Salehi et al., 2020).

The goal theory suggests that clear, realistic, and attainable goals can motivate individuals to work harder. Conversely, unrealistic or unachievable goals can lead to frustration and stress. In the context of auditing, if auditors are assigned unrealistic deadlines, they may experience significant work stress. This increased pressure can induce them to rush their work and neglect necessary analyses, ultimately compromising the accuracy of their opinion on client firms' going concern (Q. T. Pham et al., 2022). Under pressure, auditors may focus on specific aspects of the audit, neglecting other potentially more critical areas relevant to the continuity assessment (Q. T. Pham et al., 2022). In this regard, Suhardianto and Leung (2020) emphasized the negative relationship between AWS and GCAO.

Several factors might contribute to the relationship between auditor stress (AWS) and audit opinion accuracy in Egypt. These include heavy workloads, which can reduce the time available for in-depth audits and analysis, and resource constraints, such as financial and human resource shortages. Furthermore, the challenging economic environment, characterized by volatility, including currency fluctuations and inflationary pressures, complicates the audit process. This economic instability can make financial forecasting unreliable and increase the difficulty of assessing firm continuity, potentially affecting audit opinion accuracy. Finally, the political and economic instability at the country level can further complicate the audit process and make it challenging to evaluate firm continuity (Farghaly et al., 2024; Saleh, 2023). Considering the above, we formulate the third hypothesis as follows:

H₃. *AWS significantly affects the accuracy of GCAO.*

3.4. The Mediating Role of AWS

The relationship between firm complexity and GCAO accuracy is not likely to be entirely direct. We argue that AWS plays a crucial mediating role in this relationship. This mediation suggests that the impact of firm complexity on GCAO accuracy is channeled, at least in part, through the level of stress experienced by the auditor. This aligns with and expands upon the cognitive evaluation theory, the job demands–resources (JD-R) model, and builds upon the established links between firm complexity, AWS, and GCAO accuracy (Jefferson et al., 2024).

Firm complexity, as discussed earlier, increases the demands placed on auditors. Complex operations require more extensive audit procedures, greater professional skepticism, and a deeper understanding of the client’s business. This heightened demand translates into increased auditor workload, longer hours, and more intense scrutiny of financial information. This directly connects to the demands component of the JD-R model (Jefferson et al., 2024). The JD-R model suggests that job demands, when excessive, can lead to strain, including work stress. Therefore, increased firm complexity, by increasing audit demands, contributes to higher AWS.

Furthermore, the cognitive evaluation theory suggests that stress can impair cognitive functions. When auditors experience high levels of work stress due to the demands of auditing complex firms, their ability to process information, make sound judgments, and accurately assess going concern issues can be negatively affected (Peytcheva, 2014; Shi et al., 2017). This impaired cognitive function, resulting from stress induced by firm complexity, can lead to errors in judgment and a reduction in the accuracy of the GCAO. Auditors under stress may be more likely to overlook subtle but important indicators of financial distress, or they may make less effective use of available audit evidence. This diminished cognitive capacity is a direct pathway through which AWS mediates the relationship between firm complexity and GCAO accuracy.

In addition to the JD-R model and cognitive evaluation theory, the concept of resource scarcity can further explain the mediating role of AWS. As firm complexity increases, the resources available to auditors (time, personnel, expertise) may become strained. The increased workload associated with complex audits can lead to time pressure, potentially forcing auditors to cut corners or make quick decisions without sufficient analysis. This resource scarcity, exacerbated by firm complexity, contributes to AWS. The resulting stress further reduces the likelihood of thorough and accurate going concern assessments.

Therefore, the relationship between firm complexity and GCAO accuracy is not simply a direct one. Firm complexity increases the demands placed on auditors, leading to increased AWS. This stress, in turn, impairs cognitive function, reduces available resources, and ultimately negatively impacts the accuracy of the auditor’s going concern opinion. This

chain of events highlights the critical mediating role of AWS. Hence, the fourth hypothesis is formulated as follows:

H4. *AWS mediates the relationship between firm complexity and GCAO accuracy.*

Figure 1 illustrates the research model that depicts the mediating role of AWS in the relationship between firm complexity and GCAO.

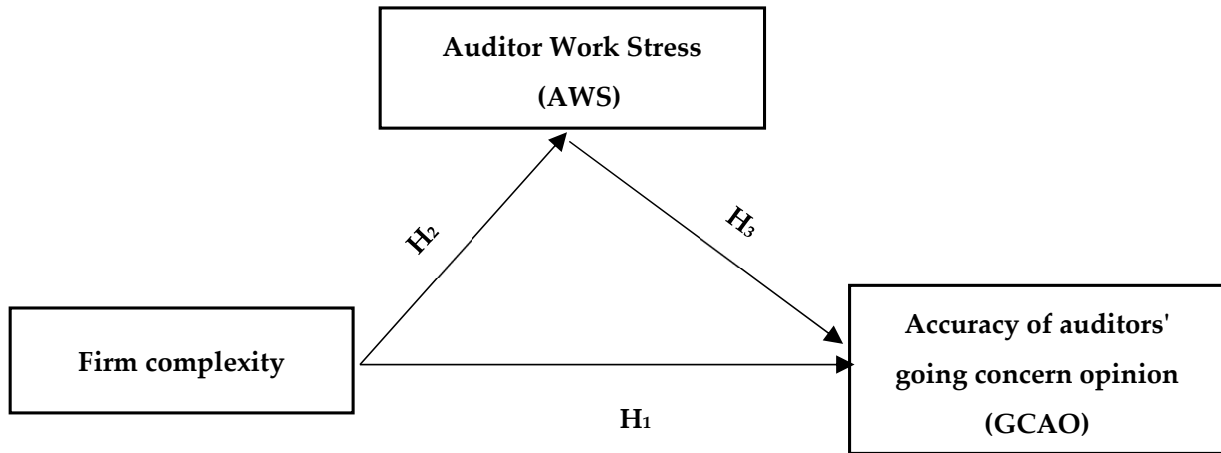


Figure 1. The research model. Source: created by the authors.

4. Research Design

4.1. Sample Selection

This study analyses publicly traded firms listed on the Egyptian Stock Exchange from 2017 to 2023. The focus on listed companies is justified for several reasons. First, listed firms are subject to more stringent regulatory requirements and disclosure obligations than unlisted firms, including mandatory annual audits conducted in accordance with recognized accounting standards. This makes their financial data more readily available and reliable for research purposes (Alsheikh & Alsheikh, 2023; Moez, 2024). Second, listed companies typically have more complex and larger scale operations than unlisted firms, making them particularly relevant for investigating the relationship between firm complexity, auditor work stress, and the accuracy of going concern opinions. Third, the auditing processes of listed companies are often more rigorous due to increased scrutiny from investors, regulators, and the public. This heightened scrutiny can influence auditor behavior and potentially impact the quality of audit opinions. Finally, the study period commences in 2017, coinciding with the widespread adoption of corporate governance reporting practices by Egyptian firms, which enhances the availability and comparability of relevant data. Financial institutions, such as banks and insurance companies, were excluded from the study due to their distinct regulatory frameworks and operational nature, which differ significantly from non-financial firms. A final sample of 105 firms was selected after applying the following criteria: being listed on the stock exchange, publication of annual reports throughout the study period, and the availability of financial statements in Egyptian pounds. Firms lacking accessible financial statements were excluded, resulting in a total of 705 firm-year observations. Table 1 presents the distribution of the sample firms across various industry sectors, outlining the number and percentage of firms in each sector relative to the total sample size.

Table 1. Sample selection.

Industry	Sample Firms (No.)	%
Basic Resources	8	7.6%
Industrial Goods, Services, and Automobiles	12	11.4%
Energy and Support Services	7	6.7%
Health Care and Pharmaceuticals	11	10.5%
Travel and Leisure	8	7.6%
Building Materials	17	16.2%
Food, Beverages, and Tobacco	21	20%
Real Estate	21	20%
Total	105	100%

Source: created by the authors.

4.2. Variables’ Measurement

4.2.1. Dependent Variable

GCAO, the study’s dependent variable, is assessed by comparing auditors’ judgments to the predictions of the Altman model. The Altman Z-Score model, used to assess the financial health and predict the likelihood of bankruptcy for firms, is calculated as follows (Nworie & Obi, 2024):

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1X_5$$

where

X_1 = working capital to total assets ratio

X_2 = retained earnings to total assets ratio

X_3 = profit before interest and tax to total assets

X_4 = market value of equity to book value of total liabilities

X_5 = revenue to total assets

An accurate opinion is indicated when an auditor correctly identifies a firm as financially distressed (by issuing a modified opinion) or financially stable (by issuing an unmodified opinion). The Altman model, a reliable predictor of financial distress, serves as a benchmark. The dependent variable is a binary one, taking a value of “1” if the auditor’s opinion aligns with the Altman model, and 0 otherwise (Wang et al., 2024; Yang et al., 2022).

4.2.2. Independent Variable

Firm complexity, the study’s independent variable, refers to the difficulty of monitoring a client’s multifaceted operations due to having, for instance, numerous branches, diverse product offerings, and extensive markets (Chen et al., 2024). Previous research (Barinov et al., 2024; Khan et al., 2023; Loughran & McDonald, 2023) has identified eight measures of firm complexity: the logarithm of total assets, inventory turnover rate, AR turnover rate, industry dummy (for complex sectors like banks, technology, finance, communications, petroleum, and insurance), number of branches, number of operations or products, using complex accounting estimates, and financial performance indicators (return on assets and return on equity). In our main analysis, we measured firm complexity using the inventory turnover rate calculated by dividing the cost of goods sold by average inventory. However, for sensitivity analysis, we employed financial performance indicators, such as return on equity (ROE).

4.2.3. Mediating Variable

We use AWS as a mediating variable, as this variable refers to auditor stress stemming from workplace factors like client pressures, regulatory changes, resource constraints, and complex client operations (Mannan & Darwis, 2023). For the main analysis, this variable

was measured as the natural logarithm of the audit client’s total assets. In joint audits, the value is halved for each auditor, and in three-auditor engagements, it is divided by three, as shown in the following equation (Talebkhah, 2020):

$$AWS = \frac{1}{m} \sum_{j=1}^n \sum_{i=1}^m TA_{ij} \tag{1}$$

where TA_{ij} is the natural logarithm of the total assets of (j) firms that the auditor (i) audited in the fiscal year, n is the total number of listed firms that the auditor audited, and m is the number of a certain j firm’s official auditors.

For the sensitivity analysis, AWS was measured as the natural logarithm of the total assets of all clients for each year regardless of the number of auditors, as proposed by Winoto and Harindahyani (2021). The following equation is used to determine AWS:

$$AWS = \sum_{j=1}^n TA_{ij} \tag{2}$$

4.2.4. Control Variables

This study incorporated several control variables to account for potential factors influencing GCAO accuracy and auditors’ work stress levels (Hutagalung et al., 2024; Uthman et al., 2022; Wang et al., 2024), as follows.

Growth rate = (Current year revenue – Previous year revenue)/Previous year revenue.

Current ratio = Current assets/Current liabilities.

Cash flows from operating activities ratio = Cash flows from operating activities/Total assets.

Debt ratio = Total liabilities/Total assets.

Return on assets = Net profit after interest and taxes/Total assets.

Loss = 1 if net profit before exceptional items is negative, 0 otherwise.

Audit firm reputation = Total assets of the auditor’s clients in a specific industry/Total assets of the clients of the industrial sector in the study sample.

4.3. Model Specification

To formally test the mediating role of AWS in the relationship between firm complexity and GCAO accuracy (H4), we will employ the approach recommended by Baron and Kenny (1986) and further developed by subsequent researchers. This approach involves examining the significance of the indirect effect of firm complexity on GCAO accuracy through AWS. We will estimate the following three regression models.

4.3.1. Firm Complexity and the GCAO Accuracy Model

The impact of firm complexity on GCAO accuracy (H₁) is estimated using the following model:

$$GCAO_{(it)} = \beta_0 + \beta_1 Complex.Oper_{(it)} + \beta_2 GROWTH_{(it)} + \beta_3 CURR_{(it)} + \beta_4 CFO_{(it)} + \beta_5 DEBT_{(it)} + \beta_6 ROA_{(it)} + \beta_7 LOSS_{(it)} + \varepsilon_{(it)} \tag{Model 1}$$

where GCAO is the accuracy of the auditor’s going concern opinion, Complex.Oper. is firm complexity, GROWTH is growth rate, CURR is current ratio, CFO is cash flows from operating activities ratio, DEBT is debt ratio, ROA is the return on assets, and LOSS is a dummy variable for a negative return on assets. This model estimates the total effect of firm complexity on GCAO accuracy, without considering the mediating variable. β_1 in this model represents the total effect.

4.3.2. Firm Complexity and the AWS Model

The impact of firm complexity on the auditor’s work stress (H₂) is estimated using the following model:

$$AWS_{(it)} = \beta_0 + \beta_1 \text{Complex.Oper.}_{(it)} + \beta_2 \text{GROWTH}_{(it)} + \beta_3 \text{CFO}_{(it)} + \beta_4 \text{DEBT}_{(it)} + \beta_5 \text{LOSS}_{(it)} + \beta_6 \text{AFR}_{(it)} + \varepsilon_{(it)} \tag{Model 2}$$

where AWS represents the auditor’s work stress and AFR represents the audit firm’s reputation. Other variables are defined in Model 1. This model estimates the effect of firm complexity on the mediator, AWS. β_1 in this model represents the effect of the independent variable on the mediator.

4.3.3. AWS and GCAO Accuracy Model

The impact of AWS and firm complexity on GCAO (H₃) is estimated using the following model:

$$GCAO_{(it)} = \beta_0 + \beta_1 \text{AWS}_{(it)} + \beta_2 \text{Complex.Oper.}_{(it)} + \beta_3 \text{GROWTH}_{(it)} + \beta_4 \text{CURR.}_{(it)} + \beta_5 \text{CFO}_{(it)} + \beta_6 \text{DEBT}_{(it)} + \beta_7 \text{ROA}_{(it)} + \beta_8 \text{LOSS}_{(it)} + \varepsilon_{(it)} \tag{Model 3}$$

All variables are as defined in Models 1 and 2. This model estimates the effect of both firm complexity and the mediator (AWS) on GCAO accuracy. β_1 in this model represents the effect of the mediator on the dependent variable, and β_2 represents the direct effect of the independent variable on the dependent variable, controlling for the mediator.

4.3.4. The Mediating Role of AWS (Model 4—Indirect Effect)

While not a separate regression, the crucial step in testing mediation is assessing the indirect effect, which is the product of the β_1 from Model 2 and β_1 from Model 3. We will use bootstrapping to determine the statistical significance of this indirect effect.

5. Results and Discussion

5.1. Descriptive Statistics

Table 2 presents a statistical summary of the study variables. The table includes measures of central tendency (mean) and dispersion (standard deviation, maximum, and minimum) for each variable. The data appears relatively stable, with the means falling within the range of observed values and low standard deviations. However, the growth rate variable exhibits greater variability, which is likely attributable to the diverse sample of 105 firms (705 observations) spanning various sectors and economic conditions.

Table 2. Descriptive statistics.

Variable	Minimum	Maximum	Mean	Std. Deviation
GCAO	0	1	0.88	0.324
Complex.Oper.	0.080	4.121	1.539	1.115
AWS	2.76	9.99	7.76	1.95
GROWTH	−0.99	0.511	−0.022	0.213
CURR.	0.11	4.951	1.979	1.494
CFO	−0.297	0.356	0.074	0.056
DEBT	0.008	0.9250	0.379	0.245
ROA	−0.689	0.482	0.0849	0.016
LOSS	0	1	0.21	0.110
AFR	0.000	3.875	1.706	0.876
N			705	

Source: created by the authors.

5.2. Multicollinearity Diagnostics Test

To evaluate the presence of multicollinearity among independent variables, this study employed the Variance Inflation Factor (VIF). A VIF value exceeding 10 typically signals potential multicollinearity issues (Abouelela et al., 2025). As indicated in Table 3, all VIF values were below this threshold, confirming the absence of multicollinearity problems.

Table 3. Multicollinearity test.

Variable	Collinearity Statistics Tolerance	VIF
Complex.Oper.	0.756	1.213
AWS	0.466	2.145
GROWTH	0.996	1.002
CURR.	0.746	1.230
CFO	0.981	1.017
DEBT	0.947	1.056
ROA	0.465	2.153
LOSS	0.886	1.129
AFR	0.371	2.693

Source: created by the authors.

5.3. Correlation

Pearson’s correlation coefficients were calculated to determine the strength of the relationships between the independent and control variables. To assess the distribution of our data, we conducted the Kolmogorov–Smirnov test for normality. The results of this test indicated that the data followed a normal distribution. Given the results of the Kolmogorov–Smirnov test, we proceeded with Pearson’s correlation analysis. A threshold of 0.7 was employed, with values below this limit indicating a weak association and mitigating concerns about multicollinearity (Abouelela et al., 2025). Table 4 presents the correlation matrix, with all coefficients below 0.7, confirming the absence of multicollinearity and supporting the use of multiple regression analysis (binary logistic regression, OLS regression, and path analysis).

Table 4. Pearson correlation coefficients.

Correlation	Complex.Oper.	AWS	GROWTH	CURR.	CFO	DEBT	ROA	LOSS	AFR
Complex.Oper.	1								
AWS	0.217 **	1							
GROWTH	−0.036	0.006	1						
CURR.	−0.263 **	0.112 **	0.019	1					
CFO	0.040	0.041	0.002	0.006	1				
DEBT	0.032	0.116 **	−0.031	−0.034	0.119 **	1			
ROA	−0.110 **	0.195 **	−0.016	0.443 **	−0.001	−0.116 **	1		
LOSS	0.027	0.157 **	−0.013	0.106 **	−0.034	−0.031	0.268 **	1	
AFR	−0.432 **	−0.542 **	−0.022	0.228 **	−0.026	−0.090 *	0.421 **	−0.063	1

N = 705

** Correlation is significant at the 0.01 level (2-tailed) and * correlation is significant at the 0.05 level (2-tailed). Source: created by the authors.

5.4. Main Findings

Table 5 presents the main results of the analysis. Results of testing H₁ (i.e., whether firm complexity significantly affects GCAO) (model 1) are presented in panel A. A Cox and Snell R Square of 0.287 indicates that 28.7% of the variation in GCAO can be explained by changes in the independent variable (firm complexity). The model’s overall significance is supported by a highly significant p-value (0.000), which is below the commonly accepted threshold of 0.05. This confirms the model’s validity in examining the hypothesized

relationship. Furthermore, the coefficient of firm complexity is negative and statistically significant (-0.315 , p -value = 0.000), indicating a significant and negative influence on GCAO. Thus, H_1 is accepted.

Table 5. Statistical results of basic analysis.

Panel A: The effect of firm complexity and AWS on GCAO (H_1 and H_3)		
Variables	Model (1)	Model (3)
Complex.Oper.	-0.315 (0.029) *	-0.262 (0.105) *
AWS		-0.044 (0.072) *
Control Variables		
GROWTH	0.824 (0.204) *	0.418 (0.000)
CURR	0.092 (21.942) *	0.148 (0.075) *
CFO	0.346 (1.767)	-0.130 (0.000)
DEBT	-1.155 (1.470)	-0.765 (0.032)
ROA	0.387 (12.972) *	0.535 (0.073)
LOSS	0.297 (0.000)	-0.304 (0.000) *
Cox and Snell R Square	0.287	0.324
Chi-square	248.563	287.383
Sig.	0.000	0.000
N	705	705

Notes: Panel A summarizes the results of statistical analyses investigating the effect of firm complexity (Model 1) and AWS (Model 2) on GCAO. Definitions of all variables employed in the model specification. The coefficients for each variable are presented first, while Wald statistics are in parentheses. Asterisk (*) denotes statistical significance at the 5% level.

Panel B: The effect of firm complexity on AWS (H_2)	
Variables	Model (2)
Complex.Oper.	1.207 (23.294) *
Control Variables	
GROWTH	-15.223 (-10.109) *
CFO	-16.092 (-5.653) *
DEBT	0.836 (0.699)
LOSS	0.127 (4.146) *
AFR	-1.187 (-7.397) *
Adjusted R ²	0.435
F-statistic	542.604
Sig.	0.000
N	705

Notes: Panel B summarizes the findings of statistical analyses investigating the influence of firm complexity on AWS. Definitions of all variables employed in the model specification. The coefficients for each variable are presented first, while t-statistics are in parentheses. Asterisk (*) denotes statistical significance at the 5% level.

Panel C: The direct, indirect, and total effect of the mediating role of AWS in the relationship between firm complexity and GCAO (H_4)				
The relationship between variables	Direct Effect	Indirect Effect	Total Effect	Path Number
Complex.Oper. → GCAO	-0.262 (0.000)	-0.053 (0.000)	-0.315 (0.000)	1
Complex.Oper. → AWS	1.207 (0.000)		1.207 (0.000)	2
Complex.Oper. → AWS → GCAO	-0.044 (0.001)		-0.044 (0.001)	3

Notes: Panel C summarizes the findings of statistical analyses investigating the direct, indirect, and total effect of the mediating role of AWS in the relationship between firm complexity and GCAO. Definitions of all variables employed in the model specification. The coefficients for each variable are presented first, while the P-values are in parentheses, denoting statistical significance at the 5% level. Finally, this table shows the path number when using path analysis to test the fourth hypothesis.

Source: created by the authors.

This finding is consistent with the principles of the risk theory, and the information theory, ensuring that firm complexity can negatively influence auditors' assessments of a firm's continuity. Furthermore, the current finding aligns with some previous studies (e.g., Bahtiar et al., 2021; Hana & Triani, 2024; Handayani et al., 2023). In other words,

obtaining sufficient evidence to corroborate the accuracy of financial information becomes more difficult in complex environments, increasing the likelihood of errors in auditors' assessments. Concerning the influence of control variables, Table 5, Panel A, further reveals a significant and positive association between the current ratio, return on assets, and GCAO. These results are consistent with Siahaan et al. (2024).

Moreover, the current finding aligns with the Egyptian context, with higher levels of firm complexity that are often linked to challenges in financial transparency and regulatory compliance. In Egypt, the potential for opaque operating environments exists, which can pose challenges for auditors in ensuring complete alignment between operational details and financial realities (Kamal Hassan, 2008). However, the financial data used in this study is still subject to regulatory requirements and auditing standards, providing a foundation for examining the relative accuracy of going concern opinions.

Panel B of Table 5 presents the results of testing H_2 (the impact of firm complexity on AWS) (Model 2). The Adjusted R^2 of 0.435 indicates that 43.5% of the variation in AWS can be explained by changes in the independent variable (firm complexity). The model's overall significance is supported by a highly significant p -value (0.000). This finding confirms the model's validity in examining the hypothesized relationship. Furthermore, the coefficient of firm complexity is positive and statistically significant (1.207, p -value = 0.003), indicating a significant and positive influence on AWS, supporting the acceptance of H_2 . Concerning the influence of control variables, Panel B further reveals a significant and positive association between debt ratio and AWS, which is consistent with Amiruddin (2019). The results also indicate a significant negative correlation between growth rate, cash flows from operating, audit firm reputation, and AWS, which is consistent with Blum et al. (2022).

This result aligns with both the theory of tasks and the theory of uncertainty. Furthermore, the current finding aligns with some previous studies (e.g., Winoto & Harindahyani, 2021; Yan & Xie, 2016). It confirms that firm complexity increases audit work difficulty by requiring significant time and effort to comprehend the nature of audit processes. It also indicates that complex firms are more susceptible to errors and fraud, prompting auditors to exert greater effort in identifying and evaluating these risks, thereby exacerbating their work pressure.

Moreover, our finding aligns with the Egyptian context, where many firms face significant operational complexities due to factors such as diverse business activities, regulatory challenges, and economic fluctuations. Egyptian auditors often encounter intricate financial structures and varied reporting requirements, which can increase their workload and contribute to elevated stress levels. This context underscores the importance of recognizing and addressing work stress in the Egyptian auditing profession. It also highlights the need for strategies to support auditors in navigating complex environments, ultimately enhancing their performance and well-being in the face of increasing demands.

Panel A of Table 5 presents the results of testing Model 3, which examines the impact of AWS on GCAO (H_3). A Cox and Snell R Square of 0.324 indicates that 32.4% of the variation in GCAO can be explained by changes in the independent variable (AWS). The model's overall significance is supported by a highly significant p -value (0.000). This confirms the model's validity in examining the hypothesized relationship. Furthermore, the coefficient of AWS is negative and statistically significant (-0.044 , p -value = 0.000), indicating a significant and negative influence on the GCAO, supporting the acceptance of H_3 .

This finding is consistent with the principles of cognitive evaluation, burnout, and goal theories. Furthermore, the current finding aligns with some previous studies (e.g., D. H. Pham, 2022; Suhardianto & Leung, 2020). This finding confirms that excessive work pressure on auditors can lead to their distraction, impairing their ability to focus on critical aspects of continuity assessments. This can result in the neglect of crucial evaluation

steps, such as verifying specific transactions or assessing certain risks, contributing to less GCAO accuracy.

Moreover, this finding aligns with the Egyptian context, where auditors often face significant pressures due to high workloads, tight deadlines, and the complexities of local economic conditions. The Egyptian accounting and auditing profession is increasingly challenged by rapid regulatory changes and a dynamic market environment, which can exacerbate work-related stress. This context is further complicated by limited resources and varying levels of organizational support, making it difficult for auditors to maintain focus and accuracy in their assessments. This finding highlights the need for improved support systems and workload management within the Egyptian auditing context.

The adequacy of the hypothesized path analysis model (Model 4) was evaluated through the assessment of several established goodness-of-fit indices. Specifically, the following indices were employed: the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the standardized root mean square residual (SRMR). The chi-square test yielded a statistically non-significant p -value of 0.988 ($p > 0.05$). This non-significant result suggests that the observed data do not deviate significantly from the model-implied covariance matrix, indicating model-data consistency rather than definitive proof of model validity (H. Li et al., 2025). The SRMR value was found to be below the conventionally accepted threshold of 0.08 ($\text{SRMR} < 0.08$), and the RMSEA value was also within acceptable limits ($\text{RMSEA} < 0.000$). Notably, the TLI achieved a perfect value of 1, while the CFI also indicated an excellent model fit with a value of 1 (>0.90). Taken together, these results provide strong evidence of a robust fit between the hypothesized model and the empirical data. The model's R^2 values ranged from 0.0185.

Finally, concerning the direct, indirect, and total effect of AWS on the relationship between firm complexity and GCAO (H_4), we used path analysis in IBM SPSS Amos 26. Three paths were analyzed: the direct relationship between firm complexity and opinion accuracy, the relationship between firm complexity and AWS, and the relationship between AWS and opinion accuracy. Panel C of Table 5 presents the results of the path analyses, where the significance of the paths was determined using the bootstrap method. The findings revealed a significant positive direct effect of firm complexity on AWS ($\beta = 1.207$, $p < 0.001$), confirming H_2 . Additionally, a significant negative direct effect of AWS on GCAO was observed ($\beta = -0.044$, $p < 0.001$), supporting H_3 . Furthermore, a significant negative indirect effect of firm complexity on opinion accuracy was found ($\beta = -0.053$, $p < 0.000$), confirming the mediating role of AWS. Given the significant direct effect of firm complexity on opinion accuracy ($\beta = -0.262$, $p < 0.000$), we conclude that AWS mediates the relationship between firm complexity and opinion accuracy, and, hence, H_4 is accepted.

5.5. Robustness Checks

Using Alternative Measures of Main Variables

We examined the robustness of the findings by using alternative measures for the independent variable (firm complexity) and the mediating variable (AWS). We re-ran the research models with alternative measures of the variables (Asnaashari et al., 2023). ROE ratio was employed as an alternative measure of firm complexity (Khan et al., 2023). Additionally, the natural logarithm of the total assets of all clients for each year, regardless of the number of auditors, was utilized as an alternative indicator of AWS (Winoto & Harindahyani, 2021).

Sensitivity analyses produced consistent results, as depicted in Panels A, B, and C of Table 6. These findings corroborated the negative relationship between firm complexity and GCAO (H_1). Moreover, they supported the positive association between firm complexity

and AWS (H₂). Additionally, they confirmed the negative relationship between AWS and GCAO (H₃). Lastly, when examining AWS as a mediating variable (H₄), these findings ensured its mediating role in the relationship between firm complexity and GCAO.

Table 6. Alternative measurement of firm complexity and auditors’ work stress.

Panel A: The effect of firm complexity and AWS on GCAO (H _{1n} and H ₃)		
Variables	Model (1)	Model (3)
Complex.Oper.	−0.917 (0.036) *	−0.659 (010)
AWS		−0.154 (2.694) *
Control Variables		
GROWTH	5.425 (0.000)	1.952 (0.000)
CURR	−14.622 (0.001)	−9.883 (0.003)
CFO	8.730 (0.000)	−7.512 (0.000)
DEBT	−7.559 (0.005)	3.648 (0.002)
ROA	12.817 (0.008)	−6.701 (0.073)
LOSS	9.336 (0.003)	−.035 (0.004)
Cox and Snell R Square	0.167	0.339
Chi-square	287.384	287.384
Sig.	0.000	0.000
N	705	705

Notes: Panel A summarizes the results of statistical analyses investigating the effect of firm complexity and AWS on GCAO. Definitions of all variables employed in the model specification. The coefficients for each variable are presented first, while Wald statistics are in parentheses. Asterisks (*) denote statistical significance at the 5% level.

Panel B: The effect of firm complexity on AWS (H ₂)	
Variables	Model (2)
Complex.Oper	1.670 (44.006) *
Control Variables	
GROWTH	0.004 (0.196)
CFO	0.015 (0.787)
DEBT	0.003 (0.132)
LOSS	−0.099 (−4.986) *
AFR	−0.048 (−2.439) *
Adjusted R ²	0.734
F-statistic	338.677
Sig.	0.000
N	705

Notes: Panel B summarizes the findings of statistical analyses investigating the influence of firm complexity on AWS. Definitions of all variables employed in the model specification. The coefficients for each variable are presented first, while t-statistics are in parentheses. Asterisks (*) denote statistical significance at the 5% level.

Panel C: The direct, indirect, and total effect of the mediating role of AWS in the relationship between firm complexity and GCAO (H ₄)				
The relationship between variables	Direct Effect	Indirect Effect	Total Effect	Path Number
Complex.Oper. → GCAO	−0.659 (0.000)	−0.258 (0.000)	−0.917 (0.000)	1
Complex.Oper. → AWS	1.670 (0.001)		1.670 (0.001)	2
Complex.Oper. → AWS → GCAO	−0.154 (0.001)		−0.154 (0.001)	3

Notes: Panel C summarizes the findings of statistical analyses investigating the direct, indirect, and total effect of the mediating role of AWS in the relationship between firm complexity and GCAO. Definitions of all variables employed in the model specification. The coefficients for each variable are presented first, while the P-values are in parentheses, denoting statistical significance at the 5% level. Finally, this table shows the path number when using path analysis to test the fourth hypothesis.

Source: created by the authors.

6. Conclusions

This study examines the direct and indirect influences of firm complexity on the accuracy of auditors’ assessments of a firm’s ability to continue operating, as well as the mediating role of auditor stress in this relationship for Egyptian listed firms. The primary

analysis revealed that firm complexity is significantly and negatively associated with the accuracy of these assessments. Additionally, complex firms are associated with higher levels of AWS. Moreover, higher AWS is linked to a decrease in the accuracy of assessments regarding a firm's ongoing viability. Finally, the current study finds that AWS mediates the relationship between firm complexity and GCAO accuracy. The findings remained robust even after conducting sensitivity analyses with alternative measures, further solidifying the overall conclusions.

This study contributes to the existing literature by providing empirical evidence on how AWS mediates the relationship between firm complexity and GCAO accuracy. Our research emphasized the impact of organizational factors on audit quality, shedding light on the psychological pressures auditors face in complex environments. It underscored the significance of managing AWS to improve the reliability of financial reporting. These findings have implications for future research and practical strategies for audit firms and policymakers, as follows.

The findings of our study have significant implications for auditing firms, policymakers, and investors, highlighting the necessity for strategies to alleviate AWS. For auditing firms, this study highlights the importance of recognizing and addressing stress among auditors, especially in complex organizations. Implementing training programs and stress management initiatives and fostering supportive work environments can help auditors to more effectively handle the pressures of their roles, potentially leading to more accurate audit judgments. For policymakers, the current results indicate a need for guidelines or regulations that promote auditor well-being. Establishing standards for workload management and stress reduction in auditing practices could enhance overall audit quality and financial reporting reliability. For investors, it is crucial to recognize the potential effects of firm complexity and AWS on GCAO accuracy. This awareness may shape their investment decisions, as understanding these factors can aid in assessing a firm's financial reporting quality.

However, our study has some limitations. Firstly, the study period is confined to 2017–2023, potentially limiting its generalizability to other timeframes. Secondly, this study focused solely on non-financial firms listed on the Egyptian Stock Exchange, excluding unlisted firms, foreign firms, and financial institutions. Thirdly, the study addressed the impact of firm complexity on GCAO accuracy by focusing on annual financial statement audits, neglecting limited reviews on interim (quarterly) financial statements. Therefore, future research avenues should encompass examining the influence of firm complexity and auditor stress on GCAO accuracy across diverse contexts (e.g., different economies and sectors), evaluating the efficacy of stress management interventions, and exploring the potential for technology and artificial intelligence to mitigate these challenges and enhance audit quality.

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References

- Abouelela, O., Diab, A., & Saleh, S. (2025). The determinants of the relationship between auditor tenure and audit report lag: Evidence from an emerging market. *Cogent Business & Management*, 12(1), 2444553. [CrossRef]
- Afzali, A., Afzali, M., & Ittonen, K. (2024). Distracted auditors, audit effort, and earnings quality. *Accounting Forum*, 48, 1–30. [CrossRef]
- Alsheikh, A. H., & Alsheikh, W. H. (2023). Does audit committee busyness impact audit report lag? *International Journal of Financial Studies*, 11(1), 48. [CrossRef]
- Amara, I., Khelil, I., El Ammari, A., & Khelif, H. (2023). Money laundering and infrastructure quality: The moderating effect of the strength of auditing and reporting standards. *Pacific Accounting Review*, 35(2), 249–264. [CrossRef]
- Amiruddin, A. (2019). Mediating effect of work stress on the influence of time pressure, work–family conflict and role ambiguity on audit quality reduction behavior. *International Journal of Law and Management*, 61(2), 434–454. [CrossRef]
- Aschauer, E., & Quick, R. (2024). Implementing shared service centres in Big 4 audit firms: An exploratory study guided by institutional theory. *Accounting, Auditing & Accountability Journal*, 37(9), 1–28. [CrossRef]
- Asnaashari, H., Safarzadeh, M. H., Kheirollahi, A., & Hashemi, S. (2023). The effect of auditors' work stress and client participation on audit quality in the COVID-19 era. *Journal of Facilities Management*, 21(4), 1–28. [CrossRef]
- Awadallah, A. A., & Elsaid, H. M. (2020). Investigating the impact of macro-economic changes on auditors' assessments of audit risk: A field study. *Journal of Applied Accounting Research*, 21(3), 345–361. [CrossRef]
- Bahtiar, A., Meidawati, N., Setyono, P., Putri, N. R., & Hamdani, R. (2021). Determinants of going concern audit opinion: An empirical study in Indonesia. *Jurnal Akuntansi dan Auditing Indonesia*, 25(2), 183–193. [CrossRef]
- Barinov, A., Park, S. S., & Yildizhan, Ç. (2024). Firm complexity and post-earnings announcement drift. *Review of Accounting Studies*, 29(1), 527–579. [CrossRef]
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182. [CrossRef]
- Blum, E. S., Hatfield, R. C., & Houston, R. W. (2022). The effect of staff auditor reputation on audit quality enhancing actions. *The Accounting Review*, 97(1), 75–97. [CrossRef]
- Chen, J. Z., Elemen, A., Hope, O. K., & Yoon, A. S. (2024). Audit-firm profitability: Determinants and implications for audit outcomes. *European Accounting Review*, 33(4), 1369–1396. [CrossRef]
- Chu, L., Fogel-Yaari, H., & Zhang, P. (2024). The estimated propensity to issue going concern audit reports and audit quality. *Journal of Accounting, Auditing & Finance*, 39(2), 589–613. [CrossRef]
- De Brabander, C. J., & Martens, R. L. (2014). Towards a unified theory of task-specific motivation. *Educational Research Review*, 11, 27–44. [CrossRef]
- Eldyasty, M. M., & Elamer, A. A. (2023). Audit (or) type and audit quality in emerging markets: Evidence from explicit vs. implicit restatements. *Review of Accounting and Finance*, 22(4), 489–507. [CrossRef]
- Farghaly, M., Basuony, M. A., Noureldin, N., & Hegazy, K. (2024). The antecedents of COVID-19 contagion on quality of audit evidence in Egypt. *Journal of Accounting in Emerging Economies*, 14(4), 717–746. [CrossRef]
- Fedyk, A., Hodson, J., Khimich, N., & Fedyk, T. (2022). Is artificial intelligence improving the audit process? *Review of Accounting Studies*, 27(3), 938–985. [CrossRef]
- Geiger, M. A., Gold, A., & Wallage, P. (2024). Practitioner perspectives on going concern opinion research and suggestions for further study: Part 1—Outcomes and consequences. *Accounting Horizons*, 38(2), 153–168. [CrossRef]
- Ghattas, P., Soobaroyen, T., & Marnet, O. (2021). Charting the development of the Egyptian accounting profession (1946–2016): An analysis of the State-Profession dynamics. *Critical Perspectives on Accounting*, 78, 102159. [CrossRef]
- Gontara, H., Khelil, I., & Khelif, H. (2023). The association between internal control quality and audit report lag in the French setting: The moderating effect of family directors. *Journal of Family Business Management*, 13(2), 261–271. [CrossRef]
- Hana, H., & Triani, N. N. A. (2024). The effect of company characteristics and audit firm on going concern audit opinion issued by audit firm. *Journal of Economic, Business and Accounting (COSTING)*, 7(6), 5404–5411. [CrossRef]
- Handayani, T., Kusumaningtyas, M., Pratiwi, R., Suryanto, E., & Manurung, H. (2023). The influence of audit quality, profitability, liquidity, solvency on going concern audit opinions: A literature review. *Jurnal Ilmiah Manajemen Kesatuan*, 11(3), 783–790.
- Hutagalung, M., Hutagalung, M. T., Afrielza, O., Ndraha, P. A. Y., & Deliana, D. (2024). The influence of previous year audit opinions, company growth and leverage on going concern audit opinions. *Prosiding Simposium Ilmiah Akuntansi*, 1(1), 935–939.
- Jefferson, D. P., Andiola, L. M., & Hurley, P. J. (2024). Surviving busy season: Using the job demands-resources model to investigate coping mechanisms. *Contemporary Accounting Research*, 41, 1–30. [CrossRef]
- Kamal Hassan, M. (2008). The development of accounting regulations in Egypt: Legitimizing the International Accounting Standards. *Managerial Auditing Journal*, 23(5), 467–484. [CrossRef]
- Kesimli, I., Karalar, S., & Tasdemir, Ö. (2018). Auditor stress: Literature review and classification. In *Sustainability and social responsibility of accountability reporting systems: A global approach* (pp. 317–346). Springer. [CrossRef]

- Khan, F., Abdul-Hamid, M. A. B., Fauzi Saidin, S., & Hussain, S. (2023). Organizational complexity and audit report lag in GCC economies: The moderating role of audit quality. *Journal of Financial Reporting and Accounting*, 21(5), 1–23. [CrossRef]
- Khelil, I., Guidara, A., & Khlif, H. (2023). The effect of the strength of auditing and reporting standards on infrastructure quality in Africa: Do ethical behaviour of firms and judicial independence matter? *Journal of Financial Management of Property and Construction*, 28(1), 145–160. [CrossRef]
- Li, H., Li, K. Y., Hu, X. R., Hong, X., He, Y. T., Xiong, H. W., & Zhang, Y. L. (2025). Development and validation of the Information Literacy Measurement Scale (ILMS-34) in Chinese public health practitioners. *BMC Medical Education*, 25(1), 75. [CrossRef] [PubMed]
- Li, X., & Sun, L. (2024). High-Quality auditor presence and informational influence: Evidence from firm investment decisions. *Auditing: A Journal of Practice & Theory*, 43(2), 189–218. [CrossRef]
- Lim, H. J., & Mali, D. (2024). An analysis of the effect of audit effort (hours) on stock price volatility: Evidence of increasing demand reducing uncertainty. *International Journal of Disclosure and Governance*, 21(3), 359–375. [CrossRef]
- Loughran, T., & McDonald, B. (2023). Measuring firm complexity. *Journal of Financial and Quantitative Analysis*, 58(3), 2487–2514. [CrossRef]
- Mannan, A., & Darwis, S. S. (2023). The Psychological impact of work stress on auditors: Exploring determinants and consequences. *Journal for ReAttach Therapy and Developmental Diversities*, 6(7s), 567–581. Available online: <https://jrtd.com/index.php/journal/article/view/833> (accessed on 20 December 2024).
- Moez, D. (2024). Does managerial power explain the association between agency costs and firm value? The French Case. *International Journal of Financial Studies*, 12(3), 94. [CrossRef]
- Mohd Sanusi, Z., Iskandar, T. M., Monroe, G. S., & Saleh, N. M. (2018). Effects of goal orientation, self-efficacy and task complexity on the audit judgement performance of Malaysian auditors. *Accounting, Auditing & Accountability Journal*, 31(1), 75–95. [CrossRef]
- Nelson, K., & Smith, A. P. (2023). Psychosocial work conditions as determinants of well-being in Jamaican police officers: The mediating role of perceived job stress and job satisfaction. *Behavioral Sciences*, 14(1), 1. [CrossRef] [PubMed]
- Nworie, G. O., & Obi, G. U. (2024). Audit firm physiognomies: A contrivance for mitigating corporate failures in listed consumer goods firms in Nigeria. *IIARD International Journal of Economics, Business and Management*, 10(5), 185–203.
- Ombati, R. M., & Karuti, J. K. (2024). Assessment of the influence of audit plan on the performance of internal auditors in the government ministries in Kenya. *International Journal of Public Administration and Management Research*, 10(4), 50–58.
- Peytcheva, M. (2014). Professional skepticism and auditor cognitive performance in a hypothesis-testing task. *Managerial Auditing Journal*, 29(1), 27–49. [CrossRef]
- Pham, D. H. (2022). Determinants of going-concern audit opinions: Evidence from Vietnam stock exchange-listed companies. *Cogent Economics & Finance*, 10(1), 1–13. [CrossRef]
- Pham, Q. T., Tan Tran, T. G., Pham, T. N. B., & Ta, L. (2022). Work pressure, job satisfaction and auditor turnover: Evidence from Vietnam. *Cogent Business & Management*, 9(1), 1–18. [CrossRef]
- Polo, O. C., Charris, N. N., Perez, E. B., Tovar, O. O., & Cantillo, I. F. C. (2023). Forensic audit: A case of automotive company, legal and accounting aspect. *Journal of Law and Sustainable Development*, 11(12), 1–34. [CrossRef]
- Proho, M. (2023). Going concern assessment: A literature review. *Journal of Forensic Accounting Profession*, 3(2), 48–62. [CrossRef]
- Saleh, S. A. (2023). Auditor's effort following the implementation of 2015 revised Egyptian Accounting Standards: An evidence from the nonfinancial listed firms on the Egyptian Stock Exchange. *Alexandria Journal of Accounting Research*, 7(3), 131–172. [CrossRef]
- Salehi, M., Seyyed, F., & Farhangdoust, S. (2020). The impact of personal characteristics, quality of working life and psychological well-being on job burnout among Iranian external auditors. *International Journal of Organization Theory & Behavior*, 23(3), 189–205. [CrossRef]
- Shi, W., Connelly, B. L., & Hoskisson, R. E. (2017). External corporate governance and financial fraud: Cognitive evaluation theory insights on agency theory prescriptions. *Strategic Management Journal*, 38(6), 1268–1286. [CrossRef]
- Siahaan, L. E. J., Sihombing, J. T., Nasution, S. A., & Ginting, W. A. (2024). The influence of company size, profitability, solvency, current ratio, and capital structure on going concern audit opinions in consumer sector companies listed on the Indonesia stock exchange (BEI) 2019–2022. *International Journal of Economics, Business and Innovation Research*, 3(03), 339–358.
- Suhardianto, N., & Leung, S. C. (2020). Workload stress and conservatism: An audit perspective. *Cogent Business & Management*, 7(1), 1–19. [CrossRef]
- Talebkhah, Z. (2020). The relationship between auditor's stress with audit quality and internal control weakness. *Iranian Journal of Accounting, Auditing and Finance*, 4(1), 99–112. [CrossRef]
- Tiron-Tudor, A., & Deliu, D. (2022). Reflections on the human-algorithm complex duality perspectives in the auditing process. *Qualitative Research in Accounting & Management*, 19(3), 255–285. [CrossRef]
- Umar, A., & Anandarajan, A. (2004). Dimensions of pressures faced by auditors and its impact on auditors' independence: A comparative study of the USA and Australia. *Managerial Auditing Journal*, 19(1), 99–116. [CrossRef]

- Uthman, A. B., Salami, A. A., & Ajape, K. M. (2022). Impact of auditor industry specialization on the audit quality of listed non-financial firms in Nigeria. *Nigerian Journal of Risk and Insurance*, 12(1), 29–56.
- Van Hau, N., Hai, P. T., Diep, N. N., & Giang, H. H. (2023). Determining factors and the mediating effects of work stress to dysfunctional audit behaviors among Vietnamese auditors. *Calitatea*, 24(193), 164–175. [CrossRef]
- Wang, Y., Chiu, T., & Kogan, A. (2024). The effects of COVID-19 pandemic and auditor-client geographic proximity on auditors' going concern opinions. *International Journal of Disclosure and Governance*, 21(2), 1–21. [CrossRef]
- Winoto, C. O., & Harindahyani, S. (2021). The effect of auditor's work stress on audit quality of listed companies in Indonesia. *Journal of Economics, Business, and Accountancy Ventura*, 23(3), 361–374. [CrossRef]
- World Bank. (2023). *World development indicators: Inflation, consumer prices (annual %)*. Available online: <https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG> (accessed on 20 December 2024).
- Yan, H., & Xie, S. (2016). How does auditors' work stress affect audit quality? Empirical evidence from the Chinese stock market. *China Journal of Accounting Research*, 9(4), 305–319. [CrossRef]
- Yang, Y., Simnett, R., & Carson, E. (2022). Auditors' propensity and accuracy in issuing going concern modified audit opinions for charities. *Accounting & Finance*, 62, 1273–1306. [CrossRef]

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Article

COVID-19-Related Audit Report Disclosures: Determinants and Consequences

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Abstract: In this study, we identified firms receiving COVID-19-related audit report disclosures through critical audit matter (CAM) mentions of COVID-19 in their audit reports. Through OLS regressions, we then investigated the fundamental accounting and auditing determinants that predict the likelihood of firms to receive these COVID-19-related disclosures, and found that firms with intangibles and goodwill were more likely to have these mentioned in their audit reports. Next, we examined the content of these disclosures and found that auditors' COVID-19 disclosures focused on significant accounting estimates (e.g., fair value accounting and asset impairment considerations). These results are consistent with the idea that COVID-19-related uncertainty represented a triggering event to firms, who then reassessed the carrying value of these long-term assets. After exploring the spillover effects to outsiders, we found that investors obtained a 7.3 basis point for abnormal returns following COVID-19 report disclosures and that auditors were able to charge these firms USD 452,000 higher audit fees relative to benchmark firms. The results are also consistent in entropy-balanced estimations and two-stage analyses that address endogeneity.

Keywords: COVID-19; coronavirus; impairment; audit report; audit fees; critical audit matters; goodwill

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1. Introduction

The emergence of COVID-19 and the resulting pandemic brought widespread global economic uncertainty (Caggiano et al., 2020; Szczygielski et al., 2021; Altiga et al., 2020). While research has investigated the effects of the COVID-19 pandemic on health outcomes, as well as public health measurements on virus spread, regulatory policies, and macroeconomic events (Harris, 2020; Greenstone & Nigam, 2020; Parmet & Sinha, 2020; Ozili & Arun, 2020; McKibbin & Fernando, 2020; Sajadi et al., 2020; Bukhari & Jameel, 2020), the full impact of this economic uncertainty in the corporate sector is still relatively unknown.¹ In particular, the accounting implications of this COVID-19-induced economic uncertainty on firms have not been sufficiently researched in the academic literature. This study aims to fill this gap in the literature by first identifying publicly listed U.S. companies with mentions of COVID-19 in the critical audit matters (CAMs) of their audit reports. This is the first study to investigate the use of COVID-19-related audit report disclosures issued by auditors in a novel setting. Therein, we are the first to investigate the use of these disclosures by auditors in assessing which accounting fundamentals act as determinants to firms receiving these disclosures from auditors in relation to COVID-19. We then investigate the types and

topics of COVID-19 disclosures, such as those representing accounting uncertainties (e.g., accounting estimates, fair value accounting disclosures, etc.). These tests are also important to our understanding of auditors' use of CAMs relating to accounting issues that have high degrees of uncertainty. Finally, we tested the subsequent effects on both shareholders and stakeholders, analyzing abnormal stock returns around the disclosures and the audit and abnormal audit fees charged by auditors.

We first investigated the determinants for firms to receive these COVID-19-related disclosures from auditors and found that, consistent with our expectations, firms with high levels of goodwill and identifiable intangible assets were statistically more likely to receive mentions of COVID-19 in their audit reports. After disaggregating mentions of COVID-19 by type and topic, we found that auditor disclosures around COVID-19 were more likely to present issues regarding significant accounting estimates, as well as matters relating to fair value accounting and asset impairments. Taken together, our findings suggest that COVID-19 represented a triggering event that caused companies to reassess the fair value of their long-term assets under Accounting Standards Codification (ASC) Topic 350, Intangibles–Goodwill and Other.

We next investigated whether COVID-19 uncertainty, proxied by these audit report disclosures, provided material, uncertainty-mitigating information to financial statement users by analyzing market reactions to auditor report issuances. We created the expected daily returns for each firm based on daily regressions from the market model over a period from -300 to -46 , then created the daily abnormal returns for the three days before and after the audit report was issued. We plotted these returns and found a large increase in abnormal returns during the $(0, +3)$ period for firms with mentions of COVID-19, while the other firms had minimal abnormal returns. We observed a large jump on the day following the audit report issuance and, while there was market correction over the following two days, the overall CARs during this period were positive (0.073%) for the focal firms. Regression analyses confirm these results, demonstrating that market reactions are concentrated in the $(+1, +3)$ window following audit report issuances. Other graphical analyses suggest this effect is stronger when a firm's financial performance is strong (e.g., profit firms, no going concerns, no restatements) and when disclosures reduce uncertainty (e.g., non-impairment, non-fair value, significant accounting estimates).

Finally, we investigated the subsequent effects on firms' audit costs and found that firms receiving COVID-19 mentions in their audit reports were associated with 17.2% higher audit costs (USD 452,000) and 8% higher abnormal audit costs relative to firms without COVID-19 mentions, likely due to the additional efforts needed from auditors to verify the complicated nature of the asset impairment assessments. Meanwhile, firms receiving COVID-19 mentions relating to asset impairment considerations were associated with 25.6% higher audit fees and 13.1% higher abnormal audit fees. In more granular tests, we found that matters relating to fair value accounting and going concerns also reflected higher fees for firms receiving COVID-19 mentions relative to firms that did not receive these audit reports. Finally, in the untabulated results, we delved deeper into the content of the COVID-19 mentions, noting that the COVID-19 mentions relating to quantitative "Step 2" impairment analyses were associated with higher audit fees, while those with mentions relating to qualitative "Step 1" analyses were not.

We also prepared several sensitivity analyses. First, we reperformed all of our analyses after reweighting the covariates based on entropy balancing (Hainmueller, 2012) and found consistent results. Reweighting limited the effects of the fundamental differences in observable characteristics to support our main findings. Next, in an attempt to extract the likelihood that firms received COVID-19-related audit reports due to a general risk of epidemic diseases, we merged our data with the Covid and epidemic disease risk data in

Hassan et al. (2023). After extracting portions of the likelihood of receiving a COVID-19-related audit report disclosure due to general epidemic risk, we found consistent results. This robustness check suggests that general epidemic risk does not drive our main findings and supports the idea that COVID-19 uncertainty and risk, specifically, provided accounting and auditing challenges to firms and their auditors.

Understanding which firms were most impacted by COVID-19 and its related uncertainty, as well as to what extent COVID-19 impacted these firms are important questions to the academic literature, and thus, our research has several contributions. First, our research demonstrates that COVID-19 had accounting implications for firms, which the literature has yet to fully investigate. We find evidence consistent with the idea that COVID-19 uncertainty created significant uncertainty around managers' expectations of future cash flows, thus causing a triggering event in which firms must consider reassessing the carrying value of non-current assets. These COVID-19 mentions by auditors suggest that auditors' verification of managers' analyses regarding this triggering event were particularly complicated and/or needed significant auditor judgment, which required additional effort by the auditor, resulting in increased audit costs to the client. Second, our findings have broader implications about the relationship between this firm-specific economic uncertainty and the ability of the auditor to audit (significant) accounting estimates as well as auditor reporting, which has yet to be investigated in the literature. While other measures of economic uncertainty are macro-level (Baker et al., 2016), we identify firm-specific implications of economic uncertainty, and demonstrate that this increased economic uncertainty forced greater audit effort by the auditor and higher costs to firms as managers assess the carrying values of these long-term assets.

Our paper also contributes to the literature on understanding auditors' use of CAMs (Suljac, 2021; Garcíaa et al., 2019; Gimbar et al., 2016; Brasel et al., 2016), providing insight into how auditors choose to discuss COVID-19 uncertainty in the audit report through CAMs. Our tests provide descriptive evidence on how auditors utilize audit report disclosures in the presence of COVID-19 uncertainty and broader economic uncertainty, both in the frequency and content of disclosures. Since prior research suggests that the use of CAMs reduces auditor liability (Backof et al., 2014; Kachelmeier et al., 2020), auditors' COVID-19 mentions may also speak to how auditors perceive potential litigation following COVID-19. Our market reaction tests also suggest that these auditor disclosures in the audit report help regulators in achieving their goal to provide more informative audit reports to financial users (PCAOB, 2019), as investors use and trade on the information content of these disclosures.

Finally, our paper also has broader implications around the determinants of goodwill impairments and the relationship between firms' non-current asset impairment assessments and auditor costs and reporting. Our research builds on Huikki et al. (2017), whose qualitative findings suggest that goodwill impairment tests utilize accounting information and other inputs beyond clients' general ledgers and accounting records. We find archival evidence in line with this as our COVID-19 mentions of goodwill impairment largely relate to auditor's need to review financial projections around macroeconomic uncertainty due to COVID-19 when assessing goodwill. Moreover, our CAM findings suggest that auditors do attempt to verify managers' "unverifiable" estimates of the current fair value of goodwill as suggested by Ramanna and Watts (2012).

2. Institutional Knowledge and Hypothesis Development

2.1. Institutional Knowledge

2.1.1. COVID-19 General Information

There were more than 238 million cases of COVID-19 worldwide, resulting in nearly 5 million deaths (more than 1,000,000 in the United States) (New York Times [NYT], 2022b; Johns Hopkins Coronavirus Resource Center, 2021). The pandemic is estimated to have cost up to USD 16 trillion to the U.S. economy (Cutler & Summers, 2020). In the U.S., economic uncertainty was particularly high in the early days of the pandemic and throughout 2020. For example, early evidence (Harris, 2020) estimated that COVID-19 cases began to flatten in late March 2020; however, ex-post evidence suggests that the 2020 peak in new cases was 10 April 2020, and the largest spike in new cases was in January 2021 (New York Times [NYT], 2021a). Moreover, research studies and public media questioned whether or not COVID-19 effects would last past the first summer in the United States (Bukhari & Jameel, 2020), which in hindsight was overly optimistic.

2.1.2. COVID-19 Public Healthcare and Economics Research

Ozili and Arun (2020) classify the spillover effects of COVID-19 on the global economy in two ways: (1) preventative measures such as shutdowns of financial markets, corporate offices, businesses, and events, and (2) the heightened uncertainty around the spread of the virus reducing consumers' consumption patterns and decreased investor demands for economic activity. Both of these factors had immediate effects on firms' stock prices and those of related stock market indices. These are, of course, measurable risks, but there are many factors that are not measurable, and therein lies the uncertainty created by the COVID-19 pandemic. It is this uncertainty that is the main driver of "panic, paralysis, and fear" (Disparte, 2021) among consumers.

Study suggests that the 1918 Flu Pandemic could have presented less uncertainty throughout the economy (Correia et al., 2020),² which one can extrapolate to COVID-19 to mean that unilateral adoptions of public health measures could have provided overall better economic outcomes. Similarly, Greenstone and Nigam (2020) estimate that moderate social distancing could have created mortality benefits of about USD 8 trillion. Since public health measures were adopted (or not adopted) to differing extents and varied across time by U.S. cities and states, these non-unilateral adoptions are likely to boost economic uncertainty for firms, particularly those with geographic dispersion or those that operate in more than one state, city, or territory.

2.1.3. The Impact of COVID-19 Uncertainty on Firms and Auditors—General

"The evolution of the disease and its economic impact is highly uncertain", which has challenged policymakers to direct relevant and suitable macroeconomic policies (McKibbin & Fernando, 2020), likely causing a trickle down of economic uncertainty to firms and their auditors. Hong et al. (2021) model COVID-19 damages on corporate earnings using earnings revisions, implying that firms are likely to experience earnings crashes and lower earnings growth expectations from managers until COVID-19 vaccine arrivals. Moreover, the impact on auditing is likely to be larger for industries more impacted by COVID-19 given the larger uncertainty for those industries. In particular, Public Company Accounting Oversight Board (PCAOB) member, Megan Zietsman, discussed at *the AICPA Conference on Current SEC and PCAOB Developments* that PCAOB inspectors will increase their focus on audits of companies in the transportation, entertainment, hospitality, manufacturing, and retail spaces (Tysiac, 2021).

2.1.4. The Impact of COVID-19 Uncertainty on Firms and Auditors—Accounting Perspective

The implications of COVID-19 uncertainty on firms' accounting and financial reporting largely focus on practitioner expectations and guidance from regulatory bodies such as the AICPA, FASB, SEC, and PCAOB, as well as third-party institutions such as the Center for Audit Quality (CAQ). Of these, the two main areas of focus by these groups are around going concern opinions and asset impairment considerations for non-financial assets. In remarks to the Center for Audit Quality in June 2020, SEC Chief Accountant, Sagar Teotia, highlighted that GCOs will be an issue for auditors during the pandemic.³ Comments by members of the AICPA (Radigan, 2021) support this view, suggesting that going concern assessments will be a large challenge to both firms and their auditors:

“Now with the updated U.S. GAAP and U.S. generally accepted auditing standards requirements, entities have to make a going concern assessment based upon whether it's probable that they will be unable to meet their obligations within one year from the issuance of the financial statements, not the balance sheet date. The increased difficulty caused by the longer period is compounded by the uncertainty arising from the unprecedented nature of the pandemic and its recession”.

Another member of the AICPA argued that the number one most likely issue to impact publicly traded companies from the COVID-19 pandemic is “Impairment related to non-financial assets” (Noll, 2020). These impairments are likely to relate to non-current assets on the balance sheet, focusing largely on those assets with high estimation uncertainty—identifiable intangible assets and goodwill. The uncertainty around COVID-19 calls into question firms' expected future cash flows and, therefore, under FASB ASC 350, “many entities are likely to conclude that triggering events occurred, causing them to perform impairment testing” (American Institute of CPAs [AICPA], 2020).

2.1.5. Critical Audit Matters (CAMs)

Auditing Standard (AS) 3101.11 defines CAMs as “any matter arising from the audit of the financial statements that was communicated or required to be communicated to the audit committee and that: (1) relates to accounts or disclosures that are material to the financial statements and (2) involved especially challenging, subjective, or complex auditor judgment (PCAOB, 2017)”. Auditors are required to provide these disclosures in the audit report for certain firms beginning for audit reports dated as of 30 June 2019. CAMs are composed of two parts—a description of the matter and the auditor's response to the matter. Several recent papers have investigated the impact of these disclosures on auditors' liability and found that CAM disclosures by auditors can reduce auditor liability (Backof et al., 2014; Kachelmeier et al., 2020), though not when CAM disclosures brought forth attention to instances where undetected misstatements would have been hard to uncover otherwise (Brasel et al., 2016). This may suggest that auditors favor additional disclosures to reduce potential legal claims against the audit firm. Whether auditors specifically mention or exclude COVID-19 from these CAMs may indicate how auditors view their potential liability to stakeholders as a function of COVID-19 uncertainty.

2.2. Hypothesis Development

An important aspect in theorizing the potential determinants for a company to receive a COVID-19-related auditor report is the macroeconomic uncertainty induced by COVID-19. This uncertainty presents systematic risk to all corporate sector participants; however, it is likely to create firm-specific uncertainty and risk around management's expectations of future cash flows, contingent on the extent that this uncertainty would impact firms' across a variety of factors. A first-order effect, most likely, is that this uncertainty will impact

firms in the short run (Radigan, 2021; Murphy, 2020). The COVID-19 global pandemic included several state-, region-, and country-wide lockdowns, limiting business operations for many firms during these periods. Moreover, these lockdowns had subsequent effects on businesses through shipping delays, reduced customer demands for particular products, and disruptions to the accounting and economic cycles of firms (Bloomberg Law, 2022; New York Times [NYT], 2022a; New York Times [NYT], 2021b). These issues are likely to create liquidity risks for firms by reducing short-run cash inflows, particularly for unprofitable firms and those firms operating on thin cash flows from operating activities pre-pandemic, and this can warrant a going concern opinion for clients.

While financial statements are typically prepared under the assumption that the firm will continue to operate indefinitely (Financial Accounting Standards Board [FASB], 2014), these short-run disruptions to positive operating cash flow activities may require the auditor to doubt the ability of the company to continue its operations beyond the following fiscal year. If COVID-19 casts a substantial doubt about a company's ability to continue as a going concern, the auditor is likely to modify the report with a going concern opinion (GCO). However, the auditor is still likely to present an audit report disclosure for COVID-19 whether or not COVID-19 created a *substantial* doubt about a company's ability to continue as a going concern because this matter is highly reliant on auditors' professional judgment, which is a key requirement for these disclosures.

On the other hand, many firms maintain significantly high levels of cash and cash equivalents, and healthy firms operating in areas with minimal lockdown procedures may not be as hindered and would continue to operate without receiving a going concern opinion in the near future. Moreover, COVID-19 lockdowns were largely regional in nature and were staggered across time and geographic location. As such, firms may have been able to reallocate resources and business operations to the extent that the overall financial health at the entity level was not cast into *substantial* doubt. Finally, several governmental options for access to liquid capital were available to firms through the largest stimulus bill and most comprehensive aid package in the history of the United States, the American Rescue Plan (Siegel, 2021). As such, firms may have been able to bear the brunt of COVID-19 adverse effects in the short run from cash inflows from the Paycheck Protection Program (PPP) (including loan forgiveness) or low-interest loans from the Small Business Administration (SBA).

A more likely overlooked, but still important, potential effect of this COVID-19 economic uncertainty is likely to have greater impacts on long-run estimations of future expected cash flows, given the long-term window for these estimations (Deloitte, 2020; KPMG, 2020). For example, fair value estimates of non-current assets rely considerably on macro-economic, industry-specific, and firm-level projections and growth rates far into the future (American Institute of CPAs [AICPA], 2003). As such, the economic uncertainty of COVID-19 may present challenges to firms and auditors in assessing potential future impairment risks for non-current assets, particularly when the assets are intangible in nature (Tysiac, 2021; Murphy, 2020). The accounting rules of ASC 350: *Intangibles-Goodwill and Other* present specific rules for firms to annually assess whether the fair value of intangible assets will "more likely than not" dip below the carrying value of the asset. The first step to applying these rules is that managers must estimate whether "facts or circumstances" have changed to the extent that this "more likely than not" dip has actually occurred (i.e., Step One: Qualitative). When these facts or circumstances have changed, a triggering event has occurred, meaning managers must actively recalculate the fair value of intangible assets and consider whether an impairment of the carrying value has occurred (i.e., Step Two: Quantitative). Therefore, one might expect COVID-19 to present a triggering event to firms,

forcing managers to re-evaluate the carrying value of recorded identifiable intangible assets and goodwill.

In addition, the accounting for intangible assets is complex, with fair value measurement being particularly complicated (KPMG, 2019) and the auditor's obligation to verify the fair value measurements of intangible assets is particularly difficult (A.U. Section 328; American Institute of CPAs [AICPA], 2014). Given the uncertainty in input classifications such as industry growth rates, potential macroeconomic policies, and projected consumer demand needed for use in these asset impairment models, verifying the likelihood of impairment by the auditor, whether qualitative or quantitative, would require significant professional judgment and a "critical audit matter" (CAM) disclosure in the auditor report. Practitioner and industry guidance support this outlook in that the American Institute of Certified Public Accountants (AICPA) expects that the most important COVID-19-related issue that impacts publicly traded companies is impairment related to non-financial assets (Noll, 2020; Murphy, 2020) and that "many entities are likely to conclude that triggering events occurred, causing them to perform impairment testing" (American Institute of CPAs [AICPA], 2020).

Given the counterarguments for which accounting fundamentals are more likely to predict a company's likelihood of receiving a COVID-19-related audit report disclosure, we present our hypotheses in the null format.

Hypothesis 1a: *Cash is not associated with the likelihood of receiving a COVID-19 audit report disclosure.*

Hypothesis 1b: *Cash Flows from Operating Activities are not associated with the likelihood of receiving a COVID-19 audit report disclosure.*

Hypothesis 1c: *Intangible Assets are not associated with the likelihood of receiving a COVID-19 audit report disclosure.*

Hypothesis 1d: *Goodwill is not associated with the likelihood of receiving a COVID-19 audit report disclosure.*

3. Research Design and Sample

3.1. COVID-19 Reports

Auditors are required to provide CAM disclosures to firms beginning after 30 June 2019. In these disclosures, auditors provide matters that were difficult to address during the audit and the response by the auditor to address the issue. We begin our investigation of COVID-19 uncertainty by isolating the auditors' report in firms' 10-K filings and utilizing textual analyses to identify instances of COVID-19 mentions in these disclosures. More specifically, we search for the following keywords and relevant stems in the audit report: "COVID", "COVID-19", "coronavirus", "pandemic". We identify audit reports with these mentions as a *COVID REPORT*, which is an indicator variable equal to one when the firm's audit report mentions COVID-19-related key words, and 0 otherwise. We manually review each audit report, utilizing context around the COVID-19 mention for further classifications, which we define later.

3.2. Data and Sample

Table 1 Panel A provides the sample selection criteria for this paper, which begins with the universe of Compustat firm-year observations for necessary accounting fundamental data, then we merge with Audit Analytics to obtain information on auditor-specific characteristics such as Big4 affiliation, auditor tenure, and audit fees as well as audit report

information. We require non-missing audit report dates, which allows us to verify a specific audit report was issued for the firm. We note that the COVID-19 citations in auditor reports primarily stem from auditor disclosures of CAMs, and as such, we limit the testing period from the beginning of the CAM period in the United States of 30 June 2019. This also limits the influence of time-varying characteristics across only 2 fiscal years of data. After requiring non-missing values for all covariates, our sample is reduced to 11,498 firm-year observations across 5651 unique firms.⁴ More broadly, this data and sample configuration allows us to first assess which accounting fundamentals predict the likelihood for a firm to receive these COVID-19-related auditor disclosures. In further analyses of the study, we utilize detailed CAM information from Audit Analytics to assess content of CAM disclosures relating to COVID-19 and stock price and return data from CRSP to assess subsequent impacts to stockholder values.

Panel B provides detailed information on COVID-19 audit reports. This focal group has 403 firm-year observations, which, through manual review, we classify into the sub-grouping classifications of Johnson and Wiley (2019) for accounting estimates, significant accounting estimates, or non-estimates. Of these 403 audit reports, approximately 76% represent audit reports with accounting estimate disclosures. Significant accounting estimates, exclusively, represent 75%. Meanwhile, the remaining 24% are CAMs not addressing accounting estimates.⁵

Panel C describes the COVID-19 audit reports by another classification, accounting topic, and we note that the majority relate to issues of fair value accounting. These 322 COVID-19 mentions represent 80% of all COVID-19 mentions. Other than the 322 fair value accounting audit reports, 63 also relate to either GCOs or emphasis of matter reports, and finally, 18 address matters of historical cost accounting. Overall, this evidence suggests that impairment considerations are the most relevant issues impacting firms with COVID-19 mentions in the audit report. Appendix B demonstrates key examples of audit reports for going concerns, fair value accounting, and historical cost accounting, respectively. Whether there is a specific style to the prose and format in the auditors' disclosure of these COVID-19 mentions is an interesting question, but one outside the scope of this paper, which we encourage future research to investigate.

Panel D provides our sample disaggregated by industry at the one-digit SIC industry level. Overall, the industries are well distributed, with construction, retail, and manufacturing having the largest percentage of the sample at 22.04, 21.06, and 18.17 percent, respectively.

3.2.1. Research Design

Since the determinants of receiving a COVID-19 auditor report are empirical questions, we provide a logit determinant model with right-hand side explanatory variables relating to the major classes of items on the balance sheet, income statement, and statement of cash flows. Equation (1) outlines this specification.

$$\begin{aligned}
 \text{COVID REPORT}_{it} = & \beta_0 + \beta_1 \text{CASH}_{it} + \beta_2 \text{AR}_{it} + \beta_3 \text{INVENTORY}_{it} + \beta_4 \text{PPE}_{it} + \beta_5 \text{INTANGIBLE}_{it} + \beta_6 \text{GOODWILL}_{it} \\
 & + \beta_7 \text{AP}_{it} + \beta_8 \text{DEFERRED REV}_{it} + \beta_9 \text{DEBT}_{it} + \beta_{10} \text{RETAINED EARNINGS}_{it} + \beta_{11} \text{DIVIDENDS}_{it} + \\
 & \beta_{12} \text{COMMON STOCK}_{it} + \beta_{13} \text{REVENUES}_{it} + \beta_{14} \text{COS}_{it} + \beta_{15} \text{SGA}_{it} + \beta_{16} \text{R\&D}_{it} + \beta_{17} \text{CAPEX}_{it} + \\
 & \beta_{18} \text{ADVERTISING}_{it} + \beta_{19} \text{NET INCOME}_{it} + \beta_{20} \text{SPI}_{it} + \beta_{21} \text{CASH FLOWS}_{it} + \lambda_i \text{Industry-FE} + \varepsilon_{it}
 \end{aligned} \tag{1}$$

Table 1. Sample selection criteria.

Panel A:			
Full Sample			
	Sample Filter	Firms	Firm Obs
1	<i>Compustat</i> : 01/01/2018 to 05/31/2021	7553	21,389
2	After merging with <i>AuditAnalytics</i>	6199	16,926
3	Limiting to the Critical Audit Matter (CAM) period Report Date: 06/30/2019 to 05/31/2021	5770	11,740
4	After requiring non-missing values for covariates	5651	11,498
		5651	11,498
Panel B:			
	Covid Audit Reports by Accounting Estimate Type		Firm Obs
1	Significant Accounting Estimates		308
2	Low Estimation Uncertainty Accounting Estimates		3
3	Not Accounting Estimates		92
	Total Covid Audit Reports:		403
Panel C:			
	Covid Audit Reports by Accounting Topic		Firm Obs
1	Fair Value Accounting		322
2	Going Concern / Emphasis of Matter Opinion		63
3	Historical Cost Accounting		18
	Total Covid Audit Reports:		403
Panel D:			
SIC	Sample by SIC 1 digit industry	Firm Obs	Firm Percentage
1	Agriculture	34	0.30%
2	Mining	781	6.79%
3	Construction	2534	22.04%
4	Manufacturing	2089	18.17%
5	Transportation, Communications, Electric	1023	8.90%
6	Wholesale	599	5.21%
7	Retail	2422	21.06%
8	Finance	1495	13.00%
9	Services	395	3.44%
10	Public Administration	126	1.10%
	Total Covid Audit Reports:	11,498	100%

Table 1 presents the sample selection criteria and descriptive details of auditor's reports citing COVID-19 by both accounting topic and accounting estimate type.

The main dependent variable is *COVID REPORT*. Other covariates are measured as the accounting fundamentals scaled by total assets. *CASH* is the firm's cash and cash equivalents (CHE). *AR* is the firm's accounts receivables (RECT). *INVENTORY* is the firm's inventory (INVT). *PPE* is the firm's net property, plant, and equipment (PPENT). *INTANGIBLE* is the firm's intangible assets (INTAN) excluding goodwill (GDWL). *GOODWILL* is the firm's goodwill (GDWL). *AP* is the firm's accounts payable (AP). *DEFERRED REV* is the sum of firm's short-term (DRC) and long-term deferred revenue (DRLT). *DEBT* is the sum of firm's short-term (DLC) and long-term debt (DLTT). *RETAINED EARNINGS* is the firm's retained earnings (RE). *DIVIDENDS* is the firm's dividends (DVC). *COMMON STOCK* is the firm's common stock (CEQ). *REVENUES* is the firm's revenues (REV). *COS* is the firm's cost of sales (COGS). *SGA* is the firm's selling, general, and administrative (XSGA). *R&D* is the firm's research and development costs (XRD). *CAPEX* is the firm's capital

expenditures (CAPX). *ADVERTISING* is the firm’s advertising costs (XAD). *NET INCOME* is the firm’s income before extraordinary items (IB). *SPI* is the firm’s special items (SPI). *CASH FLOWS* is the firm’s cash flows from operating expenses (OANCF). We also include auditor-specific characteristics as outlined in Equation (2). The coefficients on *CASH*, *CASH FLOWS*, *INTANGIBLE*, and *GOODWILL* reflect the tests of our alternating hypotheses.

$$\begin{aligned}
 \text{COVID REPORT}_{it} = & \beta_0 + \beta_1 \text{CASH}_{it} + \beta_2 \text{AR}_{it} + \beta_3 \text{INVENTORY}_{it} + \beta_4 \text{PPE}_{it} + \beta_5 \text{INTANGIBLE}_{it} + \\
 & \beta_6 \text{GOODWILL}_{it} + \beta_7 \text{AP}_{it} + \beta_8 \text{DEFERRED REV}_{it} + \beta_9 \text{DEBT}_{it} + \beta_{10} \text{RETAINED EARNINGS}_{it} + \beta_{11} \text{DIVIDENDS}_{it} + \\
 & \beta_{12} \text{COMMON STOCK}_{it} + \beta_{13} \text{REVENUES}_{it} + \beta_{14} \text{COS}_{it} + \beta_{15} \text{SGA}_{it} + \beta_{16} \text{R\&D}_{it} + \beta_{17} \text{CAPEX}_{it} + \beta_{18} \text{ADVERTISING}_{it} \quad (2) \\
 & + \beta_{19} \text{NET INCOME}_{it} + \beta_{20} \text{SPI}_{it} + \beta_{21} \text{CASH FLOWS}_{it} + \beta_{22} \text{TENURE}_{it} + \beta_{23} \text{BIG4}_{it} + \beta_{24} \text{SPECIALIST}_{it} \\
 & + \beta_{25} \text{AUD OFFICE SIZE}_{it} + \lambda_i \text{Industry-FE} + \varepsilon_{it}
 \end{aligned}$$

The additional covariates in this model are *TENURE*, *BIG4*, *SPECIALIST*, and *AUD OFFICE SIZE*. *TENURE* is the number of years of the current client–auditor relationship. *BIG4* is an indicator variable equal to one if the firm engaged a Big4 auditor during the fiscal year, and 0 otherwise. *SPECIALIST*, an indicator variable equal to one if the auditor is the current market leader in the client firm’s SIC2 digit industry during the year of the audit, and 0 otherwise, is also included in the model, as Stein (2019) demonstrates that firms with auditor industry specialization recognize more, larger, and more timely goodwill and intangible impairments.⁶ *AUD OFFICE SIZE* is the proportion of yearly total audit office fees relative to the yearly total audit fees for the audit market, which captures the proportional size of the audit office to peers since larger audit offices provide higher audit quality (Francis et al., 2013). Also included in the model are industry fixed effects to control for time-invariant industry characteristics at the SIC2 digit industry level.⁷

3.2.2. Endogeneity

As a robustness check, we try to isolate general Covid and epidemic risk from the auditor’s COVID-19 report, since the auditor’s COVID-19-related report disclosures capture general Covid and epidemic risk. We utilize general Covid and epidemic risk measure developed by Hassan et al. (2023). This dataset creates a quantifiable measure that captures discussions by management during conference calls regarding firm-level exposure to COVID-19, SARS, and H1N1. We run a first-stage regression of our COVID-19 audit report measure on the Hassan et al. (2023) firm-year level metric with industry fixed effects. We save the residual from this regression, which captures the portion of the likelihood for a company to receive a COVID-19 audit report disclosure that is unrelated to their firm-level risk exposure to all epidemic diseases and utilize this variable in the reperformance of our main tests. Therefore, based on Equation (3), we regress *COVID_REPORT* on general *COVID-RISK* from Hassan et al. (2023) and obtain the residual, *COVID-RESIDUAL_{it}*, which captures the proportion of the COVID-19 report that is not explained by the general Covid and epidemic risk.

$$\text{COVID REPORT}_{it} = \alpha_0 + \alpha_1 \text{COVID-RISK}_{it} + \lambda_i \text{Industry-FE} + \varepsilon_{it} \quad (3)$$

By using *COVID-RESIDUAL_{it}* as an alternative measure for the Covid Report, we re-estimate our results. In Equation (4), *y_{it}* is replaced with *ACCT ESTIMATE*, *SIG ACCT ESTIMATE*, *AUDIT FEES*, and *ABNORMAL AF*.

$$y_{it} = \beta_0 + \beta_1 \text{COVID-RESIDUAL}_{it} + \tau_{it} \quad (4)$$

Table 2 provides descriptive statistics for the full sample including firms not receiving COVID-19 mentions. We see that approximately 3.5% of the reports during the testing window mention COVID-19. For accounting estimate information, we merge all data

with *Audit Analytics* CAM issues and relate reports to matters reflecting accounting estimates. Unsurprisingly, given the PCAOB requirement that auditors mention in CAMs any challenging, subjective, or complex auditor judgment matter faced during the audit that was communicated or required to be communicated to the audit committee, auditors cite accounting estimates 82% of the time. The remaining covariates are scaled by total assets, which limits the deviations in distributions, and no variable measurements appear to warrant adjustment deeper investigation.

Table 2. Descriptive statistics.

	N	Mean	St.Dev	p25	Median	p75
COVID REPORT	11,498	0.035	0.184	0.000	0.000	0.000
ACCT ESTIMATE	11,498	0.822	0.881	0.000	1.000	2.000
SIG ACCT ESTIMATE	11,498	1.113	1.292	0.000	1.000	3.000
CASH	11,498	0.247	0.283	0.039	0.120	0.360
AR	11,498	0.158	0.207	0.023	0.082	0.186
INVENTORY	11,498	0.057	0.101	0.000	0.005	0.077
PPE	11,498	0.214	0.260	0.019	0.101	0.311
INTANGIBLE	11,498	0.061	0.109	0.000	0.008	0.075
GOODWILL	11,498	0.083	0.135	0.000	0.006	0.114
AP	11,498	0.171	0.388	0.016	0.043	0.113
DEFERRED REV	11,498	0.035	0.087	0.000	0.000	0.023
DEBT	11,498	0.403	0.895	0.059	0.239	0.448
RETAINED EARNINGS	11,498	-4.639	22.256	-0.968	-0.029	0.130
DIVIDENDS	11,498	0.010	0.025	0.000	0.000	0.009
COMMON STOCK	11,498	-0.029	2.519	0.127	0.369	0.605
REVENUES	11,498	0.560	0.632	0.082	0.367	0.791
COS	11,498	0.398	0.513	0.046	0.212	0.548
SGA	11,498	0.347	0.903	0.014	0.105	0.319
R&D	11,498	0.085	0.212	0.000	0.000	0.063
CAPEX	11,498	0.028	0.042	0.002	0.012	0.036
ADVERTISING	11,498	0.008	0.029	0.000	0.000	0.001
NET INCOME	11,498	-0.332	1.385	-0.168	0.004	0.039
SPI	11,498	-0.021	0.097	-0.011	-0.000	0.000
CASH FLOWS	11,498	-0.128	0.644	-0.074	0.032	0.093
TENURE	11,498	6.156	6.010	2.000	4.000	8.000
BIG4	11,498	0.626	0.484	0.000	1.000	1.000
SPECIALIST	11,498	0.155	0.362	0.000	0.000	0.000

Table 2 presents descriptive statistics of all independent and dependent variables for the sample. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix.

4. Empirical Results

Table 3 reports the univariate tests of the main dependent variables and the covariates across audit reports mentioning COVID-19 and the benchmark group. Overall, Panel A shows that COVID-19 reports are highly associated with accounting and significant accounting estimates as opposed to the benchmark group, and this difference is statistically significant at the 1% level. We see that firms receiving COVID-19 audit reports have considerably higher non-current assets, including intangibles and goodwill, in particular. Panel B shows that firms receiving COVID-19 mentions in their reports are associated with higher audit fees and abnormal audit fees. Other univariate tests provide inconsistent evidence about the differences between these two groups; firms receiving COVID-19 reports have less cash but higher accounts receivable, higher accounts payable but fewer expenses, and are more profitable. As such, we turn to multivariate regressions for further investigation.

Table 3. Univariate tests of control variables.

	Before Entropy Balancing						After Entropy Balancing					
	COVID REPORT			NON-COVID REPORT			COVID REPORT			NON-COVID REPORT		
	N	Mean		N	Mean	Diff	t-Stat	***	Mean	Variance	Mean	Variance
ACCT ESTIMATE	403	1.650		11,095	0.791	0.859	(19.55)	***				
SIG ACCT ESTIMATE	403	2.414		11,095	1.066	1.349	(20.95)	***				
CASH	403	0.142		11,095	0.251	-0.110	(-7.65)	***	0.142	0.027	0.142	0.036
AR	403	0.212		11,095	0.157	0.056	(5.30)	***	0.212	0.061	0.212	0.064
INVENTORY	403	0.057		11,095	0.058	-0.001	(-0.15)	*	0.057	0.009	0.057	0.012
PPE	403	0.216		11,095	0.214	0.001	(0.10)		0.216	0.064	0.216	0.073
INTANGIBLE	403	0.082		11,095	0.060	0.022	(3.85)	***	0.082	0.016	0.082	0.020
GOODWILL	403	0.107		11,095	0.083	0.024	(3.50)	***	0.107	0.021	0.107	0.025
AP	403	0.221		11,095	0.169	0.052	(2.65)	***	0.221	0.171	0.221	91.72
DEFERRED REV	403	0.026		11,095	0.036	-0.010	(-2.30)	**	0.026	0.004	0.026	0.005
DEBT	403	0.482		11,095	0.400	0.083	(1.80)	*	0.482	0.603	0.482	1.006
RETAINED EARNINGS	403	-1.723		11,095	-4.745	3.022	(2.70)	***	-1.723	126.1	-1.723	79.83
DIVIDENDS	403	0.008		11,095	0.011	-0.003	(-1.90)	*	0.008	0.000	0.008	0.000
COMMON STOCK	403	0.051		11,095	-0.033	0.083	(0.65)		0.051	2.733	0.051	3.185
REVENUES	403	0.590		11,095	0.559	0.031	(0.95)		0.590	0.595	0.590	0.910
COS	403	0.422		11,095	0.397	0.025	(0.95)		0.422	0.456	0.422	0.761
SGA	403	0.176		11,095	0.353	-0.177	(-3.85)	***	0.176	0.191	0.176	0.094
R&D	403	0.020		11,095	0.088	-0.068	(-6.25)	***	0.020	0.006	0.020	0.004
CAPEX	403	0.019		11,095	0.028	-0.009	(-4.35)	***	0.019	0.001	0.019	0.001
ADVERTISING	403	0.009		11,095	0.009	-0.000	(-0.00)		0.009	0.001	0.009	0.003
NET INCOME	403	-0.144		11,095	-0.340	0.196	(2.80)	***	-0.144	0.503	-0.144	0.378
SPI	403	-0.044		11,095	-0.020	-0.024	(-4.90)	***	-0.044	0.011	-0.044	0.019
CASH FLOWS	403	-0.003		11,095	-0.133	0.130	(4.00)	***	-0.003	0.082	-0.003	0.056
TENURE	403	6.250		11,095	6.152	0.099	(0.30)		6.250	43.13	6.250	40.15
BIG4	403	0.553		11,095	0.629	-0.075	(-3.10)	***	0.553	0.245	0.553	0.247
SPECIALIST	403	0.142		11,095	0.156	-0.014	(-0.75)		0.142	0.122	0.142	0.121
AUD OFFICE SIZE	403	0.005		11,095	0.004	0.000	(0.25)		0.004	0.000	0.004	0.000

Table 3. Cont.

	Before Entropy Balancing						After Entropy Balancing					
	COVID REPORT			NON-COVID REPORT			COVID REPORT			NON-COVID REPORT		
	N	Mean		N	Mean		Mean	Variance	Mean	Variance		
AUDIT FEES	403	14.09		11,095	13.65	0.431						
ABNORMAL AF	403	0.005		11,095	-0.005	-0.010	(5.49)	7.349	6.376	7.344	8.785	
SIZE	403	7.347		11,095	6.411	0.940	(0.27)	0.057	0.009	0.057	0.012	
INVENTORY	403	0.057		11,095	0.059	-0.005	(6.25)	0.213	0.061	0.212	0.065	
AR	403	0.213		11,095	0.157	0.054	(-0.35)	-0.186	2.192	-0.188	32.25	
NET INCOME	403	-0.187		11,095	-2.483	2.29	(-0.55)	0.020	0.006	0.021	0.004	
R&D	403	0.020		11,095	0.323	-0.302	(-0.50)	0.019	0.001	0.019	0.001	
CAPEX	403	0.019		11,095	0.035	-0.016	(-0.80)	0.482	0.603	0.483	1.226	
DEBT	403	0.483		11,095	0.482	0.001	(-1.80)	0.223	0.174	0.223	0.173	
FOREIGN	403	0.224		11,095	0.239	-0.015	(-0.70)	1.955	3.217	1.954	3.385	
SEGMENTS	403	1.960		11,095	1.496	0.465	(6.00)	0.047	0.045	0.047	0.045	
MW	403	0.048		11,095	0.034	0.014	(1.45)	0.007	0.007	0.007	0.007	
RESTATEMENT	403	0.007		11,095	0.084	-0.076	(-5.50)	0.553	0.248	0.553	0.247	
BIG4	403	0.553		11,095	0.629	-0.075	(-3.10)	6.345	43.13	6.343	39.04	
TENURE	403	6.250		11,095	6.152	0.099	(0.30)	0.141	0.122	0.141	0.121	
SPECIALIST	403	0.142		11,095	0.156	-0.014	(-0.75)	0.004	0.000	0.004	0.000	
AUD OFFICE SIZE	403	0.005		11,095	0.004	0.000	(0.25)	9.723	25.60	9.719	26.31	
LN NAF	403	9.723		11,095	8.999	0.724	(2.75)	0.231	0.091	0.231	0.095	
CLIENT IMPORT	403	0.231		11,095	0.258	-0.026	(-0.03)	0.859	0.122	0.859	0.121	
BUSY	403	0.859		11,095	0.830	0.029	(0.02)					

Table 3 presents univariate tests of covariates partitioned across firms receiving auditor reports citing COVID-19 and control firms not receiving auditor reports citing COVID-19. Panel A demonstrates these tests for all covariates in the determinants and accounting estimate models, while Panel B demonstrates these tests for all covariates in the audit fees and abnormal audit fee models, both before and after entropy balancing. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

Table 4 presents the results of tests investigating the determinants of receiving a COVID-19 audit report. Turning to Column (1), we test our main empirical question using a logit regression where the main dependent variable, *COVID REPORT*, is equal to one when the audit report mentions COVID-19, and 0 otherwise. In this model, we control for the predominant and potentially relevant balance sheet, income statement, and cash flow items. Turning to the results, we see that high levels of intangibles and goodwill are associated with COVID-19 audit reports. We see similar results in Column (2), where we also include auditor-level factors. The statistically significant coefficients on *INTANGIBLES* and *GOODWILL*, 0.036^* and 0.044^{***} , suggest a rejection of the null hypotheses 1c and 1d, while the lack of statistical significance for *CASH* and *CASH FLOWS* suggests that we cannot reject the null hypotheses in 1a and 1b. We interpret these results to mean that, of the accounting fundamentals, only long-term intangible assets and goodwill are predictive of receiving an audit report citing COVID-19. In terms of economic significance, the regression coefficient on *GOODWILL*, for example, indicates that a one unit increase in the ratio of goodwill to total assets increases the likelihood of the receiving a COVID-19-related audit disclosure in the audit report by approximately 1.1%.⁸ Further, the negative and statistically significant coefficient of -0.012^{***} on the Big4 variables suggests that firms with Big4 auditors are less likely to receive a COVID-19 audit report. Given that firms with Big4 auditors are typically of higher quality (Lawrence et al., 2011), this result more likely suggests that firms of non-Big4 auditors are of generally lower quality or lower financial health and, as such, are more impacted by COVID-19.

Table 4. COVID-19 audit report prediction.

	(1) COVID REPORT	(2) COVID REPORT
<i>CASH</i>	−0.006 (−0.52)	−0.007 (−0.57)
<i>AR</i>	−0.005 (−0.33)	−0.008 (−0.48)
<i>INVENTORY</i>	0.008 (0.33)	0.003 (0.15)
<i>PPE</i>	0.018 (1.37)	0.019 (1.45)
<i>INTANGIBLE</i>	0.039 ** (2.07)	0.036 * (1.89)
<i>GOODWILL</i>	0.037 ** (2.15)	0.044 ** (2.54)
<i>AP</i>	0.000 (0.84)	0.000 (0.81)
<i>DEFERRED REV</i>	−0.002 (−0.39)	−0.003 (−0.49)
<i>DEBT</i>	0.000 (0.51)	0.000 (0.46)
<i>RETAINED EARNINGS</i>	0.001 (0.34)	0.001 (0.38)
<i>DIVIDENDS</i>	−0.006 (−1.30)	−0.006 (−1.28)

Table 4. *Cont.*

	(1) COVID REPORT	(2) COVID REPORT
COMMON STOCK	0.000 (0.47)	0.000 (0.42)
REVENUES	0.003 (0.99)	0.003 (0.98)
COS	0.000 (0.20)	0.000 (0.10)
SGA	0.000 (0.21)	0.000 (0.21)
R&D	0.000 (0.34)	0.000 (0.41)
CAPEX	−0.016 (−1.45)	−0.016 (−1.48)
ADVERTISING	−0.012 (−0.57)	−0.011 (−0.54)
NET INCOME	0.000 (0.21)	0.000 (0.21)
SPI	0.000 (0.18)	0.000 (0.20)
CASH FLOWS	0.000 (0.28)	0.000 (0.42)
TENURE		−0.000 (−0.25)
BIG4		−0.012 *** (−2.83)
SPECIALIST		0.001 (0.12)
AUD OFFICE SIZE		0.170 (0.85)
CONSTANT	0.026 *** (2.90)	0.033 *** (3.53)
Observations	11,498	11,498
Ind FE	YES	YES
Pseudo R-squared	0.019	0.019

The dependent variable is an indicator variable equal to one if the firm’s audit report cited COVID-19. Table 4 presents the results of the logit regressions of *COVID REPORT* on firm fundamentals. The models are run using heteroskedasticity-robust standard errors. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

In Table 5, we examine the association between COVID-19 audit reports with Types of Matters addressed in the audit report. In Column (1), the main dependent variable of interest is the variable *ACCT ESTIMATE*, which is an indicator variable equal to one if an audit report relates to an accounting estimate and zero otherwise. In Column (2), the main dependent variable of interest is the variable *SIG ACCT ESTIMATE*, which is a discrete, ordinal variable equal to 2 if the audit report mentions a significant accounting estimate, 1 if the audit report relates to an accounting estimate with low estimation on certainty, and zero otherwise. In both specifications, the main variable of interest, COVID-19 report, is positively associated with both accounting estimates and significant accounting estimates and this relationship is statistically significant at the 1% level.⁹

Table 5. Probit/ordered probit regressions of CAM content.

	(1) ACCT ESTIMATE	(2) SIG ACCT ESTIMATE
<i>COVID REPORT</i>	1.316 *** (14.41)	1.348 *** (18.73)
<i>CASH</i>	−0.533 *** (−5.69)	−0.777 *** (−9.07)
<i>AR</i>	−0.480 *** (−3.97)	−0.401 *** (−3.66)
<i>INVENTORY</i>	−0.812 *** (−4.42)	−0.935 *** (−5.58)
<i>PPE</i>	0.178 * (1.67)	−0.144 (−1.50)
<i>INTANGIBLE</i>	−0.468 *** (−3.23)	−0.342 *** (−2.61)
<i>GOODWILL</i>	1.073 *** (8.13)	0.889 *** (7.61)
<i>AP</i>	0.042 *** (4.00)	0.026 ** (2.12)
<i>DEFERRED REV</i>	−0.021 (−0.27)	−0.142 (−1.45)
<i>DEBT</i>	0.006 ** (1.97)	0.012 *** (3.05)
<i>RETAINED EARNINGS</i>	0.703 ** (2.52)	0.320 (1.37)
<i>DIVIDENDS</i>	0.004 (0.10)	0.010 (0.27)
<i>COMMON STOCK</i>	0.001 (0.34)	0.005 (1.49)
<i>REVENUES</i>	−0.021 (−0.63)	−0.035 (−1.14)
<i>COS</i>	−0.044 (−1.46)	−0.010 (−0.35)
<i>SGA</i>	−0.012 (−1.02)	0.015 (1.22)
<i>R&D</i>	−0.247 *** (−4.55)	−0.198 *** (−3.98)
<i>CAPEX</i>	−1.679 *** (−5.49)	−1.406 *** (−4.53)
<i>ADVERTISING</i>	−0.341 (−1.59)	−0.283 (−1.43)
<i>NET INCOME</i>	−0.013 (−1.15)	0.014 (1.15)
<i>SPI</i>	−0.003 (−0.23)	−0.034 ** (−2.53)
<i>CASH FLOWS</i>	0.058 *** (4.34)	0.036 *** (3.02)
<i>TENURE</i>	0.029 *** (12.85)	0.023 *** (12.48)
<i>BIG4</i>	0.916 *** (29.32)	0.822 *** (28.37)
<i>SPECIALIST</i>	0.065 * (1.71)	0.085 *** (2.60)
<i>AUD OFFICE SIZE</i>	0.674 (0.48)	0.017 (0.01)
Observations	11,498	11,498
Ind FE	YES	YES
Pseudo R-squared	0.140	0.134

The dependent variables indicator variable or discrete ordinal variables equal to one (one or two) if the firm's audit report had critical audit matters relating to accounting estimates (significant accounting estimates). Table 4 presents the results of the logit regressions of *COVID REPORT* on firm fundamentals. The models are run using heteroskedasticity-robust standard errors. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

In Table 6, we investigate whether the determinants of receiving a COVID-19 audit report relating to the sub-classifications of accounting topic are similar to or different from the likelihood of receiving a general COVID-19 audit report. We, therefore, separate

our COVID-19 audit report measure into those mentioning fair value accounting matters, going concern matters, and historical cost accounting matters, respectively. In determining expectations, we refer to the descriptive statistics in Table 1, which suggest that fair value accounting represents the largest classification of COVID-19 mentions. As such, the results of fair value accounting tests in Column (1) may show similar findings to Table 4. However, there could be fundamental differences in determinants for the other two accounting types. As such, we report the determinants of going concerns and historical cost accounting in Table 6 as well as in Columns (2) and (3), respectively. In these specifications, we see that goodwill continues to have a positive and significant relationship with receiving COVID-19 audit reports relating to fair value accounting matters and going concern matters. Other results from Column (2) are mixed. On one hand, contrary to expectations, cash on hand is predictive of receiving a COVID-19 going concern matter disclosure; however, in line with expectations, firms able to pay dividends are less likely to receive these same disclosures. Consistent with Table 4 results, firms with Big4 auditors are less likely to experience going concern matters since they are typically of higher quality (Lawrence et al., 2011).

We find no specific determinant for historical cost matters at the 5% statistical level. Overall, since COVID-19 reports related largely to fair value accounting, our evidence suggests that COVID-19 impacted firms with high levels of goodwill the most. This is consistent with the idea that the uncertainty around COVID-19 resulted in a triggering event for firms, meaning that they needed to perform qualitative or quantitative assessments of goodwill for potential impairment in accordance with FASB ASC 350 (i.e., impairment consideration). In the next table, we investigate the influence of these issues on the auditing costs for firms.

Recent literature suggests that CAMs provide information to investors (PCAOB, 2017; Christensen et al., 2014), which suggests that COVID-19 reports should provide new information to investors. Since literature suggests that disclosure helps reduce the cost of capital (Barth et al., 2013; Verrecchia, 1983), if the COVID-19 audit report disclosures present additional information, then investors are likely to incorporate this COVID-19 information into firm values (PCAOB, 2017). As such, one would expect differential market reactions following a *COVID REPORT* issuance. Given the disclosure literature, we might expect increased trading regardless of the sign of the information, as investors' perception of firm value reflects the true cost of capital values, and therefore, abnormal returns for firms with COVID-19-related audit report disclosures should be greater than benchmark firms. To perform this analysis, we estimate the daily expected returns from the market model, as outlined below, for each firm over the -300 to -46 period before the report issuance, where R_{it} is the daily stock market returns for firm i in time t and R_{mt} is the value weighted stock market return as defined in CRSP¹⁰.

$$R_{it} = \beta_0 + \beta_1 R_{mt} + \varepsilon_{it} \quad (5)$$

After outlining these benchmark expected returns, we estimate the daily abnormal returns for each firm during the $(-3, +3)$ period relative to the issuance date of the audit report.¹¹ Figure 1 presents the graphical analysis of these daily abnormal returns for firms with COVID-19 mentions and non-COVID report firms, which are enlightening. In this graph, the daily abnormal returns between the focal and control groups are relatively similar up until the issuance date of the audit report where *COVID REPORT* firms have a slight increase on the issuance date and then a 2-basis point increase on the day following audit report issuance. Meanwhile, the increase in daily abnormal return for the benchmark group of firms increases only approximately one tenth of one basis point, which suggests that audit reports mentioning COVID-19 provided considerably more information for investors. Interestingly, for *COVID REPORT* firms, there is a reversion in daily abnormal

returns in the two and three days following the audit report issuance, suggesting that as this COVID-19 information was incorporated into stock prices, the ability of investors to obtain *abnormal* returns declined. Overall, however, the daily abnormal returns are still considerably higher for these focal firms over the 3-day period than for those firms in the benchmark groups, even following incorporation of this information into investors' expectations of firm values.

Table 6. COVID-19 audit report content by accounting topic prediction.

	(1) COVID REPORT FAIR VALUE	(2) COVID REPORT GCO	(3) COVID REPORT HISTORICAL
CASH	−0.014 (−1.31)	0.011 ** (2.19)	−0.003 (−1.26)
AR	−0.005 (−0.32)	0.003 (0.49)	−0.006 * (−1.77)
INVENTORY	−0.011 (−0.54)	0.011 (1.17)	0.004 (0.73)
PPE	0.002 (0.13)	0.019 *** (3.45)	−0.001 (−0.26)
INTANGIBLE	0.021 (1.24)	0.020 *** (2.59)	−0.005 (−1.26)
GOODWILL	0.031 ** (1.96)	0.016 ** (2.25)	−0.002 (−0.62)
AP	0.000 (0.67)	0.000 (0.47)	0.000 (0.07)
DEFERRED REV	−0.002 (−0.37)	−0.001 (−0.32)	−0.000 (−0.15)
DEBT	0.000 (0.36)	0.000 (0.38)	−0.000 (−0.04)
RETAINED EARNINGS	0.000 (0.20)	0.000 (0.42)	0.000 (0.14)
DIVIDENDS	−0.001 (−0.24)	−0.005 *** (−2.61)	−0.000 (−0.10)
COMMON STOCK	0.000 (0.32)	0.000 (0.36)	−0.000 (−0.03)
REVENUES	−0.000 (−0.16)	0.004 *** (2.92)	−0.000 (−0.23)
COS	−0.000 (−0.22)	0.001 (0.69)	0.000 (0.11)
SGA	0.000 (0.17)	0.000 (0.14)	0.000 (0.03)
R&D	0.000 (0.36)	0.000 (0.13)	0.000 (0.15)
CAPEX	−0.012 (−1.21)	−0.004 (−0.85)	−0.001 (−0.22)
ADVERTISING	−0.009 (−0.51)	−0.001 (−0.14)	−0.001 (−0.12)
NET INCOME	0.000 (0.16)	0.000 (0.16)	0.000 (0.02)
SPI	0.000 (0.08)	0.000 (0.30)	0.000 (0.06)
CASH FLOWS	0.000 (0.53)	−0.000 (−0.25)	0.000 (0.20)
TENURE	−0.000 (−0.07)	−0.000 (−0.94)	0.000 (0.87)
BIG4	0.000 (0.11)	−0.013 *** (−7.62)	0.001 (0.66)
SPECIALIST	0.000 (0.02)	0.003 (1.24)	−0.002 * (−1.83)
AUD OFFICE SIZE	0.147 (0.82)	0.025 (0.31)	−0.003 (−0.07)
CONSTANT	0.029 *** (3.40)	0.001 (0.26)	0.004 * (1.73)
Observations	11,497	11,497	11,497
Ind FE	YES	YES	YES
Pseudo R-squared	0.020	0.012	0.003

The dependent variable is an indicator variable equal to one if the firm's audit report cited COVID-19 and that citation related to a fair value accounting issue, going concern issue, or historical cost issue, respectively. Table 6 presents the results of the logit regressions of *COVID REPORT-FV* on firm fundamentals. The models are run using heteroskedasticity-robust standard errors. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. ***, **, and * denote significance levels of 1%, 5%, and 10%, respectively.

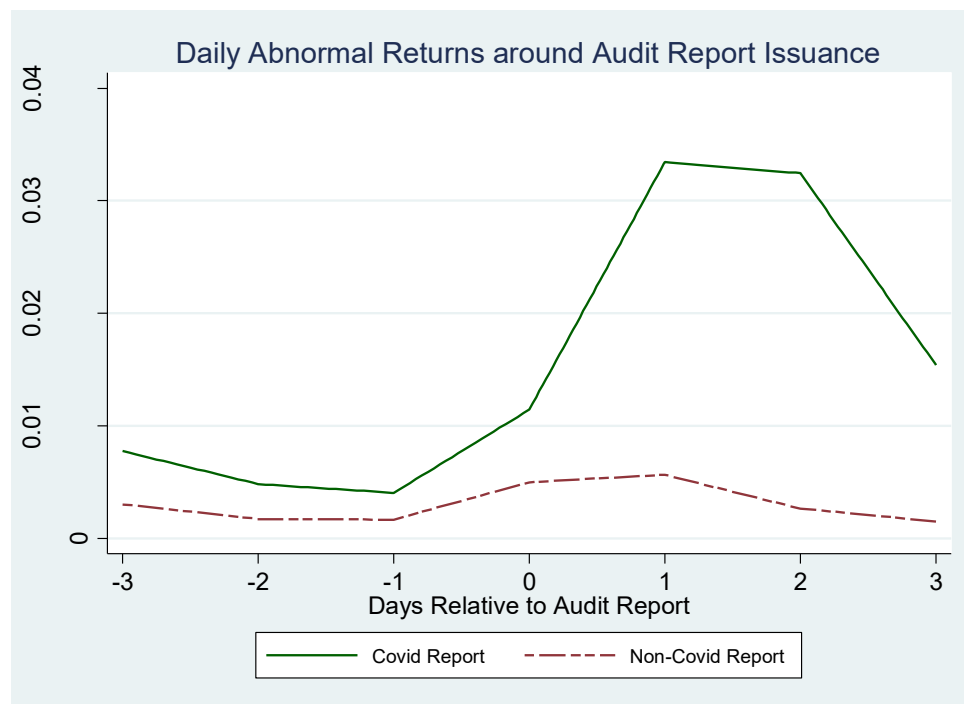


Figure 1. Daily abnormal returns around COVID-19 Reports and non-COVID-19 reports. Figure 1 illustrates the daily abnormal returns three days before and three days after the date of audit report issuance for firms with Covid Reports and Non-Covid Reports.

An important consideration for this study is whether these abnormal returns are significant. As such, we provide OLS regressions of these CARs on the key independent variable of interest, *COVID REPORT*, and controls, as described in Equation (4) below, to capture the extent to which abnormal returns for these focal firms are greater than those benchmark firms over the designated window. The control variables for the model represent those accounting fundamentals, capital market metrics, and other factors noted in recent event studies investigating auditing outcomes (Berglund, 2020; Kim & Klein, 2017).

$$CAR = \beta_0 + \beta_1 COVID-REPORT_{it} + \beta_2 SIZE_{it} + \beta_3 NET\ INCOME_{it} + \beta_4 DEBT_{it} + \beta_5 MCAP_{it} + \beta_6 MTB_{it} + \beta_7 NYSE_{it} + \beta_8 AMEX_{it} + \beta_9 NASDAQ_{it} + \beta_{10} Z-SCORE_{it} + \beta_{11} BIG4_{it} + \lambda_1 Industry-FE + \epsilon_{it} \quad (6)$$

Table 7 presents the regressions mirroring Figure 1 after controlling for company size, leverage, profitability, market-to-book, likelihood of bankruptcy, auditor quality, and exchange listing. In both panels, Column (1) relates to the pre-report issuance period (−3, −1), Column (2) relates to the date of the report issuance (0, 0), and Column (3) relates to the post-report issuance period (+1, +3). We find that CARs are indistinguishable between the focal and benchmark groups in the pre-issuance period and on the issuance date, but statistically significant at the 10% level in the post-issuance period, as demonstrated by the coefficient of 0.073 on *COVID REPORT*. For context, the coefficient on *COVID REPORT* in Model (3) suggests that focal firms have CARs that are 7.3 basis points higher than benchmark firms. Overall, these results support the idea that audit reports with COVID-19 mentions provide information useful to investors.

Table 7. Investor reactions around audit report issuances.

CAR	(1) (−3,−1) Pre	(2) (0,0) Filing Day	(3) (+1,+3) Post
<i>COVID REPORT</i>	0.008 (0.27)	0.005 (0.39)	0.073 * (1.80)
Controls	YES	YES	YES
Observations	4464	4464	4464
Ind FE	YES	YES	YES
Adjusted R-squared	0.019	0.003	0.003

The dependent variables are the Cumulative Abnormal Returns from the market model during the pre-report date period, the date of the report, or the post-report date period. This table presents the regression results of CARs on an indicator variable equal to one if the firm’s audit report cited COVID-19. The models are run using heteroskedasticity-robust standard errors. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. * denotes a significance level of 10%.

We further explore the relationship of abnormal returns around audit report issuances in Figures 2 and 3.¹² Figure 2 explores the cross-sectional variation in abnormal returns around audit report issuances for firms with *Covid Reports* and Non-Covid Reports contingent on financial statement performance. Panel A reports the average abnormal returns for firms reporting net income or net losses; Panel B reports the average abnormal returns for firms with clean or restated financial statements; and Panel C reports the average abnormal returns for firms with clean or going concerns. In all panels, consistent with the results of Figure 2, *COVID REPORT* firms with positive financial performance drive the abnormal returns following audit report issuances. For example, *COVID REPORT* firms that are not financially restated have daily abnormal returns that increase from 3 basis points to 11 basis points during the (0,+3) window.

We next investigate market reactions contingent on the content of the CAM disclosures. Figure 3 explores these cross-sectional variations in abnormal returns around audit report issuances for firms with *COVID REPORTS* and Non-Covid Reports. Panel A reports the cross-sectional variation of abnormal returns for firms with audit opinions citing no accounting estimates, accounting estimates with low estimation uncertainty, and significant accounting estimates; Panel B reports the cross-sectional variation of abnormal returns for firms with *COVID REPORTS* citing or not citing impairment considerations, and Non-Covid Reports; and Panel C reports the cross-sectional variation of abnormal returns for firms with *COVID REPORTS* citing fair value issues, *COVID REPORTS* not citing fair value issues, and Non-Covid Reports. Similarly consistent with the prior figures, *COVID REPORT* firms not addressing fair value or impairment considerations have the highest daily abnormal returns, reaching as high as 20 and 22.5 basis points in Panels B and C, respectively. Furthermore, Panel A results suggest that COVID-19 mentions provide information content, which is utilized by investors since firms with significant accounting estimate disclosures and non-accounting estimates have considerable positive (negative) abnormal returns. Panels B and C demonstrate that the abnormal returns are concentrated in firms when disclosures are more likely to present new information to investors.

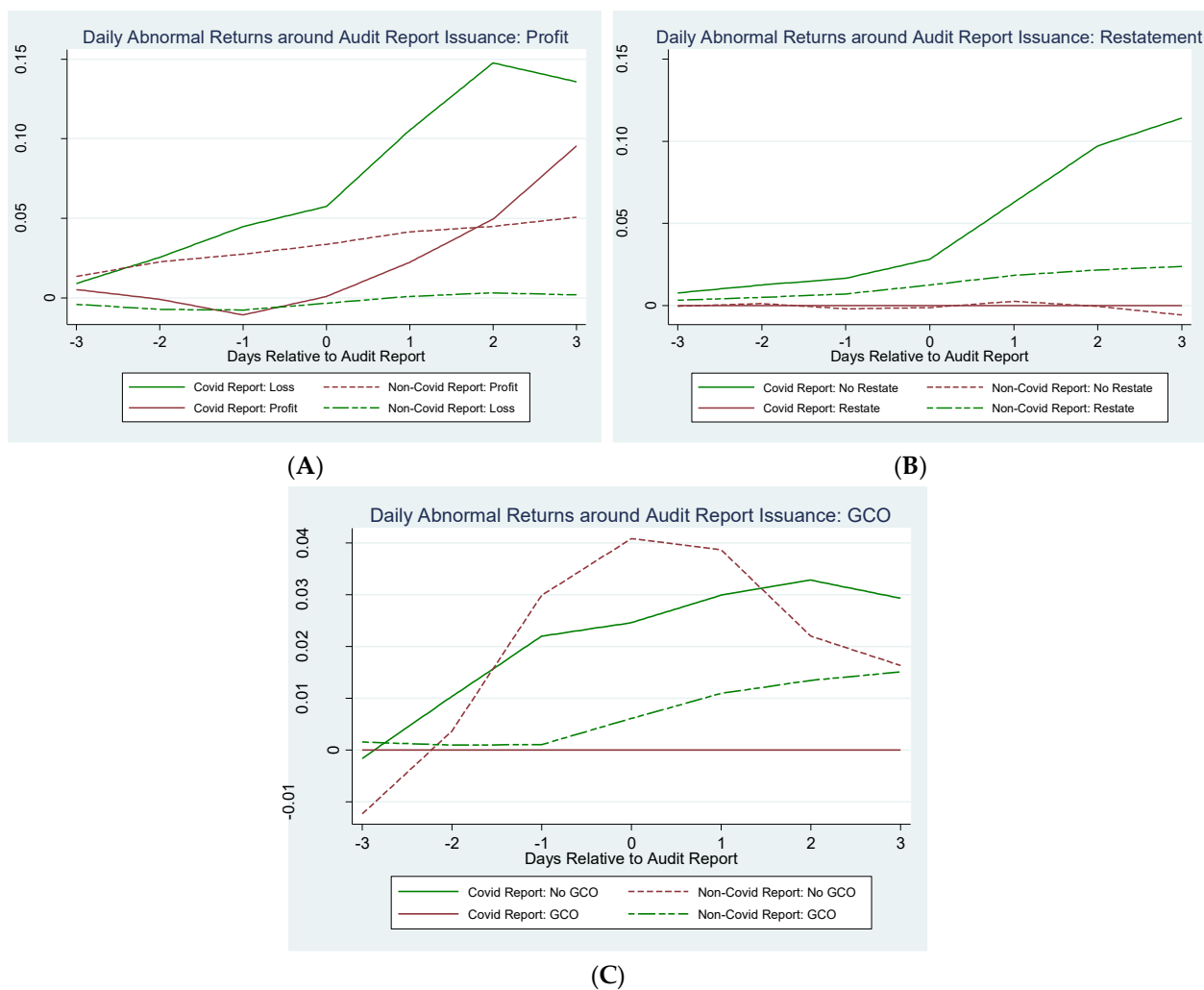


Figure 2. Cross-sectional variation around financial statement performance. Figure 2 illustrates the daily abnormal returns three days before and three days after the date of audit report issuance for firms with *Covid Reports* and *Non-Covid Reports*, contingent on financial statement performance. Panel (A) reports the cross-sectional variation of abnormal returns for firms reporting net income or net losses. Panel (B) reports the cross-sectional variation of abnormal returns for firms with clean or restated financial statements. Panel (C) reports the cross-sectional variation of abnormal returns for firms with clean or going concern opinions.

Table 8 investigates the subsequent economic effects to audit costs for firms impacted by COVID-19. Columns (1)–(3) investigate the association between firms receiving various COVID-19 audit reports and their audit fees, while Columns (4)–(6) investigate the association between firms receiving various COVID-19 audit reports and their abnormal audit fees. To adequately test this association, we utilize a modified version of well-accepted audit fee specifications (Guo et al., 2022; Blankley et al., 2012; Simunic, 1980) as follows:

$$\begin{aligned}
 \text{Audit Fees or Abnormal Audit Fees} = & \beta_0 + \beta_X \text{COVID-REPORT}_{it} + \beta_1 \text{SIZE}_{it} \\
 & + \beta_2 \text{INVENTORY}_{it} + \beta_3 \text{AR}_{it} + \beta_4 \text{NET INCOME}_{it} + \beta_5 \text{R\&D}_{it} + \beta_6 \text{CAPEX}_{it} \\
 & + \beta_7 \text{DEBT}_{it} + \beta_8 \text{FOREIGN}_{it} + \beta_9 \text{SEGMENTS}_{it} + \beta_{10} \text{MW}_{it} + \beta_{11} \text{RESTATEMENT}_{it} \quad (7) \\
 & + \beta_{12} \text{BIG4}_{it} + \beta_{13} \text{TENURE}_{it} + \beta_{14} \text{SPECIALIST}_{it} + \beta_{15} \text{AUD OFFICE SIZE}_{it} + \\
 & \beta_{16} \text{LN NAF}_{it} + \beta_{17} \text{CLIENT IMPORT}_{it} + \beta_{18} \text{BUSY}_{it} + \lambda_i \text{Industry-FE} + \varepsilon_{it}
 \end{aligned}$$

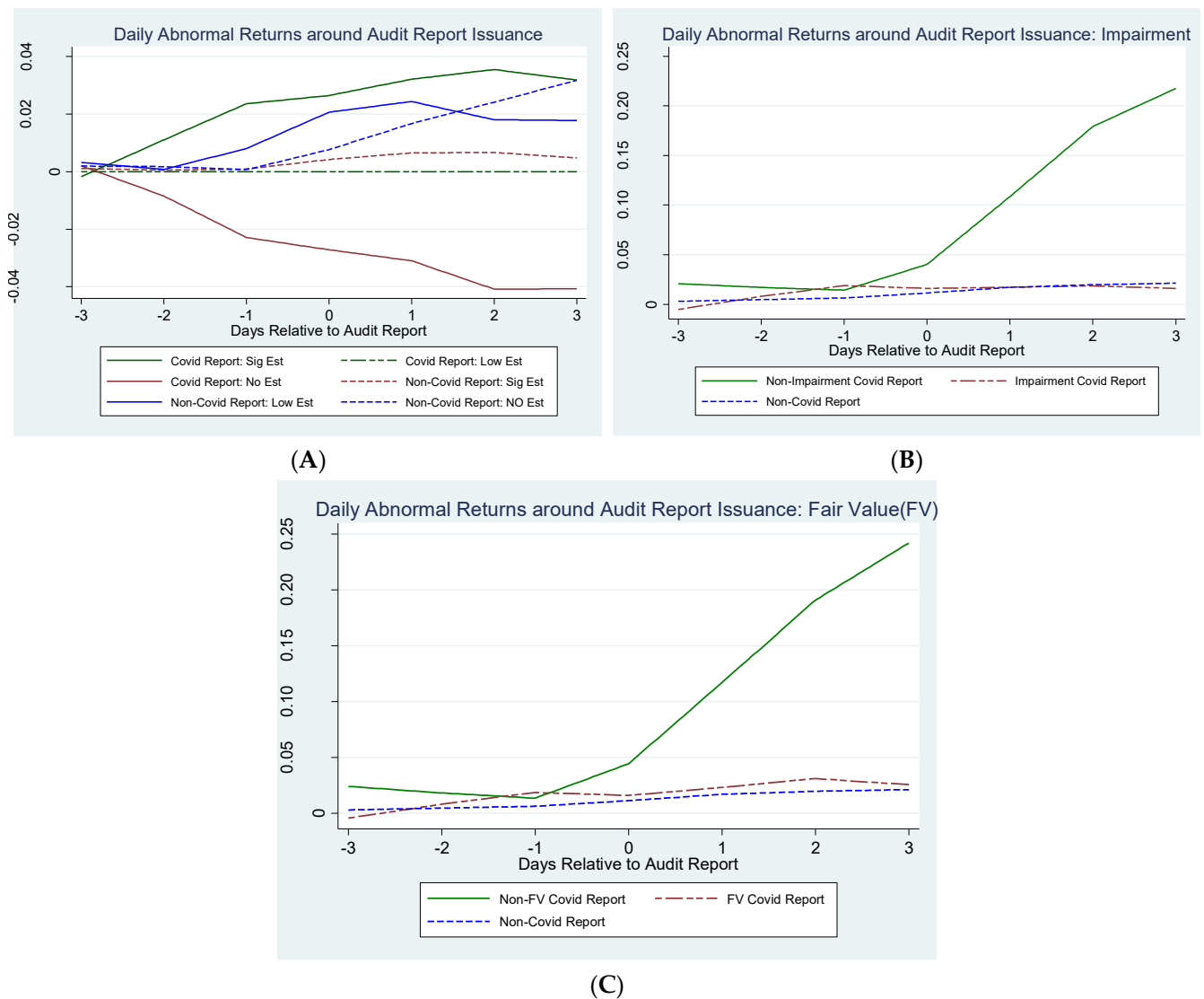


Figure 3. Cross-sectional variation around CAM content. Figure 3 illustrates the daily abnormal returns three days before and three days after the date of audit report issuance for firms with *Covid Reports* and *Non-Covid Reports*, contingent on critical audit matter content. Panel (A) reports the cross-sectional variation of abnormal returns for firms with audit opinions citing no accounting estimates, accounting estimate with low estimation uncertainty, and significant accounting estimates. Panel (B) reports the cross-sectional variation of abnormal returns for firms with *Covid Reports* citing or not citing impairment considerations, and *Non-Covid Reports*. Panel (C) reports the cross-sectional variation of abnormal returns for firms with *Covid Reports* citing fair value issues, *Covid Reports* not citing fair value issues, and *Non-Covid Reports*.

In Equation (7) above, $\beta_X \text{COVID-REPORT}_{it}$ represents a vector of possible indicator variables relating to receiving a COVID-19 audit report, dependent on the specification. We investigate this association across three levels of COVID-19 report content: *COVID REPORT*, *COVID REPORT—IMPAIRMENT*, *COVID REPORT—FV*, and *COVID REPORT—GCO*. Overall, the model controls for size, complexity, and risk (O’Keefe et al., 1994), profitability (*NET INCOME*), risk taking (*R&D*; *CAPEX*), which are the main demand side determinants, and for supply side, auditor-related variables such as audit quality outcomes (*MW*; *RESTATEMENT*), auditor quality (*BIG4*; *TENURE*; *SPECIALIST*; *AUD OFFICE SIZE*), auditor independence (*CLIENT IMPORT*), and engagement-specific qualities (*BUSY*). All variable definitions are included in the appendix. In Column (1), we first investigate

the association of receiving a COVID-19 report with audit fees. In Column (2), we test the association of receiving a COVID-19 report focused on asset impairments with audit fees. Finally, in Column (3), we further disaggregate the COVID-19 reports into fair value and GCO reports. The coefficient on *COVID REPORT* and Column (1) suggests that these firms are associated with 18.8% higher audit fees compared to those not receiving these COVID-19 audit reports.¹³ In economic terms, this represents an association of USD 452,000 higher audit fees for these focal firms relative to Non-Covid report firms.¹⁴ The results of Column (2) suggest that firms receiving COVID-19 reports relating to asset impairments are associated with 25.6%, or USD 673,000, higher audit fees relative to the firms not receiving a COVID-19 report and those receiving COVID-19 reports unrelated to asset impairments. The results in Column (3) suggest that both firms receiving COVID-19 reports relating to fair value matters and those relating to going concerns matters are associated with high audit fees as well. The 2.75 F-statistic demonstrates a statistical difference between these two coefficients, suggesting that while fair value-related COVID-19 reports require additional fees charged by the auditor, receiving a COVID-19 report about going concern issues requires even higher audit costs.

Table 8. COVID-19 audit report and auditor fees.

	(1) AUDIT FEES	(2) AUDIT FEES	(3) AUDIT FEES	(4) ABNORMAL AF	(5) ABNORMAL AF	(6) ABNORMAL AF
<i>COVID REPORT</i>	0.172 *** (5.05)			0.081 *** (2.73)		
<i>COVID REPORT—IMPAIRMENT</i>		0.256 *** (5.01)			0.131 *** (2.93)	
<i>COVID REPORT—FV</i>			0.153 *** (4.02)			0.057 * (1.73)
<i>COVID REPORT—GCO</i>			0.305 *** (3.63)			0.205 *** (2.80)
F-test: $\beta_2 = \beta_3$			F = 2.75; p = 0.10			F = 3.41; p = 0.06
Controls	YES	YES	YES	YES	YES	YES
Observations	11,498	11,498	11,498	11,498	11,498	11,498
Ind FE	YES	YES	YES	YES	YES	YES
Adjusted R-squared	0.823	0.823	0.823	0.369	0.369	0.369

The dependent variable is the natural logarithmic transformation of audit fees and abnormal audit fees as defined in Blankley et al. (2012). Table 8 presents the results of the OLS regressions of audit fees on *COVID REPORT*, *COVID REPORT—IMPAIRMENT*, or *COVID REPORT—FV* & *COVID REPORT—GCO* and control variables. The models are run using heteroskedasticity-robust standard errors. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. *** and * denote significance levels of 1% and 10%, respectively.

The results in Columns (4)–(6) largely support those in Columns (1)–(3). As discussed in the literature (Blankley et al., 2012), abnormal audit fees represent the audit fee premium extracted from the client beyond the normal amount necessary to perform the audit (Doogar et al., 2015; Hribar et al., 2014). Therefore, the abnormal audit fee dependent variable in Table 8 represents those audit costs once we remove the portion of audit costs typically necessary to perform the audit. Therefore, as expected, the magnitudes of the coefficients for these models are smaller than those for the audit fee models. For example, firms receiving COVID-19 audit reports are associated with approximately 8% higher abnormal audit fees. Overall, the results of Table 8 suggest that COVID-19 uncertainty had economic consequences for the audit process and for audit costs for those firms receiving COVID-19 audit reports.

5. Sensitivity Analyses and Discussion

5.1. Entropy Balancing

In Section 5, we investigate the sensitivity of our current analyses to specifications outside of the main research design. Table 9 demonstrates the results from these additional models when we utilize entropy balancing in an attempt to control for systematic differences in observables between firms receiving COVID-19 reports and those not receiving COVID-19 reports. We follow Hainmueller (2012) to reweight and balance all covariates in the accounting estimate or audit fee models, respectively, in the tests of Table 9.¹⁵ After entropy balancing on the first and second moments, the means and variances are reweighted for each covariate between the focal and benchmark firm groups.¹⁶ We utilize the standard, and we see that the results are consistent with the main findings. For example, the coefficient on *COVID REPORT* in the abnormal audit fee model decreases to 0.081*** from 0.082*** in Table 8, suggesting that differences in observable characteristics do not drive our main findings. Overall, this suggests that our main findings are not sensitive to pre-existing, systematic differences in these key determinants.

Table 9. Sensitivity analysis: entropy balancing.

	(1) ACCT ESTIMATE	(2) SIG ACCT ESTIMATE	(3) AUDIT FEES	(4) ABNORMAL AF
<i>COVID REPORT</i>	0.784 *** (56.18)	1.215 *** (57.23)	0.154 *** (14.34)	0.082 *** (8.57)
Accounting Estimate Controls	YES	YES		
Audit Fee Model Controls			YES	YES
Observations	11,498	11,498	11,498	11,498
Ind FE	YES	YES	YES	YES
Pseudo/Adjusted R-squared	0.374	0.378	0.875	0.368

By column, the dependent variables are an indicator variable equal to one if the firm’s audit report had a critical audit matter relating to an accounting estimates, a discrete ordinal variable equal to one if the accounting estimate had a low level of estimation uncertainty and two if the estimate had a high level of estimation uncertainty, the natural logarithmic transformation of audit fees, and abnormal audit fees as defined in Blankley et al. (2012). Table 9 presents the results of the OLS regressions in Tables 5 and 8, reperformed after reweighting all covariates in the accounting estimates and audit fee models based on entropy balancing techniques of Hainmueller (2012). The models are run using heteroskedasticity-robust standard errors. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. *** denotes a significance level of 1%.

5.2. General COVID-19 Risk and Endogeneity

Thus far, we have posited that COVID-19 audit reports empirically proxy the uncertainty imposed by COVID-19. However, one concern with this assumption is that the COVID-19 mention may effectively capture firm’s direct economic risk due to epidemics rather than the imposed uncertainty. As such, we next investigate whether the COVID-19 mentions in the audit report are unique to the addressed matter or if the mention simply captures epidemic-related risks. We obtain data on epidemic risks used in Hassan et al. (2023) from Tarek Hassan’s website, merge these data with our main sample, and reperform several tests in our data.¹⁷ We first assess the relation of their measure with ours, finding a pairwise correlation coefficient of 0.091*** [untabulated], which suggests that though the two measures are statistically correlated, the low magnitude of the correlation coefficient suggests that the variables are not wholly overlapping due to the various channels through which COVID-19 impacted businesses.¹⁸ Turning to determinants of Hassan et al. (2023) “Covid and Epidemic Risk” measure, high levels of current assets are predictors of COVID risk, while high levels of intangible assets and goodwill are not. This provides further evidence that our measures are capturing differential impacts to firms from COVID-19. Next, we attempt to isolate the COVID-19 mentions in the audit report from general pandemic risk by preparing a two-stage model, in Table 10, wherein we first regress our *COVID REPORT* metric on the Hassan et al. (2023) “Covid and Epidemic Risk”

measure, obtain the residuals, *COVID_RESIDUAL*, from the specification, and reperform the analyses of Table 4, Table 5, and Table 8 using this residual metric. Equations (3) and (4) show the first-stage and second-stage models, while Table 9 displays the results from the second-stage specifications.

Table 10. Endogeneity: analysis excluding general epidemic risk (Hassan et al., 2023).

	(1) 1st Stage	(2)	(3) 2nd Stage	(4)
	COVID REPORT	ACCT ESTIMATE	SIG ACCT ESTIMATE	AUDIT FEES
<i>COVID-RISK</i>	0.334 *** (3.88)			
<i>COVID_RESIDUAL</i>		0.338 *** (20.61)	0.334 *** (20.91)	0.039 *** (5.39)
Determinants Model Controls	YES		YES	
Accounting Estimate Controls		YES		
Audit Fee Model Controls				YES
Observations	11,034	11,034	11,034	11,034
Ind FE	YES	YES	YES	YES
Adjusted / Pseudo R-squared	0.215	0.146	0.138	0.818

By column, the dependent variables are as follows: *COVID REPORT*, an indicator variable equal to one if the firm’s audit report had a critical audit matter relating to an accounting estimates, a discrete ordinal variable equal to one if the accounting estimate had a low level of estimation uncertainty and two if the estimate had a high level of estimation uncertainty, the natural logarithmic transformation of audit fees, and abnormal audit fees as defined in Blankley et al. (2012). Table 10 presents the results of the OLS regressions in Table 4, Table 5, and Table 7, reperformed using *COVID_RESIDUAL*, which is the portion of *COVID REPORT* that is unrelated to general Covid Risk as measured by Hassan et al. (2023). The models are run using heteroskedasticity-robust standard errors. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. *** denotes a significance level of 1%.

In Column (1), our results suggest that even after controlling for general epidemic risk in the first-stage model, high levels of goodwill are still highly predictive of receiving a COVID-19 auditor report. In Columns (2) through (4), we see further evidence that our main results are not driven by general COVID-19 risk as *COVID_RESIDUAL* is statistically significant at the 1% level. Also, our COVID-19 mentions are still likely to relate to significant accounting estimates and are associated with additional audit costs to the firm. Moreover, general epidemic risk does not drive our results, but instead provides further support that our COVID-19 measure relates to firm-specific accounting and auditing uncertainty.

5.3. Instrumental Variable Approach

We next perform an instrumental variable approach in an attempt to establish a causal link between receiving a *COVID REPORT* and the type of matter addressed by the COVID-19 mention as well as to the related audit and abnormal audit fees identified in this study. A necessary condition for the appropriate instrument is a correlation between the instrument and *COVID REPORT* and no association between the instrument and the dependent variables in the models. Therefore, an association in the test between the instrumented variable and the dependent variable are likely to exist exclusively through the association between the instrument and *COVID REPORT*.

We use county-level COVID-19 cases as an appropriate instrument for these tests. The number of COVID-19 cases in the county of a firm’s headquarters is likely to indicate the extent to which firms’ normal operations are likely to be impacted by COVID-19, thereby resulting in a COVID-19 mention in the audit report. For example, a firm located in an area with few COVID-19 cases is likely to have limited lockdown periods and fewer problems with staffing to meet normal operational demands. On the other hand, higher cases of COVID-19 are less likely to correlated to firm’s specific audit fees since these fees are dependent on numerous firm factors less related to COVID-19 such as the prior year’s fees, size, complexity, and leverage as well as auditor-related factors such as industry specialization, audit firm tier (e.g., BigN vs. non-BigN), and audit tenure.

To proxy for the level of COVID-19 cases, we utilize publicly available daily COVID-19 cases per U.S. county as reported by the New York Times (NYT).¹⁹ In order to aggregate these daily data to a firm-year specific metric, we aggregate daily cases into a total monthly number of cases for each county, then prepare a rolling 6-month average of these total cases per county, defined as *COVID CASES*, and finally merge these data with our firm-year level audit report data via the year and month of the firm’s report date.²⁰ We then take the logarithmic transformation of this average number of cases in order to reduce the influence of any large heterogeneity in this metric. We utilize two-stage least square regression (2SLS) to determine, in the first stage, whether *COVID REPORT* is correlated with our instrumented variable, *COVID CASES*. Table 11 Column (1) presents the correlation between *COVID REPORT* and *COVID CASES*, based on the coefficient on *COVID CASES* of 0.006*, when including industry and state fixed effects in the model to control for time-invariant industry and state factors.²¹ Perhaps more importantly are the Durbin chi2 test statistics and Wu–Hausman F statistics, which demonstrate whether the instrumented variable is endogenous to the dependent variables in the second-stage regressions. The results of these untabulated test statistics demonstrate that our instrumental variable is exogenous to the dependent variables such as (abnormal) audit fees.²² As such, our instrument meets the exclusion criteria in that the instrument should likely only impact the dependent variable through its correlation with *COVID REPORT*. Therefore, we turn to the remaining models presenting the results of the second-stage regressions. Table 11 demonstrates that our results are consistent with the main results of the paper even after utilizing our instrumental variable, *COVID RREPORT*.²³ The coefficient on *COVID RREPORT* is positive and statistically significant at the 1% level. Taken together, this evidence is consistent with the idea that our main results are not driven by endogeneity.

Table 11. Endogeneity: instrumental variable approach.

	(1) 1st Stage	(2)	(3) 2nd Stage	(4)	(5)
	COVID REPORT	ACCT ESTIMATE	SIG ACCT ESTIMATE	AUDIT FEES	ABNORMAL AF
<i>COVID CASES</i>	0.006 * (1.67)				
<i>COVID RREPORT</i>		5.940 *** (3.93)	8.944 *** (3.96)	4.224 *** (3.34)	2.880 *** (2.69)
Accounting Estimate Controls Audit Fee Model Controls		YES	YES	YES	YES
Observations	4780	4803	4803	4803	4803
State FE	YES				
Ind FE	YES	YES	YES	YES	YES
Pseudo/Adjusted R-squared	0.054	0.219	0.222	0.828	0.350

By column, the dependent variables are as follows: *COVID REPORT*, an indicator variable equal to one if the firm’s audit report had a critical audit matter relating to an accounting estimates, a discrete ordinal variable equal to one if the accounting estimate had a low level of estimation uncertainty and two if the estimate had a high level of estimation uncertainty, the natural logarithmic transformation of audit fees, and abnormal audit fees as defined in Blankley et al. (2012). Table 11 presents the results of instrumental variable regressions of Tables 5 and 8, reperformed using *COVID RREPORT*, which is the predicted value of the dependent variable from the regression of *COVID REPORT* on the logarithm transformation of the rolling 6-month average number of cases for the county in which firms are headquartered. The models are run using heteroskedasticity-robust standard errors. The t-statistics are reported in parentheses. The definitions for each variable are included in the appendix. *** and * denote significance levels of 1% and 10%, respectively.

5.4. Untabulated Results

Since our findings suggest that COVID-19 reports focus on asset impairments, particularly for goodwill, we test, in untabulated results, audit fees for firms receiving a COVID-19 audit report that explicitly state either a qualitative or quantitative assessment of non-

current assets was performed in order to demonstrate the impact COVID-19 impairment matters had on audit costs.²⁴ Given the economic uncertainty induced by COVID-19, firms who must progress to this “Quantitative” Step 2 need to have additional work on the client accounting side as well as the auditor side as the auditor verifies the inputs (e.g., industry growth rates; macroeconomic activity) and management calculations used to determine the asset impairment amount or lack of impairment, as necessary. Therefore, one might expect firms receiving a COVID-19 audit report mentioning Step 2 quantitative assessments to have greater audit fees, as verifying these assessments of fair value require greater auditor effort (Goncharov et al., 2013).

In untabulated results, we include two indicator variables relating to these asset impairment considerations based on manual review of the CAMs: *QUALITATIVE*, which is an indicator variable equal to 1 if the auditor disclosure cites that a qualitative (Step 1) assessment was made of the non-current asset and 0 otherwise; *QUANTITATIVE*, which is an indicator variable equal to 1 if the auditor disclosure cites that a quantitative (Step 2) assessment was made of the non-current asset and 0 otherwise. When we include both variables in our audit fee model, we find that those firms needing to move onward to the quantitative Step 2 of impairment analysis have considerably higher audit fees than those that simply had to perform the step one qualitative assessments. This is in line with the expectation that Step 2 asset impairments require additional work by the auditor, which is priced into audit costs to the firm. Overall, this result further supports the idea that the uncertainty imposed by COVID-19 impacts managers’ and auditors’ assessments of long-term asset values and demonstrates the impact that this additional work has on audit costs. We perform a number of other analyses, which for brevity, we have not tabulated but that present consistent results: controlling for either auditor or year fixed effects in addition to industry fixed effects; preparing alternative measures of the main variables; limiting our tests to only those firms receiving at least one CAM; and controlling for the number of COVID-19 mentions in the 10-K filing.

5.5. Discussion

Overall, the breadth of results in this study suggest that companies with high intangible assets and goodwill were most likely to receive these COVID-19-related disclosures in the auditor’s report, which we posit is due to the high degree of uncertainty regarding the long-term value of these assets and the high degree of uncertainty induced by COVID-19 (Altiga et al., 2020). In line with these results, we find the audit report disclosures citing COVID-19 had a higher likelihood of relating to significant accounting estimates such as impairment considerations for the long-term book value of intangible assets that are classified as accounting considerations with higher levels of uncertainty (Johnson & Wiley, 2019). Our results investigating the subsequent effects to corporate outsiders—investors and auditors—suggest that the COVID-19-related disclosures provided information to investors, resulting in abnormal stock returns for companies receiving these COVID-19-related audit disclosures. Since providing information content to stakeholders in the audit report was a key aim of the PCAOB AS 3101 (PCAOB, 2017), our study provides evidence consistent with the regulatory goal from the enactment of the CAM disclosure rules, despite some mixed literature investigating whether the disclosures provide information content (Burke et al., 2023; Christensen et al., 2014). We encourage future research to further investigate the different contexts in which, and to what extent, audit report disclosures can provide information content to outside stakeholders.

It is also important to highlight some limitations of our study. First, COVID-19 was a quickly emerging economic factor that is unlikely to have obvious economic impacts to the specific extent that an auditor would be obligated to mention COVID-19 in audit

report disclosures over a long time-series. Therefore, we are unfortunately unable to test our results over a long-term horizon and there exists the potential that this information, as disclosed in the audit report, might have become expected by outsiders, and thus, the information content of the disclosures may decrease over time. Second, one inherent limitation of our study, and most modern economics-based research, is that we cannot completely rule out endogeneity, and as such, our results may be biased or contingent upon some unobservable characteristic outside of the main hypothesized relationship in our study. We encourage future research to further investigate the conceptual underpinnings of our study in other contexts wherein audit report disclosures may provide information content to outside stakeholders.

6. Conclusions

The COVID-19 pandemic has been a once-in-a-century pandemic that has brought forth unprecedented uncertainty to firms' economic operations and their expected future cash flows, the full extent of which has not yet been fully investigated in the literature. In this paper, we attempt to contribute to a small but growing literature on the effects of COVID-19 on firms, particularly with regards to accounting implications and the subsequent reporting of their auditors. We identify firms receiving COVID-19 mentions in their audit reports and assess the determinants for firms to receive these COVID-19 auditor disclosures, finding that firms with high levels of goodwill and identifiable intangible assets are more likely to receive COVID-19 mentions in their reports. We also find that COVID-19 mentions focus on accounting estimates and significant accounting estimates as well as matters relating to fair value accounting and asset impairments. Tests of investor reactions suggest that these disclosures provided tradeable information, resulting in abnormal returns for focal firms. We further investigate the subsequent effects on firms' audit costs, finding that firms receiving COVID-19 mentions in their audit reports are associated with higher audit and abnormal audit costs. Firms needed to address long-term asset impairments using Step 2, quantitative, and impairments had considerably higher audit costs than those needed to evaluate under the more common qualitative impairment method. Overall, our findings suggest that COVID-19 represented a triggering event that caused companies to reassess the carrying value of their long-term assets under ASC Topic 350.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Variable Definitions

Variable	Definition	Source
Key Variables		
COVID REPORT	An indicator variable equal to one when the firm's audit report mentions COVID-19, and 0 otherwise.	Auditor Reports
COVID REPORT—IMPAIRMENT	An indicator variable equal to one if the firm's audit report mentions COVID-19 and that citation relates to an asset impairment assessment.	Auditor Reports
COVID REPORT—FV	An indicator variable equal to one if the firm's audit report mentions COVID-19 and that citation related to a fair value accounting issue.	Auditor Reports
COVID REPORT—GCO	An indicator variable equal to one if the firm's audit report mentions COVID-19 and that citation related to a going concern issue.	Auditor Reports
ACCT ESTIMATE	An indicator variable equal to 2 if the audit report relates to an accounting estimate and zero otherwise.	Auditor Reports
SIG ACCT ESTIMATE	A discrete, ordinal variable equal to 2 if the audit report mentions a significant accounting estimate, 1 if the audit report relates to an accounting estimate with low estimation on certainty, and zero otherwise.	Auditor Reports
COVID-RISK	A firm-level measure of exposure to epidemic diseases including COVID-19, SARS, and H1N1 as calculated in Hassan et al. (2023)	Hassan et al. (2023)
COVID_RESIDUAL	The Residual from the equation: $COVID_REPORT_{it} = \beta_0 + \beta_1 COVID_RISK_{it} + \lambda_1 Industry_FE + \epsilon$	Audit Reports/Hassan et al. (2023)
COVID CASES	The logarithm transformation of the rolling 6-month average number of cases for the county in which a firm is headquartered.	NYT COVID-19 Data
COVID REPORT	The predicted value of the dependent variable from the equation: $COVID_REPORT_{it} = \beta_0 + \beta_1 COVID_CASES_{it} + \lambda_1 State_FE + \epsilon$	NYT COVID-19 Data
AUDIT FEES	The natural logarithmic transformation of audit fees for firm <i>i</i> in fiscal year <i>t</i> .	Audit Analytics
ABNORMAL AF	Abnormal audit fees as calculated by Blankley et al. (2012).	Blankley et al. (2012)
Control Variables		
ADVERTISING	Calculated as the firm's advertising costs (XAD) scaled by total assets (AT).	Compustat
AMEX	An indicator variable equal to one if the firm is traded in the American Stock Exchange, and 0 otherwise.	CRSP
AP	Calculated as the firm's accounts payable (AP) scaled by total assets (AT).	Compustat
AR	Calculated as the firm's accounts receivables (RECT) scaled by total assets (AT).	Compustat
BIG4	Calculated as the audit firm's office yearly audit fees scaled by total yearly audit fees for the audit market.	Audit Analytics
BLUSY	An indicator variable equal to one if the firm engaged a Big4 auditor during the fiscal year, and 0 otherwise.	Compustat
CAPEX	An indicator variable equal to one if the firm's fiscal year end is in December of January, and 0 otherwise.	Compustat
CASH	Calculated as the firm's capital expenditures (CAPX) scaled by total assets (AT).	Compustat
CASH FLOWS	Calculated as the firm's cash and cash equivalents (CHE) scaled by total assets (AT).	Compustat
CLIENT IMPORT	Calculated as the firm's cash flows from operating expenses (OANCF) scaled by total assets (AT).	Compustat
COS	Calculated as the sum of the client's audit fees and non-audit fees scaled by total yearly audit fees for the auditor.	Audit Analytics
COMMON STOCK	Calculated as the firm's cost of sales (COGS) scaled by total assets (AT).	Compustat
DEBT	Calculated as the firm's common stock (CEQ) scaled by total assets (AT).	Compustat
DEFERRED REV	Calculated as the sum of firm's short-term (DLC) and long-term debt (DLTT) scaled by total assets (AT).	Compustat
DIVIDENDS	Calculated as the sum of firm's short-term (DRC) and long-term deferred revenue (DRLT) scaled by total assets (AT).	Compustat
FOREIGN	Calculated as the firm's dividends (DVC) scaled by total assets (AT).	Compustat
GOODWILL	An indicator variable equal to 1 if firm <i>i</i> has any foreign operations, and 0 otherwise.	Compustat
INTANGIBLE	Calculated as the firm's goodwill (GDWL) scaled by total assets (AT).	Compustat
	Calculated as the firm's intangible assets (INTAN) excluding goodwill (GDWL) scaled by total assets (AT).	Compustat

Variable	Definition	Source
INVENTORY	Calculated as the firm's inventory (INVT) scaled by total assets (AT).	Compustat
LN_NAF	The natural logarithmic transformation of non-audit fees for firm <i>i</i> in fiscal year <i>t</i> .	Audit Analytics
MCAP	Calculated as the firms stock price at fiscal year end (PRC) multiplied by number of shares outstanding at fiscal year end (SHROUT).	CRSP
MTB	Calculated as market capitalization of equity (MCAP) scaled by the book value of common equity (CEQ).	Compustat/CRSP
MW	An indicator variable equal to 1 if the client receives a material weakness opinion in the current year or the next year and 0 otherwise.	Audit Analytics
NASDAQ	An indicator variable equal to one if the firm is traded in the NASDAQ Stock Exchange, and 0 otherwise.	CRSP
NET_INCOME	Calculated as the firm's income before extraordinary items (IB) scaled by total assets (AT).	Compustat
NYSE	An indicator variable equal to one if the firm is traded in the New York Stock Exchange, and 0 otherwise.	CRSP
POS_RETURNS	An indicator variable equal to one if the firm has a total positive Cumulative Abnormal Return (CAR) during the (-3,3) day window.	CRSP
PPE	Calculated as the firm's net property, plant, and equipment (PPENT) scaled by total assets (AT).	Compustat
R&D	Calculated as the firm's research and development costs (XRD) scaled by total assets (AT).	Compustat
RESTATEMENT	An indicator variable equal to 1 if the firm receives a financial statement restatement during fiscal year <i>t</i> , and 0 otherwise.	Audit Analytics
RETAINED_EARNINGS	Calculated as the firm's retained earnings (RE) scaled by total assets (AT).	Compustat
REVENUES	Calculated as the firm's revenues (REV) scaled by total assets (AT).	Compustat
SEGMENTS	Calculated as the logarithm of the number of business segments.	Compustat
SGA	Calculated as the firm's selling, general, and administrative (XSGA) scaled by total assets (AT).	Compustat
SIZE	Calculated as the logarithmic transformation of total assets (AT).	Compustat
SPECIALIST	An indicator variable equal to one if the auditor is the current market leader in the client firm's SIC2 digit industry during the year of the audit, and 0 otherwise.	Audit Analytics
SPI	Calculated as the firm's special items (SPI) scaled by total assets (AT).	Compustat
TENURE	The number of years of the current client-auditor relationship.	Audit Analytics
Z-SCORE	The likelihood of bankruptcy calculated per Altman (1968).	Altman (1968)

Appendix B. Examples of COVID-19 Audit Reports by Accounting Topic

Appendix B.1. Panel A: Audit Report Example—Fair Value Accounting

Company Name: Advanced Container Technologies, Inc. | CIK: 0001096950 | Report Date: 04/16/2021 | Audit Firm: Haskell & White LLP

Impairment Assessment for Goodwill and Intangible Assets – Refer to Notes 2 & 4 to the Consolidated Financial Statements

Critical Audit Matter Description

As reflected in the Company's consolidated financial statements, at December 31, 2020, the Company's goodwill was \$1,020,314 and intangible assets were \$1,324,870, excluding the distribution rights intangible asset acquired in 2020 as discussed below. As disclosed in Notes 2 and 4 to the consolidated financial statements, goodwill and intangible assets are tested for impairment at least annually or more frequently if indicators of impairment require the performance of an interim impairment assessment. As a result of these assessments, the Company concluded that there was no impairment to goodwill or the Company's intangible assets during the year ended December 31, 2020.

Auditing management's impairment tests of goodwill and intangible assets was complex and highly judgmental due to the significant measurement uncertainty in determining the fair values. In particular, the fair value estimates were sensitive to changes in significant assumptions such as discount rates, revenue growth rates, operating margins, estimated spend on capital expenditures, terminal growth rates and market multiples. These assumptions are affected by expected future market or economic conditions, including the impact of COVID-19.

How the Critical Audit Matter was Addressed in the Audit

We obtained an understanding of the relevant controls over the Company's goodwill and intangible assets and management's process to assess impairment. Additionally, we obtained a copy of an appraisal prepared by an independent valuation specialist obtained by management as part of their process to evaluate goodwill and intangible assets.

To test the fair values of the goodwill and intangible assets, our audit procedures included assessing valuation methodologies and testing the reasonableness of significant assumptions and underlying data used by the Company including forecasted revenue. We compared the significant assumptions used in the Company's long range plan, including forecasted revenue and operating margins, to current industry and economic trends, giving consideration to the impact of COVID-19, while also considering changes in the Company's business model, customer base and product mix. We assessed the historical accuracy of management's estimates by comparing past projections to actual performance and assessed sensitivity analyses of significant assumptions to evaluate the changes in the fair value of the goodwill and intangible assets resulting from changes in the assumptions. We evaluated management's reconciliation of the fair value of the reporting unit to the market capitalization of the Company and concurred with management that there was no impairment of goodwill or intangible assets as of the December 31, 2020 evaluation date.

Appendix B.2. Panel B: Audit Report Example—Going Concern Opinion

Company Name: Interpace Biosciences, Inc. | CIK: 0001054102 | Report Date: 04/01/2021 | Audit Firm: BDO USA, LLP

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Interpace Biosciences, Inc. and Subsidiaries (the "Company") as of December 31, 2020 and 2019, the related consolidated statements of operations, stockholders' equity, and cash flows for each of the two years in the period ended December 31, 2020, and the related notes and schedules (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2020 and 2019, and the results of its operations and its cash flows for each of the two years in the period ended December 31, 2020, in conformity with accounting principles generally accepted in the United States of America.

Going Concern Uncertainty

The accompanying consolidated financial statements have been prepared assuming that the Company will continue as a going concern. As discussed in Note 4 to the consolidated financial statements, the Company has suffered operating losses, has negative operating cash flows and is dependent upon its ability to generate profitable operations in the future and/or obtain additional financing to meet its obligations and repay its liabilities arising from normal business operations when they come due. In addition, the Company has been materially impacted by the outbreak of a novel coronavirus (COVID-19), which was declared a global pandemic by the World Health Organization in March 2020. These conditions raise substantial doubt about its ability to continue as a going concern. Management's plans in regard to these matters are also described in Note 4. The consolidated financial statements do not include any adjustments that might result from the outcome of this uncertainty.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's consolidated financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) ("PCAOB") and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Appendix B.3. Panel C: Audit Report Example—Historical Cost Accounting

Company Name: Signet Jewelers Limited | CIK: 000832988 | Report Date: 04/01/2021 | Audit Firm: KPMG LLP

Evaluation of revenue recognition related to extended service plans

As discussed in Note 3 to the consolidated financial statements, revenue related to the extended service plans ("ESP") is recognized in proportion to when the expected costs will be incurred. To determine the amount of revenue to recognize, the Company estimates the deferral period and pattern of future claims costs. As a result of the COVID-19 pandemic, the recognition of ESP revenue was impacted by the temporary closing and subsequent reopening of stores in fiscal 2021.

We identified the evaluation of revenue recognition related to ESP as a critical audit matter. Subjective auditor judgment was required to evaluate the estimated deferral period and patterns of future claims costs used to recognize ESP revenue because a change in these estimates could substantially impact revenues, which included assessing the aging of claims by year of contract sale and estimates of future claims.

The following are the primary procedures we performed to address this critical audit matter. We evaluated the design and tested the operating effectiveness of certain internal controls related to the Company's revenue recognition process, including controls related to the development of assumptions used to estimate the deferral period and patterns of future claims costs. We evaluated the historical claim trends used by the Company in estimating the future claims costs on a sample basis by selecting claims and tracing them back to the original proof of sale. We tested the Company's assumption related to the deferral period in which the claims are expected to be incurred by comparing it to the current aging of claim costs incurred by year of contract sale, including estimated future claims. We tested the Company's assumption that historical claim trends are representative of future claims costs by comparing the pattern and volume of claims incurred from recent claims history to the current pattern in use and volume of claims incurred. We assessed the calculations used by the Company to determine ESP revenue recognized for consistency with the estimated deferral period and patterns of future claim costs.

Appendix C. Accounting and Significant Accounting Estimates Detailed by Topic Issue

Listed below is the level of accounting or significant accounting estimates by COVID-19 audit reports topic issues as defined by Johnson and Wiley (2019).

<i>Low Accounting Estimates</i>	<i>Significant Accounting Estimates</i>
Allowance for Doubtful Accounts	Acquisitions/Business Combinations
Depreciation Expense	Contingent Liabilities
Non-impairment related Fair Value Measurement	Financial Derivatives
Inventory Obsolescence	Going Concern/Liquidity Concerns
Minor Litigation	Goodwill
Nonmonetary Exchange	Intangible Assets
Retirement Benefits	Investments
Securities Valuation	Provision for Loan Losses
Valuation	Revenue Recognition
Warranties	Share/Stock-Based Compensation
	Tax Uncertainty

Notes

- 1 See Bauer et al. (2021) for a review of research questions covering the potential impacts of the COVID-19 pandemic on auditors' group judgment and decision making (JDM).
- 2 They find that the use of these public health measures reduced disease transmission in the short run and produced better economic outcomes in the medium run.
- 3 https://www.thecaq.org/profession-in-focus-a-conversation-with-sec-chief-accountant-sagar-teotia-during-covid-19/?utm_source=mnl:cpald&utm_medium=email&utm_campaign=26Jun2020, accessed on 1 May 2021.
- 4 After investigating all CAMS, we note that the first reference to Covid-19 in the audit report occurs in December 2019. We note that if we begin the sample during this time, our results are consistent without the approximate ~700 observations reported from July through November.
- 5 Appendix C outlines the accounting and significant accounting estimates detailed by topic issue.
- 6 Results are largely similar if we defined industry specialization as the proportion of the auditor's market share in the SIC2 digit industry based on audit fees.
- 7 The lambda in Equation (1) refers to the vector of beta coefficients, which from tautology in the auditing literature are omitted in the presentation of the results.
- 8 To assess this marginal effect we refer to the relatively simplistic division rule of Gelman and Hill (2007).
- 9 For brevity, we exclude the *CONSTANT CUT 1*, *CONSTANT CUT 2*, and *CONSTANT CUT 3* variables, which represent the multiple constants generated as part of the ordered probit model.
- 10 We utilize all available daily returns data during this period and require 3 consecutive days of trading, which reduces the sample size, but results are consistent if we don't utilize this restriction.
- 11 Cumulative abnormal returns are then calculated by summing the β_0 for each time t over the relevant window.
- 12 Due to sample size limitations for some financial performance metrics such as restatements and GCOs, we are not able to effectively test the statistical significance of these in regression models.
- 13 This amount is calculated as the 17.2% of logged audit fees: $EXP(0.172) - 1$.
- 14 This economic magnitude is calculated as $0.172 * \$2,627,108$ mean audit fees for the sample, rounded to the nearest thousand dollars.
- 15 Results are also consistent if we only entropy balance in the key determinants of receiving a *COVID REPORT: INTANGIBLE*, *GOODWILL*, and *BIG4*.
- 16 See Table 3, Panel A and Panel B for descriptive statistics around the reweighting of covariates before and after entropy balancing.
- 17 Using the number of COVID-19 and other epidemic risks mentioned in firms' quarterly earnings conference call and other textual classifications, Hassan et al. (2023) measure firms' specific risk to epidemics and the channel through which these risks occur (e.g., supply and demand impacts, costs reductions, etc.).
- 18 In untabulated results, we note that when we reperform the main tests of our paper, Hassan et al. "Covid Risk" measure is not statistically related to receiving any auditor disclosure in the audit report, but it is a predictor of receiving a COVID-19 audit report.
- 19 This data can be downloaded via the NYT's GitHub page: <https://github.com/nytimes/covid-19-data> (accessed on 25 December 2024).
- 20 We utilize a 6-month rolling average (as opposed to a 12-month) in order to have sufficient data for firms with audit reports dated from September 2020 through February 2021. The NYT only began collecting data as of March 2020 so a restriction of 12-months

of data would reduce our testing sample nearly in half. Results are qualitatively and often times quantitatively significant after the reduction in sample size if we were to require a full 12 months of data.

- 21 Other important test statistics are those of the Durbin chi² tests and Wu-Hausman F statistics, which demonstrate whether the dependent variable is endogenous. For example, the results of the first stage regression, when audit fees is used as the dependent variable for the 2nd stage regression, demonstrates that COVID CASES present a correlated instrument with COVID REPORT.
- 22 For example, when using audit fees as the dependent variable for the 2nd stage regression, the p-values of 0.04 and 0.00 for the Durbin chi² test statistic and the Wu-Hausman F-statistic, respectively, indicate no endogenous regressors.
- 23 Note that the number of observations in these regressions are considerably lower than those in the main results as, by design, all observations in the pre-COVID era (NY Times data collection begins in March 2020) drop from the regression as do those observations for firms in counties with missing values of COVID-19 cases in the NYT data.
- 24 To fully understand these tests, it is important to highlight the necessary steps needed by management to assess whether long-term assets have been impaired. The FASB's guidance in ASU 2017-04 Intangibles—Goodwill and Other (Topic 350), demonstrates that management must annually perform a qualitative assessment of asset impairment and if it is more likely than not that the fair value of the reporting unit in which the asset is maintained is less than the carrying value then managers need to perform a Step 2 quantitative assessment, where they actually calculate this fair value amount and check for impairment.

References

- Altiga, D., Baker, S., Barrero, J. M., Bloom, N., Bunn, P., Chen, S., Davis, S. J., Leather, J., Meyer, B., Mihaylov, E., Mizen, P., Parker, N., Renault, T., Smietanka, P., & Thwaites, G. (2020). Economic uncertainty before and during the COVID-19 pandemic. *Journal of Public Economics*, *191*, 104274. [CrossRef] [PubMed]
- Altman, E. I. (1968). Financial ratios, discriminant analysis and prediction of. *The Journal of Finance*, *23*, 589–609. [CrossRef]
- American Institute of CPAs [AICPA]. (2003). *Auditing fair value measurements and disclosures*. A.U. Section 328. Available online: <https://pcaobus.org/oversight/standards/archived-standards/pre-reorganized-auditing-standards-interpretations/details/AU328> (accessed on 25 September 2024).
- American Institute of CPAs [AICPA]. (2014). *Guide to intangible asset valuation: Accounting and financial reporting* (R. P. Schweihs, & R. F. Reilly, Eds.). American Institute of CPAs (AICPA).
- American Institute of CPAs [AICPA]. (2020). *How to audit during a pandemic? You asked. We answered. AICPA Insights Blog*. Available online: <https://www.primeglobal.net/news/how-to-audit-during-a-pandemic-aicpa> (accessed on 25 September 2024).
- Backof, A., Bowlin, K., & Goodson, B. (2014). The importance of clarification of auditors' responsibilities under the new audit reporting standards. *Contemporary Accounting Research*, *39*(4), 2284–2304. [CrossRef]
- Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The Quarterly Journal of Economics*, *131*(4), 1593–1636. [CrossRef]
- Barth, M. E., Konchitchki, Y., & Landsman, W. R. (2013). Cost of capital and earnings transparency. *Journal of Accounting and Economics*, *55*, 206–224. [CrossRef]
- Bauer, T. D., Humphreys, K. A., & Trotman, K. T. (2021). Group judgment and decision making in auditing: Research in the time of COVID-19 and beyond. *AUDITING: A Journal of Practice & Theory*. forthcoming.
- Berglund, N. R. (2020). Do client bankruptcies preceded by clean audit opinions damage auditor reputation? *Contemporary Accounting Research*, *37*(3), 1914–1951. [CrossRef]
- Blankley, A. I., Hurtt, D. N., & MacGregor, J. E. (2012). Abnormal audit fees and restatements. *Auditing: A Journal of Practice & Theory*, *31*(1), 79–96.
- Bloomberg Law. (2022, March 31). *Why supply chains are entering third year of chaos: Quick take*. Available online: <https://news.bloomberglaw.com/international-trade/why-supply-chains-are-entering-third-year-of-chaos-quicktake> (accessed on 25 September 2024).
- Brasel, K., Doxey, M. M., Grenier, J. H., & Reffett, A. (2016). Risk disclosure preceding negative outcomes: The effects of reporting critical audit matters on judgments of auditor liability. *The Accounting Review*, *91*(5), 1345–1362. [CrossRef]
- Bukhari, Q., & Jameel, Y. (2020). *Will coronavirus pandemic diminish by summer?* SSRN Working Paper. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3556998 (accessed on 25 September 2024).
- Burke, J. J., Hoitash, R., Hoitash, U., & Xiao, S. (2023). The disclosure and consequences of U.S. critical audit matters. *The Accounting Review*, *98*(2), 59–095. [CrossRef]
- Caggiano, G., Castelnovo, E., & Kima, R. (2020). The global effects of COVID-19-induced uncertainty. *Economic Letters*, *194*, 109392. [CrossRef] [PubMed]
- Christensen, B. E., Glover, S. M., & Wolfe, C. J. (2014). Do critical audit matter paragraphs in the audit report change nonprofessional investors' decision to invest? *Auditing: A Journal of Practice & Theory*, *33*(4), 71–93.

- Correia, S., Luck, S., & Verner, E. (2020). *Pandemics depress the economy, public health interventions do not: Evidence from the 1918 Flu*. SSRN Working Paper. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3561560 (accessed on 25 September 2024).
- Cutler, D. M., & Summers, L. H. (2020). The COVID-19 pandemic and the \$16 trillion virus. *The Journal of the American Medical Association*, 324(15), 1495–1496. [CrossRef]
- Deloitte. (2020). *Financial reporting considerations related to COVID-19 and an economic downturn*. Financial Reporting Alert 20-2. Deloitte.
- Disparte, D. (2021, February 16). *Preparing for the next pandemic: Early lessons from COVID-19*. Brookings Institution. Available online: <https://www.brookings.edu/research/preparing-for-the-next-pandemic-early-lessons-from-covid-19/> (accessed on 15 May 2021).
- Doogar, R., Sivadasan, P., & Solomon, I. (2015). Audit fee residuals, costs or rents? *Review of Accounting Studies*, 20, 1247–1286. [CrossRef]
- Financial Accounting Standards Board [FASB]. (2014). *Presentation of financial statements—Going concern (subtopic 205-40)*. Financial Accounting Standards Board (FASB).
- Francis, J. R., Michas, P. N., & Yu, M. (2013). Office size of Big 4 auditors and client restatements. *Contemporary Accounting Research*, 30(4), 1626–1661. [CrossRef]
- García, S., Gambetta, N., García-Benauc, M. A., & Orta-Pérez, M. (2019). Understanding the determinants of the magnitude of entity-level risk and account-level risk key audit matters: The case of the United Kingdom. *The British Accounting Review*, 51(3), 227–240. [CrossRef]
- Gelman, A., & Hill, J. (2007). *Data analysis using regression and multilevel/hierarchical models* (1st ed.). Cambridge University Press.
- Gimbar, C., Hansen, B., & Ozlanski, M. (2016). The effects of critical audit matter paragraphs and accounting standard precision on auditor liability. *The Accounting Review*. forthcoming. [CrossRef]
- Goncharov, I., Riedl, E. J., & Sellhorn, T. (2013). Fair value and audit fees. *Review of Accounting Studies*, 19, 210–241. [CrossRef]
- Greenstone, M., & Nigam, V. (2020). *Does social distancing matter?* University of Chicago Working Paper No. 2020-26. University of Chicago.
- Guo, F., Lisic, L. L., Pittman, J. A., Seidel, T. A., Zhou, M., & Zhou, Y. (2022). Fool me once, shame on you; fool me twice, shame on me, the impact of audit partners' first-hand experience with arthur andersen's demise on their style. *Contemporary Accounting Research*, 39(3), 1986–2022. [CrossRef]
- Hainmueller, J. (2012). Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis*, 20, 25–46. [CrossRef]
- Harris, J. (2020). *The coronavirus epidemic curve is already flattening in new york city*. NBER Working Paper No. 26917. NBER.
- Hassan, T. A., Hollander, S., Lent, L. V., Schwedeler, M., & Tahoun, A. (2023). Firm-level exposure to epidemic diseases: COVID-19, SARS, and H1N1. *The Review of Financial Studies*, 36(12), 4919–4964. [CrossRef]
- Hong, H., Kubik, J. D., Wang, N., Xu, X., & Yang, J. (2021). *Pandemics, vaccines and an earnings damage function*. National Bureau of Economic Research Working Paper Number 27829. National Bureau of Economic Research.
- Hribar, P., Kravet, T., & Wilson, R. (2014). A new measure of accounting quality. *Review of Accounting Studies*, 19, 506–538. [CrossRef]
- Huikki, J., Mouritsen, J., & Silvola, H. (2017). Relative reliability and the recognisable firm: Calculating goodwill impairment value. *Accounting, Organizations, and Society*, 56, 68–83. [CrossRef]
- Johns Hopkins Coronavirus Resource Center. (2021, October 14). *COVID-19 dashboard*. Available online: <https://www.scrip.org/reference/referencespapers?referenceid=3025590> (accessed on 1 December 2021).
- Johnson, R. N., & Wiley, L. D. (2019). *Auditing: A practical approach with data analytics*. John Wiley & Sons.
- Kachelmeier, S., Rimkus, D., Schmidt, J. J., & Valentine, K. (2020). The forewarning effect of critical audit matter disclosures involving measurement uncertainty. *Contemporary Accounting Research*, 37(4), 2186–2212. [CrossRef]
- Kim, S., & Klein, A. (2017). Did the 1999 NYSE and NASDAQ listing standard changes on audit committee composition benefit investors? *The Accounting Review*, 92(6), 187–212. [CrossRef]
- KPMG. (2019, December). *Fair value measurement: questions and answers*. Available online: <https://assets.kpmg.com/content/dam/kpmg/be/pdf/2020/01/fair-value-qa-2019.pdf> (accessed on 15 May 2021).
- KPMG. (2020, December 3). *Are fair values appropriately determined and disclosed? What's the issue?* Available online: <https://home.kpmg/xx/en/home/insights/2020/03/covid-19-assets-1b.html> (accessed on 15 May 2021).
- Lawrence, A., Minutti-Meza, M., & Zhang, P. (2011). Can Big 4 versus non-Big 4 differences in audit-quality proxies be attributed to client characteristics? *The Accounting Review*, 86(1), 259–286. [CrossRef]
- McKibbin, W., & Fernando, R. (2020). *The Global macroeconomic impacts of COVID-19: Seven scenarios*. Centre for Applied Macroeconomic Analysis (CAMA) Working Paper. CAMA.
- Murphy, M. L. (2020, December). *Assessing audit risks during the pandemic*. Journal of Accountancy. Available online: <https://www.journalofaccountancy.com/news/2020/dec/assess-audit-risks-during-coronavirus-pandemic.html> (accessed on 12 May 2021).

- New York Times [NYT]. (2021a, December 5). *How the supply chain crisis unfolded*. Available online: <https://www.nytimes.com/interactive/2021/12/05/business/economy/supply-chain.html> (accessed on 15 April 2022).
- New York Times [NYT]. (2021b, October 14). *Tracking coronavirus in new york: Latest map and case count*. Available online: <https://www.nytimes.com/interactive/2021/us/new-york-covid-cases.html> (accessed on 15 April 2022).
- New York Times [NYT]. (2022a, April 25). *COVID lockdowns revive the ghosts of a planned economy*. Available online: <https://www.nytimes.com/2022/04/25/business/china-covid-zero-economy.html> (accessed on 21 May 2022).
- New York Times [NYT]. (2022b, May 16). *One million deaths. Coronavirus briefing newsletter*. Available online: <https://www.nytimes.com/2022/05/16/briefing/one-million-deaths.html> (accessed on 21 May 2022).
- Noll, D. (2020, December 14). *4 A&A challenges caused by COVID-19*. AICPA. AICPA blog. Available online: <https://nsacoop.org/articles/4-aa-challenges-caused-covid-19> (accessed on 15 May 2021).
- O’Keefe, T. B., Simunic, D. A., & Stein, M. T. (1994). The production of audit services, evidence from a major public accounting firm. *Journal of Accounting Research*, 32, 241–261. [CrossRef]
- Ozili, P., & Arun, T. (2020). *Spillover of COVID-19: Impact on the global economy*. SSRN Working Paper. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3562570 (accessed on 15 May 2021).
- Parment, W. E., & Sinha, M. S. (2020). COVID-19—The Law and Limits of Quarantine. *The New England Journal of Medicine*, 382(e28), 1–3. [CrossRef]
- PCAOB. (2017). *AS 3101. The auditor’s report on an audit of financial statements when the auditor expresses an unqualified opinion*. PCAOB Release No. 2017-001. Washington, DC, USA. Available online: <https://pcaobus.org/Rulemaking/Docket034/2017-001-auditors-report-final-rule.pdf> (accessed on 17 December 2022).
- PCAOB. (2019, March 18). *Implementation of critical audit matters: The basics. staff guidance*. Washington, DC, USA. Available online: <https://pcaobus.org/Standards/Documents/Implementation-of-Critical-Audit-Matters-The-Basics.pdf> (accessed on 17 December 2022).
- Radigan, J. (2021). *Pandemic still complicates going concern disclosures*. Journal of Accountancy. Available online: https://www.journalofaccountancy.com/news/2021/jun/coronavirus-pandemic-complicates-going-concern-disclosures.html?utm_source=mn:cpald&utm_medium=email&utm_campaign=15Jun2021 (accessed on 23 August 2021).
- Ramanna, K., & Watts, R. L. (2012). Evidence on the use of unverifiable estimates in required goodwill impairment. *Review of Accounting Studies*, 17, 749–780. [CrossRef]
- Sajadi, M. M., Habibzadeh, P., Vintzileos, A., Shokouhi, S., Miralles-Wilhelm, F., & Amoroso, A. (2020). *Temperature, humidity, and latitude analysis to predict potential spread and seasonality for COVID-19*. SSRN Working Paper. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3550308 (accessed on 23 August 2021).
- Siegel, R. (2021). *What’s in Congress’s \$1.9 trillion covid bill: Checks, unemployment insurance and more*. The Washington Post. Available online: <https://www.washingtonpost.com/business/2021/03/10/what-is-in-the-stimulus/> (accessed on 22 August 2021).
- Simunic, D. A. (1980). The pricing of audit services: Theory and evidence. *Journal of Accounting Research*, 18, 161–190. [CrossRef]
- Stein, S. (2019). Auditor industry specialization and accounting estimates: Evidence from asset impairments. *Auditing: A Journal of Practice & Theory*, 38(2), 207–234.
- Suljac, V. (2021). *Litigation risk, financial reporting quality, and critical audit matters in the audit report: Early, U.S. evidence*. SSRN Working Paper. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3771081 (accessed on 22 August 2021).
- Szczygielski, J. J., Bwanya, P. R., Charteris, A., & Brzeszczyński, J. (2021). The only certainty is uncertainty: An analysis of the impact of COVID-19 uncertainty on regional stock markets. *Finance Research Letters*. forthcoming. [CrossRef] [PubMed]
- Tysiac, K. (2021, December). *PCAOB changes 2021 inspection focus areas as a result of COVID-19*. Journal of Accountancy. Available online: <https://www.journalofaccountancy.com/news/2020/dec/pcaob-changes-2021-inspection-focus-areas-result-of-coronavirus.html> (accessed on 15 May 2022).
- Verrecchia, R. E. (1983). Discretionary disclosure. *Journal of Accounting and Economics*, 5, 179–194. [CrossRef]

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Article

Market Reaction to Earnings Announcements Under Different Volatility Regimes

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Abstract: This study investigates the occurrence and persistence of abnormal stock returns surrounding corporate earnings announcements, particularly emphasizing how varying frequencies of financial reporting influence market behavior. Specifically, this research examines the effects of the timing and frequency of disclosures on market reactions and stock price volatility during critical earnings announcement periods. By analyzing firms within the Dow Jones Industrial Average (DJIA) from 2014 to 2024, this study evaluates the interplay between financial reporting schedules and market responses to stock prices. Furthermore, it considers the impact of peer firms' reporting practices on the assimilation of firm-specific information into stock prices. Using econometric models, including Vector Auto Regression (VAR), Impulse Response Functions (IRFs), and Self-Exciting Threshold Autoregressive (SETAR) models, causal relationships between reporting frequency, stock price volatility, and abnormal return patterns across different volatility regimes are identified. The findings highlight that quarterly reporting practices intensify market responses and contribute to significant variations in stock price behavior in high-volatility periods. These insights provide a deeper understanding of the role of financial disclosure practices and forward-looking guidance in shaping market efficiency. This study contributes to ongoing discussions about balancing the transparency benefits of frequent reporting with its potential to amplify market volatility and sector-specific risks, offering valuable implications for policymakers, investors, and corporate managers.

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1. Introduction

For the investment community, publicly reported firm performance information primarily stems from mandatory disclosures, voluntary disclosures, or data furnished by third-party intermediaries. In the aftermath of the recent financial crisis, significant debate has arisen regarding the speed at which information from quarterly financial reports is reflected in stock prices and the length of time that it takes for the market to absorb this information fully (Dow et al., 2024; Fu et al., 2020; Janicka et al., 2020; García Osma et al., 2023; Gigler et al., 2014; Kraft et al., 2018; Plečnik et al., 2022; Roychowdhury et al., 2019).

Critics contend that the mandate for quarterly reporting—reinforced by regulatory bodies and recent legislative changes—places substantial pressure on publicly listed U.S.

companies, compelling them to prioritize short-term financial performance at the expense of more sustainable, long-term growth (Brav et al., 2005). Influential media commentators, such as Davis (2022), argue that focusing on short-term profits undermines long-term shareholder value creation. Recent coverage, including an article in *The Wall Street Journal* (2024), attributes certain managerial decisions at Boeing to the heightened profitability pressures associated with frequent reporting requirements. Moreover, the current shortage of accountants has increased errors and delays in financial statements, exacerbating concerns surrounding quarterly disclosures (Reinstein & Kaszak, 2024; Maurer, 2023; Burke & Polimeni, 2023).

Against this backdrop, questions arise about the interplay between mandated reporting frequency and the market's processing of new financial data. Critics advocate reevaluating the regulatory framework for financial reporting, suggesting that less frequent disclosure may alleviate immediate pressures, foster more sustainable managerial strategies, and potentially alter how swiftly and thoroughly the market integrates earnings information into stock prices.

This study contributes to the ongoing debate by examining the effects of quarterly financial reporting on stock return patterns using the Dow Jones Industrial Average (DJIA). Rather than focusing solely on synchronicity, as explored by Haga et al. (2022), we investigate the impact of reporting frequency on return dispersion over time. Utilizing Vector Autoregressive (VAR) and Self-Exciting Threshold Autoregressive (SETAR) models, we evaluate how quarterly reporting influences return behavior and volatility. This approach provides insights into the immediate market reactions and temporal patterns of returns that may be shaped by the regulatory and market structures unique to the U.S.

2. Literature Review

2.1. Literature Exploring Reporting Frequencies Across Jurisdictions

Mandatory disclosure frequency varies across countries and over time (Beyer et al., 2010; Blankespoor et al., 2020). In the U.S., public firms have submitted quarterly income statements since 1962, with the SEC mandating more comprehensive quarterly disclosures in 1970. Canada, Japan, China, and Malaysia also require quarterly reports, while the EU and Australia generally employ semi-annual mandates. The UK primarily uses semi-annual reporting, though specific industries must report quarterly. Japan transitioned from semi-annual to quarterly in 2004, and China shifted to voluntary quarterly reporting. Singapore alternates between mandating and retracting quarterly requirements (Ferreira & Morais, 2022; Kajüter et al., 2022; Kubota & Takehara, 2016; Van Buskirk, 2012).

Proponents assert that frequent reporting enhances price efficiency by quickly reflecting firm-specific data in share prices and improving corporate governance. However, some argue that amid today's abundant information, the impact of quarterly reports may be waning (Kajüter et al., 2022).

2.2. Research Supporting Frequent Financial Reporting

Frequent disclosures are posited to keep investors informed of the most current firm-specific details, potentially producing more efficient share pricing (Abdel-Khalik & Espejo, 1978; Lang & Lundholm, 1993; Tsao et al., 2016). Research consistently shows positive abnormal returns around earnings announcements, termed the earnings announcement premium (Aboody et al., 2010; Ball & Kothari, 1991; Chapman, 2018; Cheng et al., 2021; Patton & Verardo, 2012; Levi & Zhang, 2015; Savor & Wilson, 2016; Barber et al., 2013). More frequent reporting can enhance the predictability of future earnings (D'Adduzio et al., 2024) and improve analysts' forecasting accuracy (Schipper, 2007). Additional evidence links frequent reporting to reduced cost of capital (Fu et al., 2020) and lower information

asymmetry (Guttman et al., 2006). Removing quarterly disclosures can diminish liquidity (Bornemann et al., 2023). These findings align with Fama's (1970) efficient market hypothesis, suggesting that quarterly updates speed up price formation (McMullin et al., 2019).

2.3. Research Supporting Less Frequent Reporting

Other studies question whether frequent reporting always enhances market efficacy. Nallareddy et al. (2021) find no significant shift in corporate investment following the UK's mandatory quarterly reporting. This stands in contrast to the findings of Kraft et al. (2018), who noted that the transition in the U.S. from semi-annual to quarterly reporting during the mid-20th century contributed to managerial myopia, characterized by a tendency for management to prioritize short-term gains at the expense of long-term objectives. Managerial myopia has long been a concern in corporate finance. Stein (1989) suggested that the pressure to meet quarterly earnings targets can lead to inefficient investment decisions that undermine future growth prospects. Ernstberger et al. (2017) demonstrated that a higher reporting frequency in the EU had encouraged some firms to engage in manipulative practices in response to investor pressures. Their study is consistent with Healy and Wahlen's (1999) findings regarding the incentives for quarterly earnings management under performance pressure; in particular, they define earnings management as manipulating financial reports to achieve desired financial outcomes, potentially harming a firm's long-term performance. Ernstberger et al. (2017) further demonstrated that the higher reporting frequency in the EU had driven some firms toward manipulative practices in response to investor pressures. As summarized by Bui (2024), many studies have explored the motives behind earnings management, and increased reporting frequency creates increased opportunity for earnings management.

Furthermore, García Osma et al. (2023) highlighted that increased guidance associated with quarterly earnings reports may incentivize earnings management, echoing prior studies pointing to the risks of overemphasizing short-term targets (Roychowdhury, 2006). Roychowdhury emphasizes that firms often manipulate actual activities, for example, altering operational decisions, to meet or beat quarterly earnings expectations, which can distort the proper economic health of the company. Similarly, Byun et al. (2024) suggest that companies could manipulate reporting dates to influence investor reactions. Mensah and Werner (2008) studied the relationship between disclosure frequency—quarterly reporting versus semi-annual reporting—and stock price volatility, finding that companies reporting quarterly experienced greater stock price volatility.

Balakrishnan and Ertan (2018) researched the impact of quarterly reporting on the banking sector. Their results indicate that quarterly reporting could reduce risk-taking, suggesting a nuanced landscape where reporting frequency influences managerial behaviors differently across sectors. Quarterly reporting may replicate or pre-empt information already available through alternative communication channels, leading to a static or even reduced volume of public information (Butler et al., 2007; McNichols & Manegold, 1983). Moreover, an increase in interim reporting frequency might result in declining voluntary management disclosures, fostering short-term thinking among management. This finding supports the idea that mandated interim reports may not enhance disclosures' overall quality or timeliness (Butler et al., 2007; Cho et al., 2023; Fu et al., 2020; Gigler et al., 2014). Increased reporting frequency may also diminish the marginal benefits of new information (Pitre, 2012). Bhandari et al. (2022) indicate that companies demonstrating lower financial reporting aggressiveness are less likely to meet or exceed analyst expectations, which suggests adherence to higher-quality financial reporting standards. Das et al. (2009) discovered that U.S. firms experiencing negative earnings changes in the first three quarters (Q1–Q3) were more likely to report positive changes in the fourth quarter, rather than following a

random pattern. This observation implies the potential for earnings management if companies utilize fourth-quarter earnings to “adjust” Q1 to Q3 earnings to meet annual targets, which undermines the reliability of quarterly financial data. Specifically, interim earnings necessitate estimations of annual revenues or expenses and are generally not subject to audit. If analysts neglect this reduced reliability, then they may overreact to interim reports, adversely impacting the accuracy of their forecasts. DeHaan et al. (2015) demonstrate that managers strategically schedule earnings announcements to obscure negative information or highlight positive outcomes. Sengupta (2004) investigated the reporting lag (the interval between the fiscal period’s end and the quarterly earnings release date) and identified firm characteristics contributing to this lag. Byun et al. (2024) analyzed the variability of firms’ annual earnings announcement dates over time and discovered that firms with fewer resources, weaker internal monitoring systems, and increased financial uncertainty were significantly more likely to exhibit greater variability in their announcement dates, resulting in a noticeably weaker capital market response to earnings announcements.

Evidence on whether frequent disclosures invariably lead to myopic decision-making remains mixed (Biehl et al., 2024). The interaction between mandatory and elective disclosures in shaping a firm’s external information environment remains a key focus for scholars in information economics and regulatory organizations (Einhorn, 2005; Gatti et al., 2019; Lennox & Pittman, 2011). Voluntary disclosures are generally perceived as a positive engagement, while the absence of disclosure can carry negative implications. Conversely, in mandatory disclosure settings, silence is often interpreted primarily as a negative signal (Lennox & Pittman, 2011; Polinsky & Shavell, 2012). Voluntary disclosures increase the overall availability of information and generate positive signals, enabling analysts to formulate more accurate forecasts. However, companies can strategically leverage the option of disclosure to shape market perceptions (Castellani et al., 2024).

The pressure to report with increased frequency may lead to short-term thinking among management (Gigler et al., 2014; Kraft et al., 2018), presenting additional challenges for analysts’ predictive efforts. Another area of research investigates the effects of earnings calls and earnings guidance. Atiase et al. (2005) explored the value of current earnings versus future earnings guidance and identified differences in impact based on investors’ relative preferences for reliability.

Smaller firms have lobbied for reduced reporting frequency using the arguments that less frequent reporting would promote sustainable, long-term strategies and reduce the financial burden of producing the financial reports on a quarterly basis (Fink, 2018). Regulators with the Jumpstart Our Business Startups Act of 2012 gave into pressures exerted by smaller firms and reduced the reporting for those firms from quarterly to semi-annual frequency.

Stock price volatility caused by frequent financial reporting has an excessive impact not only on smaller firms but possibly on firms in some sectors. This impact of price volatility by sector has not been explored in prior studies. Our study examined stock price volatility in quarterly reporting environments, with a breakdown for different sectors. The results imply that the reporting frequency should be reduced not only to smaller firms but also to firms from the sectors impacted by the greatest volatility. The results of this study should be considered by policymakers when reducing reporting frequency in sectors impacted excessively during financial reporting announcements.

3. Hypothesis

We hypothesize that by examining the reporting of the Dow Jones Industrial Average (DJIA) components across 40 quarterly cycles, we can better understand the relationship between different volatility regimes and the time that it takes for earnings information to

be fully absorbed by the market. We focus on the past ten years because they encompass three distinct volatility regimes, multiple economic cycles, and periods of both low and, later, more pronounced—and ultimately declining—interest rates. These evolving market conditions provide a diverse backdrop against which to assess how corporate earnings disclosures interact with and shape investor behavior, offering valuable insights into price discovery processes across varying levels of market uncertainty.

4. The Data and Research Methods

Our analysis examines the interactions between the log changes in the DJIA (Dow Jones Industrial Average) and those in the VIX (CBOE Volatility Index). The daily data cover a sample period from 3 November 2014 to 11 November 2024, with 2483 observations for each series. The data were obtained from the Federal Reserve Economic Data (FRED), Yahoo Finance, and Compustat. Before conducting empirical modeling, we obtained descriptive statistics and unit root tests for the log changes in DJIA and VIX, as detailed in Table 1.

Table 1. Descriptive statistics and unit root tests for log changes in DJIA and VIX.

Statistics	Log DJIA	Log VIX
Mean	0.000348	0.000187
Median	0.000661	−0.007243
Maximum	0.107643	0.768245
Minimum	−0.138418	−0.330681
Std. Deviation	0.011070	0.079473
Skewness	−0.216	3.774
Kurtosis	8.208	25.429
Jarque–Bera	55,031.73 ***	6469.26 ***
Probability	0.0000	0.0000
ADF Statistic	−15.779 ***	−20.977 ***
ADF <i>p</i> -value	0.0000	0.0000
KPSS Statistic	0.024	0.012
KPSS <i>p</i> -value	0.1	0.1
Observations	2483	2483

Notes: Daily data from 3 November 2014 to 11 November 2024, with 2483 observations. ADF represents the Augmented Dickey–Fuller test statistic, while KPSS denotes the Kwiatkowski–Phillips–Schmidt–Shin test. *** denotes significance at 1%. Source: FRED and authors’ estimation.

Table 1 shows that the distributions of log changes in the DJIA and the VIX are non-normal, based on the Jarque–Bera test, which reports a *p*-value of 0.000 for each. This means that the data do not follow a normal distribution. The DJIA and the VIX also have kurtosis values above 3 (especially the VIX), indicating they are leptokurtic or “heavy-tailed”, which increases the likelihood of extreme values. Furthermore, the VIX is positively skewed, pointing to more frequent large upward movements, while the DJIA is slightly negatively skewed, indicating a mild tendency toward negative returns.

The Dow Jones Industrial Average (DJIA) demonstrates a historically high correlation with the S&P 500, often exceeding 0.95 over multi-year periods, indicating that the DJIA reliably captures a significant portion of the broader market’s performance (S&P Dow Jones Indices, 2021). This strong relationship underscores the DJIA’s utility as a proxy for studying market trends and dynamics, particularly when a simplified yet representative index is required. Consequently, the DJIA’s selection for this study is justified, given its ability to effectively reflect the movements and patterns of the broader U.S. equity market.

The Augmented Dickey–Fuller (ADF) test strongly suggests that the DJIA and VIX log changes are stationary (with very negative test statistics and *p*-values close to zero), implying that their statistical characteristics, such as mean and variance, remain relatively consistent over time, making them appropriate for time-series modeling.

Lastly, the KPSS test, which has high p -values (0.1) for the DJIA and the VIX, supports the conclusion that both series are stationary. Therefore, the log changes do not require additional transformations to meet stationarity requirements for further econometric analysis.

4.1. Identification of Low, Intermediate, and High VIX Zones

Our analysis used a SETAR(2,3) model, specifying two thresholds and three lagged terms. This choice was guided by the Akaike Information Criterion (AIC), which evaluates a model’s fit while penalizing unnecessary complexity. A lower AIC value means that the model explains the data well without becoming overly complicated. First, we systematically tested different threshold values that divide the data into distinct volatility zones (low, intermediate, and high). We estimated the model and calculated the AIC for each potential threshold combination. The thresholds that produced the lowest SAC were then selected, ensuring that the final model balanced accuracy and simplicity.

Next, we determined the optimal number of lagged terms by trying various lag lengths and again relying on the AIC to identify the best fit. Ultimately, we settled on three lagged terms ($VIX_{(t-1)}$, $VIX_{(t-2)}$, and $VIX_{(t-3)}$), capturing how past volatility levels influence current fluctuations. Including these lags allowed the model to account for the persistence and dynamics in the VIX data, improving the regime-switching accuracy.

After finalizing the thresholds and lag length, we validated the model using out-of-sample data. A high R-squared value and statistically significant coefficients indicated that the model was well specified, while the Durbin–Watson statistic of 2.054 suggested no significant autocorrelation in the residuals. These results confirm that the SETAR(2,3) model fits the historical data and remains robust in predictive performance, making it a reliable tool for capturing different volatility regimes as implied by the VIX.

As indicated before, we employed the SETAR(2,p) test to identify three discernible zones of the VIX: low, intermediate, and high. We used the SETAR model as this methodological approach helps to quantify the distinctive zones of changeable interactions between the tested variables quite precisely. Our SETAR testing was rooted in the generalized two-regime, one-threshold SETAR(1,p) model (Tong & Lim, 1980; Tong, 2015), specified as follows:

$$X_t = \begin{cases} \alpha_{10} + \alpha_{11}X_{t-1} + \varepsilon_t & \text{if } X_{t-p} < r \\ \alpha_{20} + \alpha_{21}X_{t-1} + \varepsilon_t & \text{if } X_{t-p} \geq r \end{cases}, \tag{1}$$

where αn is a real constant.

The self-exciting component, the SE of the SETAR, is a lagged value of the dependent variable X_{t-p} driven by the threshold “ r ”.

Our extension of Tong’s original methodology aims to identify three volatility zones for the VIX. Our SETAR model, using the same method as Herley et al. (2024), can be expressed as follows:

$$Vix_t = \begin{cases} \alpha_{10} & \text{if } Vix_{t-p} < r_1 \\ \alpha_{20} & \text{if } r_1 \leq Vix_{t-p} < r_2 \\ \alpha_{30} & \text{if } Vix_{t-p} \geq r_3 \end{cases} + \alpha_{k1}Vix_{t-1} + \alpha_{k2}Vix_{t-2} + \alpha_{k3}Vix_{t-3} + \varepsilon_k. \tag{2}$$

As Equation (2) implies, our SETAR(2,3) model specification was optimized using two thresholds and three lagged terms. The optimization process of the SETAR model involved determining the optimal number of thresholds, lags, and the best fit to capture non-linearity in the data. This optimization was achieved by minimizing information criteria, specifically the Akaike Information Criteria (AIC), which balance the goodness-of-fit with the model complexity.

We systematically tested potential values that segment the data into distinct regimes to identify the optimal thresholds. The AIC was calculated for each potential threshold

combination, and the thresholds that produced the lowest values for these criteria were selected. This ensured that the model was both parsimonious and effective in identifying the different volatility zones. We ultimately identified two thresholds, defining three regimes: low, intermediate, and high volatility.

The lag length used in the model was also determined through an iterative process in which different lag lengths were tested, and the model fit was evaluated based on the information criteria mentioned above. Including three lagged terms (VIX $t - 1$, $t - 2$, and $t - 3$) was optimal, as this minimized the AIC while capturing the persistence and dynamics of the volatility process. The AIC of -2.587 indicated that the model fitted the data well, balancing its ability to explain the variability while avoiding overfitting. This lag length allowed the model to account for the temporal dependencies in the VIX data, making the regime-switching more informative.

After determining the thresholds and lag length, the model was validated using out-of-sample data to assess its predictive accuracy and robustness. The high R-squared value and significant coefficients indicated that the model was well specified. Furthermore, the Durbin–Watson statistic of 2.054 suggested no significant autocorrelation in the residuals, further validating the model’s reliability.

The empirical testing results for Equation (2) are provided in Table 2.

Table 2. Zones of VIX, estimated with SETAR(2,p).

Volatility Regimes	Condition	Constant Term	No. of Observations
Low VIX Zone	$VIX(t - 2) < 16.72\%$	0.9441 *** (104.69)	1969
Intermediate VIX Zone	$16.72\% \leq VIX(t - 2) < 26.53\%$	1.0000 *** (6361.16)	511
High VIX Zone	$VIX(t - 2) \geq 26.53\%$	0.0000 *** (nan)	59

Notes: The table shows the estimated thresholds and zones for VIX based on the SETAR(2,p) model. *** denotes significance at 1%. Source: authors’ estimation.

The SETAR estimation identified the following VIX thresholds and zones:

- a. Low VIX zone, for $VIX(t - 2) < 16.72\%$ (1969 observations);
- b. Intermediate VIX zone, for $16.72\% \leq VIX(t - 2) < 26.53\%$ (511 observations);
- c. High VIX zone, for $VIX(t - 2) \geq 26.53\%$ (59 observations).

The obtained thresholds and zones were robust and statistically significant at all levels. The estimated constant terms for each regime and the lagged terms were all significant at the 1% level, implying that these thresholds adequately capture changes in market volatility. Including lagged VIX values as non-threshold variables indicates their influence across regimes, providing insights into how past volatility influences current market conditions. The R-squared value of the model was high, suggesting that the model explains most of the variability in the VIX series.

Identifying these zones is critical in understanding volatility behavior in financial markets. Low VIX values typically indicate periods of market stability, whereas high VIX values are associated with heightened market uncertainty or stress. The intermediate zone represents a transition state between calm and turbulent conditions.

4.2. VAR Model

We considered a trivariate Vector Autoregressive (VAR) model including the log changes in DJIA (Dow Jones Industrial Average), the log changes in VIX (CBOE Volatility Index), and the log changes in a stock ticker of interest. The VAR model was specified as follows, in Equation (3):

Let

- Y_t = log changes in the DJIA at time t ;

- X_t = log changes in the VIX at time t ;
- Z_t = log changes in the selected stock ticker at time t .

Then, the VAR(p) model is given by

$$\begin{bmatrix} Y_t \\ X_t \\ Z_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} + \begin{bmatrix} \beta_{11}(L) & \beta_{12}(L) & \beta_{13}(L) \\ \beta_{21}(L) & \beta_{22}(L) & \beta_{23}(L) \\ \beta_{31}(L) & \beta_{32}(L) & \beta_{33}(L) \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ X_{t-1} \\ Z_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_{Y,t} \\ \epsilon_{X,t} \\ \epsilon_{Z,t} \end{bmatrix}, \quad (3)$$

where

- α_i (for $i = 1, 2, 3$) are the constant terms;
- $\beta_{ij}(L)$ represents the lagged coefficients of the variables for $i, j = 1, 2, 3$;
- $\epsilon_{Y,t}, \epsilon_{X,t}, \epsilon_{Z,t}$ are the error terms.

This VAR(p) specification allowed us to model the interdependencies between the DJIA, the VIX, and the selected stock ticker. Through including lagged values for each variable, we captured the dynamic interactions and temporal relationships among them.

The model was estimated using ordinary least squares (OLS) for each equation in the VAR system. The optimal lag length (p) was determined based on information criteria such as the Akaike Information Criterion (AIC).

The VAR model helps us to understand how shocks to the VIX or the DJIA propagate over time to other variables; for instance, a sudden increase in the VIX might affect future values of the DJIA or the stock ticker, allowing us to analyze the volatility spillovers in financial markets and the corresponding impulse response functions (IRFs).

4.3. IRF Model

An impulse response function (IRF) describes the reaction of any dynamic system in response to an external change. Thus, the IRF illustrates how the system responds to a shock over time, capturing a variable's evolution over a specified time horizon following a shock at a given moment. The IRF represents the response of each variable in the system to a shock, providing insights into the system's dynamic behavior. As mentioned, Byun et al. (2024) focused on the timing of reporting dates (investor communication) and how investor perception may change based on how managers manipulate reporting dates. Our study takes the reporting dates as given.

The VAR model was transformed into its moving average (MA) representation to derive the impulse response functions. The MA representation expresses each variable as a function of current and past shocks:

where represents the impulse response coefficients, which describe the response of the variable to a shock in a variable at lag. Intuitively, the first case is the univariate AR(1) process:

$$x_t = \varphi x_{t-1} + u_t, \quad (4)$$

where x_t is a scalar, $\varphi < 1$ (which makes the process stationary), and u_t is a (scalar) random disturbance with a mean of 0.

Specifically for this model, we can rewrite

Period t : Initial Impact

For each regime:

Earnings: At time t , E_t receives the shock:

$$E_t = c_E^{(k)} + \phi_{11}^{(k)} E_{t-1} + \phi_{12}^{(k)} VIX_{t-1} + \phi_{13}^{(k)} DJIA_{t-1} + \sigma_E, \quad (5)$$

where $k \in \{1, 2, 3\}$ indicates the regime.

Period $t + 1$: Response of Earnings and DJIA

In period $t + 1$, the effect of the shock propagates through the autoregressive structure.

For each subsequent period, previous values are iteratively substituted into the equations to observe how the shock to E_t propagates to both E_{t+k} and $DJIA_{t+k}$. The VIX level potentially shifts the model into a new regime through autoregressive terms and across different regimes.

This approach allows us to compute the IRF over time, revealing how a 1 SD shock impacts earnings and the DJIA across low, medium, and high VIX regimes. The results reveal differential impacts depending on the parameters $\phi_{ij}^{(k)}$ within each regime.

These impulse response functions provide valuable insights into the dynamic interactions between the DJIA, the VIX, and the selected stock ticker, illustrating how shocks to one variable propagate throughout the system and affect the other variables over time. Similarly to Sims (1980), our interest lies in examining the relationships between variables rather than focusing solely on coefficient estimates. Future studies could examine alternative structural breakpoints using the methodology of Bai and Perron (1998).

5. Results

This section summarizes the results of an analysis of Dow 30 stocks over 40 quarters, categorized by distinct volatility regimes. The efficiency of this analysis was constrained by the inherent complexity of market dynamics, including sector-specific factors, variability in stock behavior, and broader economic conditions. Despite these challenges, the findings provide valuable insights into individual stock reporting, time diffusion, and DJIA interactions.

Our analysis as shown in Table 3, confirms the initial hypothesis that the time required for a firm's earnings or performance news to be fully incorporated into its stock price depends substantially on the prevailing volatility regime, as identified by the SETAR model. Under high-volatility conditions, investors process information more swiftly, leading to shorter impulse response functions (IRFs) being derived from the VAR model. Conversely, information diffuses slower in low-volatility markets, resulting in extended IRFs. While most stocks among the Dow 30 revert to baseline levels within 3–5 days, technology and financial firms often display more drawn-out fluctuations due to their heightened sensitivity to market sentiment and macroeconomic indicators.

An unexpected finding within this framework is the pronounced impact of a company's beta—its exposure to systematic risk—on the duration and amplitude of these IRFs. Higher-beta stocks, such as Boeing (BA) and Goldman Sachs (GS), exhibited more significant and persistent price swings, even in conditions where rapid market absorption would otherwise be expected. This phenomenon is especially evident during lower-volatility regimes, suggesting that firm-specific risk factors can prolong the market's adjustment process despite a relatively subdued overall sentiment.

Sectoral characteristics further highlight these dynamics. Technology stocks like Microsoft (MSFT) and Apple (AAPL) tend to experience protracted and more vigorous reactions to new information, mainly when high-impact news on innovation or growth prospects captures investor attention. Industrial names, including Honeywell (HON) and Caterpillar (CAT), stabilize more rapidly as their performance closely tracks macroeconomic drivers like GDP forecasts and interest rates. In contrast, defensive sectors—such as consumer staples (e.g., Procter & Gamble [PG] and Coca-Cola [KO])—exhibit milder initial responses, reflecting their stable demand profiles and weaker correlation with broader market movements. Financial stocks, notably JPMorgan Chase (JPM) and Goldman Sachs (GS), show robust yet sometimes slower-to-dissipate shocks tied to shifts in market sentiment and economic data releases. Once again, the role of the individual stock beta needs to be considered.

Table 3. Sector analysis.

Sector/Example Stocks	Typical Initial Reaction	Volatility Profile	Time to Reversion
Technology (MSFT, AAPL)	Highly positive	High	3–5 days
Industrials (HON, CAT)	Moderate to strong	Moderate	~2–4 days
Consumer Staples (KO, PG)	Mild or muted reaction	Low (defensive)	~2–3 days
Financials (JPM, GS)	Strong initial surge; reversion may take several days	Medium–high	~3–5 days
Healthcare and Utilities (Various)	Occasional negative initial responses (sector-specific factors)	Low–moderate	~2–3 days
High-Volatility Stocks (BA, GS)	Substantial fluctuation in IRFs	High	Variable

These findings underscore the interplay between systemic conditions and firm-level risk characteristics. While broad-market volatility regimes largely govern the speed of information absorption, a company’s beta can unexpectedly prolong or intensify price adjustments—even in calmer markets—thereby serving as a critical determinant of how quickly earnings and performance shocks are fully priced.

6. Conclusions and Future Directions

This study employs comprehensive econometric models to examine how Dow Jones Industrial Average (DJIA) stocks behave under varying volatility regimes, emphasizing the interaction between financial disclosures and market reactions. The findings reveal that quarterly reporting and systemic factors significantly influence the magnitude and duration of shocks at the individual stock and index levels. While many stocks show a positive response to their reporting dates, the intensity and persistence of these reactions differ by sector. High-volatility sectors like technology often display more pronounced and sustained effects, whereas defensive sectors, including utilities, remain relatively stable. Furthermore, most shocks dissipate within three to five days, indicating the rapid market absorption of new information—but this efficiency depends on the prevailing volatility regime: high-volatility periods generally compress reaction times due to heightened investor vigilance.

A critical takeaway is that frequent reporting can enhance market transparency and amplify short-term volatility and sector-specific risks. Policymakers could exempt specific high-volatility sectors from mandatory frequent reporting to balance transparency with market stability. Despite these insights, this study faces inherent complexity due to sector-specific dynamics, variations in stock behavior, and overarching economic conditions. In particular, the absence of beta-adjusted impulse response functions (IRFs) limits the ability to differentiate how individual stocks’ market risk profiles influence their responses under different volatility regimes.

Future research should address these limitations by examining cumulative response functions over successive quarters—comparing, for example, the IRF for Q1 with Q2—to capture the compounded effects of earnings announcements over time. Such an approach would clarify whether reactions become more or less pronounced with repeated disclosures. Incorporating beta-adjusted IRFs, especially under lower-volatility conditions, would offer a more nuanced view of stock price adjustments. Additionally, exploring how growth-orientated versus value-orientated firms respond to varying frequencies and depths of financial reporting could reveal whether reduced disclosure benefits firms with inherently higher beta values. Finally, evaluating the extent of detail provided in quarterly filings may yield strategies to mitigate short-term market pressures and encourage longer-term decision-making. By integrating these enhancements, future studies can refine our understanding of

the complex interplay among volatility regimes, financial disclosure practices, and stock price dynamics.

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References

- Abdel-Khalik, A. R., & Espejo, J. (1978). Expectations data and the predictive value of interim reporting. *Journal of Accounting Research*, 16, 1–13. [CrossRef]
- Aboudy, D., Lehavy, R., & Trueman, B. (2010). Limited attention and the earnings announcement returns of past stock market winners. *Review of Accounting Studies*, 15(2), 317–344. [CrossRef]
- Atiase, R. K., Li, H., Supattarakul, S., & Tse, S. (2005). Market reaction to multiple contemporaneous earnings signals: Earnings announcements and future earnings guidance. *Review of Accounting Studies*, 10(1), 497–525. [CrossRef]
- Bai, J., & Perron, P. (1998). Estimating and testing linear models with multiple structural changes. *Econometrica*, 66(1), 47–78. [CrossRef]
- Balakrishnan, K., & Ertan, A. (2018). Banks' financial reporting frequency and asset quality. *The Accounting Review*, 93(3), 1–24. [CrossRef]
- Ball, R., & Kothari, S. (1991). Security returns around earnings announcements. *The Accounting Review*, 66(4), 718–738.
- Barber, B., De George, E., Lehavy, R., & Trueman, B. (2013). The earnings announcement premium around the globe. *Journal of Financial Economics*, 108(1), 118–138. [CrossRef]
- Beyer, A., Cohen, D. A., Lys, T. Z., & Walther, B. R. (2010). The financial reporting environment: Review of the recent literature. *Journal of Accounting and Economics*, 50(2–3), 296–343. [CrossRef]
- Bhandari, A., Golden, J., Walker, K., & Zhang, J. H. (2022). The relationship between stock repurchase completion rates, firm reputation, and financial reporting quality: A commitment-trust theory perspective. *Accounting and Finance*, 62, 2687–2724. [CrossRef]
- Biehl, H., Bleibtreu, C., & Stefani, U. (2024). The real effects of financial reporting: Evidence and suggestions for future research. *Journal of International Accounting, Auditing and Taxation*, 54, 100594. [CrossRef]
- Blankespoor, E., de Haan, E., & Marinovic, I. (2020). Disclosure processing costs, investors' information choice, and equity market outcomes: A review. *Journal of Accounting and Economics*, 70(2–3), 101344. [CrossRef]
- Bornemann, T., Moosmann, A. L., & Novotny-Farkas, Z. (2023). The consequences of abandoning the quarterly reporting mandate in the prime market segment. *European Accounting Review*, 11, 1–34. [CrossRef]
- Brav, A., Graham, J. R., Harvey, C. R., & Michaely, R. (2005). Payout policy in the 21st century. *Journal of Financial Economics*, 77(3), 483–527. [CrossRef]
- Bui, T. H. (2024). Past, present, and future of earnings management research. *Cogent Business & Management*, 11(1), 2300517. [CrossRef]
- Burke, J. A., & Polimeni, R. S. (2023). The accounting profession in crisis. *CPA Journal*, 93, 6–8. Available online: <https://www.cpapjournal.com/2023/12/01/the-accounting-profession-is-in-crisis/> (accessed on 12 October 2024).
- Butler, M., Kraft, A., & Weiss, I. S. (2007). The effect of reporting frequency on the timeliness of earnings: The cases of voluntary and mandatory interim reports. *Journal of Accounting and Economics*, 43, 181–217. [CrossRef]
- Byun, S., Roland, K. C., & Dongchang, K. (2024). The determinants and information effects of earnings announcement date variability. *Journal of Risk and Financial Management*, 17(10), 462. [CrossRef]
- Castellani, V., Muller, K. A., & Park, K. J. (2024). Investor reaction to SPACs' voluntary disclosures. *The Accounting Review*, 99, 105–137. [CrossRef]
- Chapman, K. (2018). Earnings notifications, investor attention, and the earnings announcement premium. *Journal of Accounting and Economics*, 66(1), 222–243. [CrossRef]
- Cheng, L., Roulstone, D., & Buskirk, A. (2021). Are investors influenced by the order of information in earnings press releases? *The Accounting Review*, 96(2), 413–433. [CrossRef]

- Cho, H., Choi, S., & Kim, R. (2023). Less timely earnings announcements and voluntary disclosure. *Journal of Business Finance & Accounting*, 50(3–4), 524–564. [CrossRef]
- D’Adduzio, J., Koo, D. S., Ramalingegowda, S., & Yu, Y. (2024). Does More Frequent Financial Reporting Bring the Future Forward? *Accounting Horizons*, 38(2), 119–141. [CrossRef]
- Das, S., Shroff, P. K., & Zhang, H. (2009). Quarterly earnings patterns and earnings management. *Contemporary Accounting Research*, 26, 797–831. [CrossRef]
- Davis, D. (2022, June 1). *Short-term profits and long-term consequences: Did Jack Welch break capitalism?* [Audio podcast]. NPR. Available online: <https://www.npr.org/2022/06/01/1101505691/short-term-profits-and-long-term-consequences-did-jack-welch-break-capitalism> (accessed on 14 October 2024).
- DeHaan, E., Shevlin, T., & Thornock, J. (2015). Market (in) attention and the strategic scheduling and timing of earnings announcements. *Journal of Accounting and Economics*, 60, 36–55. [CrossRef]
- Dow, J., Han, J., & Sangiorgi, F. (2024). The short-termism trap: Catering to informed investors with limited horizons. *Journal of Financial Economics*, 159, 103884. [CrossRef]
- Einhorn, E. (2005). The nature of the interaction between mandatory and voluntary disclosures. *Journal of Accounting Research*, 43, 593–621. [CrossRef]
- Ernstberger, J., Link, B., Stich, M., & Vogler, O. (2017). The real effects of mandatory quarterly reporting. *The Accounting Review*, 92(5), 33–60. [CrossRef]
- Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance*, 25(2), 383–417. [CrossRef]
- Ferreira, A. C., & Morais, A. (2022). Frequency of interim reporting and impairment losses on financial assets. *Brazilian Business Review*, 20(2), 119–132. [CrossRef]
- Fink, L. (2018, January 16). *A sense of purpose*. BlackRock. Available online: <https://www.blackrock.com/corporate/investor-relations/2018-larry-fink-ceo-letter> (accessed on 14 October 2024).
- Fu, R., Kraft, A., Tian, X., Zhang, H., & Zuo, L. (2020). Financial reporting frequency and corporate innovation. *The Journal of Law and Economics*, 63(3), 501–530. [CrossRef]
- García Osma, B., Guillamón Saorín, E., & Mercado, F. (2023). Quarterly earnings guidance and real earnings management. *Journal of Business Finance & Accounting*, 50(5–6), 1029–1059. [CrossRef]
- Gatti, L., Vishwanath, B., Seele, P., & Cottier, B. (2019). Are we moving beyond voluntary CSR? Exploring theoretical and managerial implications of mandatory CSR resulting from the new Indian Companies Act. *Journal of Business Ethics*, 160, 961–972. [CrossRef]
- Gigler, F., Kanodia, C., Sapiro, H., & Venugopalan, R. (2014). How frequent financial reporting can cause managerial short-termism: An analysis of the costs and benefits of increasing reporting frequency. *Journal of Accounting Research*, 52, 357–387. [CrossRef]
- Guttman, I., Kadan, O., & Kandel, E. (2006). A rational expectations theory of kinks in financial reporting. *The Accounting Review*, 81(4), 811–848. [CrossRef]
- Haga, J., Högholm, K., & Sundvik, D. (2022). Peer firms’ reporting frequency and stock price synchronicity: European evidence. *Journal of International Accounting, Auditing and Taxation*, 49, 100505. [CrossRef]
- Healy, P. M., & Wahlen, J. M. (1999). A review of the earnings management literature and its implications for standard setting. *Accounting Horizons*, 13(4), 365–383. [CrossRef]
- Herley, M. D., Orłowski, L. T., & Ritter, M. A. (2024). US dollar exchange rate elasticity of gold returns at different Federal Fund rate zones. *Economies*, 12, 229. [CrossRef]
- Janicka, M., Pieloch-Babiarz, A., & Sajnog, A. (2020). Does short-termism influence the market value of companies? Evidence from EU countries. *Journal of Risk and Financial Management*, 13(11), 272. [CrossRef]
- Kajüter, P., Lessenich, A., Nienhaus, M., & van Gemmen, F. (2022). Consequences of interim reporting: A literature review and future research directions. *European Accounting Review*, 31, 209–239. [CrossRef]
- Kraft, A., Vashishtha, R., & Venkatachalam, M. (2018). Frequent financial reporting and managerial myopia. *The Accounting Review*, 93(2), 249–275. [CrossRef]
- Kubota, K., & Takehara, H. (2016). Information asymmetry and quarterly disclosure decisions by firms: Evidence from the Tokyo stock exchange. *International Review of Finance*, 16(1), 127–159. [CrossRef]
- Lang, M., & Lundholm, R. (1993). Cross-sectional determinants of analyst ratings of corporate disclosures. *Journal of Accounting Research*, 31, 246–271. [CrossRef]
- Lennox, C. S., & Pittman, J. A. (2011). Voluntary audits versus mandatory audits. *The Accounting Review*, 86, 1655–1678. [CrossRef]
- Levi, S., & Zhang, X. (2015). Asymmetric decrease in liquidity trading before earnings announcements and the announcement return premium. *Journal of Finance*, 118(2), 383–398. [CrossRef]
- Maurer, M. (2023, July 11). The accountant shortage is showing up in financial statements. *The Wall Street Journal*. Available online: <https://www.wsj.com/articles/the-accountant-shortage-is-showing-up-in-financial-statements-b14a6b94> (accessed on 14 October 2024).

- McMullin, J. L., Miller, B. P., & Twedt, B. J. (2019). Increased mandated disclosure frequency and price formation: Evidence from the 8-K expansion regulation. *Review of Accounting Studies*, 24, 1–33. [CrossRef]
- McNichols, M., & Manegold, J. G. (1983). The effect of the information environment on the relationship between financial disclosure and security price variability. *Journal of Accounting and Economics*, 5, 49–74. [CrossRef]
- Mensah, Y. M., & Werner, R. H. (2008). The capital market implications of the frequency of interim financial reporting: An international analysis. *Review of Quantitative Finance and Accounting*, 31, 71–104. [CrossRef]
- Nallareddy, S., Pozen, R., & Rajgopal, S. (2021). Consequences of more frequent reporting: The UK experience. *Journal of Law, Finance, and Accounting*, 6(1), 51–88. [CrossRef]
- Patton, A., & Verardo, M. (2012). Does beta move with news? Firm-specific information flows and learning about profitability. *Review of Financial Studies*, 25(9), 2789–2839. [CrossRef]
- Pitre, T. J. (2012). Effects of increased reporting frequency on nonprofessional investors' earnings predictions. *Behavioral Research in Accounting*, 24, 91–107. [CrossRef]
- Plečnik, J. M., Yang, L. L., & Zhang, J. H. (2022). Corporate innovation and future earnings: Does early patent disclosure matter? *Accounting and Finance*, 62, 2011–2056. [CrossRef]
- Polinsky, A. M., & Shavell, S. (2012). Mandatory versus voluntary disclosure of product risks. *The Journal of Law, Economics, & Organization*, 28, 360–379. [CrossRef]
- Reinstein, A., & Kaszak, S. E. (2024). Addressing the shortage of accountants: Suggestions for academe and the profession. *Journal of Accounting Education*, 66, 100888. [CrossRef]
- Roychowdhury, S. (2006). Earnings management through real activities manipulation. *Journal of Accounting and Economics*, 42(3), 335–370. [CrossRef]
- Roychowdhury, S., Shroff, N., & Verdi, R. S. (2019). The effects of financial reporting and disclosure on corporate investment: A review. *Journal of Accounting and Economics*, 68, 101246. [CrossRef]
- Savor, P., & Wilson, M. (2016). Earnings announcements and systematic risk. *Journal of Finance*, 71(1), 83–138. [CrossRef]
- S&P Dow Jones Indices. (2021). *Comparing iconic indices: The S&P 500 and DJIA*. Available online: <https://www.spglobal.com/spdji/en/education/article/comparing-iconic-indices-the-sp-500-and-djia> (accessed on 12 December 2024).
- Schipper, K. (2007). Required Disclosures in Financial Reports. *The Accounting Review*, 82(2), 301–326. [CrossRef]
- Sengupta, P. (2004). Disclosure timing: Determinants of quarterly earnings release dates. *Journal of Accounting and Public Policy*, 23(6), 457–482. [CrossRef]
- Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*, 48(1), 1–48. [CrossRef]
- Stein, J. C. (1989). Efficient capital markets, inefficient firms: A model of myopic corporate behavior. *Quarterly Journal of Economics*, 104(4), 655–669. [CrossRef]
- The Wall Street Journal. (2024, March 24). Boeing CEO david calhoun steps down. *The Wall Street Journal*. Available online: <https://www.wsj.com/articles/boeing-ceo-david-calhoun-steps-down-airlines-government-business-78800f4f> (accessed on 14 October 2024).
- Tong, H. (2015). Threshold models in time series analysis—30 years on. *Statistics and Interface*, 4(1), 107–118. [CrossRef]
- Tong, H., & Lim, K. S. (1980). Threshold autoregression, limit cycles and cyclical data. *Journal of the Royal Statistical Society: Series B*, 42(3), 245–268. [CrossRef]
- Tsao, S. M., Lu, H. T., & Keung, E. C. (2016). Voluntary monthly earnings disclosures and analyst behavior. *Journal of Banking & Finance*, 71, 37–49. [CrossRef]
- Van Buskirk, A. (2012). Disclosure frequency and information asymmetry. *Review of Quantitative Finance and Accounting*, 38(1), 411–440. [CrossRef]

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Article

The Role of Board Independence in Enhancing External Auditor Independence

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Abstract: Legislative regulations have recognized the significance of board independence in enhancing the board's role and strengthening its autonomy, which are among the key features that mitigate conflicts of interest between management and shareholders. External auditing serves as a pivotal element of corporate governance, acting as a monitoring mechanism to reduce information asymmetry and safeguard principal interests by ensuring the accuracy and fairness of financial statements. This, in turn, reassures data users and stakeholders. The study aimed to examine the effect of board independence on enhancing external auditor independence among 72 Jordanian service companies listed on the Amman Stock Exchange from 2017 to 2021, with a study sample of 62 companies. The findings revealed a negative impact of board member independence on external auditor independence, as measured by audit firm size. However, company size positively influenced external auditor independence, while no effect was found for financial leverage or company age. The findings highlight the need for companies to strengthen internal controls and governance practices to enhance external auditor independence. Additionally, they suggest that company size plays a crucial role, while other factors like financial leverage and company age may have limited impact, indicating areas for further exploration in future research.

Keywords: board independence; external auditor independence; audit firm size; company size; financial leverage; company age

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1. Introduction

The pressing need for auditing services arose as a natural consequence of corporate expansion agency theory. This theory entails the delegation of authority by owners to the board of directors to manage the company's affairs, which has introduced several issues, including conflicts of interest in the agency relationship between the principal (shareholders) and the agent (management). These issues are often exacerbated in countries with dispersed ownership structures, leading to reduced oversight benefits (Azzoz et al., 2016). Shareholders increasingly rely on independent external auditors, elected by them, for continuous monitoring. Financial auditing serves as a mechanism to reduce information asymmetry and protect the interests of the principal by ensuring the accuracy and fairness of financial statements, thereby reassuring data users and stakeholders (Bahrawe, 2024). External auditors act as a bridge between a company's management, which possesses internal information, and financial markets, that depend on external financial reports (Suwaidan et al., 2015). According to Christopher et al. (2019), the objective of auditing is to provide

an independent opinion on the audited accounts, as well as to detect and correct errors and prevent fraud. Thus, external auditor independence has been a cornerstone of the auditing profession since its inception. It is crucial for ensuring the credibility of audit reports and building trust among stakeholders such as investors and shareholders in the accuracy and reliability of financial data. The board of directors, as a key internal mechanism of corporate governance, is tasked with implementing various governance practices (Bosse & Phillips, 2016). The board plays a significant role in planning, organizing, monitoring, and supervising all aspects of the company's operations (Bueno et al., 2018). However, the board's effectiveness depends on specific characteristics, such as the independence of its members (Makni et al., 2012; Rijal et al., 2023). Board independence is not merely a principle but a cornerstone for ensuring transparency, accountability, and ethical corporate practices. One of its critical roles is to create an environment that allows the external auditor to operate independently, free from executive management pressures (Soliman & Abdel Salam, 2012). This is achieved through the audit committee, which coordinates among the board, executive management, and external auditors, providing all necessary support during the auditing process. Jordan, as a developing country, faces challenges in protecting investors and implementing effective corporate governance mechanisms compared to developed nations. Weak application of corporate governance rules characterizes Jordanian companies (Azzoz et al., 2016). Additionally, concentrated ownership in Jordanian companies reduces the demand for high-quality external audits (Niskanen et al., 2011). To address these challenges, efforts have been made to raise awareness about corporate governance and promote its best practices. For instance, the Jordan Securities Commission amended certain laws and instructions, including the 2017 Corporate Governance Instructions for Listed Companies (Securities Depository Center, 2024). Previous studies have shown mixed results regarding the impact of board independence on enhancing the independence of external auditors. Some studies found a negative effect, such as Hay et al. (2006) and Orshi et al. (2018). Others found no effect, as indicated by Al Jabr (2011), Makni et al. (2012), Gajevszky (2015), and Kasim et al. (2015). However, the majority of studies, including Beasley and Petroni (2001), Abdullah et al. (2008), Niskanen et al. (2011), Kuang (2011), Soliman and Abdel Salam (2012), Gana and Krichen (2013), Jizi and Nehme (2018), Al Daoud (2020); and Bahrawe (2024) confirmed a positive effect. The above highlights several motivations for conducting the current study, the most significant being that previous studies have not provided conclusive evidence regarding the nature of the relationship between board independence and external auditor independence. What one study considers a positive effect, another views as a negative effect, while a third finds no effect at all. Furthermore, the application environments of these studies vary widely. Some were conducted in developed countries, such as Gajevszky (2015) study in Bucharest, while others were conducted in developing countries, such as Al Farooque et al.'s (2020) study in Thailand. This topic, however, has not received the same attention in Arab environments, particularly in Jordan. This variation could lead to difficulties in generalizing their results. Additionally, the time frames of these studies vary, and no similar study has been conducted in Jordan since corporate governance regulations became mandatory in 2017 up to the time of this study. In light of the above, the research gap lies in the scarcity of accounting literature on the nature and direction of the relationship between board independence and external auditor independence. This study aims to provide empirical evidence from the Jordanian stock exchange on the existence, strength, and direction of the relationship between these research variables. Based on the above, a key research question emerges: What is the impact of board independence on enhancing external auditor independence in companies listed on the Amman Stock Exchange?

This study employs a quantitative research methodology using data from companies listed on the Amman Stock Exchange. The analysis is conducted through multiple linear regression to examine the impact of board independence on external auditor independence, while controlling for factors such as firm size, leverage, and company age. Moreover, this study contributes to the accounting literature by addressing the gap in Arab contexts, particularly in Jordan, and by providing empirical evidence on the impact of board independence on external auditor independence post-2017 corporate governance reforms. It also offers valuable insights for policymakers, corporate governance experts, and practitioners. Moreover, the findings of this study are particularly relevant to regulators seeking to strengthen corporate governance mechanisms, investors assessing the quality of governance in listed companies, and external auditors aiming to maintain independence. Academics may also find the results valuable for further research.

The remainder of this paper is organized as follows: Section 2 reviews the relevant literature and develops the hypotheses. Section 3 describes the research methodology. Section 4 presents the results and their analysis, while Section 5 concludes with implications, limitations, and recommendations for future research.

2. Conceptual Framework

2.1. Auditor Independence

The concept of auditor independence has been defined in various ways, with one of the most common definitions being DeAngelo's (1981). DeAngelo defines auditor independence as the ability of the external auditor to detect manipulations and errors in the client's accounting system and to report those irregularities in the audit report issued at the conclusion of the audit process. In other words, auditor independence refers to the likelihood that the auditor will disclose the errors and irregularities identified in their report. Arens et al. (2011) describe auditor independence as "the auditor's ability to act with honesty, integrity, and objectivity at all stages of the audit process, without being influenced by any external pressure or engaging in activities that conflict with objectivity and integrity". Other definitions of auditor independence focus on aspects such as error detection and financial report outcomes, based on the belief that greater auditor independence enhances the detection of errors in reported earnings, thereby improving earnings quality and trust in financial statements (Chang et al., 2009). Some definitions emphasize the size of the auditor's workload or effort (Carcello et al., 2002), while others center on the outcomes of the auditing process (Porter & Sherwood, 2023). Despite the lack of consensus on a universal definition of auditor independence, the U.S. Securities and Exchange Commission (SEC) and the International Federation of Accountants (IFAC) have outlined two primary dimensions of independence (International Auditing Assurance Standards Board, 2022):

Mental (or Intellectual) Independence: This refers to "a state of mind that enables the auditor to provide an opinion without being affected by influences that compromise professional judgment, allowing them to act with integrity and exercise objectivity and professional skepticism".

Perceived Independence: This dimension requires auditors to "avoid circumstances or facts that could give the impression to external parties that the auditor's neutrality and independence have been compromised, thus diminishing trust in their objectivity and fairness when issuing opinions on financial statements".

2.2. Measuring Auditor Independence

Although auditor independence is critical, there is no agreed-upon comprehensive framework for defining or measuring it (AlTheebeh & Abu Qobu, 2017). This is due to the diverse needs of stakeholders and the varying contexts in which auditing occurs. The

lack of a standardized measurement framework has led to the development of proxies or indicators for assessing auditor independence, as highlighted by prior studies (DeAngelo, 1981; Abdullah et al., 2008; Gajevszky, 2015; DeFond & Zhang, 2014; and Jizi & Nehme, 2018). Audit fees are considered a reflection of auditor independence (Hoitash et al., 2007) and one of the most prominent indicators of independence, as they represent the auditor's efforts (Soyemi & Olowookere, 2013). High audit fees lead to more effort and time dedicated to the audit process, increasing the likelihood of detecting errors, fraud, and manipulation in the financial statements of the audited company. Sundgren and Svanström (2013) found that lower audit fees result in reduced auditor independence because lower fees compel auditors to allocate fewer resources, such as fewer auditors from their office and shorter audit durations, to the audit process to minimize costs. Additionally, studies by Asthana and Boone (2012), Ettredge et al. (2014), and Abdul-Rahman et al. (2017) found a positive effect of audit fees on enhancing auditor independence. The duration of the auditor's engagement with the audited company is another indicator of external auditor independence, reflecting the period during which the audited company benefits from the auditor's services (Asmara & Situanti, 2018). However, previous studies have reported conflicting results on this matter. From one perspective, the duration of the auditor–client relationship is inversely related to auditor independence because the auditor may prioritize retaining the client, even at the expense of independence (Bedard & Johnstone, 2010). This is due to the development of personal relationships between the auditor and the client's management, negatively impacting independence (Asmara & Situanti, 2018). Conversely, it can also be argued that longer engagement periods are positively associated with independence, as extended durations enhance the auditor's ability to detect errors and improve their expertise in auditing the specific company (Eshleman & Guo, 2014). Board independence is a critical factor in the effectiveness of board oversight, as it minimizes conflicts of interest between management and shareholders. It enables the board to perform its supervisory monitoring functions more effectively (Dimitropoulos & Asteriou, 2010). Board independence refers to the presence of board members who are entirely independent of the company's executive management and have no connections or interests tied to the company. This independence reassures shareholders stakeholders about the credibility of the company's management (Al Farooque et al., 2020). The Jordanian Corporate Governance Code recommends that one-third of the board members be independent. If the calculation results in a fraction, the number is rounded up to the nearest whole number. The importance of board independence lies in the neutrality of board decisions, ensuring balance in strategy formulation, performance evaluation, and risk monitoring. Independent board members improve internal company relations, as well as those between executive management stakeholders (Sharif & Hossain, 2020; Al Harbi, 2018). Independent directors contribute their expertise and unbiased judgment, working in the best interest of stakeholders. Their role positively impacts board effectiveness (Gómez et al., 2017; Fuzi et al., 2016). From an agency theory perspective, independent directors act as representatives of shareholders, motivated to prevent and detect opportunistic behaviors by executive management. These motivations stem from maintaining their reputation, avoiding legal liabilities, and protecting shareholder rights, particularly given the significant financial losses associated with issues in financial reports. Independent directors influence the independence of external auditors by impacting the selection appointment process (Gómez et al., 2017; Assidi, 2020). Numerous studies have examined the impact of independent board members on enhancing auditor independence, particularly the relationship with Big Four auditing firms. Beasley and Petroni (2001) found that having independent directors is a critical mechanism for influencing other board members to engage independent external auditors. Abdullah et al. (2008) concluded that independent directors increase demand for high-quality external

audits to safeguard themselves from litigation risks, maintain their reputations, and protect shareholder interests. In contrast, other studies present conflicting findings. This is the same result reached by the study of Somoye et al. (2020) for a sample of 18 companies listed in Nigeria for the period (2011–2015). The study of Bahrawe (2024) also reached the conclusion that there is a positive impact of board independence on audit quality. For example, Gajevszky (2015) found no correlation between board independence and auditor independence in companies listed on the Bucharest Stock Exchange. Similarly, Makni et al. (2012) found no significant impact of independent board members on selecting Big Four auditors in Tunisian companies. Given these divergent results, this study investigates whether board independence positively affects auditor independence in companies listed on the Amman Stock Exchange. This leads to the formulation of the following hypothesis: Board independence positively influences auditor independence in companies listed on the Amman Stock Exchange.

3. Research Design and Methodology

3.1. Sample Data Collection

In this study, data from 72 companies listed on the Amman Stock Exchange were used. These are large-scale enterprises with a long enough listing period; they constitute an important pillar of the Jordanian economy. The research period is from 2017 to 2021. The data were collected from audited financial statements and annual reports. The data were corrected for errors, then used in quantitative analysis. As for the study sample, companies that met the following conditions were selected: 1. financial reports were regularly available throughout the study period; 2. the company was listed on the Amman Stock Exchange throughout the study period, and it was not merged or suspended from trading during the study period; 3. the company must have disclosed in the auditor's report the auditing process of the company's annual financial reports; and 4. the company must have published its financial reports in Jordanian dinars, its fiscal year must have ended at the end of December of each year throughout the study period.

Based on the methodology used to select the study sample, the number of companies that met the conditions reached 62, equivalent to 86% of the study population.

3.2. Study Variables and the Measurement Methods

- **Dependent Variable:** The dependent variable in this study is auditor independence, measured using the following indicator:
- **Audit Firm Size:** This refers to the external auditor's affiliation with one of the global auditing firms (Big Four). It is a binary variable that takes the value of 1 if the auditor is affiliated with a Big Four firm and 0 otherwise (Soliman & Abdel Salam, 2012; Gajevszky, 2015).
- **Independent Variable:** The independent variable in this study is board independence. Due to the difficulty of verifying all the conditions outlined in the regulations regarding board member independence, the study focuses on non-executive board members. A non-executive board member is defined as one who is not fully engaged in managing the company, is not employed by the company or receiving a salary from it, and does not own 5% or more of the company's shares. Measurement: Board independence is measured as the ratio of independent board members to the total number of board members. This variable is denoted as BIN (Gómez et al., 2017; Assidi, 2020).
- **Control Variables:** Three control variables are included in this study: company age, financial leverage, and company size (Kuang, 2011; Gajevszky, 2015; Kasim et al., 2015; Jizi & Nehme, 2018):

- ✓ **Company Age:** Measured using the natural logarithm of the number of years the company has been listed on the Amman Stock Exchange since its establishment. Denoted as AGE.
- ✓ **Financial Leverage:** Calculated as the book value of total liabilities divided by total assets. Denoted as LEV.
- ✓ **Company Size:** Measured using the natural logarithm of the company’s total assets. Denoted as SIZE.

3.3. Statistical Model

Figure 1 below outlines the conceptual framework, providing a structured approach to investigating the relationship between board independence and auditor independence.

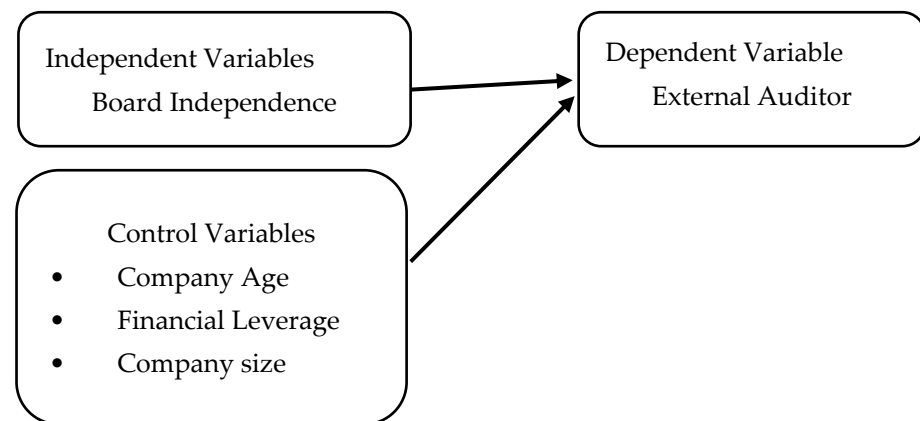


Figure 1. The study model.

Based on Figure 1, which shows the relationships between the independent and dependent variable of the study, the model has been formulated as follows

$$BIG_{it} = \beta_0 + \beta_1 BIN_{it} + \beta_2 AGE_{it} + \beta_3 LEV_{it} + \beta_4 SIZE_{it} + \varepsilon_{it} \dots \dots \dots 1$$

- BIG_{it}:** External Auditor Independence
- BIN_{it}:** Independence of Board Members A
- GE_{it}:** Company Age
- LEV_{it}:** Financial Leverage
- SIZE_{it}:** Company size
- β₀:** Intercept Value
- β₁–β₄:** Regression Coefficients
- ε_{it}:** Rom Error

4. Data Analysis and Discussion

4.1. Descriptive Statistics

This section of the analysis presents the results of the descriptive statistics conducted on the study data from 2017 to 2021 for the dependent variable and the independent control variables, which include the mean, standard deviation, maximum value, and minimum value. Additionally, the percentages and frequencies for the dummy variables used in the study model will also be presented.

4.1.1. Descriptive Statistics for Audit Firm Size

As shown in Table 1, 119 companies (38%) in the sample are audited by the Big Four firms, while 191 companies (62%) are audited by non-Big4 firms. The preference for non-Big4 firms among service companies listed on the Amman Stock Exchange may be due to high internal control standards or concerns about the high audit fees of the Big4 firms.

Table 1. Descriptive statistics for audit firm size.

Variable	Frequency	Percentage
BIG4 (1)	119	38%
Other (0)	191	62%
Total	310	100%

4.1.2. Descriptive Statistics for Study Variables

The results presented in Table 2 indicate the following:

- ✓ **Board Independence:** The mean percentage of independent board members for the period (2017–2021) was 42.62%, with a standard deviation of 25.66%. The maximum value was 100%, indicating that many companies adhered to corporate governance rules requiring at least one-third of board members to be independent. However, the minimum value of 0.000% is notable, suggesting that some companies lack independent board members entirely.
- ✓ **Company Age:** The mean company age was 19.85 years, with a standard deviation of 9.94 years. The oldest company was 43 years old, while the youngest was 7 years old, reflecting the relatively recent establishment of some service companies in Jordan.
- ✓ **Financial Leverage:** The mean financial leverage was 26.95%, with a standard deviation of 22.60%. The maximum value was 95.90%, and the minimum was 0.164%, showing significant variation in companies’ debt levels.
- ✓ **Company Size:** The mean total assets were 97,476,912 JOD, with a standard deviation of 225,192,173 JOD. The maximum total assets were 1,440,221,599 JOD, and the minimum was 870,329 JOD, indicating substantial differences in company sizes within the sample.

Table 2. Descriptive statistics for the study variables.

Variable	Mean	S D	Max	Min
Board Independence	42.62%	25.66%	100%	0.000%
Company Age	19.85	9.94	43	7
Financial Leverage	26.95	22.60	95.90	0.164
Company Size	97,476,912	225,192,173	1,440,221,599	870,329

4.2. Hypothesis Testing

After verifying the suitability of the data for the study models describing the study variables, the model was subjected to multiple linear regression analysis. The results are presented in Table 3 below.

Based on the results of the multiple linear regression analysis, the following observations can be made regarding the impact of board independence on enhancing external auditor independence: The study model used to test the relationship between the independent variable (board independence) and the control variables in relation to external auditor independence, measured by (audit firm size), shows a statistically significant effect at the 1% significance level. The calculated F value was (33.83). Comparing these values indicates that the computed value exceeds the critical value, thus supporting the hypothesis and rejecting the null hypothesis, which is confirmed by the significance level of (0.000), less than the 0.01 threshold (α).

Table 3. Results of multiple linear regression analysis.

Variables	Sig	T	β
BIN	0.004 ***	−2.90	−0.39
AGE	0.314	1.01	0.005
LEV	0.253	1.14	0.003
LOG_SIZE	0.090 *	1.70	0.118
R Square		32.51	
F_statistic		33.83	
Sig (F_statistic)		0.000 ***	

Significance levels: *** $p < 0.01$, * $p < 0.10$.

The results indicate that 32.51% of the variation in enhancing external auditor independence, measured by audit firm size, can be explained by the combined variation in the variables. This suggests the presence of other factors influencing auditor independence that were not addressed in the current study.

There is a negative impact of board member independence on enhancing external auditor independence, measured by audit firm size, in the companies sampled. The t-value was −2.90 with a significance level of 0.004. Accordingly, we reject the hypothesis stating that board independence positively impacts external auditor independence in companies listed on the Amman Stock Exchange.

This finding aligns with supervision theory, which posits that an increase in executive members on the board is more beneficial, as they are more familiar with the company's operations and exhibit greater loyalty than independent members. It can also be interpreted from the perspective of agency theory that having independent board members strengthens internal oversight and control over the company, thus reducing the level of manipulation and fraud, potentially lowering the demand for external auditor independence. This result is consistent with the findings of researchers such as Hay et al. (2006), Orshi et al. (2018). Conversely, it contradicts the results of studies by Beasley and Petroni (2001), Niskanen et al. (2011), Kuang (2011), Soliman and Abdel Salam (2012), Gana and Krichen (2013), and Jizi and Nehme (2018), who found a positive effect. Similarly, it conflicts with the results of Makni et al. (2012), Kasim et al. (2015), and Al Jabr (2011), who concluded that board independence does not significantly affect external audit quality.

Regarding the control variables, the results indicated the following:

There is a positive effect with statistical significance at the 10% level for firm size in enhancing external auditor independence, with a t-value of 1.70 and a significance level of 0.09. This can be interpreted as external auditors expecting to conduct more audit work as the size of the audited firm increases, ensuring that appropriate compliance procedures and sufficient testing are performed. Additionally, larger firms tend to disclose more information than smaller firms, such as voluntarily reporting certain events and financial data or issuing their financial statements earlier. This finding aligns with studies by Jizi and Nehme (2018), while it contradicts the findings of Makni et al. (2012), who concluded that there was no significant effect.

There is no effect of leverage on enhancing external auditor independence, with a t-value of 1.14 and a significance level of 0.253. This may be explained by the fact that companies with significant reliance on debt in their economic activities tend to face increased creditor oversight due to concerns that the board may transfer wealth from debt holders to shareholders.

There is also no effect of firm age on enhancing external auditor independence, as indicated by a t-value of 1.01 and a significance level of 0.314. This could be attributed to

the higher expertise available to implement corporate governance mechanisms in older firms, leading to a lower demand for high-quality auditing.

These findings reflect the complexity of the relationship between these variables and their influence on external auditor independence, consistent with literature on corporate governance and auditing practices.

5. Conclusions

External audits serve the public by increasing the credibility of financial reports. However, this function can only be fulfilled if audit quality is sufficiently high, which requires auditor independence. Independence is a cornerstone of the audit profession, however, auditors are permanently suspected of not acting independently. In the aftermath of financial crises and accounting scandals, regulators have tightened measures to strengthen auditor independence. Jordan is classified as a developing country, where the level of investor protection and the effectiveness of corporate governance mechanisms provided by companies to market participants differ from those in developed countries. Jordanian companies are characterized by ownership concentration, which may contribute to a reduced demand for high-quality external auditing. Efforts have been ongoing to raise awareness about the concept of governance and promote best practices for corporate governance. The Securities Commission has amended several regulations, laws, and instructions, including requirements for independent members on boards of directors and the separation of the chairman's role from any executive position in the company. Accordingly, this study aims to shed light on the extent to which board independence enhances external auditor independence. The study, through descriptive analysis of the variables, found that most companies in the sample adhere to corporate governance rules related to board independence. However, some companies are non-compliant, indicating a lack of independent members on their boards. Thirty-eight percent of service companies are audited by the Big Four auditing firms (BIG4). Hypothesis testing revealed a negative impact of board independence on enhancing external auditor independence, measured by audit firm size, with results indicating that board independence affects external auditor independence by -37% . Additionally, there was a positive effect at the 10% significance level for firm size on external auditor independence, while no effects were found for leverage or firm age. Based on the results obtained from both the theoretical framework and statistical analysis, the current study recommends that companies should adopt several strategies to reduce potential risks, such as strengthening their internal control systems to enhance transparency and accountability. Further research should explore other aspects of board characteristics, such as board size, professional certifications of board members, financial expertise, and board member compensation, to examine their potential to enhance external auditor independence. The study's practical implications highlight the importance of strengthening corporate governance practices, particularly board independence, to enhance external auditor independence. Companies should also focus on internal control systems and transparency to mitigate risks. Additionally, large firms may benefit from robust auditing practices due to their greater disclosure requirements, while further research could explore board characteristics like size, expertise, and financial incentives to provide deeper insights.

The study's findings emphasized the importance of strengthening corporate governance practices, particularly board independence, to enhance external auditor independence. While the results showed that board independence negatively affects auditor independence in the Jordanian context, they also underlined the need for robust internal control systems and greater transparency to mitigate risks. Theoretically, this study enriched the literature on governance practices in developing economies, shedding light on

the unique challenges of ownership concentration and regulatory frameworks. Given the study's limitations, future research should explore other board characteristics and include diverse sectors and comparative analyses to further investigate the dynamics of governance and auditor independence.

6. Limitations Future Research

Each study has limitations ranging from its comprehensiveness to the ability to generalize its results. The most important limitations of this study are: The study was limited to studying and analyzing the financial data and annual board of directors reports of companies listed on the Amman Stock Exchange, consisting of service companies. The financial and industrial sectors were excluded due to the different nature of their businesses, activities, and accounting structure. Therefore, the results of this study cannot be generalized to these sectors. The study period was also limited to the period from 2017 to 2021. This is due to the approval of the Board of Commissioners of the Securities Commission of the Governance Instructions for Listed Joint Stock Companies for the year 2017, which came into effect on 5/22/2017. These instructions are intended to obligate companies to implement corporate governance rules, while the previous instructions issued by the Commission in 2009 were not binding but for guidance only. The researchers believe that these limitations can provide prospects for future studies.

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References

- Abdullah, W. Z., Ismail, I., & Jamaluddin, N. (2008). The impact of board composition, ownership, CEO duality on audit quality: The Malaysian evidence. *Malaysian Accounting Review*, 7, 17–28.
- Abdul-Rahman, O. A., Benjamin, A. O., & Olayinka, O. H. (2017). Effect of audit fees on audit quality: Evidence from cement manufacturing companies in Nigeria. *European Journal of Accounting, Auditing Finance Research*, 5, 6–17.
- Al Daoud, K. A. (2020). An investigation into the effect of audit firm size, auditor tenure, institutional ownership, board characteristics on auditor independence. *International Journal of Management Practice*, 13, 462–477. [CrossRef]
- Al Farooque, O., Buachoom, W., & Sun, L. (2020). Board, audit committee, ownership, financial performance: Emerging trends from Thailand. *Pacific Accounting Review*, 32, 54–81. [CrossRef]
- Al Harbi, A. (2018). *An assessment of the impact of corporate governance practices on the values of firms in the United Kingdom Kingdom of Saudi Arabia: A comparative study using the ethical process thinking model (EPTM)* [Master's thesis, University of Hull].
- Al Jabr, Y. (2011). The role of non-executive members of the board of directors in auditor choice: Evidence from Saudi Arabia. *Journal of King Saud University-Business Administration*, 22, 19–28.
- AlTheeb, Z. A., & Abu Qobu, H. Y. (2017). Some Influential Elements in Improving Effectiveness of External Audit in Jordanian Audit Offices Field Study from the Point of View of External Auditors. *Accounting Finance Research*, 6, 31–41. [CrossRef]

- Arens, A., Elder, R., Beasley, M., Best, P., Shailer, G., & Fielder, B. (2011). *Auditing, Assurance Services Ethics in Australia* (8th ed.). Pearson Australia.
- Asmara, R. Y., & Situanti, R. (2018). The effect of audit tenure firm size on financial reporting delays. *International Journal of Economics Business Administration*, 6, 115–126.
- Assidi, S. (2020). The effect of voluntary disclosures corporate governance on firm value: A study of listed firms in France. *International Journal of Disclosure Governance*, 17, 168–179. [CrossRef]
- Asthana, S., & Boone, J. (2012). Abnormal audit fee audit quality. *Auditing: A Journal of Practice and Theory*, 31, 1–22. [CrossRef]
- Azzoz, M., Abdel, A. E. -R., & Khamees, B. (2016). The impact of corporate governance characteristics on earnings quality earnings management: Evidence from Jordan. *Jordan Journal of Business Administration*, 12, 187–207. [CrossRef]
- Bahrawe, S. (2024). Effect of the Board of Directors Size, Independence, Frequency of Board Meetings on Audit Fees: Evidence From GCC Market. *Revista De Gestão Social E Ambiental*, 18, e07286. [CrossRef]
- Beasley, M., & Petroni, K. (2001). Board independence audit-firm type. *Auditing: A Journal of Practice Theory*, 20, 97–114. [CrossRef]
- Bedard, J., & Johnstone, K. (2010). Audit partner tenure audit planning pricing. *Auditing: A Journal of Practice and Theory*, 29, 45–70. [CrossRef]
- Bosse, D. A., & Phillips, R. A. (2016). Agency theory bounded self-interest. *Academy of Management Review*, 41, 276–297. [CrossRef]
- Bueno, G., Marcon, R., Pruner-da-Silva, A. L., & Ribeiro, F. (2018). The role of the board in voluntary disclosure. *The International Journal of Business in Society*, 18, 886–910. [CrossRef]
- Carcello, J. V., Hermanson, D. R., Neal, T. L., & Riley, R. A., Jr. (2002). Board characteristics audit fees. *Contemporary Accounting Research*, 19, 365–384.
- Chang, X., Dasgupta, S., & Hilary, G. (2009). The effect of auditor quality on financing decisions. *The Accounting Review*, 84, 1085–1117. [CrossRef]
- Christopher, D. A., Orshi, T. S., & Ekundayo, O. O. (2019). Audit client characteristics audit fees of listed pharmaceutical firms in Nigeria. *Journal of Advanced Research in Business Management Studies*, 14, 1–15.
- DeAngelo, L. E. (1981). Auditor size audit quality. *Journal of Accounting Economics*, 3, 183–199. [CrossRef]
- DeFond, M., & Zhang, J. (2014). A review of archival auditing research. *Journal of Accounting Economics*, 58, 275–326. [CrossRef]
- Dimitropoulos, P., & Asteriou, D. (2010). The effect of board composition on the informativeness quality of annual earnings: Empirical evidence from Greece. *Research in International Business Finance*, 24, 190–205. [CrossRef]
- Eshleman, J. D., & Guo, P. (2014). Abnormal audit fees and audit quality: The importance of considering managerial incentives in tests of earnings management. *Auditing: A Journal of Practice and Theory*, 33(1), 117–138. [CrossRef]
- Ettredge, M., Fuerherm, E. E., & Li, C. (2014). Fee pressure audit quality. *Accounting, Organizations Society*, 39, 247–263. [CrossRef]
- Fuzi, S. F. S., Halim, S. A. A., & Julizaerma, M. K. (2016). Board independence firm performance. *Procedia Economics Finance*, 37, 460–465. [CrossRef]
- Gajevszky, A. (2015). Audit quality corporate governance: Evidence from the Bucharest Stock Exchange. *Journal of Economic and Social Development*, 2, 1–11.
- Gana, M. R., & Krichen, A. L. (2013). Board characteristics external audit quality: Complementary or substitute mechanisms? The Belgium case. *International Journal of Management Sciences Business Research*, 2, 68–74.
- Gómez, J. I. M., Cortés, D. L., & Betancourt, G. G. (2017). Effect of the board of directors on firm performance. *International Journal of Economic Research*, 14, 349–361.
- Hay, D. C., Knechel, R., & Wong, N. (2006). Audit fees: A meta-analysis of the effect of supply dem attributes. *Contemporary Accounting Research*, 23, 141–191. [CrossRef]
- Hoitash, R., Markelevich, A., & Barragato, C. (2007). Auditor fees audit quality. *Managerial Auditing Journal*, 22, 761–786. [CrossRef]
- International Auditing Assurance Standards Board. (2022). *Hbook of international quality management, auditing, review, other assurance, related services pronouncements, part one*. International Auditing Assurance Standards Board.
- Jizi, M., & Nehme, R. (2018). Board monitoring audit fees: The moderating role of CEO/chair dual roles. *Managerial Auditing Journal*, 33, 217–243. [CrossRef]
- Kasim, N., Hashim, N., Bahiyah, S., & Sharifah, A. (2015). The impact of corporate governance mechanisms on audit quality of Shari'ah compliant companies. *International Journal of Economics Research (IJER)*, 12, 2077–2091.
- Kuang, X. (2011, January 8–9). Board characteristics higher audit quality: Evidence from Chinese listed companies. In *International Conference on Management Science Industrial Engineering (MSIE)* (pp. 348–352). IEEE.
- Makni, I., Kolsi, M. C., & Affes, H. (2012). The impact of corporate governance mechanisms on audit quality: Evidence from Tunisia. *The IUP Journal of Corporate Governance*, 11, 48–70.
- Niskanen, M., Karjalainen, J., & Steijvers, T. (2011). Audit quality: The role of board structure in family firms. *SSRN Electronic Journal*. [CrossRef]
- Orshi, T. S., Ekundayo, O. O., & Samuel, J. (2018). Corporate governance audit fees of listed pharmaceutical firms in Nigeria. *Accounting Taxation Review*, 2, 14–26.

- Porter, C., & Sherwood, M. (2023). The effect of increases in board independence on financial reporting quality. *Accounting Research Journal*, 36, 109–128. [CrossRef]
- Rijal, S., Bakri, A. A., & Arjang. (2023). Effect of Auditor Specialization, Auditor Characteristics, Board Independence on Audit Quality through intellectual capital: Study on service companies. *The ES Accounting and Finance*, 1, 95–103. [CrossRef]
- Securities Depository Center. (2024). Available online: www.sdc.com.jo (accessed on 10 November 2024).
- Sharif, M. J., & Hossain, M. I. (2020). The effect of corporate governance practice on firms' profitability in the manufacturing industry of Bangladesh. *Buft Journal of Business Economics*, 1, 101–120.
- Soliman, M., & Abdel Salam, M. (2012). Corporate governance practices audit quality: An empirical study of the listed companies in Egypt. *World Academy of Science, Engineering Technology*, 71, 1292–1297. [CrossRef]
- Somoye, R. O. A., Akisanya, A. O., & Makinde, K. O. (2020). The Impact of Corporate Governance on Auditors' Independence of Some Selected Quoted Companies in Nigeria. *The Pacific Journal of Science Technology*, 21, 224–234.
- Soyemi, K. A., & Olowookere, J. K. (2013). Determinants of external audit fees: Evidence from the banking sector in Nigeria. *Research Journal of Finance Accounting*, 4, 50–58.
- Sundgren, S., & Svanström, T. (2013). Audit Office Size, Audit Quality Audit Pricing: Evidence from Small-Medium-Sized Enterprises. *Accounting Business Research*, 41, 31–55. [CrossRef]
- Suwaidan, M., Abed, S., & Melham, S. (2015). Audit fees agency costs: An empirical examination of companies listed on the Amman Stock Exchange. *Jordan Journal of Business Administration*, 11, 215–226.

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Article

Impact of AI Disclosure on the Financial Reporting and Performance as Evidence from US Banks

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Abstract: Purpose: This study examines the impact of artificial intelligence disclosure within the US banking sector. It may explore the implications of AI disclosure on issues like financial reporting, transparency, accountability, and ethical considerations within the banking sector. Design/methodology/approach: Using a blend of qualitative and quantitative analyses, the researchers utilized SEC and NASDAQ databases to scrutinize AI disclosures within the top 10 banks. The sample comprised 100 annual reports, and through multiple regression analysis, the research discerned a noteworthy enhancement in performance metrics. Findings: The study found that AI influences financial performance only when moderated by the interaction of shareholders, the board of directors, and independent board members. The findings indicate a rising trend of AI disclosure in financial reports. The study indicates that AI disclosure impacts NII, TEXP, and P/E. Additionally, the study indicated a conflict of interest between agents and principals. Large shareholders tended to favor more AI disclosures, whereas the board of directors either did not support or adopted a more conservative stance on disclosure. Research limitations/implications: This study acknowledges a limitation in the dataset; initially comprising 100 annual reports, it was later refined to meet regression analysis assumptions. Despite this limitation, the study's insightful results contribute significantly to our understanding of the dynamic relationship between AI disclosure and the performance of top-tier banks in the USA. Originality/Value: By investigating the impact of AI disclosure, the study aims to provide insights into the broader considerations associated with artificial intelligence disclosures in the US banking sector. This study also analyzes how stakeholders respond to the disclosed information about artificial intelligence.

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1. Introduction

In the rapidly evolving technological landscape, US banks striving for competitiveness must adopt a proactive approach. Recognizing the dynamic nature of customer preferences, banks have consistently enhanced their services. To stay ahead in the competitive landscape, banks have integrated technology into their operations, and the latest frontier is artificial intelligence. Thanks to computer hardware and software advancements, artificial intelligence empowers banks to efficiently process extensive data sets, leading to the development of innovative business solutions (Kaya et al., 2019).

AI refers to computer programs that can acquire and apply knowledge independently without human involvement. These systems analyze information and draw conclusions based on their observations of the world. As “they learn from their previous judgments”,

their performance improves over time (Kaya et al., 2019), making AI an emerging technology that can give companies a competitive edge (Harrington & Voehl, 2010). AI integration positively influences different dimensions of the business, such as financial performance, marketing performance, and customer satisfaction. Companies that integrate AI into their operations realize an increase in financial performance (Alsheibani et al., 2018; Davenport & Ronanki, 2018) and expect a “38% increase in profitability by 2035” (Purdy & Daugherty, 2017). Also, research shows that AI improves marketing effectiveness by processing customers’ data regarding their preferences, which enables AI to enhance market segmentation (Enholm et al., 2022). AI can collect information about customers’ behavior, which helps companies provide a better customer experience (Riikkinen et al., 2018; Schmidt et al., 2020), thus increasing customer satisfaction.

The integration of AI technology in companies will profoundly impact their management and governance since AI considers decision-making and evaluation in its analysis, which will necessitate significant changes in corporate governance (Omar et al., 2017). One proposed solution is to establish positions such as “Chief AI Officer” and “Risk AI Officer” (Schäfer et al., 2022). However, opinions among AI experts are divided, with some believing that such roles could exist within large organizations, while others speculate that they may emerge in the future (Schäfer et al., 2022). Nevertheless, the suggestion to introduce new governance positions to manage AI in companies represents an eye toward the future.

Furthermore, without proper regulation, AI could contribute to agency problems within organizations by mitigating or amplifying information asymmetry, allowing agents to use it for their benefit. One of the signals that agents use to inform shareholders is disclosures in the annual reports. Thus, AI disclosures can be used to send a signal to shareholders. Accordingly, the study aims to explore AI disclosures’ impact on banks’ performance while considering the agency between shareholders and agents.

Previous studies regarding AI and technology disclosure examined the effect of such disclosures on financial performance, using it as an indicator for AI adoption (Finkenwirth, 2021; Alkaraan et al., 2022; Shiyyab et al., 2023; Shehadeh et al., 2024).

Finkenwirth (2021) used AI terms mentioned in the German financial institutions’ annual reports from 2016 to 2019 to assess the effect of AI disclosures on ROA, ROE, and P/E. Alkaraan et al. (2022) used textual analysis of UK firms’ annual reports from 2013 to 2018 to identify the disclosures of technology practices (CITTI4.0) and how such practices affect UK companies ROA and ROE. On the other hand, Shiyyab et al. (2023) studied AI disclosures, and Shehadeh et al. (2024) studied digital transformation disclosures within the Jordanian banks’ context. While previous studies focused on German financial institutions, UK firms, and Jordanian banks, this study examines AI disclosure in the US banking sector.

Previous studies were limited to certain geographical and environmental contexts, and the sample was not extended across different countries. This study is different from the previous ones. First, there are differences in business culture, institutional setting, and regulatory environment. Culture in the US fosters competition and individualism (Eckhardt, 2001). Since business culture differs in previous studies and some scholars indicate that culture influences financial reporting (Doupnik & Tsakumis, 2004), the current study examines a different sample with different financial reporting standards.

Additionally, the corporate governance system in the US is power concentrated in which the CEO acts as chairman, is more shareholder-focused than stakeholder-inclusive, is highly regulated, and lacks mandatory CSR disclosure requirements (Aguilera et al., 2006). Furthermore, listed firms in the UK, Germany, and Jordan are required to use IFRS reporting standards (IFRS Foundation, 2024), while listed firms in the US are required to use US GAAP. The difference in the regulatory setting would affect how listed companies disclose their information, as GAAP is more rule-based while IFRS is principal-based.

Hence, the current study is the first to examine AI disclosures' influence on measurable financial outcomes within the US GAAP context.

Second, similar to Shiyab et al. (2023), our analysis included broader financial performance metrics beyond ROA and ROE, including total expenses, interest income, and P/E. Third, unlike Shiyab et al. (2023), our study is the first to assess the moderation effect of AI disclosures with the board of directors (the board of director's size and the independent board members) and AI disclosures with large shareholders on financial performance. While Alkaraan et al. (2022) examine the interaction between CITI4.0 disclosures and ESG, it is important to note that the corporate governance system in the UK is a dual leadership structure that separates the chairman and the CEO roles. UK's leadership integrates CSR into corporate governance, and the role of institutional investors is a key driver of this integration (Aguilera et al., 2006). Furthermore, Alkaraan et al.'s (2022) study is not limited to AI as it is a component of the Industry 4.0 paradigm; also, the study excludes financial institutions from the sample.

In light of this, this study aims to investigate the impact of artificial intelligence disclosures in the US banking sector and how these disclosures are perceived by bank governance and shareholders. Using a sample of 100 financial reports from the top 10 US banks, the study uncovered evidence of a potential conflict of interest between agents and principals. Notably, AI influences financial performance only when moderated by the interaction of shareholders, the board of directors, and independent board members.

The motivation to focus on the top ten banks stems from the scale of their operations, which necessitates the use of AI technology. Previous studies (e.g., Bayo-Moriones & Lera-López, 2007; Ramdani et al., 2009) suggest that larger firms have more significant needs and resources to adopt new technologies, enabling them to manage associated risks better. Financial resources and firm size are pivotal in AI adoption, as Hradecky et al. (2022) found that these factors drive faster implementation of AI. As company size grows, so does task complexity, necessitating innovative solutions to streamline operations (Chenhall & Langfield-Smith, 1998). Thus, larger organizations are likely to adopt AI at a quicker pace. Additionally, the second motivation lies in the fact that boards of directors in financial institutions face severe information overload (Chao, 2017), and AI can enhance information flow (Srinivas et al., 2019). Finally, the financial sector is heavily regulated, and these stringent regulatory measures result in more effective governance in the banking industry.

This study is structured after the introduction: Section 2 provides a literature review. Section 3 provides the theoretical framework. Section 4 provides results and data analysis. Section 5 explains the results and provides the findings. Section 6 discusses the results and findings. Section 7 provides the implications, contributions, limitations, and conclusion.

2. Literature Review

2.1. AI Disclosure and Financial Reporting

Financial disclosure is a critical component of financial reporting, mandated by regulatory bodies across the globe, as it openly communicates financial data to an organization's stakeholders. As a result, businesses that incorporate AI into their operations must consider pertinent financial disclosures, including disclosures related to AI-related terms. Such disclosures are essential for clearly conveying how AI assists in their operations and clarifying the extent to which such technology is critical to their performance. Conversely, the inappropriate disclosure of financial data that do not align with reporting standards can harm a company's performance and create financial instability (Chen & Zhang, 2022).

Content analysis of AI discourse in public companies in Malaysia indicated that fewer than 20 companies mentioned the words "Artificial intelligence", "machine learning", and "Big data" (Omar et al., 2017). On the other hand, Spanish companies' annual reports

mentioned “Artificial intelligence”, “machine learning”, “Deep Learning”, and “Big data” 704 times (Bonsón et al., 2021), which suggests that AI disclosure is on the rise. The increasing trend of AI disclosure is also indicated in German financial institutions, Jordanian banks, and UK companies; it has been reported that “in 2019, 31% of the companies mentioned AI-related words in their annual reports.” (Finkenwirth, 2021) in Germany, and Jordan ASE-listed banks showed an incremental increase in AI disclosures from 73 words in 2014 to 733 in 2022 (Shiyyab et al., 2023). Additionally, UK-listed companies are consistent with this trend and showed an accelerated increase in CITT4.0 disclosures from 2013 to 2018 (Alkaraan et al., 2022).

Analysis of AI-related term disclosure in the financial reporting of German financial institutions through qualitative and quantitative analysis revealed that the effect of AI disclosure on financial performance measures such as “ROA”, “ROE”, and P/E were insignificant; nevertheless, some evidence suggests that companies pioneering in AI disclosures practices in the annual reports have a better financial performance than late adopters (Finkenwirth, 2021). On the other hand, in Jordan, AI term disclosures significantly affect performance measures such as ROA, ROE, and NII and significantly reduce total expenses (Shiyyab et al., 2023). However, AI disclosures in Jordanian banks are uneven; while some banks extensively mention AI words in their annual reports, others show a minimal disclosure, indicating varying adoption stages (Shiyyab et al., 2023).

Companies use AI disclosure as a strategic component of their digital transformation journey. These disclosures signal the degree of involvement in the transformation process and how such transformation improves their financial performance. For instance, corporations that extensively disclose CITT4.0 tend to exhibit a better financial outcome (Alkaraan et al., 2022). Similarly, banks with higher digital transformation generally exhibit better financial performance, such as improved ROA and ROE (Shehadeh et al., 2024).

Accordingly, does AI-related disclosure in the top US banks show the same trend as Jordanian banks and companies in Germany, Malaysia, the UK, and Spain?

It is logical to assume that when companies expand their use of AI in their operations, AI disclosure in financial reporting should increase accordingly. Hence, AI-related terms disclosures can be used to analyze the entity’s performance after implementing AI. The existing literature on AI and banks’ performance suggests that using AI leads to better performance.

2.2. AI Function in the Banking Sector and the Financial Performance

The banking industry has shown considerable acceptance and implementation of artificial intelligence, setting it apart from other sectors (Husain et al., 2022). Banks have always been early adopters of technology, and installing the first ATM in London in 1967, about 56 years ago, is a prime example (Kaya et al., 2019). The introduction of ATMs revolutionized the way routine transactions were performed, allowing bankers to focus on more critical tasks such as customer service, issuing credit cards, and selling investment loans (Kaya et al., 2019). Stanford Federal Credit Union was the first bank to provide customers with online banking in 1994, and in 1995, Presidential Bank was the first to allow customers to access their online bank accounts (England, 2022). This technological advancement has reduced the number of customers visiting bank branches, allowing them to perform various transactions online without physically interacting with bankers (Kaya et al., 2019). Consequently, banks have become more dependent on online platforms than bank branches.

Banking corporations need to incorporate AI into their business strategy to maintain their competitive edge (Singh, 2020). In today’s world, banks strive to reduce costs, meet margins, and exceed customer expectations through personalized experiences (Singh, 2020).

AI integration in various financial service applications can contribute to banks' performance. Chatbots and voice assistants can be used for customer support (Kaya et al., 2019; Singh, 2020; Umamaheswari & Valarmathi, 2023), while robo-advisors can provide investment advice (Kaya et al., 2019; Singh, 2020). AI can also be used for identification (Kaya et al., 2019; Umamaheswari & Valarmathi, 2023), detecting fraudulent activities (Kaya et al., 2019; Singh, 2020; Umamaheswari & Valarmathi, 2023), and risk and credit assessment (Kaya et al., 2019; Singh, 2020).

Chatbots and AI voice assistants provide customers with fast and efficient solutions without human interaction. They use neutral language and tone, avoiding offensive tones and reducing the risk of human error (Singh, 2020). As a result, customers using chatbots might use them to receive offers and discount recommendations (Bhattacharya & Sinha, 2022). Robo-advisors offer automated financial advice, asset management, and portfolio management without human intervention (Kaya et al., 2019; Singh, 2020). AI-powered systems can quickly and accurately vet customer documents through algorithms that analyze and compare information from various sources, including the Internet, and any discrepancies in the customer's identity can be reported (Kaya et al., 2019; Umamaheswari & Valarmathi, 2023). AI can also prevent the risk associated with credit transactions by analyzing past transaction patterns and blocking any fraudulent transactions before they occur (Kaya et al., 2019). Additionally, it can assess customers' creditworthiness by analyzing the documents they provide (Singh, 2020).

Studies have proven that AI integration in banks positively impacts performance. In Jordan, implementing AI in Jordanian commercial banks increases job performance (Abusalma, 2021). Similarly, financial performance in banks was found to be higher with AI programs (Setiawan et al., 2021). Another example from South Korea shows that AI has a positive impact on business performance through "information system risk management" and "corporate entrepreneurship" (Lee, 2020). Additionally, AI positively affects "customer satisfaction", "service quality", "competitive advantage", and "employee efficiency" (Elegunde & Oladimeji, 2020). Furthermore, AI can decrease technical inefficiency (Mor & Gupta, 2021) by eliminating repetitive tasks and reducing the demand for less skilled workers. This allows employees to focus on more important tasks (Kaya et al., 2019), reducing their workload (Satheesh & Nagaraj, 2021). As a result, employees can provide customers with more advanced, high-quality services like "chatbots", "mobile banking", "augmented reality" (Satheesh & Nagaraj, 2021), and smart wallets (Umamaheswari & Valarmathi, 2023).

Accordingly, the first hypothesis:

Hypothesis 1: *The disclosure of AI-related terms indicates that applying AI in banks' operations improves banks' performance by positively affecting one or more performance measures (ROA, ROE, NII, and P/E).*

Using AI helps reduce the expenses associated with a larger workforce and increases profitability (Kaya et al., 2019). Furthermore, AI in banks leads to cost reduction (Ali et al., 2022; Kochhar et al., 2019) through enhancing risk management (Ali et al., 2022). Hence, incorporating AI into bank operations can improve efficiency and accuracy, leading to innovative solutions that can revolutionize the financial landscape.

Accordingly, the second hypothesis:

Hypothesis 2: *The disclosure of AI-related terms indicates that the application of AI in banks' operations negatively affects TEXP.*

It is interesting to see how organizations are starting to embrace AI technology, even though the future is uncertain. Companies must be transparent about using AI to build trust with stakeholders. According to research, incorporating AI in business operations has many positive effects, making it a promising avenue for growth. Therefore, it is worth exploring AI disclosure in bank operations, as it can benefit companies, regulators, and stakeholders alike.

3. Theoretical Framework

In the face of growing organizational complexity, it becomes crucial to grasp the dynamics between principals and agents and the challenges that stem from conflicting interests. A comprehensive understanding of delegation, decision-making processes, control mechanisms, and incentive structures is instrumental in developing governance frameworks that effectively align owners' interests with those entrusted with the organization's management.

The agency theory perspective is "the separation of ownership and control" (Shleifer & Vishny, 1997), initially developed by Stephen Ross and Barry Mitnick, with both scholars making significant contributions to its development. Ross's perspective considers agency relationships as challenges related to compensation contracting and incentives. Conversely, Mitnick's institutional theory of agency underscores the role of institutions in addressing imperfections within agency relationships and adapting to them over time (Mitnick, 2019).

Agency theory emphasizes the relationship between the agent (managers or fund managers) and the principal (Shareholders or clients). According to the theory, individuals are egoists who work for their best interests, and there is an information gap between the agents and principals (Linder & Foss, 2013). The agents and principals use the available information to create contracts and determine how to act; as a result, agents have more power as they have access to more information and are able to make decisions (Linder & Foss, 2013). Agency conflict can lead to agency loss, which is maximized when agents work for their interests. The more alignment in interest between the agent and principal, the lower the agency loss will be (Kopp, 2023). Agency problems can have devastating consequences, leading to agency costs that affect the efficiency of company governance and reduce the company's market value (Andrijašević & Pašić, 2018). One example of agency problems is the ENRON company, where the managers and directors attempted to hide financial losses to maintain high stock prices and avoid falling due to increased debt by using tricky accounting tactics (Segal, 2023).

The problem of information asymmetry between the agents and the owners can be resolved through signaling, as the signaling theory suggests that firms use disclosures to signal the quality of their value to investors. Shehata (2014) and Cotter et al. (2011) state that voluntary disclosures are one of the signals managers use to inform investors, and they argue that managers in high-quality firms use voluntary disclosures to differentiate themselves from lower-quality firms. Cotter et al. (2011) argue that poor companies tend to conceal or delay voluntary disclosures due to the magnitude that such disclosures have on the market, as bad news always has a higher impact than good news (Hooghiemstra, 2010).

Beyond examining the impact of AI disclosures on financial performance, it is crucial to understand how bank governance and shareholders influence these disclosures. Since AI implementation directly affects shareholders and the board of directors, applying agency theory can clarify whether these parties align in their support for AI usage and its disclosure in the annual reports or if conflicting interests exist between them.

Hence the question:

Is there a disagreement between shareholders and the board of directors regarding AI disclosure? If so, is that attributable to the information gap between both parties?

AI has the potential to significantly enhance governance within the banking industry. The Federal Reserve's "Proposed Guidance on Supervisory Expectations for Boards of Directors" highlights that "Boards of large financial institutions face significant information flow challenges, especially in preparing for and participating in board meetings. Absent actively managing its information flow, boards can be overwhelmed by the quantity and complexity of information they receive" (Chao, 2017). AI technology offers a powerful solution to this problem, effectively reducing information complexity by streamlining information processing and flow for boards of directors (Srinivas et al., 2019).

Prior studies' findings on AI and technology disclosures are consistent with the agency and signaling theory perspective. Alkaraan et al. (2022) found that firms with higher profitability are more willing to disclose CITT4.0 initiatives in their annual reports, and those firms with higher ESG performance strengthen the relationship, consistent with the signaling theory that governance of highly profitable firms uses disclosures to signal their success and attract further investment. Additionally, Shiyyab et al. (2023) found that AI disclosures correlate positively with board size and board independence, consistent with the theory, where firms voluntarily disclose favorable information (e.g., AI adoption) to exhibit operational efficiency and financial performance.

However, while the aforementioned studies align with the signaling perspective, larger or independent boards might still dilute the effectiveness of such disclosures in improving specific financial performance measures due to inefficiencies in decision-making or conflicting interests within diverse governance structures. Shehadeh et al. (2024) found that gender diversity in governance is inversely associated with digital transformation. Stakeholders often hold differing opinions on technological innovation, and adopting new technologies can intensify these disparities (Enholm et al., 2022). While Srinivas et al. (2019) found that AI helps boards manage information overload and reduce complexity, many interviewed directors expressed reservations about its use. They believed the complexity of AI systems necessitates extensive training, leading to unfavorable attitudes toward its implementation. While higher ESG practices in the UK advocate for increasing CITT4.0 disclosures (Alkaraan et al., 2022), the institutional setting in the US differs in that emphasis on CSR practices disclosures is less and not mandatory (Aguilera et al., 2006). Therefore, in firms with less CSR emphasis, their governance might influence the magnitude of AI disclosure. More importantly, "In the absence of appropriate AI governance practices, negative and unintended consequences can occur" (Enholm et al., 2022). Additionally, while larger and independent boards encourage transparency in AI disclosures (Shiyyab et al., 2023), directors and top management may view the adoption of AI as a significant risk that comes with substantial costs (Omar et al., 2017), as poor AI implementation and inadequate AI governance will lead organizations to incur significant costs (Higgins et al., 2024). Therefore, it might amplify cost-related impacts due to their comprehensive oversight.

Hence, the third and the fourth hypotheses are:

Hypothesis 3a: *The size of the board of directors weakens the association between AI-related term disclosures and one or more financial performance measures (ROA, ROE, NII, and P/E).*

Hypothesis 3b: *The size of the board of directors strengthens the association between AI-related term disclosures and TEXP.*

Hypothesis 4a: *The size of the independent board of directors weakens the association between AI-related term disclosures and one or more financial performance measures (ROA, ROE, NII, and P/E).*

Hypothesis 4b: *The size of the independent board of directors strengthens the association between AI-related term disclosures and TEXP.*

The bank's governance may adopt a more cautious and negative stance toward AI disclosures. This reluctance likely stems from potential setbacks in AI implementation that could impact operational performance, and disclosing such information may invite increased scrutiny of their performance.

In contrast, shareholders view AI implementation as a tool for boosting efficiency and cutting costs (Dedrick et al., 2013), seeing it as a strategic avenue to enhance returns on investment (Güngör, 2020). However, concentrated ownership is negatively correlated with AI-related disclosures in Jordan banks, which means that the dominant shareholders show reluctance about AI disclosures (Shiyyab et al., 2023). However, the institutional setting in the US differs in that it is more shareholder-focused than stakeholders-inclusive, and the institutional investors are more short-term-oriented (Aguilera et al., 2006). Therefore, driven by a focus on economic value, shareholders are incentivized to invest in and support AI technology, recognizing its potential to maximize profitability.

Hence, the fifth hypothesis:

Hypothesis 5a: *The increase in large shareholders strengthens the association between AI-related term disclosures and one or more financial performance measures (ROA, ROE, NII, and P/E).*

Hypothesis 5b: *The increase in large shareholders weakens the association between AI-related term disclosures and TEXP.*

Therefore, shareholders are likely to favor AI-related term disclosures, as such transparency would enhance their credibility with other stakeholders, positioning them as forward-thinking and aligned with cutting-edge technological advancements.

4. Research Methodology

This study implements qualitative and quantitative data analysis based on the annual reports of the leading banks in the United States, particularly the top 10 banks, in terms of total assets from 2013–2022.

Step 1: Create an index with the most used AI-related terms.

The most used AI terms in the financial services sector in the United States include "Computer vision, Physical robotics", "Natural language text understanding", "Virtual agents or conversational interfaces", "Natural language speech understanding", "Robotic process automation", "Machine learning", "Autonomous vehicles", and "Natural language generation" (Cam et al., 2019). However, a recent study by Shiyyab et al. (2023) developed a term index for the most frequent AI-related terms in financial disclosures from previous literature (refer to Appendix A, Table A3). This index will be adopted to analyze banks in the United States, as it provides a comprehensive list of AI-related disclosure terms that are divided into three main categories: "Digital awareness, transformation, and capabilities", "AI application, product, service, and process", and "AI information challenges and cyber security threats."

Step 2: Generate the frequency table using the term index.

In step 2 of the analysis, the term index is used to calculate the frequency of AI terms in the annual reports. For this purpose, the content analysis software "MAXQDA 24.0.0" will be used to perform content analysis. Once calculated, the frequency will be used to measure the dependent variables as an independent variable at the next step in the regression model.

Step 3: Regression models

Previous literature used financial performance measures to study the impact of AI-related term disclosure on financial performance (Finkenwirth, 2021; Shiyyab et al., 2023). For this study, bank performance will be measured based on several factors, including return on assets, return on equity, P/E, net interest income, and total expenses. ROA and ROE are metrics that measure the bank’s management effectiveness, indicating its overall performance (McClure, 2024). Higher ratios of ROA and ROE indicate better management effectiveness.

On the other hand, adopting AI in banking operations can help reduce expenses (Kaya et al., 2019; Kochhar et al., 2019; Ali et al., 2022) as AI can mimic human brain function, performing various tasks such as customer service through chatbots, sales automation through analyzing customers’ behavior and performing predictive market analysis, data mining, and financial management (Kundurur, 2023), which can save time and resources. Researchers found that 63% of respondents reported revenue increases in companies that use AI in their operations, with most of the increase often coming from marketing and sales (Cam et al., 2019). Alternatively, 44% reported a cost decrease (Cam et al., 2019).

Investors often use the P/E ratio to assess a bank’s stock performance and decide whether to invest (Fernando, 2023). Additionally, net interest income is a crucial performance indicator for banks since it reflects the revenue generated from lending and borrowing interest rates. Ultimately, using AI can positively enhance performance metrics such as ROA, ROE, P/E, and net interest income and negatively affect total expense, leading to higher performance outcomes for banks.

It is essential to account for various internal and external factors that shape AI practices and disclosure decisions, as these can differ based on each bank’s unique characteristics (Shiyyab et al., 2023). These variations create distinct incentives for managers to adopt AI and disclose related activities. To address this, controlling for crucial aspects such as bank governance, ownership structure, and relevant economic variables is important, ensuring a comprehensive analysis of the factors influencing AI adoption and disclosure.

Extensive research in prior literature has examined the impact of board size and board independence on performance within the banking sector (Staikouras et al., 2007; Belkhir, 2009; Isik & Ince, 2016; Weerink, 2019; Majeed et al., 2020)—accordingly, our analysis accounts for both board size and independence.

Public companies’ conflicts between shareholders and creditors can escalate into agency capital costs; therefore, it is crucial to control for ownership structure factors, including the large share ratio—calculated as the percentage of major shareholders owning 5% or more—and the debt ratio, measured by long-term debt over total liabilities. Additionally, the study accounts for key economic factors, such as bank size, the age of the bank since its establishment, and the impact of the COVID-19 years.

$$BK. Performance_t = Constant + \beta_1 * AIFQ_{t-1} + \beta_2 * BSIZE_{t-1} + \beta_3 * DEBT_{t-1} + \beta_4 * BDSIZE_{t-1} + \beta_5 * INDPB_{t-1} + \beta_6 * LARSHE_{t-1} + \beta_7 * AGE_{t-1} + \beta_8 * YEAR + e \quad (1)$$

Model specifications:

AIFQ = the number of AI-related terms mentioned in each annual report

BSIZE = bank size, which is the natural log of assets

DEBT = long-term debt to total debt ratio

BDSIZE = number of board of directors

INDPB = the proportion of independent board members

LARSHE = percentage of accumulated shareholders who own more than 5% of total shares

AGE = the age of the bank. Number of years from the date of establishment

YEAR = dummy variable 1: COVID year and years after COVID, 0: Other

The interaction effect:

Analysis of the interaction effect is crucial to evaluate the perspectives of the board of directors, independent board members, and shareholders on AI disclosures in annual reports. Equation (2) illustrates the regression model incorporating these interaction effects.

$$BK. Performance_t = Constant + \beta_1 * AIFQ_{t-1} + \beta_2 * BSIZE_{t-1} + \beta_3 * DEBT_{t-1} + \beta_4 * BDSIZE_{t-1} + \beta_5 * AI*DB_{t-1} + \beta_6 * INDPB_{t-1} + \beta_7 * AI*INDB_{t-1} + \beta_8 * LARSHE_{t-1} + \beta_9 * AI*SHE_{t-1} + \beta_{10} * AGE_{t-1} + \beta_{11} * YEAR + e \tag{2}$$

Model specifications:

AI*BD = AI-related terms disclosures interaction with board size.

AI*INDB = AI-related terms disclosures interaction with independent board members

AI*SHE = AI-related terms disclosures interaction with large shareholders.

Figure 1 illustrates the main effect of AIFQ and the interaction effect of AIFQ with other variables.

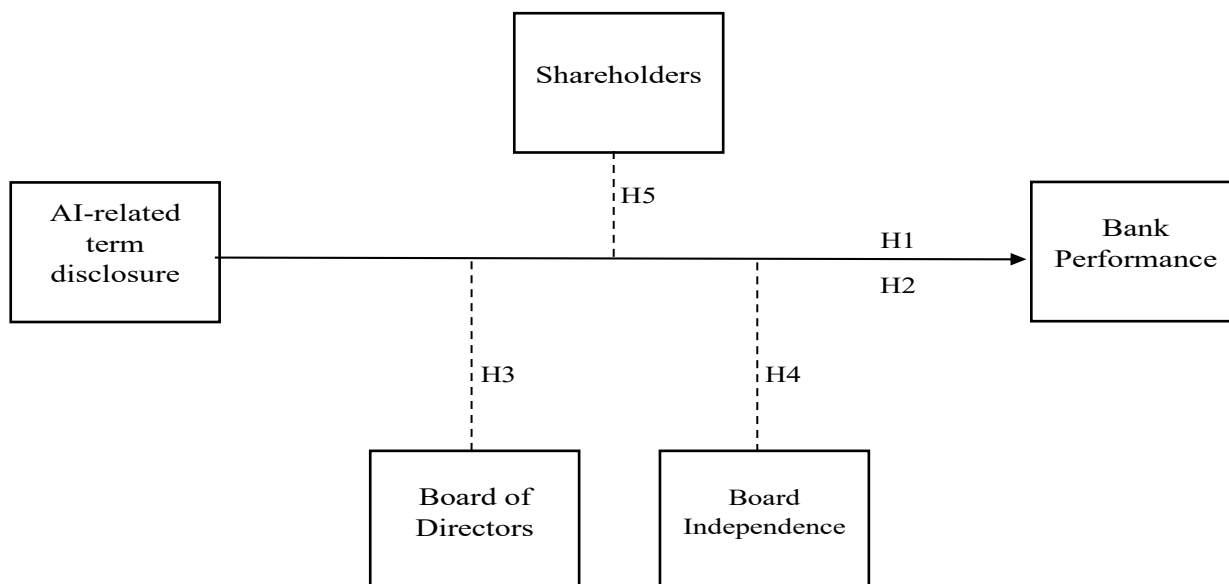


Figure 1. Research model.

5. Data Analysis and Results

The data were collected from 100 annual reports and proxy statements for the leading ten banks in the USA (Appendix A, Table A1). The selected banks were ensured to be American banks. Therefore, the 10th bank on the list (TD Bank) was not selected because it is a subsidiary bank affiliated with TD Bank NA, the parent headquarters in Canada. Instead, the 11th bank on the list, Charles Schwab Corp, was included in the sample size.

5.1. Qualitative Analysis Through MAXQDA

Step 1: Coding the AI-term index.

In Step One, the AI-related term index (Appendix A, Table A3: AI-related term index) is coded into MAXQDA software.

Step 2: Generate the frequency table using MAXQDA.

Annual reports uploaded to MAXQDA to analyze the frequency of AI-term disclosures. Table 1 below shows the related AIFQ by bank and year.

Table 1. AI-related term frequency.

Bank	AI-Frequency by Bank	Year	AI-Frequency by Year
Chase	274	2013	72
Bank of America	244	2014	97
Citibank	233	2015	152
Wells Fargo	295	2016	158
Goldman Sachs	203	2017	154
Morgan Stanley	90	2018	228
US. Bancorp	131	2019	241
PNC	226	2020	271
Truist Financial	111	2021	263
Charles Schwab Corp	48	2022	219
Total	1855		1855

The qualitative analysis shows that AIFQ disclosure in the annual reports is progressively increasing yearly, reaching its peak in 2020 by 271. The increased use of AI in bank operations explains such a progressive increase. Later, in 2021 and 2022, the AIFQ decreased by 263 and 219, respectively. Such a decrease is reasonable, as in 2020, during COVID-19, the use of online and mobile banking services that require AI increased. Wells Fargo and Chase Bank have the highest reported AIFQ, with 295 and 274, constituting 15.65% and 14.77% of the total sample, respectively. On the other hand, Morgan Stanley and Charles Schwab Corp have the least reported AIFQ by 90 and 48 times, constituting approximately 5% and 2.6% of the AI frequency sample, respectively. (Appendix B, Figures A1 and A2 shows AIFQ by bank and year.)

5.2. Analysis and Results

First, researchers rigorously ensured that all variables in the dataset followed a normal distribution, eliminating any outliers beyond the -3 to $+3$ standard deviation range. The process was achieved by normalizing the fractional ranks of each variable using SPSS, ensuring the dataset was fully optimized for analysis. Subsequently, multiple regression analyses were conducted for each dependent variable, applying both Equations (1) and (2).

5.3. Descriptive Statistics

Table 2 presents the descriptive statistics for the study variables. The mean value of AIFQ is 18.562, revealing that the frequency of AI-related term disclosures per year is low. The highest count of AI-related terms in a single year is 50, recorded by Chase Bank in 2016, while the lowest is a mere 2, disclosed by US Bancorp in 2013 (see Appendix C, Table A4). The mean board size is 14.064, reflecting a notably large board structure, with an average of 12.248 independent board members, signifying that the vast majority are independent.

The mean percentage of large shareholders is 0.205, indicating that approximately 20% of bank shareholders are large shareholders, suggesting their substantial influence over bank decisions. The average bank age is 138.5 years, underscoring that the banks in the sample are well-established, with significant market experience. In terms of size, the average total assets per bank amount to roughly 1.27 billion, reflecting their substantial financial standing. Lastly, the mean debt ratio is 0.129, signifying that, on average, banks carry around 13% debt, highlighting a relatively modest reliance on debt financing.

Table 2. Descriptive statistics **.

	N	Minimum	Maximum	Mean	Std.	Skewness		Kurtosis	
						Stat	Std. Error	Stat	Std. Error
<i>BFSIZE</i>	99	18.58	22.67	20.629	0.849	0.000	0.243	−0.319	0.481
<i>DEBT</i>	99	−0.01	0.27	0.129	0.058	0.000	0.243	−0.319	0.481
<i>BDSIZE</i>	100	8.33	20.25	14.064	2.396	0.165	0.241	−0.058	0.478
<i>INDPB</i>	99	6.81	17.31	12.248	2.196	0.046	0.243	−0.393	0.481
<i>LARSHE</i>	99	−0.01	0.42	0.205	0.089	0.000	0.243	−0.319	0.481
<i>AGE</i>	99	35.98	241.02	138.500	42.532	0.000	0.243	−0.318	0.481
<i>AIFQ</i>	99	−10.25	45.42	18.562	11.882	0.006	0.243	−0.348	0.481
<i>ROA</i>	99	0.002	0.018	0.010	0.003	0.000	0.243	−0.319	0.481
<i>ROE</i>	99	0.02	0.18	0.100	0.033	0.000	0.243	−0.319	0.481
<i>TEXP</i>	99	15.008	19.284	17.146	0.887	0.000	0.243	−0.319	0.481
<i>PE</i>	99	−6.62	36.73	15.052	8.993	0.000	0.243	−0.319	0.481
<i>NII</i>	99	13.86	19.00	16.429	1.065	0.000	0.243	−0.319	0.481
<i>YEAR</i> *	100	0	1	0.30	0.461	0.886	0.241	−1.240	0.478
<i>Valid N (listwise)</i>	87								

* All variables have been normalized via SPSS using fractional ranks and normal distribution function, except the (Year) variable. ** Numbers are rounded to the third decimal point. *BFSIZE*: LN total assets, *DEBT*: debt ratio, *BDSIZE*: number of board members, *INDPB*: number of independent board members, *LARSHE*: the percentage of owners who own 5% and more, *AGE*: bank age, *AIFQ*: AI-related term frequency, *YEAR*: dummy variable represent COVID-19 years, *ROA*: return on assets, *ROE*: return on equity, *TEXP*: LN total expenses, *PE*: prices–earnings ratio, *NII*: LN total interest income.

5.4. Correlation Analysis

The correlation analysis in Table 3 reveals an alarming degree of multicollinearity, with the moderating variables *AI*INDB* and *AI*BD* showing a staggering correlation coefficient of 0.949 and *BDSIZE* and *INDPB* displaying a similarly high coefficient of 0.931. These coefficients are exceptionally high, indicating severe multicollinearity, significantly violating the assumption (Kim, 2019). The VIF scores from the regression output confirmed the extent of collinearity between the variables. Specifically, the variables *BDSIZE*, *INDBP*, *AI*BD*, and *AI*INDB* all have VIF scores exceeding the critical threshold of 10 (see Appendix C, Table A5). As a result, *BDSIZE* alone was deemed adequate to represent the bank’s governance, necessitating a separate regression analysis for *INDBP* and *AI*INDB*.

AIFQ exhibits a significant positive correlation with *BFSIZE* and *AGE*, indicating that larger and older banks correlate with higher AI-related terms disclosures. Additionally, the COVID-19 years demonstrate a clear positive correlation with *AIFQ*, further reinforcing the fact that COVID-19 years correlate with more AI-terms disclosures. Conversely, *BDSIZE* shows a negative correlation with *AIFQ*, suggesting that larger boards correlate with more AI disclosures.

Moreover, *AIFQ* is positively and significantly correlated with *TEXP* and *NII*, implying that increased AI-related disclosures are aligned with rising total expenses and net interest income. However, it negatively correlates with P/E, indicating that banks with higher AI disclosures have lower price-to-earnings ratios.

Table 3. Correlation.

	AIFQ	BFSIZE	DEBT	BDSIZE	INDPB	LARSHE	AGE	YEAR	ROA	ROE	TEXP	NII	PE	AI*BD	AI*INDB	AI*SHE
AIFQ	0.616**															
BFSIZE	0.167	0.202*														
DEBT	-0.224*	-0.350**	-0.194													
BDSIZE	-0.068	-0.237*	-0.323**	0.931**												
INDPB	-0.085	-0.073	0.007	0.037	-0.073											
LARSHE	0.566**	0.262**	0.205*	-0.112	0.026	-0.469**										
AGE	0.362**	0.251**	-0.235*	0.022	0.006	0.191	0.124									
YEAR	-0.021	-0.275**	-0.242*	0.179	0.297**	-0.025	0.189	-0.136								
ROA	-0.073	-0.196	-0.414**	-0.097	-0.017	0.298**	-0.114	0.088	0.779**							
ROE	0.606**	0.937**	0.300**	-0.353**	-0.252*	-0.149	0.359**	0.116	-0.182	-0.190						
TEXP	0.580**	0.700**	-0.163	-0.127	0.086	-0.377**	0.506**	0.167	0.161	0.032	0.745**					
NII	-0.474**	0.386**	-0.338**	0.184	-0.157	0.162	-0.502**	-0.180	-0.271**	-0.073	-0.501**	-0.350**				
PIE	-0.053	0.177	0.010	0.041	0.029	0.181	0.060	-0.098	-0.147	-0.121	0.107	0.026	-0.085			
AI*BD	0.000	0.082	0.024	0.027	-0.001	0.266**	-0.004	-0.038	-0.227*	-0.133	0.134	0.012	-0.054	0.949**		
AI*INDB	-0.021	-0.021	0.114	0.163	0.241*	-0.511**	0.237*	-0.102	0.205*	-0.096	0.033	0.175	-0.110	-0.060	-0.120	

$p < 0.10, * p < 0.05, ** p < 0.01.$

5.5. The Regression Analysis

a- The first regression without moderation (Equation (1))

Table 4a shows the summary of the regression models for Equation (1). The case of AIFQ effect without moderation.

Table 4. (a) Regression analysis—Equation (1); (b) regression analysis—Equation (2) (moderation); (c) regression analysis for removed variables.

(a)					
	Model 1 (ROA) ^a	Model 2 (ROE) ^a	Model 3 (NII) ^b	Model 4 (TEXP) ^b	Model 5 (P/E) ^a
<i>B</i> SIZE	−0.001 *	−0.006	0.867 ***	0.977 ***	−1.818
<i>DEBT</i>	−0.019 ***	−0.294 ***	−5.004 ***	0.510	−32.722 **
<i>B</i> SIZE	0.000	−0.002 *	0.046 **	0.003	−0.153
<i>LARSHE</i>	0.008 **	0.166 ***	−1.571 **	−0.475 *	−2.138
<i>AGE</i>	3.412×10^{-5} ***	0.000 **	0.008 ***	0.002	−0.080 **
<i>AIFQ</i>	1.600×10^{-5}	-5.681×10^{-5}	0.005	0.000	−0.063
<i>YEAR</i>	−0.002 **	−0.008	−0.374 ***	−0.176 **	−1.807
<i>CONSTANT</i>	0.020 *	0.299 **	−2.246	−3.069 ***	72.622 **
<i>N</i>	92	94	94	92	94
<i>R SQUARED</i>	0.299	0.361	0.863	0.963	0.404
<i>ADJ. R SQ.</i>	0.241	0.309	0.852	0.960	0.356
<i>MODEL SIG</i>	<0.001	<0.001	<0.001	<0.001	<0.001
(b)					
	Model 1 (ROA) ^a	Model 2 (ROE) ^a	Model 3 (NII) ^b	Model 4 (TEXP) ^a	Model 5 (P/E) ^a
<i>B</i> SIZE	0.000	−0.002	0.917 ***	0.969 ***	−1.536
<i>DEBT</i>	−0.025 ***	−0.341 ***	−6.711 ***	0.725 *	−34.069 **
<i>B</i> SIZE	0.000	−0.003 *	0.039 **	0.013	−0.091
<i>LARSHE</i>	0.018 ***	0.248 ***	−0.658	0.043	−0.413
<i>AGE</i>	4.143×10^{-5} ***	0.000 **	0.008 ***	-7.777×10^{-5}	−0.073 **
<i>AIFQ</i>	-1.639×10^{-6}	0.000	0.011 *	0.007 **	−0.083
<i>YEAR</i>	−0.002 ***	−0.013 *	−0.524 ***	−0.190 **	−1.998
<i>AI*BD</i>	−0.001 **	−0.008 **	−0.091 **	0.039	−0.655
<i>AI*SHE</i>	0.001 **	0.007 **	0.101 **	0.079 **	−0.185
<i>CONSTANT</i>	0.011	0.136	−3.247 **	−3.169 ***	65.114 **
<i>N</i>	92	93	94	89	93
<i>R SQUARED</i>	0.413	0.438	0.870	0.945	0.410
<i>ADJ. R SQ.</i>	0.349	0.377	0.856	0.939	0.346
<i>MODEL SIG</i>	<0.001	<0.001	<0.001	<.0001	<0.001
(c)					
	Model 1 (ROA) ^a	Model 2 (ROE) ^a	Model 3 (NII) ^b	Model 4 (TEXP) ^b	Model 5 (P/E) ^a
<i>INDPB</i>	0.000 **	0.000	0.020	0.108 *	0.539
<i>AI*INDP</i>	−0.0001 **	−0.005	−0.037	−0.065 **	−0.456
<i>AIFQ</i>	-1.178×10^{-7}	0.000	0.053 ***	0.043 ***	−0.356 ***
<i>CONSTANT</i>	0.005 **	0.109 ***	15.201 ***	17.101 ***	14.942 **
<i>N</i>	95	97	96	92	97
<i>R SQUARED</i>	0.138	0.023	0.507	0.526	0.224
<i>ADJ. R SQ.</i>	0.110	−0.008	0.491	0.510	0.219
<i>MODEL SIG.</i>	0.004	0.531	<0.001	<0.001	<0.001

p * < 0.10, *p* ** < 0.05, *p* *** < 0.01; ^a OLS Regression. ^b WLS Regression.

Researchers employed ordinary multiple regression analysis for Models 1, 2, and 5. However, due to significant heteroscedasticity detected in Models 3 and 4, weighted least squares (WLS) regression was applied. Heteroscedasticity was tested using the Breusch and Pagan test, also known as the score test (Rosopa et al., 2013). The test yielded significant results, with *p*-values of <0.01 for the TEXP model and 0.002 for the NII model.

Consequently, WLS was chosen for its greater power and robustness in the presence of heteroscedasticity (Rosopa et al., 2013) to ensure more reliable and accurate results.

While all five regression models demonstrate a strong fit and are highly significant at $p < 0.01$, AIFQ consistently remains insignificant across all models, which indicates that the main effect of AIFQ on financial performance is insignificant, leading to the rejection of hypotheses 1 and 2. The R^2 values are notably high in Models 3 and 4, at 86.3% and 96.3%, respectively.

In Model 2, BDSIZE is negative and significant at <0.10 , while in Model 3, it shows a positive and significant effect at <0.05 . This suggests that larger boards of directors are negatively associated with ROE but positively linked to increases in net interest income. LARSHE is both positive and significant in Models 1 and 2 at <0.05 and <0.01 , respectively, but turns negative in Models 3 and 4 at <0.05 and <0.10 , which reveal that an increase in large shareholders is positively associated with higher ROA and ROE but is negatively associated with net interest income and total expenses.

b- The second regression with moderation (Equation (2))

Table 4b shows the summary of the regression models for Equation (2). The case of AIFQ effect with moderation.

The second regression analysis was conducted to assess the impact of moderators on AIFQ and financial performance. Ordinary least squares (OLS) multiple regression was applied to all models except for Model 3, where weighted least squares (WLS) regression was utilized due to significant heteroscedasticity. Each regression model demonstrated a robust fit, with significance levels at $p < 0.01$.

The earlier regression analysis without moderators revealed that the main effect of AIFQ was insignificant across all models. However, the introduction of the moderators dramatically shifted the significance of AIFQ in Models 3 and 4 to <0.10 and <0.05 , respectively. Such an outcome indicates that AI-related term disclosure positively and meaningfully impacts net interest income and total expenses.

The moderator variable (AI*BD) shows a negative and significant effect at <0.05 across Models 1, 2, and 3, indicating that as the size of the board of directors increases, the association between AI-related term disclosure and financial performance becomes negative. Specifically, the relationship between AIFQ and ROA, AIFQ and ROE, and AIFQ and NII becomes increasingly negative, suggesting that larger boards tend to inhibit the positive impact of AI disclosures on these key financial metrics; thus, the results confirmed Hypothesis 3a and rejected Hypothesis 3b because AI*BD is insignificant in Model 4.

On the other hand, the interaction between AI-related term disclosure and large shareholders is positive and significant at <0.05 across Models 1, 2, 3, and 4. Such an outcome indicates that as large shareholders increase, the relationship between AIFQ and key financial metrics—ROA, ROE, and NII—strengthens, becoming increasingly positive. In other words, larger shareholder influence amplifies the beneficial impact of AI disclosures on financial performance, whereas it increases TEXP. Thus, the results confirm Hypothesis 5a while rejecting Hypothesis 5b.

c- The Third Regression-for the eliminated variables:

Table 4c shows the regression models for the removed variables.

All models demonstrate a strong fit except for Model 2, which is insignificant with a p -value of 0.531. AIFQ exerts a highly significant impact on NII, TEXP, and P/E at <0.01 . However, the moderator variable (AI*INDB) shows a negative and significant effect in Models 1 and 4, indicating that as the proportion of independent board members increases, the influence of AIFQ on ROA and TEXP becomes increasingly negative. It suggests that

greater board independence diminishes the positive effects of AI-related disclosures on these financial metrics. Hence, the results confirm hypotheses 4a and 4b.

6. Findings

The results reveal that AI-related term disclosure has no impact across all five models in the initial regression analysis before introducing moderating variables. However, after incorporating the moderating effects of (AI*BD and AI*SHE) in the second regression, the significance of AIFQ’s main effect shifts, positively affecting total expenses and net interest income. Likewise, in the third regression, the moderating variable (AI*INDB) alters AIFQ’s main effect, positively impacting net interest income and total expenses while negatively affecting the price-to-earnings (P/E) ratio.

- The second regression (moderating effect):

In Models 1 and 2 (ROA and ROE), the interaction between the board of directors and AI disclosure is significant. Figures 2–5 show that the changes in the board of directors have an inverse effect on AI disclosures and ROA and AI disclosures and ROE, while changes in the proportion of large shareholders have a direct relationship with AI disclosure and ROE and AI disclosures and ROA. Accordingly, the board of directors and shareholders affect AI disclosure signals differently. Shareholders consider disclosure signals valuable when explaining performance measures such as ROA and ROE.

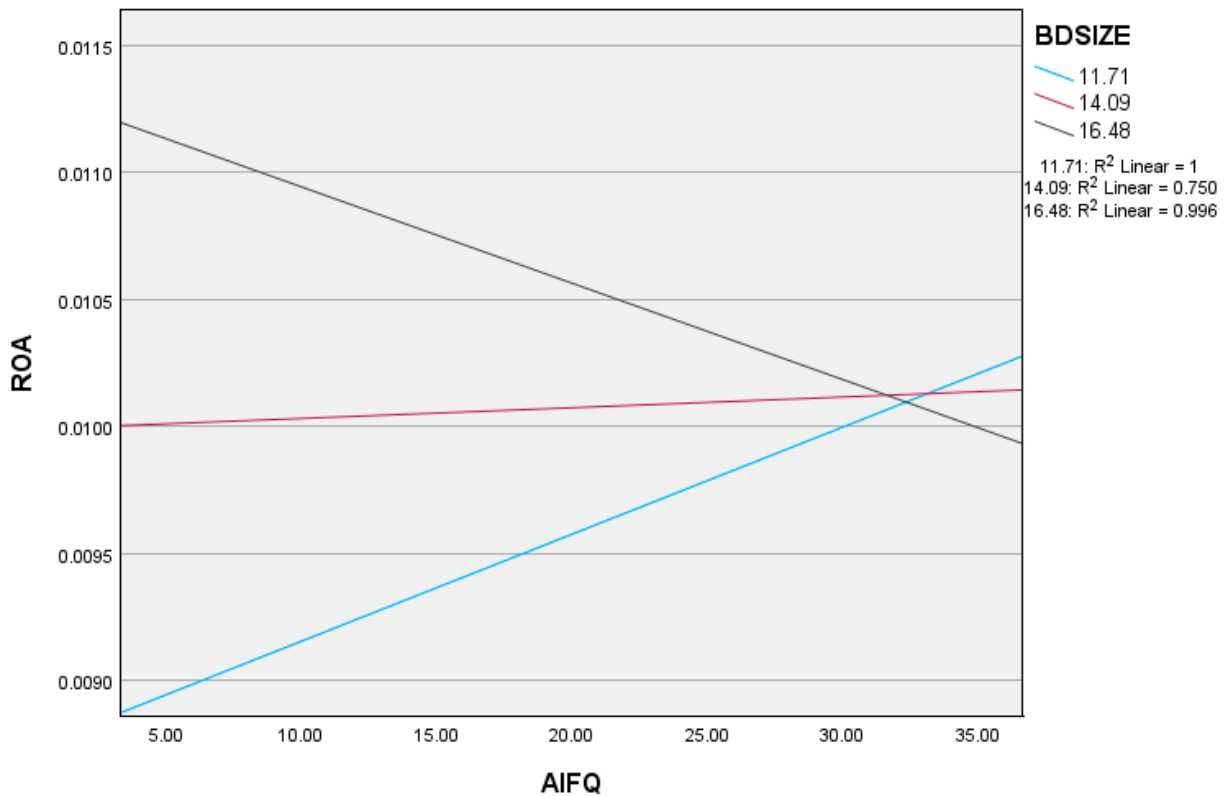


Figure 2. Model 1: AIFQ and BDSIZE moderation Graph.

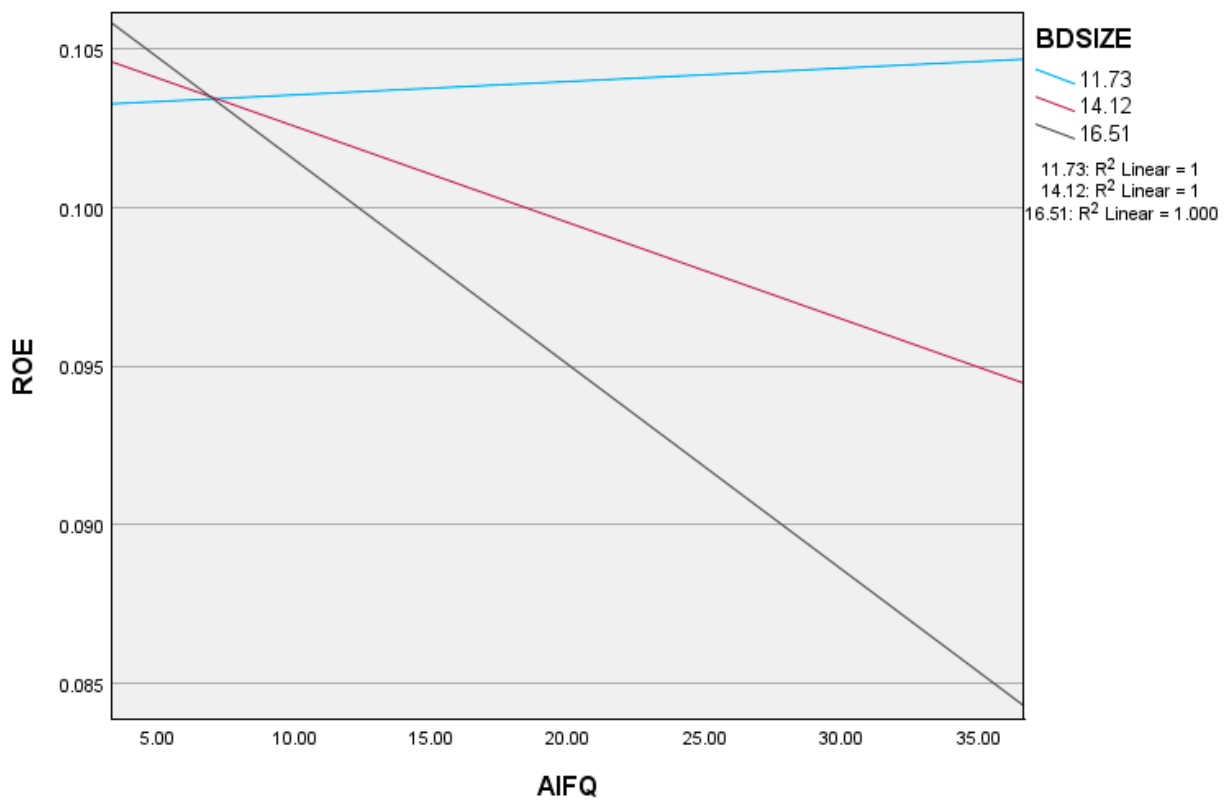


Figure 3. Model 2: AIFQ and BDSIZE moderation Graph.

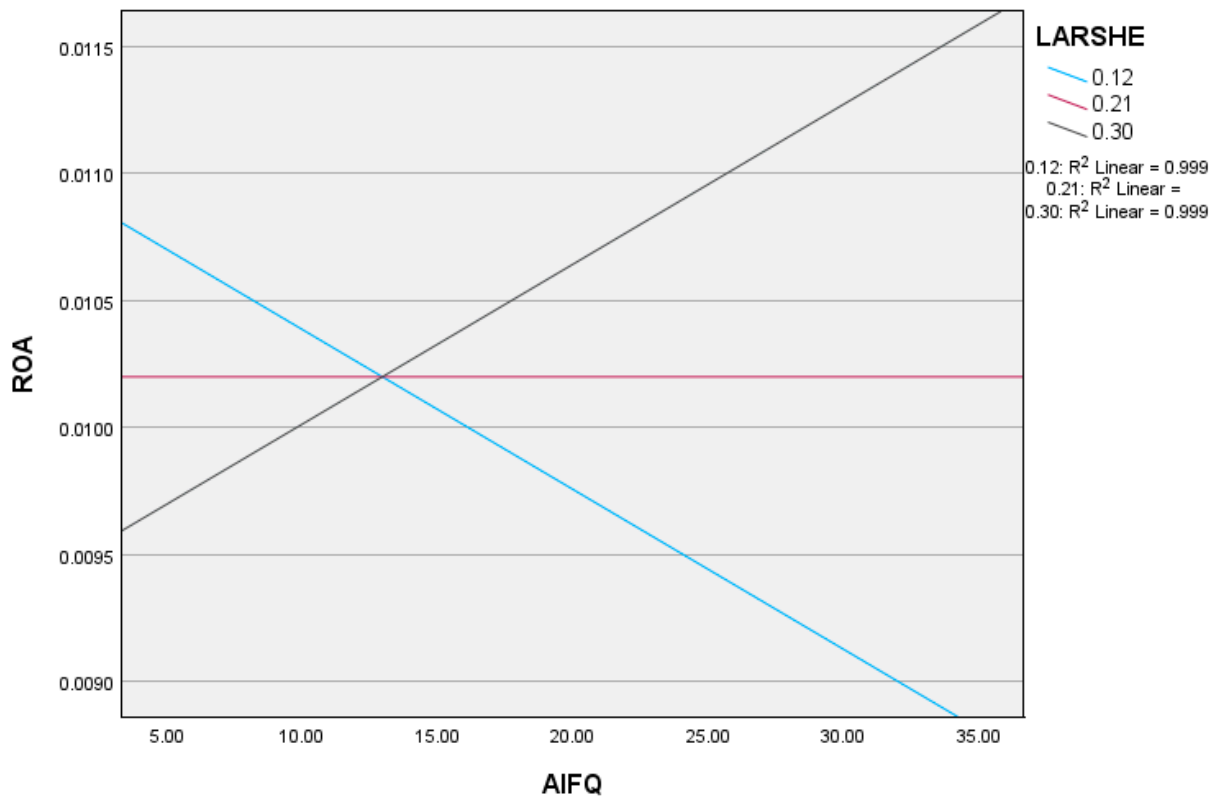


Figure 4. Model 1: AIFQ and LARSHE moderation Graph.

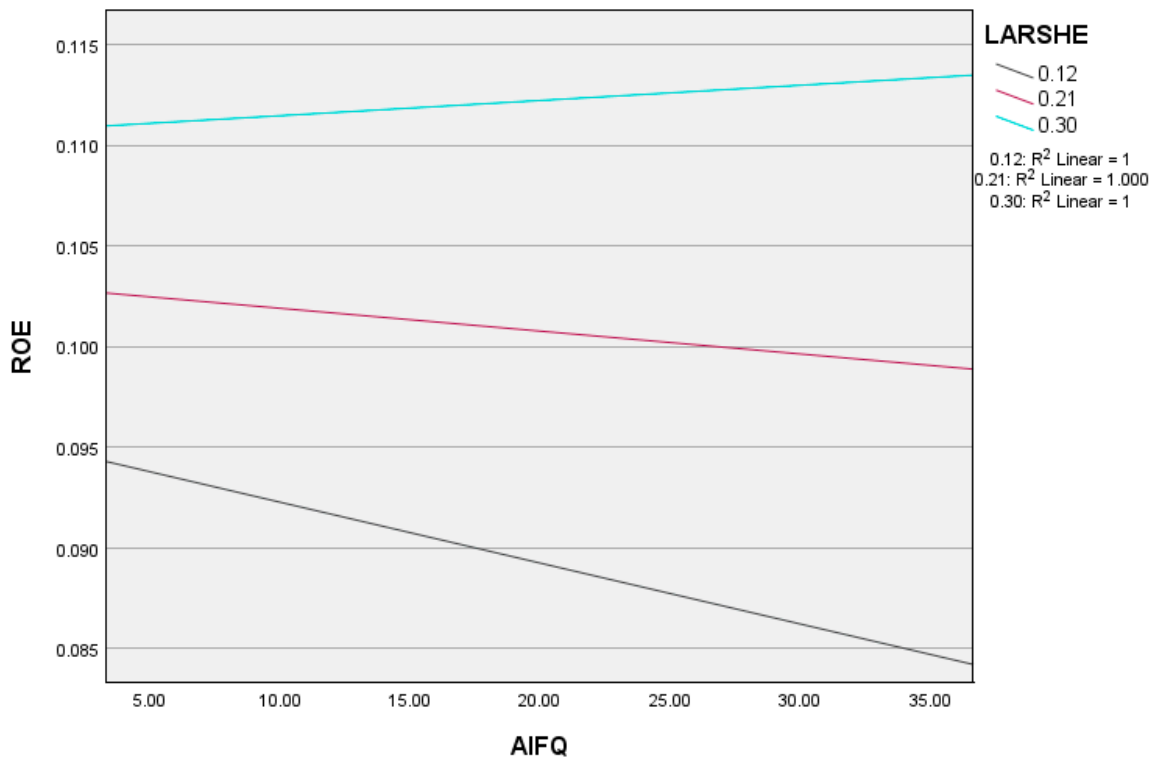


Figure 5. Model 2: AIFQ and LARSHE moderation Graph.

In Model 3 (NII), AIFQ positively affects net interest income (NII) at a p -value < 0.1 . Notably, without the moderating effect, AIFQ had no impact on NII. However, Figure 6 shows that when interacting with the board of directors, the interaction between the board of directors and the AI disclosure is negative, suggesting that the board of directors does not view it as a significant signal that explains the positive influence of AI disclosure on net interest income.

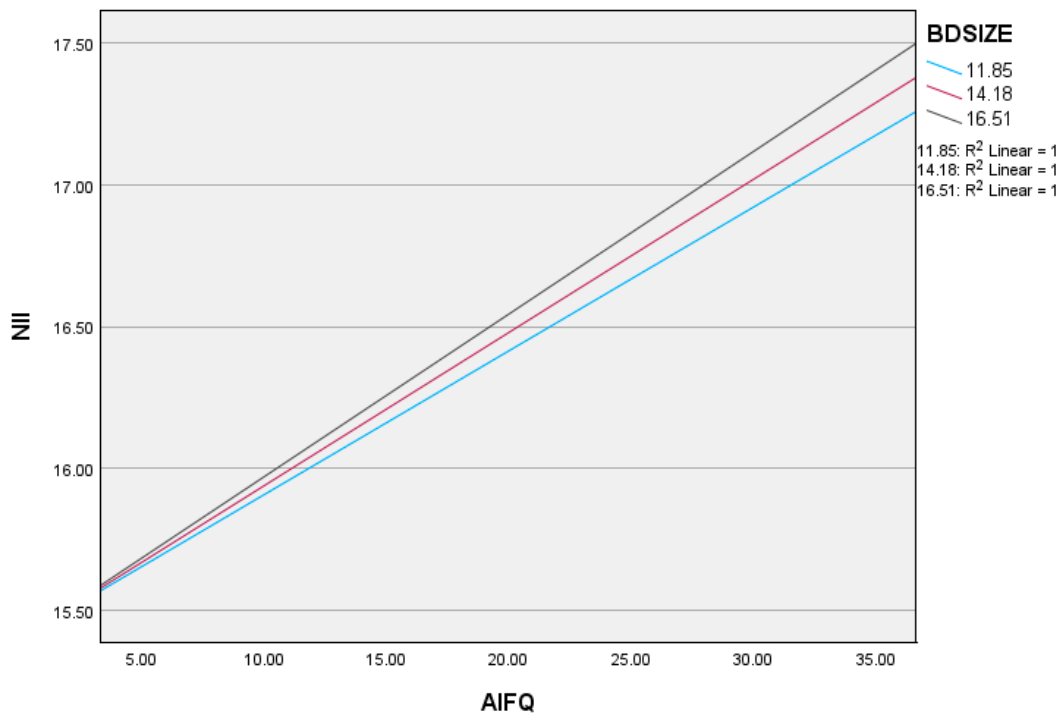


Figure 6. Model 3: AIFQ and BFSIZE moderation Graph.

Figure 7, On the other hand, as the influence of large shareholders grows, the positive association between AIFQ and NII strengthens. Therefore, it highlights the importance of AI disclosures to the shareholders as they consider it a signal explaining the changes in net interest income.

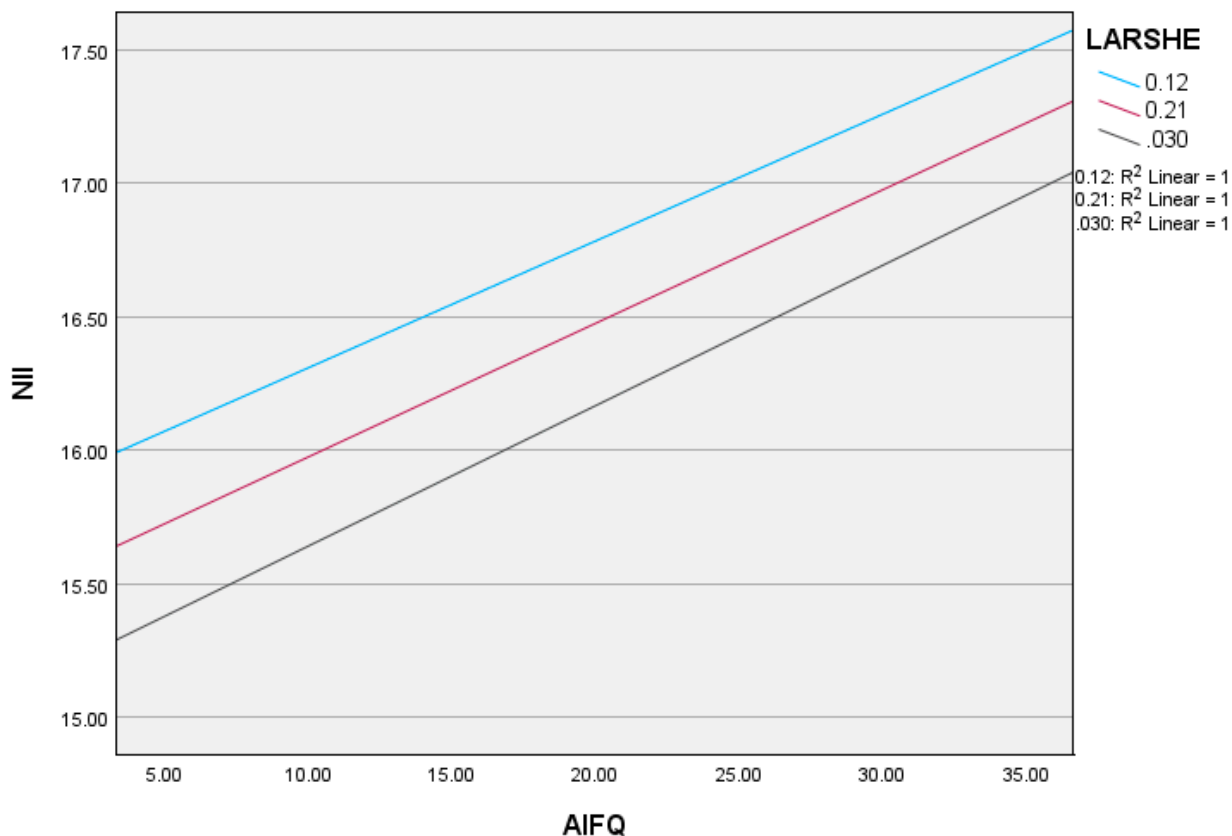


Figure 7. Model 3: AIFQ and LARSHE moderation Graph.

In Model 4 (TEXP), after introducing the moderating effect in the second regression, AIFQ has a positive effect on total expenses (TEXP) at a p -value < 0.05 . Note that without considering moderation, AIFQ does not affect total expenses. However, in Figure 8, the interaction between AIFQ and large shareholders is significantly positive, while in Figure 9, the interaction between AIFQ and board size is insignificant. Hence, such a finding suggests that as the proportion of large shareholders increases, their interest in AI disclosures increases because such signals are crucial to explain the increase in expense, whereas changes in board size do not influence AI's effect on total expenses.

- *The third regression (eliminated variables):*

In Model 3 (NII), AIFQ is both positive and significant at a p -value < 0.01 . However, in Figure 10, the interaction between AIFQ and board independence is insignificant, showing that changes in the level of board independence neither weaken nor enhance the positive effect of AI-related term disclosure on NII. Accordingly, such a finding suggests that the top ten banks' governance structures may not consider AI disclosure as a critical single to explain performance, especially the positive changes in net interest income.

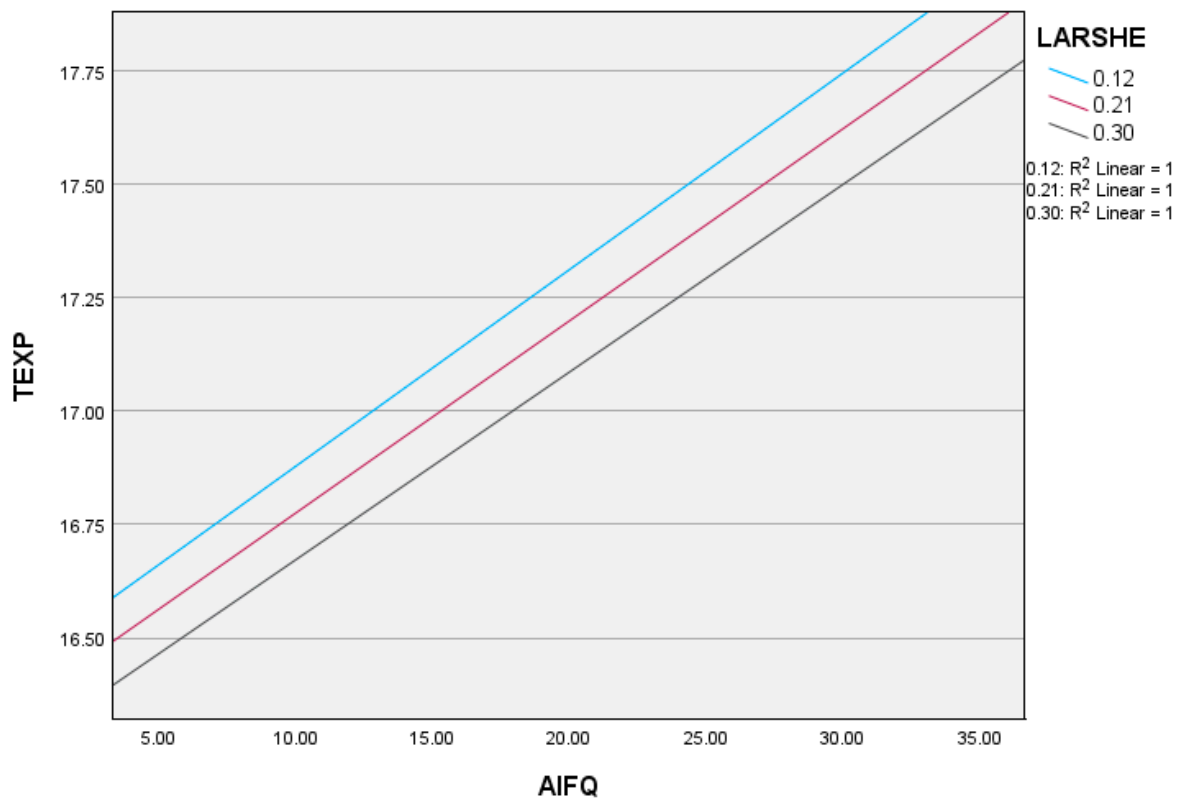


Figure 8. Model 4: AIFQ and LARSHE moderation Graph.

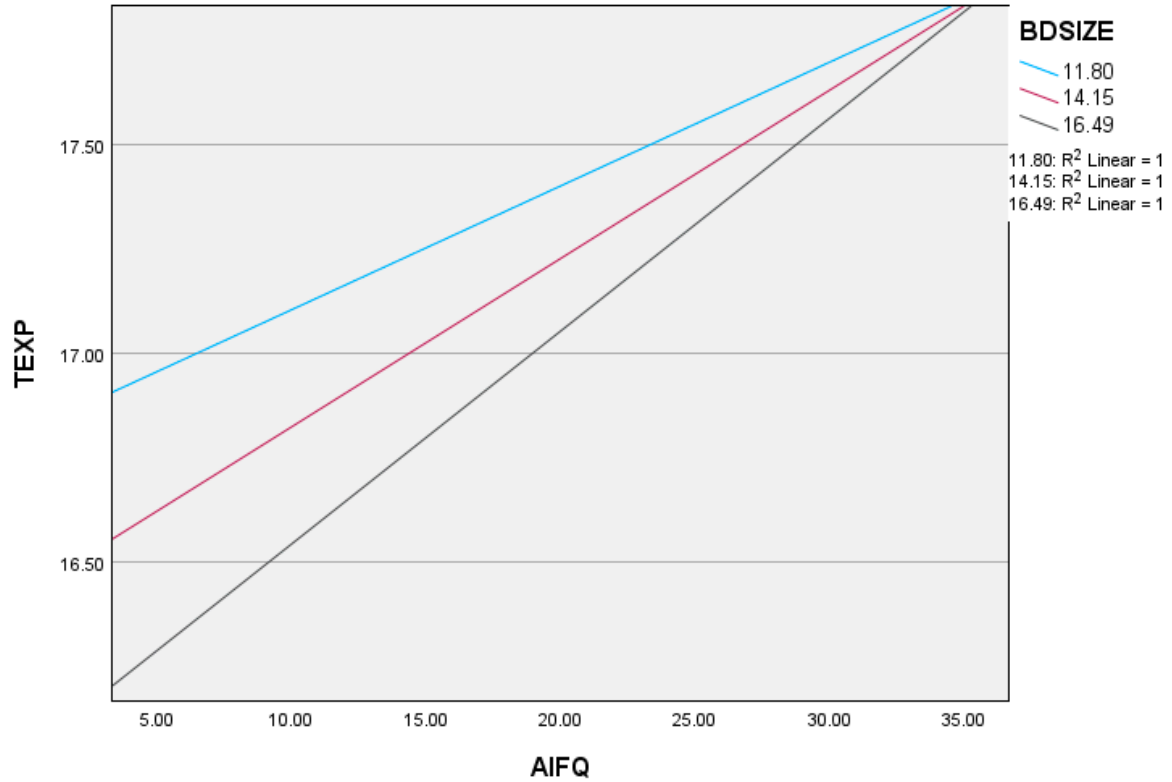


Figure 9. Model 4: AIFQ and BDSIZE moderation Graph.

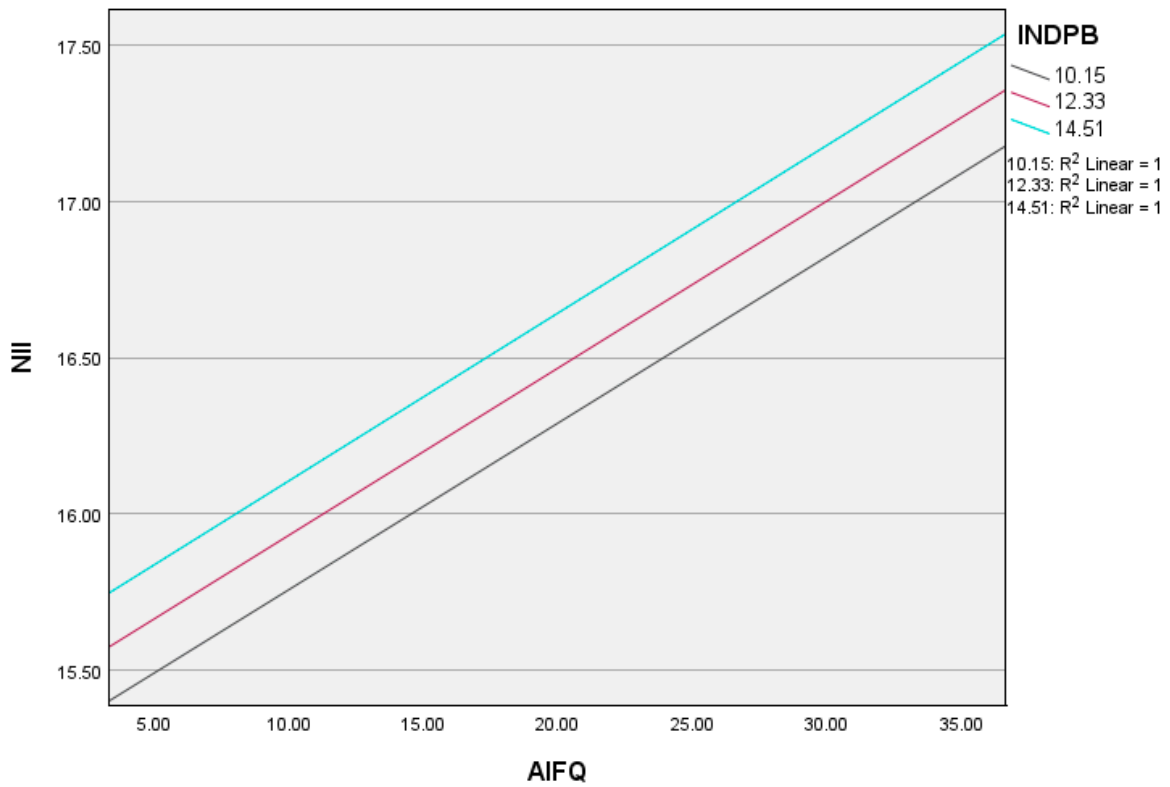


Figure 10. Model 3: AIFQ and INDPB moderation Graph.

In Model 4 (TEXP), the interaction between AI-related term disclosure and an independent board of directors reveals that increased board independence weakens the positive effect of AI-related term disclosure on total expenses (See Figure 11), indicating that independent board members are reacting negatively to AI disclosures as they view such signals less effective to explain the changes in total expenses.

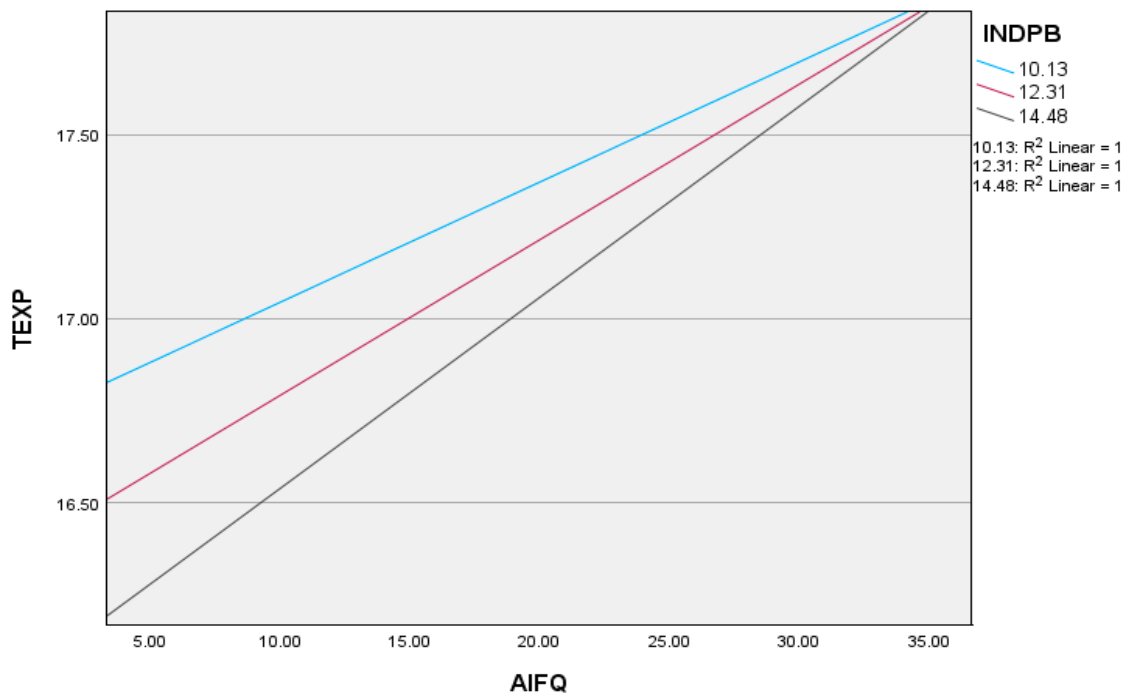


Figure 11. Model 4: AIFQ and INDPB moderation Graph.

- COVID-19 effect:

The independent variable, YEAR, is a dummy variable used to control the impact of COVID-19 during and after the pandemic, with 2020, 2021, and 2022 classified as COVID-19-affected years. Correlation analysis shows that the YEAR variable is significantly correlated with AIFQ (positive at $p < 0.05$), BSIZE (positive at $p < 0.05$), and DEBT (positive at $p < 0.1$). To capture COVID-19's effect on these variables, an independent sample *t*-test was conducted (See Appendix C, *t*-test section). Levene's Test for Equality of Variances was insignificant for AIFQ, BSIZE, and DEBT, confirming the homogeneity assumption. The one-sided *p*-value for all three variables was < 0.01 , indicating that the COVID-19 years significantly affected them.

The average bank size during COVID-19 was 20.959, compared to 20.493 before the pandemic. With a significant *p*-value, this indicates that banks' total assets increased during the pandemic. At the same time, the debt ratio was lower throughout the pandemic, with an average of 0.108 compared to 0.194 before 2020. This rise in assets and reduction in debt can be attributed to the federal government's increased money supply, strengthening banks' financial positions. Additionally, AI-related term disclosures saw a notable increase during 2020, 2021, and 2022, with an average of 25.05 terms, compared to just 15.741 terms before Covid. This surge reflects banks' heavy reliance on AI technology to meet customer needs during the pandemic.

7. Discussion

AI terms disclosure frequency in the annual reports in the US banks showed the same trend as in Jordanian banks, with the highest value of 2 and the lowest of 50. Figure A1 in Appendix B shows that such a variation in terms mentioned in the annual reporting exists. This is consistent with previous studies (e.g., Shiyyab et al., 2023; Shehadeh et al., 2024), in which banks show variations in disclosures. The variation in disclosures indicates that banks in the US do not engage in the same level of AI adoption and that the board of directors of those banks does not exhibit the same level of signaling across different banks. Additionally, the findings align with (Bonsón et al., 2021; Finkenwirth, 2021; Shiyyab et al., 2023; Shehadeh et al., 2024), indicating that AI term disclosures exhibit incremental growth in financial reporting. Figure A2 in Appendix B shows an increasing trend in the most recent year.

Although there is an increase in AI disclosures in US banks, findings indicate that such an increase does not affect financial performance, which contradicts the first and the second hypotheses. This is consistent with (Finkenwirth, 2021) and contradictory to (Alkaraan et al., 2022; Shiyyab et al., 2023; Shehadeh et al., 2024). Such a disparity between the current and prior studies might be attributed to the difference in the US institutional setting and business environment. As in the US, the CEO's power is concentrated, which leverages their influence over the board (Aguilera et al., 2006). Additionally, the difference in the accounting standards might cause a disparity between the current study results and prior studies.

This analysis shows that banks with larger and independent boards are less likely to view AI disclosures as less effective signals to explain financial performance or changes in such metrics. Accordingly, it confirms that bank governance may adopt a more cautious and negative stance toward AI disclosures because AI disclosure could draw unwanted attention to their performance instead of sending a positive signal to shareholders. This finding, as expected, is contradictory to (Alkaraan et al., 2022; Shiyyab et al., 2023), and it supports that the difference in the institutional setting and accounting standards would lead to different results. Alternatively, concentrated ownership and institutional investors in the US banks view AI disclosures as valuable signals to explain financial performance, which

is contradictory to (Shiyyab et al., 2023), as the institutional investors in the US are more short-term-oriented and driven by a focus on economic value to maximize their profitability.

Finally, COVID-19 analysis shows a negative effect in the first and second regression analysis, which inversely affects financial performance during COVID-19 years. This finding is consistent with (Shehadeh et al., 2024), in which COVID-19 negatively affects digital transformation initiatives in Jordan, and it contradicts (Shiyyab et al., 2023), in which COVID-19 did not affect financial performance. On the contrary, the study found that during COVID-19, the frequency of AI discourses increased in the annual reports.

This study highlights a different view between banks' governance and large shareholders. While bank agents' and principals' goals and objectives may appear aligned, the board of directors reacts negatively to AI disclosures, while shareholders react positively to AI disclosures. While a potential conflict of interest may exist, the disparity in perspectives could also stem from a knowledge gap, lack of information between the two parties, or CEOs' concentrated power in the US institutional setting. In direct decision-making, agents have immediate control, whereas principals remain more distanced from the bank's day-to-day operations (Linder & Foss, 2013). This separation likely contributes to the differing views on AI disclosures.

8. Limitations, Recommendations, and Conclusions

This study's findings have implications for financial reporting and disclosure. First, shareholders react positively to AI disclosures, believing they could help explain the bank's performance. Accordingly, banks could increase AI disclosures to signal the positive influences of AI in banks' operations. Second, the study showed that AI disclosures affect performance measures; therefore, regulators and policymakers could establish rules and guidelines for AI disclosures, ensuring that AI-related activities are disclosed in annual reports. Furthermore, the study findings could call for future mandatory disclosures by accounting governing bodies.

While the study's findings may not be generalizable due to the sample size, they substantially contribute to the literature on AI technology's role in major U.S. banks. It highlights how boards of directors and principals view AI disclosure in financial reports to signal financial performance, offering valuable insights into the effective use of AI in the banking sector.

The core idea of this study is that frequent AI-related term disclosures in annual reports indicate innovation and market competitiveness. Banks that extensively report AI usage invest in advanced technology, enhancing their competitive edge. The analysis of AI term disclosures among leading US banks indicates that these disclosures mirror the extent of AI integration in their operations. The lowest frequency of AI-related terms observed in annual reports is just 2, highlighting a need for greater attention (see Appendix C). Meanwhile, Wells Fargo has the highest AI disclosure, totaling 295 AIFQ mentions from 2013 to 2022.

The primary aim of this study is to assess how the board of directors, independent board members, and larger shareholders influence the relationship between AI-related term disclosures and financial performance and to determine whether their interaction mitigates or exacerbates agency problems. This study reveals that AIFQ alone does not affect financial performance. However, the moderating effects of the board of directors, independent board members, and larger shareholders significantly impact financial performance in some models.

The study's limitations include data collection methods, the study's timeframe, and the nature of the data. Data were gathered from bank annual reports, proxy statements, and websites. The limited sample size and short timeframe restricted the ability to expand the

sample. Additionally, the data required transformation to meet the normality assumption. Heteroscedasticity was identified as an issue in Models 3 and 4. In order to solve the issue, a score test was conducted to assess the significance of heteroscedasticity (see Appendix C, Table A6), and a weighted least squares regression model was applied accordingly.

Further analysis is recommended to validate the impact of AIFQ on US banks' financial performance and explore the moderating effects of board size, independent board members, and large shareholders. Future research should consider a larger sample size to improve the relevance and accuracy of the results. Given the data's inherent heterogeneity, transforming the data is essential for robust measurements. Employing a larger sample or alternative statistical methods may enhance the evaluation of the relationship between these variables.

The age of AI is here, and businesses need to capitalize on the benefits while minimizing the drawbacks. In the coming years, competition will be fierce among institutions developing and investing in AI technology. Banks, in particular, have already shown a keen interest in adopting this emerging technology through various banking services. However, given the preliminary stage of the technology, accounting regulations must consider its usage and disclosure. To this end, this study aimed to examine the impact of AI-related disclosures on the performance of top US banks, analyze trends in their financial reporting, and measure agency issues between related parties.

This study has two questions. As per the first question, does AI-related disclosure in the top US banks show the same trend as Jordanian banks and companies in Germany, Malaysia, the UK, and Spain? AI-related disclosures showed an increase in the top US banks' financial reports, similar to those in other countries. As for the second question, is there a disagreement between shareholders and the board of directors regarding AI disclosure? If so, is that attributable to the information gap between both parties? The board of directors and shareholders did not share the same view about AI disclosure; the shareholders' view was toward more disclosure than the board of directors, and apparently, their conflicting interest is attributable to the information gap.

Despite the small sample size, this study successfully addresses all research questions and concludes that AI disclosure affects net interest income, total expense, and prices-to-earnings ratio only by moderating the bank's governance and large shareholders. To further solidify these findings, it is recommended that future analyses employ a larger sample size or alternative statistical methods. Additionally, the study advocates for further exploration of AI disclosures across various industries to develop comprehensive accounting standards that regulate AI disclosures and practice.

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Appendix A

Table A1. List of banks included in the sample size.

<i>Rank</i>	<i>Bank Name</i>	<i>Headquarters</i>	<i>Total Assets</i>
1	JP Morgan Chase	New York City	\$3868
2	Bank of America	Charlotte	\$3123
3	Citigroup	New York City	\$2423
4	Wells Fargo	San Francisco	\$1876
5	Goldman Sachs	New York City	\$1571
6	Morgan Stanley	New York City	\$1164
7	US. Bancorp	Minneapolis	\$680
8	PNC Financial Services	Pittsburg	\$558
9	Truist Financial	Charlotte	\$544
11	Charles Shwab Corp	Westlake, Texas	\$511

Table A2. List of variables description.

AIFQ	The number of mentioned AI-related terms in each annual report
ROA	Return on Assets
ROE	Return on equity
NII	Net interest income
P/E	P/E ratio
TEXP	Natural log of total expenses
TNIEXP	Total non-interest expenses
BSIZE	Bank size, which is the natural log of assets
DEBT	Long-term debt to total debt ratio
BDSIZE	Number of board of directors
AI*BD	AI-related terms disclosures interaction with board size
INDPB	The proportion of independent board members
AI*INDB	AI-related terms disclosure interaction with independent board member
LARSHE	Percentage of shareholders who own more than 5% of total shares
AI*SHE	AI-related terms disclosure interaction with Large shareholders
AGE	The age of the bank. Number of years from the date of establishment
YEAR	Dummy variable 1: COVID year and years after COVID, 0: Other

Table A3. AI-related term Index.

<i>Digital awareness, transformation, and capabilities</i>	Digital transformation, fintech, financial technology, modern technology, AI digital strategy, latest technology, advanced technology, AI computing technology, digital infrastructure, digital library, electronic channel, electronic system, internet of things, 5 g technology, advanced technical experiences, digital platform, digital technology, 5 g networks, blockchain, smart connection, digital awareness, digital capabilities, digital culture, digital economy, digital futuristic, digital transition, augmented reality technology, technical platform, web technology, machine learning, deep learning, augmented intelligence, natural language processing (NLP).
<i>AI application, product, service, and process</i>	Robotics, robo-advisors, automation, digital banking, mobile banking, online banking, digital services, mobile apps, electronic payment, Internet banking service, mobile branches, mobile payment, robots, mobile ATMs, digital payment, digital identity, smartphones, smart bank websites, digital product, electronic service, intelligently analyses, digital wallet, electronic wallet, mobile device service
<i>AI information challenges and cyber security threats</i>	Information security, cyber security, electronic security, it risks security, electronic security policies, card security, cyber risk, electronic security, cybercrime, bank electronic security, customized electronic security methods, cyber breach, cyber resiliency, defense technology, cyber intelligence, electronic attack, global security, information security breaches, security vulnerabilities.

Shiyab et al. (2023). No. 3.

Appendix B. Plots and Figures

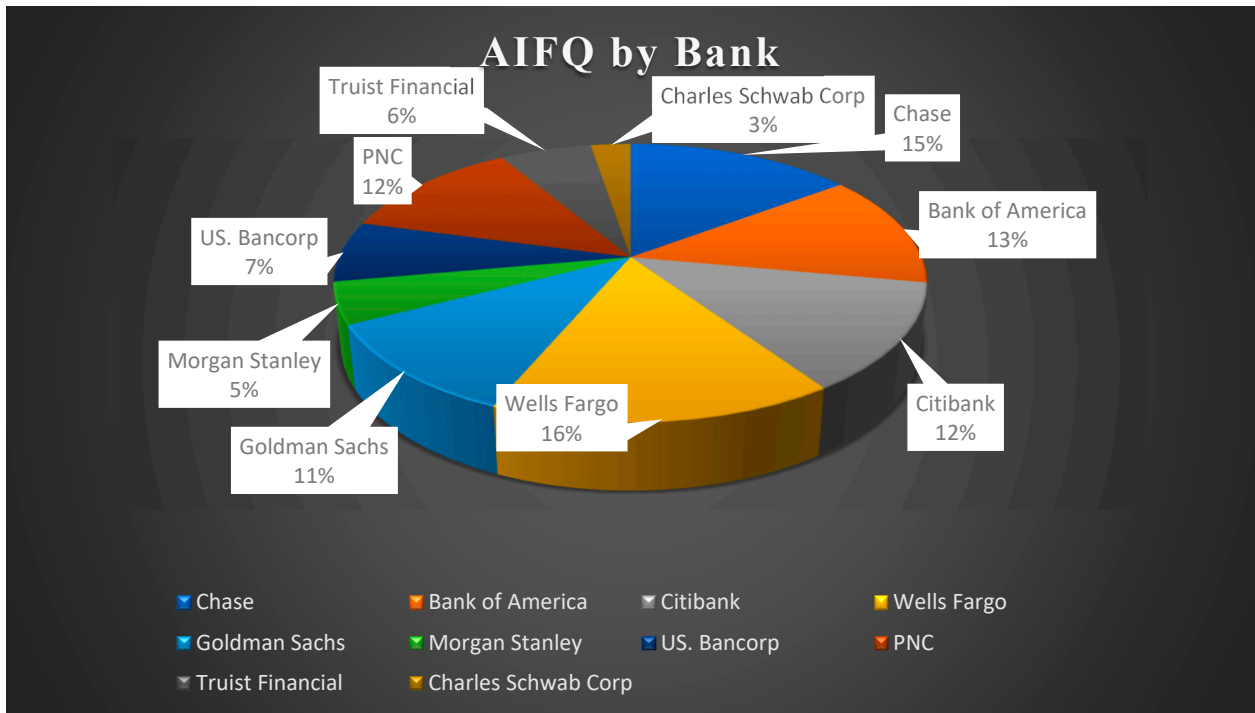


Figure A1. AI frequency by bank.

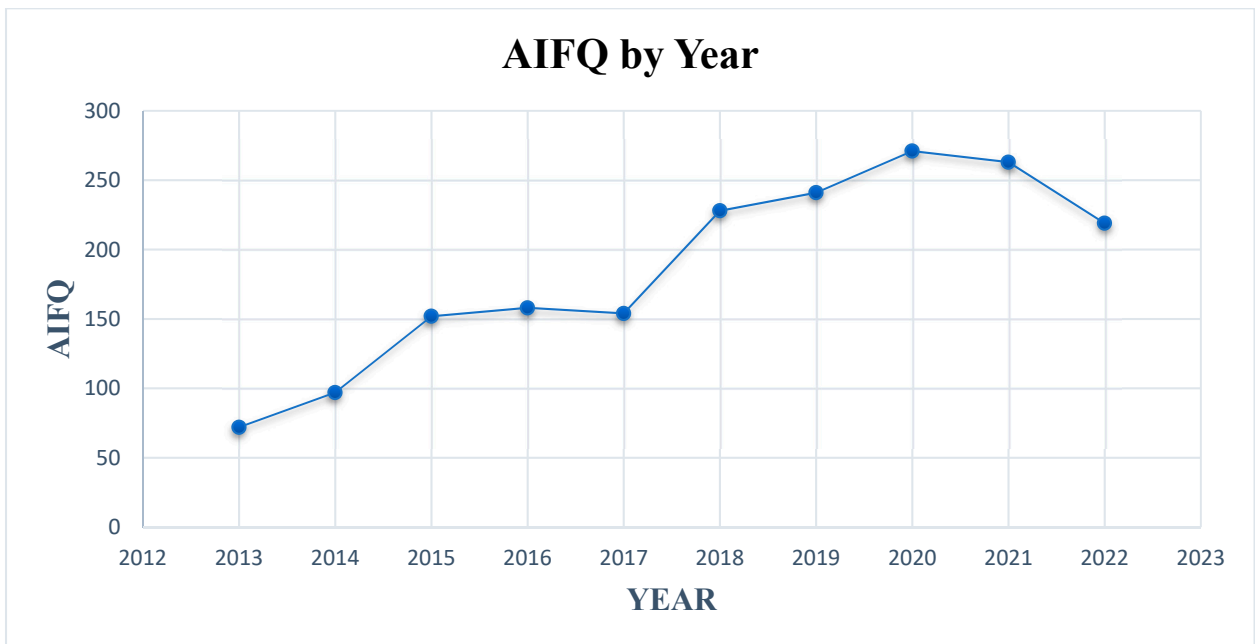


Figure A2. AI frequency by year.

Appendix C

Table A4. Banks AIFQ per single year.

<i>Bank Name</i>	<i>YEAR</i>	<i>AIFQ</i>
CHASE	2013	10
CHASE	2014	9
CHASE	2015	41
CHASE	2016	50
CHASE	2017	19
CHASE	2018	34
CHASE	2019	11
CHASE	2020	47
CHASE	2021	32
CHASE	2022	21
BANK OF AMERICA	2013	16
BANK OF AMERICA	2014	14
BANK OF AMERICA	2015	17
BANK OF AMERICA	2016	10
BANK OF AMERICA	2017	14
BANK OF AMERICA	2018	22
BANK OF AMERICA	2019	26
BANK OF AMERICA	2020	34
BANK OF AMERICA	2021	46
BANK OF AMERICA	2022	45
CITIBANK	2013	6
CITIBANK	2014	11
CITIBANK	2015	19
CITIBANK	2016	19
CITIBANK	2017	25
CITIBANK	2018	32
CITIBANK	2019	47
CITIBANK	2020	33
CITIBANK	2021	22
CITIBANK	2022	19
WELLS FARGO	2013	16
WELLS FARGO	2014	22
WELLS FARGO	2015	18
WELLS FARGO	2016	23
WELLS FARGO	2017	23
WELLS FARGO	2018	43
WELLS FARGO	2019	37
WELLS FARGO	2020	38
WELLS FARGO	2021	38
WELLS FARGO	2022	37
GOLDMAN SACHS	2013	5
GOLDMAN SACHS	2014	13
GOLDMAN SACHS	2015	10
GOLDMAN SACHS	2016	13
GOLDMAN SACHS	2017	23
GOLDMAN SACHS	2018	24
GOLDMAN SACHS	2019	31
GOLDMAN SACHS	2020	31
GOLDMAN SACHS	2021	34
GOLDMAN SACHS	2022	19
MORGAN STANLEY	2013	4
MORGAN STANLEY	2014	6
MORGAN STANLEY	2015	6
MORGAN STANLEY	2016	10
MORGAN STANLEY	2017	11
MORGAN STANLEY	2018	10
MORGAN STANLEY	2019	11

Table A4. *Cont.*

<i>Bank Name</i>	<i>YEAR</i>	<i>AIFQ</i>
<i>MORGAN STANLEY</i>	2020	11
<i>MORGAN STANLEY</i>	2021	10
<i>MORGAN STANLEY</i>	2022	11
<i>USBANCORP</i>	2013	2
<i>USBANCORP</i>	2014	5
<i>USBANCORP</i>	2015	9
<i>USBANCORP</i>	2016	6
<i>USBANCORP</i>	2017	10
<i>USBANCORP</i>	2018	19
<i>USBANCORP</i>	2019	24
<i>USBANCORP</i>	2020	20
<i>USBANCORP</i>	2021	26
<i>USBANCORP</i>	2022	10
<i>PNC</i>	2013	7
<i>PNC</i>	2014	8
<i>PNC</i>	2015	19
<i>PNC</i>	2016	16
<i>PNC</i>	2017	18
<i>PNC</i>	2018	27
<i>PNC</i>	2019	31
<i>PNC</i>	2020	34
<i>PNC</i>	2021	34
<i>PNC</i>	2022	32
<i>TRUIST FINANCIAL</i>	2013	3
<i>TRUIST FINANCIAL</i>	2014	6
<i>TRUIST FINANCIAL</i>	2015	7
<i>TRUIST FINANCIAL</i>	2016	6
<i>TRUIST FINANCIAL</i>	2017	6
<i>TRUIST FINANCIAL</i>	2018	11
<i>TRUIST FINANCIAL</i>	2019	19
<i>TRUIST FINANCIAL</i>	2020	17
<i>TRUIST FINANCIAL</i>	2021	17
<i>TRUIST FINANCIAL</i>	2022	19
<i>CHARLES SCHWAB CORP</i>	2013	3
<i>CHARLES SCHWAB CORP</i>	2014	3
<i>CHARLES SCHWAB CORP</i>	2015	6
<i>CHARLES SCHWAB CORP</i>	2016	5
<i>CHARLES SCHWAB CORP</i>	2017	5
<i>CHARLES SCHWAB CORP</i>	2018	6
<i>CHARLES SCHWAB CORP</i>	2019	4
<i>CHARLES SCHWAB CORP</i>	2020	6
<i>CHARLES SCHWAB CORP</i>	2021	4
<i>CHARLES SCHWAB CORP</i>	2022	6

Table A5. Multicollinearity test.

<i>Variable</i>	<i>Collinearity Statistics (VIF)</i>
<i>YEAR</i>	1.683
<i>BFSIZE</i>	2.184
<i>DEBT</i>	2.513
<i>BDSIZE</i>	17.800 *
<i>LARSHE</i>	2.292
<i>AGE</i>	2.625
<i>AIFQ</i>	3.479
<i>AI*BD</i>	13.534 *
<i>AI*SHE</i>	1.727
<i>AI*INDB</i>	13.703 *
<i>INDPB</i>	19.158 *

* high collinearity.

Table A6. Score test.

<i>Model</i>	<i>REGRESSION W/O MODERATION P-VALUE</i>	<i>REGRESSION W/MODERATION P-VALUE</i>	<i>REGRESSION FOR ELIMINATED VARIABLES P-VALUE</i>
<i>NII</i>	0.002	0.011	<0.001
<i>TEXP</i>	<0.001	0.417	0.092

• **T-test:**

Table A7. Independent samples test ***.

		<i>Levene's Test for Equality of Variances</i>				<i>t-Test for Equality of Means</i>					
		<i>F</i>	<i>Sig.</i>	<i>t</i>	<i>df</i>	<i>Sig.</i>		<i>Mean Difference</i>	<i>Std. Error Difference</i>	<i>95% Confidence Interval of the Difference</i>	
						<i>One-Sided p</i>	<i>Two-Sided p</i>			<i>Lower</i>	<i>Upper</i>
<i>BSIZE</i>	Equal variances assumed	0.525	0.470	2.553	97	0.006 **	0.012 *	0.466	0.182	0.104	0.827
	Equal variances are not assumed.			2.651	56.982	0.005 **	0.010 *	0.466	0.176	0.114	0.817
<i>AIFQ</i>	Equal variances assumed	0.018	0.893	3.823	97	<0.001	<0.001	9.309	2.435	4.476	14.141
	Equal variances are not assumed.			3.832	55.542	<0.001	<0.001	9.309	2.429	4.442	14.175
<i>DEBT</i>	Equal variances assumed	0.463	0.498	-2.384	97	0.01 *	0.019 *	-0.030	0.012	-0.055	-0.005
	Equal variances are not assumed.			-2.565	65.921	0.006 **	0.013 *	-0.030	0.012	-0.053	-0.007

* $p < 0.05$, ** $p < 0.01$; *** Numbers are rounded to the third decimal point.

Table A8. Group statistics **.

	<i>Year *</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Std. Error Mean</i>
<i>BSIZE</i>	1	29	20.959	0.773	0.144
	0	70	20.493	0.846	0.101
<i>AIFQ</i>	1	30	25.050	11.088	2.024
	0	69	15.741	11.153	1.343
<i>DEBT</i>	1	30	0.108	0.050	0.009
	0	69	0.194	0.060	0.007

* Year is a dummy variable coded 1 as COVID-19 year and 0 before COVID-19 year. ** Numbers are rounded to the third decimal point.

References

Abusalma, A. (2021). The effect of implementing artificial intelligence on job performance in commercial banks of Jordan. *Management Science Letters*, 11, 2061–2070. [CrossRef]

Aguilera, R. V., Williams, C. A., Conley, J. M., & Rupp, D. E. (2006). Corporate governance and social responsibility: A comparative analysis of the UK and the US. *Corporate Governance: An International Review*, 14, 147–158. [CrossRef]

Ali, M. S., Swiety, I. A., & Mansour, M. H. (2022). Evaluating the role of artificial intelligence in the automation of the banking services industry: Evidence from Jordan. *Humanities and Social Sciences Letters*, 10, 383–393. [CrossRef]

Alkaraan, F., Albitar, K., Hussainey, K., & Venkatesh, V. G. (2022). Corporate transformation toward Industry 4.0 and financial performance: The influence of environmental, social, and governance (ESG). *Technological Forecasting and Social Change*, 175, 121423. [CrossRef]

Alsheibani, S., Cheung, Y., & Messom, C. (2018). Artificial Intelligence Adoption: AI-readiness at Firm-Level. *PACIS*, 4, 231–245.

- Andrijašević, M., & Pašić, V. (2018). *Theoretical assumptions of agency problem*. Paper presented at the Second International Symposium on Natural Resources Management, Faculty of Management. Available online: https://www.researchgate.net/publication/322701162_THEORETICAL_ASSUMPTIONS_OF_AGENCY_PROBLEM (accessed on 4 November 2024).
- Bayo-Moriones, A., & Lera-López, F. (2007). A firm-level analysis of determinants of ICT adoption in Spain. *Technovation*, 27, 352–366. [CrossRef]
- Belkhir, M. (2009). Board of directors' size and performance in the banking industry. *International Journal of Managerial Finance*, 5, 201–221. [CrossRef]
- Bhattacharya, C., & Sinha, M. (2022). The role of artificial intelligence in banking for leveraging customer experience. *Australasian Accounting, Business and Finance Journal*, 16, 89–105. [CrossRef]
- Bonsón, E., Alejo, V., & Lavorato, D. (2021). Artificial intelligence disclosure in the annual reports of Spanish IBEX-35 companies (2018–2019). In *Digital transformation in industry: Trends, management, strategies* (vol. 44, pp. 147–155). Springer International Publishing.
- Cam, A., Chui, M., & Hall, B. (2019). *Global AI Survey: AI proves its worth, but few scale impact*. Available online: <https://www.mckinsey.com/featured-insights/artificial-intelligence/global-ai-survey-ai-proves-its-worth-but-few-scale-impact> (accessed on 4 November 2024).
- Chao, Y. -C. (2017) August 9. *Proposed guidance on supervisory expectation for boards of directors*. Available online: <https://www.govinfo.gov/content/pkg/FR-2017-08-09/pdf/2017-16735.pdf> (accessed on 1 September 2024).
- Chen, Y., & Zhang, S. (2022). Accounting information disclosure and financial crisis beforehand warning based on the artificial neural network. *Wireless Communications and Mobile Computing*, 2022, 1–11. [CrossRef]
- Chenhall, R. H., & Langfield-Smith, K. (1998). Adoption and benefit of management accounting practices: An Australian study. *Management Accounting Research*, 9, 1–19. [CrossRef]
- Cotter, J., Lokman, N., & Najah, M. M. (2011). Voluntary disclosure research: Which theory is relevant? *Journal of Theoretical Accounting Research*. Available online: <https://ssrn.com/abstract=3470466> (accessed on 4 November 2024). [CrossRef]
- Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review*, 96, 108–116.
- Dedrick, J., Kraemer, K. L., & Shih, E. (2013). Information technology and productivity in developed and developing countries. *Journal of Management Information Systems*, 30, 97–122. [CrossRef]
- Doupnik, T. S., & Tsakumis, G. T. (2004). A critical review of tests of Gray's theory of cultural relevance and suggestions for future research. *Journal of Accounting Literature*, 23, 1–48.
- Eckhardt, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. Sage Publications.
- Elegunde, A. F., & Oladimeji, I. (2020). Effects of artificial intelligence on business performance in the banking industry (a study of access bank plc and united bank for africa-uba). *IOSR Journal of Business and Management*, 22(5), 41–49.
- England, J. (2022, June 8). Technology in fintech and the story of online banking. *FinTech Magazine*. Available online: <https://fintechmagazine.com/banking/fintech-timelines-and-the-story-of-online-banking> (accessed on 20 November 2023).
- Enholm, I. M., Papagiannidis, E., Mikalef, P., & Krogstie, J. (2022). Artificial intelligence and business value: A literature review. *Information Systems Frontiers*, 24, 1709–1734. [CrossRef]
- Fernando, J. (2023, March 25). P/E Ratio Definition: Price-to-Earnings Ratio Formula and Examples. *Investopedia*. Available online: <https://www.investopedia.com/terms/p/price-earningsratio.asp#:~:text=In%20short,%20the%20P/E,is%20low%20relative%20to%20earnings> (accessed on 1 October 2023).
- Finkenwirth, K. (2021). *The impact of artificial intelligence on financial performance in the German financial service industry—A content analysis* [Master's dissertation, Nova School of Business and Economics]. Available online: https://run.unl.pt/bitstream/10362/122610/1/2020-21_fall_41614_katharina-finkenwirth.pdf (accessed on 4 November 2024).
- Güngör, H. (2020). Creating value with artificial intelligence: A multi-stakeholder perspective. *Journal of Creating Value*, 6, 72–85. [CrossRef]
- Harrington, J., & Voehl, F. (2010). Innovative Problem Solving: The Next Big Thing. *International Journal of Innovation Science*, 2, 113–121. [CrossRef]
- Higgins, M., Shortt, S., Khanna, A., & Resmerita, L. (2024, January 8). Bridging the gap between artificial intelligence implementation, governance and democracy. *FTI Consulting*. Available online: <https://www.fticonsulting.com/insights/articles/bridging-gap-between-artificial-intelligence-implementation-governance-democracy> (accessed on 10 September 2024).
- Hooghiemstra, R. (2010). Letters to the shareholders: A content analysis comparison of letters written by CEOs in the United States and Japan. *The International Journal of Accounting*, 45, 275–300. [CrossRef]
- Hradecky, D., Kennell, J., Cai, W., & Davidson, R. (2022). Organizational readiness to adopt artificial intelligence in the exhibition sector in Western Europe. *International Journal of Information Management*, 65, 102497. [CrossRef]
- Husain, A. R. A. M., Hamdan, A., & Fadhul, S. M. (2022). The impact of artificial intelligence on the banking industry performance. In *Future of organizations and work after the 4th industrial revolution: The role of artificial intelligence, big data, automation, and robotics* (vol. 1037, pp. 145–156). Springer.

- IFRS Foundation. (2024). *Who uses IFRS accounting standards? IFRS*. Available online: <https://www.ifrs.org/use-around-the-world/use-of-ifrs-standards-by-jurisdiction/> (accessed on 14 December 2024).
- Isik, O., & Ince, A. R. (2016). Board size, board composition and performance: An investigation on Turkish banks. *International Business Research*, 9, 74–84. [CrossRef]
- Kaya, O., Schildbach, J. A. G. D. B., & Schneider, S. (2019). *Artificial intelligence in banking*. *Artificial intelligence*. Available online: https://www.dbresearch.com/PROD/RPS_EN-PROD/PROD000000000495172/Artificial_intelligence_in_banking:_A_lever_for_pr.pdf?undefined&reload=3MtS4KaiKNdreken5s~QGqPQT1QnlOcq6Yt9IPoMANssbym~RtcirmH8tCl2os8j (accessed on 4 November 2024).
- Kim, J. H. (2019). Multicollinearity and misleading statistical results. *Korean Journal of Anesthesiology*, 72, 558–569. [CrossRef]
- Kochhar, K., Purohit, H., & Chutani, R. (2019, October 22–23). *The rise of artificial intelligence in banking sector*. 5th International Conference on Educational Research and Practice (ICERP) (vol. 127, pp. 127–135), Putrajaya, Malaysia.
- Kopp, C. M. (2023, July 17). Agency theory: Definition, examples of relationships, and disputes. *Investopedia*. Available online: <https://www.investopedia.com/terms/a/agencytheory.asp> (accessed on 24 November 2023).
- Kunduru, A. R. (2023). Effective usage of artificial intelligence in enterprise resource planning applications. *International Journal of Computer Trends and Technology*, 71, 73–80. [CrossRef]
- Lee, H. (2020). Role of artificial intelligence and enterprise risk management to promote corporate entrepreneurship and business performance: Evidence from Korean banking sector. *Journal of Intelligent & Fuzzy Systems*, 39, 5369–5386.
- Linder, S., & Foss, N. J. (2013). *Agency theory*. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2255895 (accessed on 4 November 2024).
- Majeed, M. K., Jun, J. C., Zia ur Rehman, M., Mohsin, M., & Rafiq, M. Z. (2020). The board size and board composition impact on financial performance: An evidence from the Pakistani and Chinese's listed banking sector. *The Journal of Asian Finance, Economics and Business (JAFEB)*, 7, 81–95.
- McClure, B. (2024, November 5). How Roa and Roe give a clear picture of Corporate Health. *Investopedia*. Available online: <https://www.investopedia.com/investing/roa-and-roe-give-clear-picture-corporate-health/> (accessed on 5 December 2023).
- Mitnick, B. M. (2019). *Origin of the theory of agency: An account by one of the theory's originators*. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1020378 (accessed on 4 November 2024).
- Mor, S., & Gupta, G. (2021). Artificial intelligence and technical efficiency: The case of Indian commercial banks. *Strategic Change*, 30, 235–245. [CrossRef]
- Omar, S. A., Hasbolah, F., & Ulfah, M. Z. (2017). The diffusion of artificial intelligence in governance of public listed companies in Malaysia. *International Journal of Business, Economics and Law*, 14, 1–9.
- Purdy, M., & Daugherty, P. (2017). *“How AI boosts industry profits and innovation” accenture research*. Available online: <https://www.accenture.com/us-en/insight-ai-industry-growth> (accessed on 24 November 2023).
- Ramdani, B., Kawalek, P., & Lorenzo, O. (2009). Predicting SMEs' adoption of enterprise systems. *Journal of Enterprise Information Management*, 22, 10–24. [CrossRef]
- Riikkinen, M., Saarijärvi, H., Sarlin, P., & Lähtenmäki, I. (2018). Using artificial intelligence to create value in insurance. *International Journal of Bank Marketing*, 36, 1145–1168. [CrossRef]
- Rosopa, P. J., Schaffer, M. M., & Schroeder, A. N. (2013). Managing heteroscedasticity in general linear models. *Psychological Methods*, 18, 335. [CrossRef]
- Satheesh, M., & Nagaraj, S. (2021). Applications of artificial intelligence on customer experience and service quality of the banking sector. *International Management Review*, 17, 9–17.
- Schäfer, M., Schneider, J., Drechsler, K., & vom Brocke, J. (2022, June 18–24 Research in Progress.). *AI governance: Are chief AI officers and AI risk officers needed?* European Conference on Information Systems (ECIS), Timișoara, Romania.
- Schmidt, R., Zimmermann, A., Moehring, M., & Keller, B. (2020, August 10–14). *Value creation in connectionist artificial intelligence—A research agenda*. AMCIS 2020 Proceedings-Advancements in Information Systems Research (pp. 1–10), Online.
- Segal, T. (2023, April 5). Enron scandal: The fall of a wall street darling. *Investopedia*. Available online: <https://www.investopedia.com/updates/enron-scandal-summary/> (accessed on 27 November 2023).
- Setiawan, R., Cavaliere, L. P. L., Koti, K., Ogunmola, G. A., Jalil, N. A., Chakravarthi, M. K., Rajest, S. S., Regin, R., & Singh, S. (2021). *The artificial intelligence and inventory effect on banking industrial performance* [Doctoral dissertation, Petra Christian University].
- Shehadeh, M., Alshurafat, H., & Arabiat, O. (2024). Inverting the paradigm: Digital transformation's impact on firm performance and the counterintuitive role of gender. *Competitiveness Review: An International Business Journal*. Available online: <https://www.emerald.com/insight/content/doi/10.1108/cr-11-2023-0299/full/html> (accessed on 4 November 2024).
- Shehata, N. F. (2014). Theories and determinants of voluntary disclosure. *Accounting and Finance Research (AFR)*, 3, 18–26. [CrossRef]
- Shiyyab, F. S., Alzoubi, A. B., Obidat, Q. M., & Alshurafat, H. (2023). The impact of artificial intelligence disclosure on financial performance. *International Journal of Financial Studies*, 11, 115. [CrossRef]
- Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. *The Journal of Finance*, 52, 737–783. [CrossRef]

- Singh, K. (2020). Banks banking on ai. *International Journal of Advanced Research in Management and Social Sciences*, 9, 1–11.
- Srinivas, V., Lamm, R., & Ramsay, T. (2019). *Bringing digital to the boardroom* (pp. 2–11). Deloitte Insights.
- Staikouras, P. K., Staikouras, C. K., & Agoraki, M. -E. K. (2007). The effect of board size and composition on European bank performance. *European Journal of Law and Economics*, 23, 1–27. [CrossRef]
- Umamaheswari, S., & Valarmathi, A. (2023). Role of artificial intelligence in the banking sector. *Journal of Survey in Fisheries Sciences*, 10, 2841–2849.
- Weerink, R. (2019). *The effect of board size on firm performance and how this relationship is influenced by uncertainty avoidance* [Master's thesis, University of Groningen].

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Article

Bank Loan Loss Provision Determinants in Non-Crisis Years: Evidence from African, European, and Asian Countries

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Abstract: Loan loss provision is an important accounting accrual in the banking sector. There have been numerous debates about the determinants of loan loss provision in several contexts. This study extends the debate by investigating the determinants of bank loan loss provision in non-crisis years for 28 countries from 2011 to 2018. The non-crisis years cover the periods after the global financial crisis and the periods before the COVID-19 pandemic while the countries consist of African, European, and Asian countries. Using the generalized linear model regression and the quantile regression methodologies, the results show that institutional quality is a significant determinant of bank loan loss provision, indicating that the presence of strong institutions decreases the size of bank loan loss provision in non-crisis years. In the regional analyses, it was found that economic growth is a significant determinant of bank loan loss provisions in African and Asian countries. Loan loss provision is higher in times of economic prosperity in African and Asian countries. Bank overhead cost is a significant determinant of bank loan loss provisions in Asian countries. Meanwhile, bank loan loss provision determinants are insignificant in European countries.

Keywords: financial reporting; accruals; loan loss provision; banks; income smoothing; earnings management; noninterest income; overhead costs; institutional quality; determinants

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1. Introduction

This study examines the determinants of loan loss provision in non-crisis years.

Loan loss provision is the amount of money that a bank must set aside as protection against expected credit losses in their loan portfolios (Jia 2024; Lee et al. 2024; Dal Maso et al. 2022). Loan loss provision is the most significant and important accounting accrual in the banking industry (Bushman and Williams 2012). Loan loss provision is important to accounting standard setters because overstated loan loss provision affects the transparency of reported accounting numbers. It decreases earnings quality and financial reporting quality (Nicoletti 2018). Loan loss provision is also important to bank regulators and bank supervisors because understated loan loss provision will be insufficient to cover expected credit losses and it can increase bank fragility (Nicoletti 2018). Therefore, there is much attention on bank loan loss provision from accounting standard setters and bank supervisors.

An extensive literature investigates the determinants of bank loan loss provision. The existing literature has identified several determinants of loan loss provision. These include loan charge-offs (Basu et al. 2020), nonperforming loans (Biswas et al. 2024), capital adequacy ratio (Mnif and Slimi 2023), accounting regulation (Kilic et al. 2013), economic policy uncertainty (Ng et al. 2020; Danisman et al. 2021), and bank lending (Setiyono 2024). But the existing literature has paid little attention to the non-traditional determinants that may influence the size of bank loan loss provision, and there is little knowledge on how these non-traditional determinants might affect loan loss provision, especially in non-crisis years. Understanding how the non-traditional determinants affect bank loan loss provision is important because it can reveal other important factors that influence loan loss provision, which have remained unknown in the literature and which policymakers need to pay more attention to.

This study examines the influence of three non-traditional determinants on bank loan loss provision particularly non-interest income, bank overhead costs, and institutional governance factors in relation to the traditional determinants of loan loss provision. Regarding non-interest income, it is argued that banks that anticipate a decline in non-interest income will decrease their loan loss provision in order to boost their interest income. Banks will do this as a way to augment any expected shortfall in their profit levels. It is also argued that banks that have high overhead costs will keep fewer loan loss provisions in order to preserve or increase their earnings. It is further argued that the presence of strong institutions is beneficial for banks because strong institutions will create the legal and institutional frameworks that will compel debtors to repay their debt or face legal consequences. Such frameworks will help banks in loan recovery, help to decrease loan default rates, and decrease the size of loan loss provisions.

This study extends the literature by examining the dynamics of the non-traditional determinants of loan loss provision in non-crisis years and along regional dimensions. In the empirical analysis, annual country-level data from 2011 to 2018 were used and the generalized linear model regression and the quantile regression methodologies were employed. The results show that institutional quality is a significant determinant of bank loan loss provision. Also, economic growth is a significant determinant of bank loan loss provisions in African and Asian countries while bank overhead cost is a significant determinant of bank loan loss provisions in Asian countries. Meanwhile, bank loan loss provision determinants are insignificant in European countries.

This study makes two important contributions to the literature. First, it contributes to the emerging literature on the non-traditional determinants of bank loan loss provision. Prior studies examined some non-traditional determinants of loan loss provision (see, for, example, Basu et al. 2020; Biswas et al. 2024; Mnif and Slimi 2023; Kilic et al. 2013; Ng et al. 2020; Danisman et al. 2021; Setiyono 2024). The present study complements these studies by examining other non-traditional determinants of loan loss provision that have not been examined in the previous literature. Secondly, this study contributes to the banking literature that investigates the determinants of LLPs under unique conditions. The present study contributes to this literature by examining the determinants of LLPs under non-crisis years.

The rest of this study is structured as follows. Section 2 presents the literature review. Section 3 presents the methodology. Section 4 presents the empirical results. Section 5 presents the conclusion of this study.

2. Theory and Literature Review

2.1. Theoretical Framework

The academic debate about bank loan loss provision is deeply rooted in the positive accounting theory. The positive accounting theory argues that the accounting information reported in financial statements often reflects the accounting and non-accounting decisions taken into consideration by managers during the financial year (Watts and Zimmerman 1986), and managers' decision to alter reported accounting information is influenced by many factors such as the presence of bonus plans, loss avoidance constraints, debt covenant violation, etc. (Watts and Zimmerman 1990, 1986). The implication of the positive accounting theory for bank loan loss provision is that bank managers also have incentives to alter accounting numbers such as loan loss provision estimates if they have explicit contracts that are tied to loss avoidance, generating higher profits for shareholders or the possibility of receiving higher bonuses for good performance (Beattie et al. 1994; Ozili and Arun 2023). When this is the case, bank managers will have incentives to keep fewer loan loss provisions.

2.2. Literature Review

The existing literature examined some determinants of loan loss provision, but the literature has not considered non-interest income, bank overhead costs, and institutional

quality to be determinants of bank loan loss provision. For instance, Luu et al. (2023) considered organizational culture to be a determinant of bank loan loss provision. Luu et al. (2023) were interested in whether banks with different organizational cultures adjust their loan loss provision in response to industry competition following the passage of the US Interstate Banking and Branching Efficiency Act (IBBEA) of 1994. They examined US banks that have four different organizational cultures: a control-dominant culture, a collaborate-dominant culture, a compete-dominant culture, or a create-dominant culture. They found that banks that have a collaborate-dominant organizational culture are less likely to exercise discretion over LLPs. In contrast, banks with compete- and create-dominant organizational cultures are more likely to exercise their discretion over LLPs. They also found that banks that have a collaborate-dominant organizational culture exhibit less income smoothing.

Ren et al. (2023) considered fluctuating economic growth targets to be a determinant of bank loan loss provision. Ren et al. (2023) examined how fluctuations in economic growth targets affect bank loan loss provision. They found that banks in prefecture-level cities that have higher economic growth targets keep more LLPs in order to deal with potential loan losses. Ozili and Arun (2023) considered foreign bank presence, bank ownership, and institutional quality to be determinants of bank income smoothing in African countries. Ozili and Arun (2023) examined whether 370 African banks use loan loss provision to smooth income and whether this behavior is influenced by foreign bank presence, ownership, and institutional quality differences across African countries. The authors found that African banks use LLPs to smooth their income, and income smoothing is persistent (i) among banks that have a widely dispersed ownership, (ii) among banks that have strong government ownership, and (iii) among banks that have weak government ownership.

Ng et al. (2020) considered economic policy uncertainty to be a determinant of bank loan loss provision. Ng et al. (2020) examined the effect of economic policy uncertainty on bank loan loss provision. They found that banks signal more expected loan losses during times of high economic policy uncertainty. Ozili (2023) considered the global financial crisis to be a determinant of bank loan loss provision. Ozili (2023) investigated whether banks use LLPs for earnings management purposes. The study examined four countries: the UK, France, South Africa, and Egypt, and found that bank income smoothing is present in the UK and Egypt and absent in France and South Africa. It was also found that banks in Egypt used LLPs to smooth income before the global financial crisis while bank income smoothing was pronounced in France during and after the financial crisis. Degryse and Huylebroek (2023) considered the government's fiscal support to be a determinant of bank loan loss provision. Degryse and Huylebroek (2023) were interested in the response of bank loan loss provisions to governments' fiscal support in 37 different countries during the COVID-19 pandemic. The sample period examined was from 2016 to 2021. The authors break down the government's fiscal support into two components: (i) direct support, which includes cash transfers, tax reliefs, and tax deferrals, and (ii) liquidity support, which includes government-backed loans and equity injections. They found that fiscal support in terms of direct support led to a decrease in bank loan loss provision while fiscal support in terms of liquidity support did not decrease bank loan loss provision.

Biswas et al. (2024) considered trade openness to be a determinant of bank loan loss provision. Biswas et al. (2024) investigate whether trade openness affects how banks use loan loss provisions to smooth earnings and how adopting the International Financial Reporting Standards (IFRS) helps to mitigate earnings smoothing. They examined 78 commercial banks in Brazil, Russia, India, China, and South Africa (BRICS) countries from 2014 to 2020 and found that trade openness led BRICS commercial banks to engage in income smoothing using LLPs while the adoption of IFRS decreased income smoothing among banks that operate in countries that have better institutional environment. Basu et al. (2020) considered loan charge-offs to be a determinant of bank loan loss provision. Basu et al. (2020) examined whether large net loan charge-offs lead to lower nonperforming loans and higher loan loss provisions. They found that bank LLPs have a V-shaped relation with changes in nonperforming loans, and net loan charge-off was a contributing factor to

the V-shaped relationship. They also found that loan loss provision is more sensitive to increases in nonperforming loans.

Mnif and Slimi (2023) considered auditor characteristics to be a determinant of bank loan loss provision. Mnif and Slimi (2023) examined how auditor characteristics affect earnings management using loan loss provisions by African banks. They examined 14 African countries from 2011 to 2016 and used discretionary LLP as a proxy for earnings management. They found that the auditor's industry specialization and tenure have a negative impact on earnings management using loan loss provisions. They show that higher total fees paid to the bank auditor lead to higher earnings management. The authors also found that industry specialist auditors are more effective in reducing incoming-increasing earnings management. Kilic et al. (2013) considered accounting regulation to be a determinant of bank loan loss provision. Kilic et al. (2013) investigated the effect of SFAS 133—Accounting for Derivative Instruments and Hedging Activities regulation—on the income smoothing behavior of US banks using loan loss provision. They found that the adoption of the SFAS 133 regulation decreased banks' ability to smooth income through derivatives, and it led banks to smooth income using loan loss provisions.

Overall, previous studies show that organizational culture (Luu et al. 2023), economic growth target (Ren et al. 2023), ownership structure (Ozili and Arun 2023), economic policy uncertainty (Ng et al. 2020), the global financial crisis (Ozili 2023), government's fiscal support (Degryse and Huylebroek 2023), trade openness (Biswas et al. 2024), loan charge-off (Basu et al. 2020), auditor characteristics (Mnif and Slimi 2023), and accounting regulation (Kilic et al. 2013) are determinants of bank loan loss provision. But previous studies have not considered non-interest income, bank overhead costs, and institutional quality to be determinants of bank loan loss provision, and there is very little understanding of how these non-traditional determinants might affect loan loss provision, particularly in non-crisis years. Understanding how these non-traditional determinants affect bank loan loss provision is important because it can reveal other crucial factors that bank managers should take into account in their loan loss provisioning decisions. Therefore, the present study fills this gap in the literature by examining additional non-traditional determinants of bank loan loss provision and examining these determinants in non-crisis years to determine their effect on bank loan loss provision. This study also examines the effect of the non-traditional determinants on bank loan loss provision along regional dimensions.

3. Methodology

3.1. The Sample

Country-level data were extracted for 42 countries. A total of 14 out of the 42 countries had insufficient data. Some countries had missing data for the dependent variable (LLP), some had missing data for the majority of the crucial determinants, and others reported fewer than three years of data, which are too few and affect the quality of the data. Therefore, these countries, 14 of them, were excluded from the analysis. The final sample yields 28 countries. The countries are Argentina, Brazil, Cambodia, Cameroun, China, Democratic Republic of Congo, Cote d'Ivoire, Egypt, Georgia, Ghana, India, Indonesia, Japan, Kenya, Korea Republic, Malaysia, Mexico, Netherlands, Nigeria, Pakistan, Philippines, Russia, Singapore, Tanzania, Thailand, United Kingdom, United States, and Vietnam. The data were obtained from the World Bank's Global Financial Development Indicators (GFDIs), the World Development Indicators (WDIs), and the World Governance Indicators (WGIs) databases from 2011 to 2018 (see Table 1 for variable description and source). The sample period covers only the non-crisis years. This means that the sample excludes the pre-2010 years, which were affected by the global financial crisis and the aftershocks of the crisis as well as the post-2019 years, which were affected by the COVID-19 pandemic event.

Table 1. Descriptions and sources of the variables used in this study.

Variable	Indicator Name	Description	Source	Expected Sign
LLP	Loan loss provision to gross loan ratio (%)	It is the ratio of total loan loss provision to total loan in the bank portfolio	GFDI	
CAR	Bank regulatory capital to risk-weighted assets (%)	It is the ratio of total regulatory capital to its assets held, weighted according to the risk of those assets.	GFDI	-
NII	Bank noninterest income to total income (%)	Bank’s income that has been generated by noninterest related activities as a percentage of total income (net-interest income plus noninterest income).	GFDI	+
NPL	Bank nonperforming loans to gross loans (%)	The ratio of defaulting loans (payments of interest and principal past due by 90 days or more) to total gross loans (total value of loan portfolio)	GFDI	+
GDPGR	Economic growth	Annual change in gross domestic product in percentage	WDI	-
ISI	Institutional quality	The simple average of the six world governance indicators: voice and accountability index; political stability and absence of violence/terrorism index; government effectiveness index; regulatory quality index; rule of law index; control of corruption index.	WGI	-
COST	Bank overhead costs to total assets	Operating expenses of a bank as a share of the value of all assets held.	GFDI	-

Source: World Bank WDI, GFDI, and WGI.

3.2. Model Specification and Estimation Techniques

Four models were used in this study. The models are a variation of the model used in Luu et al. (2023), Ren et al. (2023) and Ozili and Arun (2023). The first model, Equation (1), estimates the determinants of bank loan loss provision in the full sample. The second model, Equation (2), estimates the determinants of bank loan loss provisions in African countries. The third model, Equation (3), estimates the determinants of bank loan loss provision in European countries. The fourth model, Equation (4), estimates the determinants of bank loan loss provisions in Asian countries.

In the model, the LLP variable is the dependent variable. The CAR variable is the regulatory capital ratio. The NII variable is the non-interest income ratio of banks. The NPL variable is the nonperforming loan to gross loan ratio. The GDPGR variable is the annual rate of growth in real gross domestic product. The ISI variable measures institutional quality. The COST variable is the overhead cost of banks. ϵ is the error term while i,t is the subscript for country and year. The AFR variable is the binary variable representing the African countries in the sample. The EUR variable is the binary variable representing the European countries in the sample. The ASN variable is the binary variable representing the Asian countries in the sample.

Regarding the estimation techniques, the models are estimated using the generalized linear model (GLM) regression. The GLM regression estimation is used to account for potential nonlinearity between the response variable and predictors through a link function and when the response variable is not normally distributed (Thompson and Baker 1981). The study also used the quantile regression method as a robustness test. The quantile regression is used because it is less affected by outliers in the data, and it makes no assumptions about the distribution of the target variable (Koenker 2005).

$$LLPi,t = \beta_0 + \beta_1CARi,t + \beta_2NIIi,t + \beta_3NPLi,t + \beta_4GDPGRi,t + \beta_5ISIi,t + \beta_6COSTi,t + \epsilon \quad (1)$$

$$LLPi,t = \beta_0 + \beta_1CARi,t + \beta_2NIIi,t + \beta_3NPLi,t + \beta_4GDPGRi,t + \beta_5ISIi,t + \beta_6COSTi,t + \beta_7AFRi,t + \beta_8AFR * CARi,t + \beta_9AFR * NIIi,t + \beta_{10}AFR * NPLi,t + \beta_{11}AFR * GDPGRi,t + \beta_{12}AFR * ISIi,t + \beta_{13}AFR * COSTi,t \quad (2)$$

$$LLP_{i,t} = \beta_0 + \beta_1 CAR_{i,t} + \beta_2 NII_{i,t} + \beta_3 NPL_{i,t} + \beta_4 GDPRI_{i,t} + \beta_5 ISI_{i,t} + \beta_6 COST_{i,t} + \beta_7 EUR_{i,t} + \beta_8 EUR * CAR_{i,t} + \beta_9 EUR * NII_{i,t} + \beta_{10} EUR * NPL_{i,t} + \beta_{11} EUR * GDPRI_{i,t} + \beta_{12} EUR * ISI_{i,t} + \beta_{13} EUR * COST_{i,t} \quad (3)$$

$$LLP_{i,t} = \beta_0 + \beta_1 CAR_{i,t} + \beta_2 NII_{i,t} + \beta_3 NPL_{i,t} + \beta_4 GDPRI_{i,t} + \beta_5 ISI_{i,t} + \beta_6 COST_{i,t} + \beta_7 ASN_{i,t} + \beta_8 ASN * CAR_{i,t} + \beta_9 ASN * NII_{i,t} + \beta_{10} ASN * NPL_{i,t} + \beta_{11} ASN * GDPRI_{i,t} + \beta_{12} ASN * ISI_{i,t} + \beta_{13} ASN * COST_{i,t} \quad (4)$$

3.3. Justifying the Variables Included in the Model and the Hypotheses

The LLP variable is the dependent variable. It is measured as the loan loss provision divided by gross loans, and it is the most significant accrual in the banking sector (Mahieux et al. 2023; Ozili 2023; Tran et al. 2020; Hou et al. 2021; Kim et al. 2020; Bratten et al. 2020).

The CAR variable is the regulatory capital ratio. The literature shows that banks with low regulatory capital ratios will increase loan loss provisions to compensate for their low regulatory capital levels (Luu et al. 2023). This implies a negative relationship between the regulatory capital ratio and bank loan loss provision. Therefore, the hypothesis for CAR is stated below.

H1. *The regulatory capital ratio has a negative impact on bank loan loss provision.*

The NII variable is the non-interest income ratio of banks. Banks that anticipate a low level of non-interest income will decrease loan loss provisions in order to boost their interest income and as a way to augment any expected shortfall in profit levels (Conti et al. 2023; Ozili 2017). Therefore, a positive relationship between non-interest income and bank loan loss provision is expected. Therefore, the hypothesis for NII is stated below.

H2. *The non-interest income ratio has a positive impact on bank loan loss provision.*

The NPL variable is the nonperforming loan to gross loan ratio. The literature shows that banks will increase the size of loan loss provisions when they expect rising loan default rates (Degryse and Huylebroek 2023). This implies a positive relationship between nonperforming loans and bank loan loss provision. Therefore, the hypothesis for NPL is stated below.

H3. *The nonperforming loan ratio has a positive impact on bank loan loss provision.*

The GDPR variable represents the annual rate of growth in real gross domestic product. Generally, banks will keep higher loan loss provisions during bad economic times and keep fewer loan loss provisions in periods of economic prosperity (Ozili and Arun 2023). This signals procyclical loan loss provisioning, and it implies a negative relationship between economic growth and bank loan loss provision. Therefore, the hypothesis for GDPR is stated below.

H4. *The economic growth rate has a negative impact on bank loan loss provision.*

The ISI variable measures institutional quality. High institutional quality, or the presence of strong institutions, is beneficial for banks because strong institutions will create the legal and institutional frameworks that will compel debtors to repay their debt or face legal consequences. Such frameworks will help banks in loan recovery, thereby reducing loan defaults and reducing the size of loan loss provision (Kanagaretnam et al. 2014). This implies a negative relationship between institutional quality and bank loan loss provision. Therefore, the hypothesis for ISI is stated below.

H5. *Institutional quality has a negative impact on bank loan loss provision.*

The COST variable is the overhead cost of banks. It is expected that banks that have high overhead costs will seek to decrease their loan loss provision in order to preserve or increase their earnings (Ozili and Arun 2023). This implies a negative relationship between institutional quality and bank loan loss provision. Therefore, the hypothesis for COST is stated below.

H6. *The overhead cost ratio has a negative impact on bank loan loss provision.*

The AFR, EUR, and ASN binary variables were introduced into the model. The AFR binary variable is equal to one if the country is an African country and it is zero if the country is not an African country. The EUR binary variable is equal to one if the country is a European country and it is zero if the country is not a European country. The ASN binary variable is equal to one if the country is an Asian country and it is zero if the country is not an Asian country. These three binary variables interact with each LLP determinant to determine their effect on bank loan loss provision in each region.

4. Empirical Results

This section presents the empirical results. It presents the correlation results. Thereafter, it presents the baseline results, the regional results, and the robustness test results.

4.1. Correlation Analysis

The Pearson correlation result, reported in Table 2, shows that the LLP variable is significant and positively correlated with the NII, NPL, and COST variables. This correlation result indicates that high levels of non-interest income, nonperforming loans, and overhead costs are significantly correlated with higher bank loan loss provision. The correlation result also shows that the AFR variable is significant, and positively correlated with the LLP variable, which suggests that LLP is higher in African countries. In contrast, the LLP variable is significant and negatively correlated with the CAR, GDPR, and ISI variables in Table 2. This correlation result indicates that high levels of regulatory capital ratio, positive economic growth, and institutional quality are significantly correlated with fewer bank loan loss provisions. The correlation result also shows that the ASN and EUR variables are significant, and negatively correlated with the LLP variable, which suggests that LLP is lower in Asian and European countries.

Table 2. Pearson correlation matrix for the variables.

Variable	LLP	CAR	NII	NPL	GDPR	ISI	COST	AFR	ASN	EUR
LLP	1.000 -----									
CAR	−0.281 *** (0.00)	1.000 -----								
NII	0.131 * (0.08)	−0.125 * (0.09)	1.000 -----							
NPL	0.121 * (0.10)	−0.180 ** (0.01)	0.060 (0.42)	1.000 -----						
GDPR	−0.162 ** (0.02)	0.085 (0.25)	−0.447 *** (0.00)	0.025 (0.73)	1.000 -----					
ISI	−0.250 *** (0.00)	0.201 *** (0.00)	0.161 ** (0.03)	−0.412 *** (0.00)	−0.156 ** (0.03)	1.000 -----				
COST	0.133 * (0.07)	0.017 (0.82)	0.489 *** (0.00)	0.355 *** (0.00)	−0.122 * (0.10)	−0.294 *** (0.00)	1.000 -----			
AFR	0.006 (0.92)	−0.012 (0.87)	−0.003 (0.96)	0.644 *** (0.00)	0.097 (0.19)	−0.378 *** (0.00)	0.362 *** (0.00)	1.000 -----		
ASN	−0.342 *** (0.00)	0.006 (0.92)	−0.426 *** (0.00)	−0.534 *** (0.00)	0.397 *** (0.00)	0.132 * (0.07)	−0.553 *** (0.00)	−0.511 *** (0.00)	1.000 -----	
EUR	−0.168 ** (0.02)	0.035 (0.63)	0.374 *** (0.00)	−0.042 (0.57)	−0.246 *** (0.00)	0.404 *** (0.00)	0.223 *** (0.00)	−0.226 *** (0.00)	−0.346 *** (0.00)	1.000 -----

***, **, * represent statistical significance at the 1%, 5% and 10% levels.

4.2. Baseline Full Sample Result: Bank Loan Loss Provision Determinants

The GLM regression estimation results are reported in Table 3. The CAR variable is negatively significant, indicating that a higher bank regulatory capital ratio leads to a significant decrease in bank loan loss provision. This implies that banks with higher regulatory capital ratios will keep fewer loan loss provisions. This result is consistent with the findings of Luu et al. (2023), who also found a negative relationship between regulatory capital ratio and bank loan loss provision. The NII variable is insignificant, indicating that bank non-interest income does not have a significant effect on banking sector’s loan loss provisions. The NPL variable is also insignificant, indicating that bank nonperforming loans do not have a significant effect on banking sector’s loan loss provisions. This result is inconsistent with the findings of Degryse and Huylebroek (2023) and Ozili and Arun (2023), who found a positive effect of NPL on LLP. The COST variable is also insignificant, indicating that the cost overhead of banks does not have a significant effect on loan loss provisions in the banking sector. The GDPR variable is negative and significant, indicating that bank loan loss provisions are significantly higher during times of economic recession. This is due to procyclical provisioning, which occurs when banks keep fewer provisions in good economic times and keep higher provisions in bad economic times. This result is consistent with Ozili and Arun (2023), who found a negative relationship between economic growth and bank loan loss provision. The ISI variable is negative and significant, indicating that high institutional quality leads to a significant decrease in loan loss provision. This implies that the presence of strong institutions in a country is beneficial for banks because it helps in decreasing the size of loan loss provision in the banking sector.

Table 3. Bank loan loss provision determinants: generalized linear model (GLM) regression estimation.

Variables	Coefficient	p-Value
C	134.676 ***	0.000
CAR	−3.182 ***	0.004
NII	0.250	0.492
NPL	−0.308	0.730
GDPR	−2.816 *	0.057
ISI	−20.063 ***	0.004
COST	0.423	0.806
LR statistic	31.76	
Prob(LR statistic)	0.000	

***, * represent statistical significance at the 1% and 10% levels.

4.3. Bank Loan Loss Provision Determinants in African Countries

The GLM regression estimation results are reported in column 1 of Table 4. The AFR*CAR variable is insignificant, indicating that the bank regulatory capital ratio does not have a significant effect on the banking sector’s loan loss provisions in African countries. The AFR*NII variable is also insignificant, indicating that the bank’s non-interest income does not have a significant effect on the banking sector’s loan loss provisions in African countries. The AFR*NPL variable is positive and significant, indicating that higher nonperforming loans lead to a significant increase in bank loan loss provisions in African countries. This result is consistent with Ozili and Arun (2023), who found a significant positive relationship between nonperforming loans and bank loan loss provisions in African countries. The AFR*GDPR variable is also positive and significant, indicating that bank loan loss provisions are significantly higher during times of economic prosperity in African countries. This might be due to counter-cyclical provisioning, which requires African banks to keep higher loan loss provisions in good economic times so that the high provision that was set aside during the good economic times could be used as a safety buffer during times of economic downturns in African countries. Notwithstanding, this result is inconsistent with Ozili and Arun (2023), who found a negative relationship between economic growth and bank loan loss provisions in African countries. The AFR*ISI variable is insignificant, indicating that institutional quality does not have a significant effect on the banking sector’s loan loss provisions in African countries. The AFR*COST variable is also insignificant, indicating that the cost overhead of banks does not have a significant effect on the banking sector’s loan loss provisions in African countries.

Table 4. Bank loan loss provision determinants: generalized linear model (GLM) regression estimation.

	(1)	(2)	(3)
Variables	Coefficient (<i>p</i> -Value)	Coefficient (<i>p</i> -Value)	Coefficient (<i>p</i> -Value)
C	162.82 *** (0.00)	128.114 ** (0.00)	162.405 *** (0.00)
CAR	−3.640 *** (0.00)	−3.922 *** (0.00)	−3.207 ** (0.04)
NII	0.332 (0.38)	0.676 * (0.10)	0.351 (0.44)
NPL	−4.085 *** (0.00)	−0.806 (0.40)	−1.400 (0.17)
GDPR	−5.344 *** (0.00)	−2.839 * (0.06)	−2.822 * (0.08)
ISI	−41.769 *** (0.00)	−19.187 ** (0.02)	−13.709 * (0.08)
COST	−0.107 (0.95)	3.520 (0.14)	−2.116 (0.26)
AFR	−43.838 (0.65)		
AFR*CAR	−1.049 (0.72)		
AFR*NII	−0.604 (0.65)		
AFR*NPL	7.984 *** (0.00)		
AFR*GDPR	7.347 * (0.05)		
AFR*ISI	34.689 (0.28)		
AFR*COST	−6.639 (0.27)		
EUR		−70.704 (0.69)	
EUR*CAR		3.489 (0.68)	
EUR*NII		−0.817 (0.61)	
EUR*NPL		4.054 (0.75)	
EUR*GDPR		3.886 (0.68)	

Table 4. *Cont.*

	(1)	(2)	(3)
Variables	Coefficient (<i>p</i> -Value)	Coefficient (<i>p</i> -Value)	Coefficient (<i>p</i> -Value)
EUR*ISI		13.973 (0.78)	
EUR*COST		−2.536 (0.76)	
ASN			−39.061 (0.44)
ASN*CAR			0.044 (0.98)
ASN*NII			−0.955 (0.18)
ASN*NPL			−5.390 * (0.07)
ASN*GDPR			11.851 *** (0.00)
ASN*ISI			14.516 (0.37)
ASN*COST			−13.317 * (0.05)
LR statistic	59.53	122.66	101.51
Prob(LR statistic)	0.000	45.16	0.000

***, **, * represent statistical significance at the 1%, 5%, and 10% levels.

4.4. Bank Loan Loss Provision Determinants in European Countries

The GLM regression estimation results are reported in column 2 of Table 4. The EUR*CAR variable is insignificant, indicating that the bank regulatory capital ratio does not have a significant effect on the banking sector’s loan loss provisions in European countries. The EUR*NII variable is also insignificant, indicating that bank non-interest income does not have a significant effect on the banking sector’s loan loss provisions in European countries. The EUR*NPL variable is also insignificant, indicating that bank nonperforming loans do not have a significant effect on the banking sector’s loan loss provisions in European countries. The EUR*GDPR variable is also insignificant, indicating that the state of the economy does not have a significant effect on the banking sector’s loan loss provisions in European countries. The EUR*ISI variable is also insignificant, indicating that institutional quality does not have a significant effect on the banking sector’s loan loss provisions in European countries. The EUR*COST variable is also insignificant, indicating that the cost overhead of banks does not have a significant effect on the banking sector’s loan loss provisions in European countries.

4.5. Bank Loan Loss Provision Determinants in Asian Countries

The GLM regression estimation results are reported in column 3 of Table 4. The ASN*CAR variable is insignificant, indicating that the bank regulatory capital ratio does not have a significant effect on the banking sector’s loan loss provisions in Asian countries. The AFR*NII variable is also insignificant, indicating that bank non-interest income does not have a significant effect on the banking sector’s loan loss provisions in Asian countries. The ASN*NPL variable is negative and significant, indicating that higher nonperforming loans lead to a significant decrease in bank loan loss provisions in Asian countries. This result is inconsistent with Degryse and Huylebroek (2023) and Ozili and Arun (2023), who found a significant positive relationship between nonperforming loans and bank loan

loss provisions. The ASN*GDPR variable is positive and significant, indicating that bank loan loss provisions are significantly higher during times of economic prosperity in Asian countries. This might be due to counter-cyclical provisioning, which requires Asian banks to keep higher loan loss provisions in good economic times so that the high provision that was set aside during good economic times could be used as a safety buffer during times of economic downturns in Asian countries. Notwithstanding, this result is inconsistent with Ozili and Arun (2023), who found a negative relationship between economic growth and bank loan loss provision. The AFR*ISI variable is insignificant, indicating that institutional quality does not have a significant effect on the banking sector’s loan loss provisions in Asian countries. The ASN*COST variable is negative and significant, indicating that the high overhead cost of banks leads to a significant decrease in bank loan loss provisions in Asian countries. This result is expected because Asian banks that have excessive overhead costs will seek to decrease their loan loss provision to preserve or increase their earnings.

4.6. Robustness Test: Quantile Regression Estimation

This section re-estimates the models using the quantile regression method and examines whether the quantile regression results are robust and consistent with the GLM regression results.

In the baseline results, only the ISI variable is statistically significant both in the GLM and the quantile regression estimation results in Table 3 and in column 1 of Table 5. The ISI variable is significant and negative, which confirms that the presence of strong institutions in a country is beneficial for banks because it helps to decrease the size of loan loss provision in the banking sector. Meanwhile, the CAR, NII, NPL, GDPR, and COST variables are not robust because they do not report the same sign and significance both in the GLM and the quantile regression estimations.

Table 5. Bank loan loss provision determinants: quantile regression estimation.

	(1)	(2)	(3)	(4)
Variables	Coefficient (p-Value)	Coefficient (p-Value)	Coefficient (p-Value)	Coefficient (p-Value)
C	69.395 *** (0.00)	65.531 ** (0.01)	69.312 ** (0.02)	146.348 *** (0.00)
CAR	−0.389 (0.52)	−0.313 (0.63)	−0.832 (0.27)	−1.976 (0.13)
NII	0.073 (0.79)	0.095 (0.84)	0.425 (0.31)	0.134 (0.79)
NPL	3.098 *** (0.00)	1.470 (0.20)	1.323 (0.20)	−0.996 (0.77)
GDPR	−3.303 (0.18)	−5.392 ** (0.02)	−5.552 ** (0.04)	−6.501 *** (0.00)
ISI	−11.967 ** (0.02)	−15.910 *** (0.00)	−21.490 ** (0.01)	−28.793 * (0.10)
COST	0.220 (0.85)	7.180 * (0.07)	5.003 (0.13)	−1.708 (0.45)
AFR		69.933 (0.17)		
AFR*CAR		−1.664 (0.24)		
AFR*NII		0.116 (0.86)		
AFR*NPL		1.395 (0.39)		

Table 5. Cont.

	(1)	(2)	(3)	(4)
Variables	Coefficient (p-Value)	Coefficient (p-Value)	Coefficient (p-Value)	Coefficient (p-Value)
AFR*GDPR		5.287 * (0.08)		
AFR*ISI		24.807 (0.21)		
AFR*COST		−15.638 *** (0.00)		
EUR			−11.954 (0.86)	
EUR*CAR			0.318 (0.92)	
EUR*NII			−0.566 (0.40)	
EUR*NPL			2.253 (0.61)	
EUR*GDPR			5.966 (0.14)	
EUR*ISI			20.006 (0.29)	
EUR*COST			−3.783 (0.37)	
ASN				−90.952 ** (0.02)
ASN*CAR				1.006 (0.51)
ASN*NII				−0.50 (0.67)
ASN*NPL				1.558 (0.67)
ASN*GDPR				6.142 ** (0.02)
ASN*ISI				18.903 (0.31)
ASN*COST				8.896 ** (0.04)
Adjusted R2	17.65	21.47	20.81	23.68
Quasi LR statistic	93.11	157.38	122.66	155.44

***, **, * represent statistical significance at the 1%, 5% and 10% levels.

In the African countries’ interaction analysis, only the AFR*GDPR variable is statistically significant both in the GLM and the quantile regression estimation results in column 1 of Table 4 and column 2 of Table 5. The AFR*GDPR variable is significant and positive, which confirms that bank loan loss provisions are significantly higher during times of economic prosperity in African countries. This might be due to counter-cyclical provisioning, which requires African banks to keep higher loan loss provisions in good economic times so that the high provision that was set aside in good times could be used as a safety buffer during times of economic downturns in African countries. Meanwhile, AFR*CAR, AFR*NII,

AFR*NPL, AFR*ISI, and AFR*COST variables are not robust because they do not report the same sign and significance both in the GLM and the quantile regression estimations.

In the European countries' interaction analysis, none of the variables are significant in column 2 of Table 4 and column 3 of Table 5. This indicates that the EUR*CAR, EUR*NII, EUR*NPL, EUR*ISI, EUR*GDPR, and EUR*COST variables are insignificant, indicating that all the variables have no impact on bank loan loss provision in European countries.

In the Asian countries' interaction analysis, the ASN*GDPR and ASN*COST variables are statistically significant both in the GLM and the quantile regression estimation results in column 3 of Table 4 and column 4 of Table 5. The ASN*GDPR variable is significant and positive, which confirms that bank loan loss provisions are significantly higher during times of economic prosperity in Asian countries. This might be due to counter-cyclical provisioning which requires Asian banks to keep higher loan loss provisions in good economic times so that the high provision that was set aside during good times could be used as a safety buffer during times of economic downturns in Asian countries. Meanwhile, ASN*CAR, ASN*NII, ASN*NPL, and ASN*ISI variables are not robust because they do not report the same sign and significance both in the GLM and quantile regression estimations.

5. Conclusions

This study examined the determinants of bank loan loss determinants in non-crisis years in African countries, European countries, and Asian countries from 2011 to 2018. The GLM estimation method and the quantile regression method were used in the empirical analysis.

It was found that institutional quality is a significant determinant of bank loan loss provision. In the regional analyses, it was found that economic growth is a significant determinant of bank loan loss provisions in African and Asian countries, while bank overhead cost is a significant determinant of bank loan loss provisions in Asian countries. Meanwhile, bank loan loss provision determinants are insignificant in European countries.

The implication of the findings is that both internal and external factors can affect bank loan loss provision. Secondly, policymakers need to pay close attention to how institutional quality, the state of the economy, and bank overhead costs affect the size of reported loan loss provisions. Ignoring these factors could lead to inaccurate loan loss provision estimates in banks.

The findings of this study have several policy recommendations. One, policymakers should strengthen existing institutions in order to decrease loan default rates and decrease the size of loan loss provisions. Two, it is recommended that bank managers should strive to lower their overhead costs in order to reduce the size of reported loan loss provision. Three, it is recommended that bank managers should consider undertaking countercyclical provisioning so that they can have sufficient loan loss reserves that could serve as a buffer to absorb unexpected and expected loan losses during bad economic times. Four, it is recommended that policymakers should ensure that there is positive economic growth while bank supervisors should assist the banking sector in lowering their overhead costs since it has been established in this study that there is a passthrough from bank overhead costs to loan loss provisions. A good place to start in helping banks to lower their overhead costs is for regulators to reduce the huge cost of regulatory compliance. Five, it is recommended that accounting setters should consider the role of the state of the economy and bank overhead costs in influencing bank accruals, which are subject to manipulation by bank managers.

The limitation of this study is that the determinants of bank loan loss provisions were not examined for individual banks. Rather, they were examined at the country level. Examining the determinants of bank loan loss provisions for individual banks may offer additional insights that are not captured in this study. Another limitation of this study is the short sample period from 2011 to 2018. The narrow period was intended to capture the non-crisis years and avoid the crisis years, which were the pre-2010 years and the post-2019 years. Another limitation is that the methodologies used in this study may have been

responsible for the many insignificant results obtained in the analysis, especially for the European countries in the sample.

Future research can extend this study by investigating the determinants of bank loan loss provisions using bank-level data. Future research can re-examine this topic by using a longer sample period. Future research can extend this study by examining other non-traditional determinants of loan loss provisions that may offer new insights. Finally, future research can extend this study by investigating the determinants of bank loan loss provisions in other regions that were not examined in this study.

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References

- Basu, Sudipta, Justin Vitanza, and Wei Wang. 2020. Asymmetric loan loss provision models. *Journal of Accounting and Economics* 70: 101359. [CrossRef]
- Beattie, Vivien, Stephen Brown, David Ewers, Brian John, Stuart Manson, Dylan Thomas, and Michael Turner. 1994. Extraordinary items and income smoothing: A positive accounting approach. *Journal of Business Finance & Accounting* 21: 791–811.
- Biswas, Sarit, Sharad Nath Bhattacharya, Justin Y. Jin, Mousumi Bhattacharya, and Pradip H. Sadarangani. 2024. Loan loss provisions and income smoothing in banks: The role of trade openness and IFRS in BRICS. *China Accounting and Finance Review* 26: 76–101. [CrossRef]
- Bratten, Brian, Monika Causholli, and Linda A. Myers. 2020. Fair value exposure, auditor specialization, and banks' discretionary use of the loan loss provision. *Journal of Accounting, Auditing & Finance* 35: 318–48.
- Bushman, Robert M., and Christopher D. Williams. 2012. Accounting discretion, loan loss provisioning, and discipline of banks' risk-taking. *Journal of Accounting and Economics* 54: 1–18. [CrossRef]
- Conti, Antonio M., Andrea Nobili, and Federico M. Signoretti. 2023. Bank capital requirement shocks: A narrative perspective. *European Economic Review* 151: 104254. [CrossRef]
- Dal Maso, Lorenzo, Kiridaran Kanagaretnam, Gerald J. Lobo, and Francesco Mazzi. 2022. Does disaster risk relate to banks' loan loss provisions? *European Accounting Review*, 1–30. [CrossRef]
- Danisman, Gamze Ozturk, Ender Demir, and Peterson Ozili. 2021. Loan loss provisioning of US banks: Economic policy uncertainty and discretionary behavior. *International Review of Economics & Finance* 71: 923–35.
- Degryse, Hans, and Cedric Huybrebroek. 2023. Fiscal support and banks' loan loss provisions during the COVID-19 crisis. *Journal of Financial Stability* 67: 101150. [CrossRef]
- Hou, Xiaohui, Bo Wang, Jiale Lian, and Wanli Li. 2021. Bank executive pay limits and discretionary loan loss provisions: Evidence from China. *Research in International Business and Finance* 58: 101427. [CrossRef]
- Jia, Xiaoran. 2024. FinTech Penetration, Charter Value, and Bank Risk-taking. *Journal of Banking & Finance* 161: 107111.
- Kanagaretnam, Kiridaran, Chee Yeow Lim, and Gerald J. Lobo. 2014. Effects of international institutional factors on earnings quality of banks. *Journal of Banking & Finance* 39: 87–106.
- Kilic, Emre, Gerald J. Lobo, Tharindra Ranasinghe, and K. Sivaramakrishnan. 2013. The impact of SFAS 133 on income smoothing by banks through loan loss provisions. *The Accounting Review* 88: 233–60. [CrossRef]
- Kim, Jinyong, Mingook Kim, and Yongsik Kim. 2020. Bank transparency and the market's perception of bank risk. *Journal of Financial Services Research* 58: 115–42. [CrossRef]
- Koenker, Roger. 2005. *Quantile Regression*. Cambridge: Cambridge University Press, vol. 38.
- Lee, Chien-Chiang, Chih-Wei Wang, Pei-Hsuan Hong, and Weizheng Lin. 2024. Environmental policy stringency and bank risks: Does green economy matter? *International Review of Financial Analysis* 91: 103040. [CrossRef]
- Luu, Hiep N., Linh H. Nguyen, and John O. Wilson. 2023. Organizational culture, competition and bank loan loss provisioning. *The European Journal of Finance* 29: 393–418. [CrossRef]
- Mahieux, Lucas, Haresh Sapra, and Gaoqing Zhang. 2023. CECL: Timely loan loss provisioning and bank regulation. *Journal of Accounting Research* 61: 3–46. [CrossRef]
- Mnif, Yosra, and Imen Slimi. 2023. How do auditor attributes affect bank earnings management? Evidence from Africa. *Journal of Accounting in Emerging Economies, ahead-of-print*. [CrossRef]
- Ng, Jeffrey, Walid Saffar, and Janus Jian Zhang. 2020. Policy uncertainty and loan loss provisions in the banking industry. *Review of Accounting Studies* 25: 726–77. [CrossRef]
- Nicoletti, Allison. 2018. The effects of bank regulators and external auditors on loan loss provisions. *Journal of Accounting and Economics* 66: 244–65. [CrossRef]

- Ozili, Peterson K. 2017. Bank earnings management and income smoothing using commission and fee income: A European context. *International Journal of Managerial Finance* 13: 419–39. [CrossRef]
- Ozili, Peterson K. 2023. Bank earnings management using loan loss provisions: Comparing the UK, France, South Africa and Egypt. *Journal of Economic and Administrative Sciences* 39: 354–65. [CrossRef]
- Ozili, Peterson. K., and Thankom G. Arun. 2023. What drives bank income smoothing? Evidence from Africa. *International Journal of Disclosure and Governance* 20: 274–95. [CrossRef]
- Ren, Meixu, Konglin Ke, Xin Yu, and Jinxuan Zhao. 2023. Local governments' economic growth target pressure and bank loan loss provision: Evidence from China. *International Review of Economics & Finance* 87: 1–14.
- Setiyono, Bowo. 2024. Related party lending and rural bank risk: Evidence during the COVID-19 period. *Research in International Business and Finance* 67: 102079. [CrossRef]
- Thompson, R., and R. J. Baker. 1981. Composite link functions in generalized linear models. *Journal of the Royal Statistical Society: Series C (Applied Statistics)* 30: 125–31. [CrossRef]
- Tran, Dung Viet, M. Kabir Hassan, and Reza Houston. 2020. Discretionary loan loss provision behavior in the US banking industry. *Review of Quantitative Finance and Accounting* 55: 605–45. [CrossRef]
- Watts, Ross L., and Jerold L. Zimmerman. 1986. *Positive Accounting Theory*. Saddle River: Prentice-Hall Inc.
- Watts, Ross L., and Jerold L. Zimmerman. 1990. Positive accounting theory: A ten year perspective. *Accounting Review* 65: 131–56.

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Article

Perceived Internal Audit Quality and External Auditors' Attributes in Iranian and Iraqi Banks

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Abstract: The significance of internal auditing and its quality cannot be overstated, making it essential to investigate the factors influencing this quality. This study, employing a cross-sectional analysis, aims to assess how the characteristics of external auditors affect the perceived quality of internal audits in Iranian and Iraqi banks. In 2024, data regarding the attributes of external auditors and the perceived quality of internal audits were collected through a questionnaire distributed to external auditors from various banks in Iran and Iraq. The data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM). The study reveals a positive relationship between external auditors' competence and independence and the perceived quality of internal audits, while it shows a negative impact of external audit methodologies on this perceived quality. These findings highlight the importance of external auditors' independence as a key determinant of perceived internal audit quality.

Keywords: perceived internal audit quality; competence; independence; audit methodologies; Partial Least Squares Structural Equation Modeling (PLS-SEM)

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1. Introduction

Today, public companies face a significant number of stakeholders and, therefore, need to implement many controls to ensure that the company's resources are used properly and the rights of these stakeholders are not violated. Many efforts have been made in this regard, and internal audit, as one of the internal mechanisms of corporate governance, has played a valuable role in this regard (Mashayekhi et al., 2023). With the onset of financial crises in the 1980s and the emergence of a new wave of studies on corporate governance, the issue of internal audit quality has been repeatedly discussed and examined (Abdullah et al., 2018). Then, with the occurrence of financial problems around the world during 2007–2008, special attention was paid to improving the quality of corporate governance, and subsequently, with the increasing importance of internal audits, a growing need arose to familiarize with the quality of internal audits in the context of corporate governance (Boskou et al., 2019).

Studying internal audit quality is important because numerous positive consequences have been observed in previous studies. For instance, high-quality internal audits can increase corporate governance quality (Lenz & Hahn, 2015), achieved by helping management improve internal controls (IIA, 2015). Additionally, qualified internal audits lead to growth and prosperity in organizations by ensuring the proper functioning of internal

controls as a mechanism for protecting assets and preventing the wastage of limited organizational resources, as well as gaining confidence in management's performance in line with organizational goals (Arel et al., 2012). Many studies have confirmed the positive impact of high-quality internal audits on the quality of the internal control system (Mazza & Azzali, 2015). Additionally, in companies with higher-quality internal audits, lower earnings management and higher-quality financial figures are observed (Prawitt et al., 2009).

In addition to all of this, internal audit quality is also essential for external auditors. External auditors rely on internal auditors when internal auditors are sufficiently objective and competent and, consequently, of high quality (Pizzini et al., 2015). Some studies have concluded that high-quality internal auditing increases the external auditor's reliance on the internal audit function. Greater reliance on the services of internal auditors is likely to lead to a reduction in the work of external auditors and, consequently, to a reduction in fees (Mat Zain et al., 2015) and a reduction in the delay of external audits (Abbott et al., 2012).

According to professional standards and previous research by Prawitt et al. (2009), the quality of internal audits encompasses specific characteristics of both organizations and internal audit practitioners, including their competence. It also considers the nature and scope of audit activities, such as how thoroughly the correction of previously identified control deficiencies is monitored. Additionally, there are criteria for assessing internal audit quality based on the six components outlined in SAS No. 65 concerning the role of internal audits in the financial reporting process. These components include (1) experience, (2) professional certifications, (3) training, (4) emphasis on financial audit work, (5) reporting lines, and (6) the size of the internal audit unit (Prawitt et al., 2009).

Internal audit quality has implications for a wide range of stakeholders, yet existing literature primarily focuses on how this concept is defined by a specific group of corporate governance participants—external auditors. A likely reason for this emphasis is that external auditors are often responsible for assessing internal audit quality (Messier et al., 2011) and benefit significantly from it, as internal audit reports play a crucial role in the audit of financial statements (Gramling & Vandervelde, 2006).

Given this context, it is important to study internal audit quality from the perspective of external auditors, specifically their perception of internal audit quality. Additionally, understanding the factors that influence this perceived quality can be beneficial. This study aims to evaluate how external auditors perceive the quality of internal audits and investigate how their attributes affect this perception.

The banking system is a vital part of every economy, so banks' performance can greatly impact it. On the other hand, in the rapidly changing landscape of the banking sector, the quality of internal audits has become a crucial factor in determining organizational effectiveness and financial integrity (Hazaea et al., 2020; Basel Committee, 2012). In recent years, the Central Bank of Iran has seriously looked at the banking sector's effective corporate governance system (Mashayekhi et al., 2024), particularly focusing on the quality and effectiveness of internal auditing within the country's banking sector. Moreover, given Iran's political situation, particularly the sanctions that foreign countries have imposed in recent decades, the Iranian environment presents a unique opportunity for a deeper examination of financial oversight, especially in the realm of the internal audit function (Mashayekhi et al., 2022). However, more studies need to be conducted in this area within Iran, highlighting the need for such research.

Likewise, according to Waheed and Sfan (2024), qualified internal audit is crucial in Iraq, particularly within the banking sector, as it enhances confidence in financial reports, reduces fraud risk, and consequently contributes significantly to Iraq's economic stability and development. Additionally, considering the many similarities in the economic, religious, and cultural systems of Iran and Iraq and the increasing economic interactions between

these neighboring countries in recent years, there is a strong justification for conducting a joint study on this topic in both countries. According to the authors' search, no research has examined the question discussed in this study in banks in the countries in question.

This study aims to assess the impact of external auditors' attributes on the perceived quality of internal audits in Iranian and Iraqi banks. For this purpose, we utilize external auditors' competence, independence, and audit methodologies as their characteristics. We also consider the perceived quality of internal audit procedures and reporting practices and their overall effectiveness as proxies of perceived internal audit quality.

To address the research questions, data on the characteristics of external auditors and the perceived quality of internal auditing were gathered from external auditors at various banks in Iran and Iraq through a questionnaire in 2024. The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM).

Extensive research has been conducted on the quality of internal audits and the performance of external auditors. However, the impact of external auditor characteristics on the perceived quality of internal audits has not yet been explored. This study aims to fill that gap in the existing body of knowledge by examining how the attributes of external auditors influence the perceived quality of internal audits. This analysis is particularly relevant as it focuses on the relationship between these factors within the economic contexts of two neighboring countries with similar cultural and religious backgrounds who have developed strong ties in recent years.

External auditors will find the results of this study invaluable. By understanding the critical role of attributes such as competence and independence, as well as increasing collaboration with internal auditors, they can take proactive steps to enhance the perceived quality of internal audits. This empowerment to make a difference in the field is a significant benefit of these insights.

The paper is structured as follows. The second section reviews the relevant literature, and the third section outlines the research hypotheses. Subsequently, in Section 4, the research methodology, including the research population, sample, method, and variables, is described. The fifth section presents the data analysis, leading to compelling conclusions in the final section.

2. Literature Review

Internal audits are essential for maintaining transparency and trustworthiness in financial statements, as well as ensuring reliable governance within a company. Previous studies have provided insights into the various aspects and standards that are crucial for evaluating the quality of internal audits (Noordin et al., 2022). The occurrence of financial crises in some reputable companies has shaken investors' confidence in the accuracy and reliability of financial reporting, the health and integrity of managers, and particularly the adequacy and effectiveness of internal controls required to prevent fraudulent behavior (Rezaee, 2005). In this context, the role of internal audits, considered an effective corporate governance mechanism in protecting investors, has come under scrutiny. This has led to a surge in studies exploring various dimensions of internal audit quality, as it is crucial in preventing fraudulent behavior and maintaining the integrity of financial reporting.

Previous studies have underscored the pivotal role of the internal audit manager's personal characteristics, such as competence and organizational position, in shaping the quality of internal audits (Erasmus & Coetzee, 2018). The absence or inadequacy of the requisite talent and skills in the internal auditor can pose a threat to the fulfillment of their mission. Furthermore, the backing and authority of senior management can significantly enhance the quality of internal audits (Samagaio & Felício, 2023). Jiang et al. (2018) demonstrated that while independence and organizational commitment bolster internal

audit quality, the time constraints imposed on internal auditors can diminish it. Other factors influencing the quality of internal audits include the utilization of information technology by internal auditors (Deribe & Regasa, 2014), the performance quality of the audit committee, and its level of involvement in internal audit planning and reporting (Abdullah et al., 2018), the size of the internal audit unit (Erasmus & Coetzee, 2018), and the uncertainty and complexity of the company's environment (Jiang et al., 2018).

Several previous studies have demonstrated that high-quality internal audits can significantly enhance the quality of corporate governance (Lenz & Hahn, 2015). This is achieved by assisting management in enhancing internal controls (IIA, 2015). A high-quality internal audit can also yield positive outcomes by ensuring the effective operation of internal controls as a means of safeguarding assets, preventing the misuse of limited organizational resources, and ensuring that management's performance aligns with organizational objectives. This, in turn, fosters growth and prosperity within organizations (Arel et al., 2012). Numerous studies have validated the favorable impact of high-quality internal audits on the quality of the internal control system (Mazza & Azzali, 2015). Furthermore, companies with high-quality internal audits exhibit lower levels of earnings management and higher-quality financial figures (Prawitt et al., 2009). External auditors also rely on internal auditors when they are sufficiently impartial and competent and, thus, of high quality (Pizzini et al., 2015). Increased reliance on internal auditor services is likely to lead to a reduction in the workload of external auditors and, consequently, a decrease in fees (Mat Zain et al., 2015) and a reduction in the delay of external audits (Abbott et al., 2012).

Perceived internal audit quality refers to the subjective assessment of the effectiveness and reliability of an internal audit function as viewed by various stakeholders, such as external auditors, management, and audit committees. This perception can significantly influence how internal audits are valued within an organization and their overall impact on governance and control processes. Internal audit quality perceptions can vary among stakeholders based on their experiences and expectations. Management may focus on the effectiveness of the audit in identifying risks, while audit committees prioritize compliance with standards and the auditor's independence. Moreover, external auditors perceive internal audit quality through various lenses, influenced by factors such as competence, independence, and the effectiveness of the internal audit function (Samagaio & Felício, 2023).

External auditors play a crucial role in ensuring accurate financial reporting for organizations. By conducting independent examinations of financial statements, records, and processes, they verify that numbers are truthful and that rules are followed. This duty supports fiscal transparency and strengthens faith in reports (Alhazmi et al., 2024). Past research shows that external auditors' characteristics are among the factors affecting the perceived quality of internal auditing.

In previous literature, many things have been considered characteristics of external auditing, and in this study, three characteristics are considered: external auditor's competence and independence and external auditing methodology. External audit competence encompasses professional knowledge, technical skills, analytical abilities, ethical standards, communication skills, industry-specific knowledge, continuous professional development, and problem-solving capabilities. These attributes collectively ensure that external auditors can conduct thorough and reliable audits that meet stakeholder expectations and regulatory requirements (Mansouri et al., 2009).

External audit independence is essential for allowing auditors to perform their work without influence or bias. This principle is crucial for maintaining the integrity of the audit process and directly impacts stakeholders' trust in financial statements. Ensuring this independence fosters essential confidence and transparency in the financial landscape (Stewart & Subramaniam, 2010).

External auditing methodology, a systematic approach, is the cornerstone of evaluating an organization's financial statements and related processes. This comprehensive process, which includes planning, evidence gathering, performing audit procedures, evaluating findings, reporting results, and follow-up actions, ensures that audits are thorough and that stakeholders, as key participants, can trust the information provided in financial statements (Appelbaum et al., 2018). Hamza and Damak-Ayadi (2023) state that effective audit procedures and methodologies are essential for comprehensive and systematic auditing. These procedures encompass planning, risk assessment, audit execution, and documentation. Standardized methodologies, including those outlined in the International Standards for the Professional Practice of Internal Auditing (ISPPPIA), provide a framework that promotes high-quality audits (Bae et al., 2021). Moreover, Noordin et al. (2022) found that the thoroughness of audit procedures directly impacts the quality of audit outcomes.

3. Hypothesis Development

3.1. External Auditors' Competency and Perceived Internal Audit Quality

External auditors with esteemed qualifications, such as a CPA (Certified Public Accountant) or CIA (Certified Internal Auditor), possess a level of expertise that significantly enhances their evaluation of internal audit findings. These professional certifications are not just badges of honor; they represent a steadfast commitment to upholding the highest auditing standards, thereby building trust in the integrity of the internal audits they assess (AL Fayi, 2022). Furthermore, the years of experience external auditors bring to the table are directly related to their ability to pinpoint potential issues within internal audits. External auditors with extensive experience have a deeper understanding of specific industry risks and subtleties, equipping them to make well-informed judgments about the reliability of internal audit work (Zhang et al., 2024; Alhazmi et al., 2024). As Nurdiono and Gamayuni (2018) highlight, highly competent external auditors are more inclined to trust the findings and recommendations provided by internal audits. This trust leads to improved efficiency in the overall audit process and enhances internal audits' credibility in the eyes of stakeholders. When external auditors recognize and appreciate the quality of internal audit work, it casts a positive light on the entire internal audit function. Additionally, external auditors are tasked with evaluating the effectiveness and objectivity of internal audit functions. A skilled and knowledgeable external auditor is better equipped to identify high-quality internal audits, which ultimately boosts stakeholder confidence in financial reporting and governance processes (Zhang et al., 2024; AL Fayi, 2022).

Moreover, skilled external auditors play a critical role in identifying gaps or weaknesses in internal audit reporting practices. With their extensive knowledge and keen analytical skills, they can evaluate whether internal audit reports clearly and effectively convey their findings, recommendations, and proposed action plans. When external auditors pinpoint these deficiencies and work to rectify them, it not only leads to significant enhancements in the quality of internal audit reporting but also positively impacts how such reports are perceived over time (Usman et al., 2023). Therefore, in this study, we state the first hypothesis as follows:

H1: *There is a positive relationship between the competence of external auditors and the perceived internal audit quality.*

3.2. External Auditors' Independence and Perceived Internal Audit Quality

When external auditors are viewed as truly independent, they significantly enhance trust in the evaluations of internal audits. Stakeholders are far more likely to consider internal audit findings credible and trustworthy when they believe external auditors have

performed their assessments free from external pressures (Aliu et al., 2018). External auditors tend to rely more on the work of internal auditors, which boosts the overall perception of the quality of these audits. This reliance hinges on the understanding that external auditors will objectively assess internal audit effectiveness (Herdiati et al., 2023). The independence of external auditors allows them to report any deficiencies or challenges identified in internal audits without fear of repercussion from management. This level of transparency is vital for upholding high standards within internal auditing and reinforces the credibility of the audit process (Zhang et al., 2024; Okechukwu & Ene, 2023). In this study, we propose our second hypothesis as follows:

H2: *There is a positive relationship between the external auditors' independence and the perceived internal audit quality.*

3.3. External Audit Methodologies and Perceived Internal Audit Quality

Previous studies highlight that well-defined, structured, and consistently applied procedures enhance the accuracy and comprehensiveness of audits (Alhazmi et al., 2024). Effective procedures guarantee that all critical areas are assessed, enhancing internal audit quality. The more robust these methods, the more consistent they are with auditing standards, and the better the internal audit quality assessment will be. External auditors objectively assess internal audit effectiveness and compliance with professional standards, which increases stakeholders' confidence in the internal audit function. External quality assessments can also highlight areas for improvement and facilitate a culture of continuous improvement within the internal audit team. Through a systematic approach, external auditors can identify strengths and weaknesses in internal audit processes. This feedback is critical for continuous improvement and reinforces the value of internal audit as a tool for organizational governance and risk management (Samagaio & Felício, 2023).

On the other hand, according to Rogers and Johnson (2023), external auditors, who often use risk-based approaches to prioritize higher-risk areas, can provide a more relevant assessment of internal audit work by focusing more on significant risks and ensuring that critical areas are fully assessed. This targeted approach can lead to a higher perceived internal audit quality because stakeholders see that underlying risks are adequately addressed. Furthermore, proper external methodologies, which often include structured communication strategies between external and internal auditors, ensure that both parties understand expectations and findings, leading to clearer reporting and improved perceived quality of internal audit performance (Rogers & Johnson, 2023). Consequently, we propose our third hypothesis as follows:

H3: *There is a positive relationship between the external audit methodologies and the perceived internal audit quality.*

4. Research Methodology

4.1. Research Method

This research utilizes a quantitative approach with a cross-sectional design to assess the relationship between the perceived quality of internal audits and the characteristics of external auditors in Iranian and Iraqi banks. Our cross-sectional study aims to provide an overview of the population in 2024; thus, we collected data from external auditors (our participants) simultaneously this year. This study uses Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the proposed hypotheses. It adopts a causal-predictive approach within the framework of Structural Equation Modeling, focusing on predictive accuracy in estimating statistical models. These models are specifically designed

to support the development of causal inferences (Hair et al., 2019; Sarstedt et al., 2021). PLS-SEM is often seen as an alternative to Jöreskog’s (1970) covariance-based structural equation modeling (CB-SEM), which is based on several assumptions that are frequently viewed as overly restrictive (Hair et al., 2011). This method effectively bridges the gap between explanatory research, commonly found in academia, and predictive modeling, which is crucial for guiding practical managerial decisions (Hair et al., 2019). The conceptual model being examined is illustrated in Figure 1.

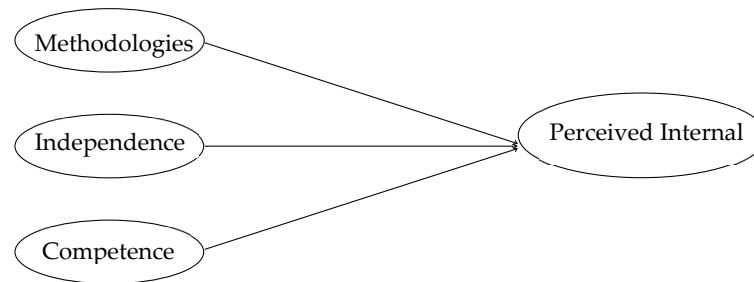


Figure 1. Conceptual Model.

4.2. Research Population

Cultural factors, such as hierarchical organizational structures and resistance to change, complicate the implementation of standardized audit practices (Andiola et al., 2020). Previous studies indicate that appropriate frameworks considering regional characteristics can enhance the effectiveness of internal audits in these countries (ALbawwat et al., 2021). Additionally, political instability, economic fluctuations, and varying degrees of regulatory enforcement significantly influence the internal audit environment (Al-Olimat & Al Shbail, 2021). This situation underscores the need for a comprehensive and consistent model to assess internal audit quality in Iran and Iraq. Khalil and Nehme (2023) emphasized the importance of enhanced transparency and timely submissions to strengthen the overall effectiveness of the internal audit function in these regions. Consequently, investigating the quality of internal auditing from the perspective of external auditors in Iran and Iraq presents unique challenges and improvement opportunities. Therefore, the external auditors of Iranian and Iraqi banks comprise our research population. There are 493 banks across Iran and Iraq, with approximately 94 actively considered in this study (54 banks in Iraq and 40 in Iran).

4.3. Sample and Data Collection

In this research, we used the following sample size formula to determine the sample size:

$$n = \frac{(z^2 p(1 - p) \times N)}{(E^2 \times (N - 1) + (z^2 \times P \times (1 - P)))}$$

$$n = \frac{(1.96^2 \times 0.5(1 - 0.5) \times 493)}{(0.05^2 \times (493 - 1) + 1.96^2 \times 0.5 \times (1 - 0.5))}$$

$$n \approx 216$$

Likert scale-based survey questionnaires were distributed among the Iranian and Iraqi participants in 2024. Our extensive follow-up efforts to receive responses from external auditors of Iranian and Iraqi banks resulted in the receipt of 109 and 107 completed and usable questionnaires from Iranian and Iraqi banks, respectively. To ensure proportional representation in the effective sample size of 216, the allocation was based on the proportion of banks in each country. Iraq, contributing 57.4% of the active banks (54 out of 94), accounts

for 124 samples, while Iran, contributing 42.6% (40 out of 94), accounts for 92 samples. This approach maintains a balanced and representative sample for analysis.

A structured questionnaire is used to collect data on two main areas: (1) characteristics of external auditors, including aspects such as competency, independence, and the methodologies they employ, and (2) perceived internal audit quality, which is assessed through internal audit procedures, reporting practices, and overall effectiveness as perceived by external auditors. This methodology allows for the collection of numerical data that can be statistically analyzed to examine the relationships between the variables of interest. The questionnaire was carefully constructed, drawing on key concepts and questions from various academic articles and field expert books on auditing and internal control systems. This process involved a thorough review of general sources, audit quality, the characteristics of external auditors, and the effectiveness of internal audits. Drawing from KPMG’s “Guide to Audit Quality” (KPMG, 2014), the “Quality Assessment Manual” developed by the Institute of Internal Auditors (IIA, 2024), and other previous research (Wehrhahn & Velte, 2024), the questionnaire was designed to incorporate recommended frameworks for assessing external auditor competencies, independence, and approaches. This alignment with industry standards ensures that the questionnaire provides a reliable and effective tool for evaluation. After developing the questionnaire, we discussed the questions with several academics and professionals, finalizing them based on their feedback.

The questionnaire was distributed either by email or in person, based on the accessibility of the respondents. Clear instructions were provided to ensure that participants understood how to complete the questionnaire. Additionally, respondents were assured of their anonymity and confidentiality to encourage honest and accurate answers.

4.4. Research Variables

The independent variable (attributes of external auditors) and the dependent variable (perceived quality of internal audits) in this study are measured based on the questions asked in the questionnaire. The questions related to each variable are displayed in Table 1.

Table 1. Variable Definitions.

Part A	Related References
Independent Variables: Characteristics of External Auditors	
Competency	
The external auditor has extensive experience in internal auditing.	KPMG (2014)
The external auditor possesses in-depth knowledge of organizational activities.	KPMG (2014)
The external auditor holds a professional designation in accountancy or a qualification in internal auditing.	IIA (2024)
The external auditor has a track record of satisfactory past interactions with internal auditors.	Wehrhahn and Velte (2024)
The external auditor complies with codified professional norms of conduct and professional standards promulgated by the internal audit.	IIA (2024)
Independence	
The external auditor operates in a completely independent manner.	KPMG (2014)
The external auditor can execute audit activities without any interference or influence from the organization.	KPMG (2014)
The external auditor has free access to the organization’s information and data necessary for the audit.	IIA (2024)

Table 1. *Cont.*

Part A	Related References
The external auditor is free to include any findings in their audit report and communicate them directly to the responsible parties.	Wehrhahn and Velte (2024)
The external auditor requires the approval of the audit committee and/or the board of directors for the completion of audit work.	KPMG (2014)
Audit Methodologies	
The external auditor uses tools, techniques, programs, step-by-step approaches, and best-practice examples of deliverables.	IIA (2024)
The external auditor successfully passes external assessments performed by an independent internal audit-certified reviewer and complies with specific quality assessment criteria.	IIA (2024)
The external auditor incorporates modern technology, including computer data tools and specific software, into the audit process.	Wehrhahn and Velte (2024)
The external auditor cooperates with the internal audit department of the organization for a quality external audit.	Wehrhahn and Velte (2024)
Periodic meetings between the external auditor and the internal auditor improve the quality of internal audits.	KPMG (2014)
Part B	
Dependent Variables: Perceived Quality of Internal Audits	
Audit Procedures	
Internal auditors have appropriate and relevant training enabling them to audit all of the organization’s systems.	IIA (2024)
Internal auditors intervene in all organizational units and all questions.	Wehrhahn and Velte (2024)
Internal auditors regularly monitor measures taken to correct problems encountered.	KPMG (2014)
Internal auditors have regular and direct working relationships with the managing director and the management team.	Wehrhahn and Velte (2024)
Internal auditors have free access to the organization’s information and data, which they can download and examine.	IIA (2024)
Reporting Practices	
Internal auditors are free to include any findings in their audit reports and communicate them directly to responsible parties.	KPMG (2014)
The internal audit work requires the approval of the audit committee and/or the board of directors.	Wehrhahn and Velte (2024)
Internal auditors comply with codified professional norms of conduct and professional standards.	IIA (2024)
Internal audit reports provide clear and actionable recommendations.	Wehrhahn and Velte (2024)
Internal auditors follow up on recommendations to ensure implementation and effectiveness.	IIA (2024)
Overall Effectiveness	
The internal audit department’s work is considered high quality by external auditors.	Wehrhahn and Velte (2024)
The internal audit department operates independently and without influence from other departments.	KPMG (2014)
The internal audit department ensures the organization’s strategic goals and objectives are met.	IIA (2024)
The internal audit department’s findings and recommendations lead to meaningful improvements in organizational processes.	Wehrhahn and Velte (2024)
The internal audit department is perceived as a valuable asset by the organization’s management.	KPMG (2014)

5. Results

We conducted the Exploratory Factor Analysis (EFA) to identify the underlying factors related to external auditor attributes and perceived internal audit quality. According to the results presented in Table 2, our variables correlate well with the questions presented.

Table 2. Factor Analysis.

Component Matrix ^a	
External Auditor Competency	0.987
External Auditor Independence	0.987
External Audit Methodologies	0.987
Internal Audit Procedures	0.987
Reporting Practices	0.980
Overall Effectiveness of Internal Audit	0.980
<i>Extraction Method: Principal Component Analysis.</i>	
<i>a. 1 components extracted.</i>	

Table 3 shows the reliability analysis used to evaluate the internal consistency of various constructs using Cronbach’s Alpha. The analysis results show that all variables exhibit acceptable reliability, with Cronbach’s Alpha values exceeding 0.70. Competence and Effectiveness demonstrate high reliability, with Alpha values of 0.832 and 0.833, respectively. Similarly, Methodologies and Independence have values of 0.809 and 0.796, reflecting strong internal consistency. Procedures have a slightly lower Alpha of 0.757, which is still within the acceptable range, indicating moderate reliability. These results confirm that the scales used to assess these variables are reliable and suitable for further analysis. This analysis underscores the robustness of the measurement framework used for the study.

Table 3. Reliability Analysis.

Variables	Number of Items	Cronbach Alpha
External Auditor Competency	5	0.832
External Auditor Independence	5	0.796
External Audit Methodologies	5	0.809
Internal Audit Procedures	5	0.757
Reporting Practices	5	0.878
Overall Effectiveness of Internal Audit	5	0.833

The demographic data were systematically encoded based on the parameters outlined in Table 4. Table 5 provides the descriptive statistics for the demographic variables.

Table 4. Demographic Encoded Data.

Variable	1	2	3	4
Age	18–24	25–34	35–44	45 and above
Gender	Male	Female		
Position	Internal Auditor	Senior External Auditor	Audit Committee members	Manager
Education	BA	MA	Ph.D.	

Table 5. Descriptive statistics.

Age	Frequency	Percent	Position	Frequency	Percent
1	29	13.43	1	68	31.48
2	76	35.19	2	125	57.87
3	74	34.26	3	14	6.48
4	37	17.13	4	9	4.17
Total	216	100	Total	216	100
Education	Frequency	Percent	Gender	Frequency	Percent
1	155	71.76	1	153	70.83
2	37	17.13	2	63	29.17
3	24	11.11	Total	216	100
Total	216	100			

The highest frequency in the age groups is observed in Age Group 2 (25–34 years) with 76 individuals, while the lowest frequency is found in Age Group 4 (45 years and above) with 37 individuals. Regarding gender, the sample consists of 153 males and 63 females. Position 2 (Senior External Auditor), with 125 individuals, has the highest representation, whereas Position 4 (Manager) has the lowest representation, with only 9 individuals. Regarding education level, the sample includes 155 individuals categorized under Education Level 1 (BA), 37 under Education Level 2 (MA), and 24 under Education Level 3 (Ph.D.), with a total of 216 individuals surveyed.

As mentioned before, this study used Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the proposed hypotheses. Perfect multicollinearity among a subset of questionnaire items poses a challenge to effectively implementing Partial Least Squares (PLS) regression. A dimensionality reduction procedure will be undertaken to address this, employing Principal Component Analysis (PCA) within the R statistical environment. It is a widely used multivariate statistical method employed across diverse scientific fields. It operates on datasets where observations are characterized by multiple, often correlated, quantitative variables. The primary objective of PCA is to reduce the dimensionality of the data by identifying a smaller set of uncorrelated variables, termed principal components, which capture the most significant variance within the original dataset. These components facilitate the visualization of both observation and variable similarities through graphical representations, typically in the form of two-dimensional or three-dimensional plots.

Furthermore, PCA simplifies the data structure and highlights underlying relationship patterns. Its historical roots extend back over a century, establishing it as one of the earliest multivariate techniques (Abdi & Williams, 2010; Saporta & Keita, 2009). This preprocessing step will be applied to the indicators associated with each latent variable. Following this, the regression analysis will be conducted. A key consideration is the shift in the measurement model necessitated by the PCA. While the original indicators are conceptualized as reflective, the derived principal components, owing to the inherent characteristics of PCA, will be treated as formative constructs within the subsequent PLS model. The results are presented in Figure 2.

Figure 2 presents our research findings, which have significant implications for the field of internal and external auditing. We discovered a strong positive correlation between external auditor independence and perceived internal audit quality ($\beta = 0.814$). The results of this study support the findings of Herdiati et al. (2023), which indicate that external auditors place greater trust in the work of internal auditors who assess their effectiveness independently and objectively. Additionally, these findings align with the conclusions of Zhang et al. (2024) and Okechukwu and Ene (2023), who argue that the independence of

external auditors enables them to report any deficiencies or challenges identified during internal audits, thereby allowing them to evaluate the quality of those audits better.

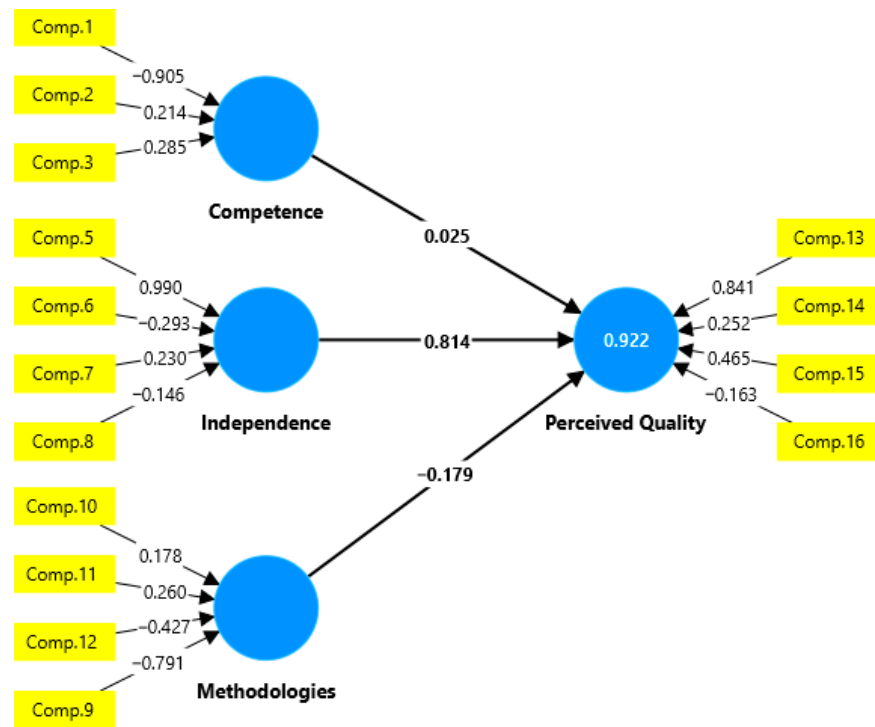


Figure 2. Regression Results.

Similarly, there is a positive but weak relationship between external auditor competence and perceived internal audit quality ($\beta = 0.025$). These findings are part of a growing consensus among researchers, including Zhang et al. (2024), Alhazmi et al. (2024), and Usman et al. (2023), who argue that competent external auditors are adept at making well-informed judgments about the reliability of internal audit work and also perceive a higher quality in the internal audit function. This result also aligns with the research of Nurdiono and Gamayuni (2018) and AL Fayi (2022), who state that highly competent external auditors are more trusted in internal audits and perceive a higher quality for them.

In contrast, external audit methods show a slight negative relationship with perceived internal audit quality ($\beta = -0.179$). Our analysis in this study offers results that differ from those of Rogers and Johnson (2023). They assert that external auditors, who frequently employ qualified audit methodologies and procedures, are able to deliver a more relevant evaluation of internal audit work and achieve a better understanding of internal audit quality.

Based on the obtained results, the first and second hypotheses of the study can be accepted, while the third hypothesis cannot. These findings, based on our study sample from Iranian and Iraqi banks, highlight the importance of external auditor competence and independence in enhancing perceived internal audit quality. Conversely, external audit methodologies may have a detrimental effect on perceived internal audit quality. The comparison of β among the three independent variables underscores external auditor independence as the dominant factor. These three independent variables, with an R-squared value of 0.922, explain a significant portion of the perceived variance in internal audit quality.

Robustness Test

To maintain the independent status of the indicators, they were treated as formative from a statistical perspective. However, theoretically, these indicators are reflective and were subsequently synthesized using Principal Component Analysis. Thus, within a theoretical framework, when only one component is included for each latent variable in the model, these components are considered reflective. To validate the results shown in Figure 2, the model has been modified to determine whether the theoretical and statistical approaches produce consistent outcomes. The results of this modification, i.e., the regression results for reflective indicators, are illustrated in Figure 3.

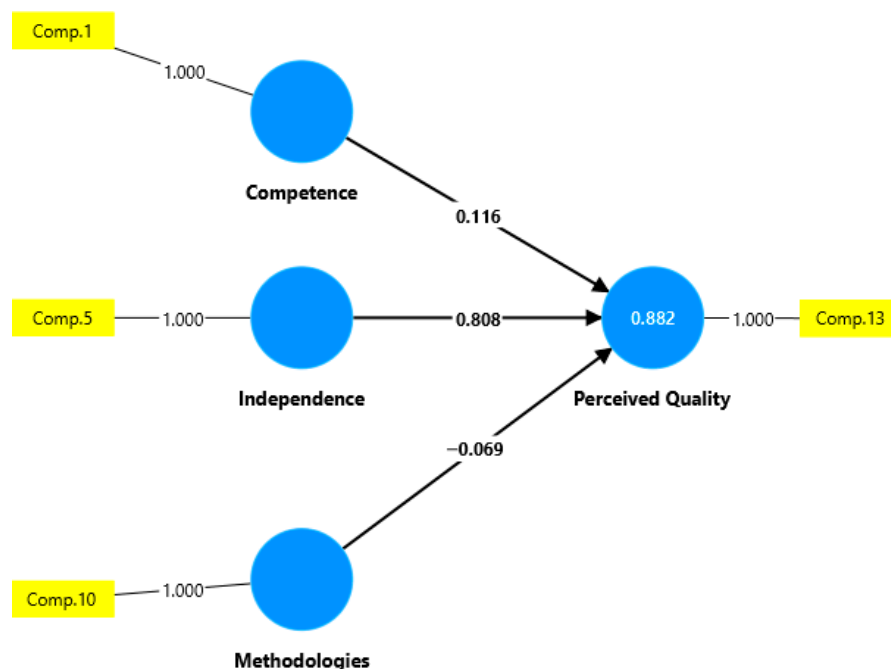


Figure 3. Regression Results for Reflective Indicators.

We utilized the first principal components extracted from the PCA for each variable, as this technique dictates that the first component invariably possesses the highest explanatory power. However, in the case of the “Methodologies” construct, the ninth component exhibited perfect collinearity with the first component. Consequently, to circumvent this issue, we employed the second-ranked component, which was the tenth component.

The results indicate that our findings remained largely consistent across both models. The minor discrepancies observed can be attributed to the reduced number of components in Figure 3. These findings provide compelling evidence that neither the statistical nor the theoretical approach significantly altered the results.

6. Conclusions

The importance of internal auditing and its quality is undeniable. It is also important to examine the factors that affect this quality. One factor affecting internal audit quality is the relationship between internal and external auditors. External auditors can contribute considerably to improving internal auditing and thereby enhance the accountability of executive management to the board of directors. On the other hand, increasing the quality of internal audits perceived by external auditors can increase the reliance of external auditors on the work of internal auditors, thereby not only reducing external audit fees but also improving the accountability of the board of directors to shareholders by increasing

the quality of financial reporting. Therefore, it is of great importance to study the impact of external auditor characteristics on the perceived quality of internal auditing.

The purpose of this study is to assess the impact of external auditors' attributes on the perceived internal audit quality in Iranian and Iraqi banks. The external auditors' competence, independence, and audit methodologies are considered as external auditor characteristics. Moreover, the perceived quality of internal audit procedures and reporting practices and their overall effectiveness are considered as surrogates for perceived internal audit quality. The data on the characteristics of external auditors and the perceived internal audit quality were gathered from external auditors at various banks in Iran and Iraq through a questionnaire in 2024. The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM).

This study uncovers a complex interplay between external auditor competence, independence, methodology, and perceived internal audit quality. It reveals that while a positive yet weak link exists between external auditor competence and perceived internal audit quality, external auditor independence is the key player. It emerges as a dominant factor, showing a strong positive correlation and significantly influencing perceived internal audit quality. On the other hand, external auditor methodologies show a slight negative association, suggesting a potential adverse effect on perceived internal audit quality. These findings underscore the critical role of external auditor independence as a major determinant of perceived internal audit quality, with external auditor competence and methodology playing a relatively minor role. The results imply that strategies to enhance perceived internal audit quality should focus on bolstering external auditor independence, thereby highlighting the importance of this research in shaping future auditing practices.

This study contributes to the auditing literature in two ways, with a thorough examination. First, it scrutinizes how external auditors' attributes influence internal auditors' perceived quality. Second, it focuses on the relationship between these factors within the economic contexts of Iran and Iraq, two neighboring countries with similar cultural and religious backgrounds and fluctuating economies. The research findings also offer several practical implications. First, regulators and professional organizations should consider developing or refining standards that emphasize the importance of external auditor independence. This may include implementing stricter regulations on auditor rotation, imposing restrictions on non-audit services provided by external auditors, and enhancing transparency in external auditor reporting. Second, public accounting firms should invest in continuous professional development and training for auditors to improve their skills and knowledge. This training should focus on ethical standards, independence, and the importance of objectivity in the auditing process. Third, external auditors are encouraged to collaborate more effectively with internal auditors. Such collaboration can lead to a better understanding of each other's roles and responsibilities, fostering a culture of quality and integrity and ultimately enhancing the perceived quality of internal audits.

This research, like many others, has some limitations. Firstly, it relies on the perceptions of external auditors regarding the quality of internal audits, which may not provide a complete understanding of the situation. Future studies could benefit from including insights from other stakeholders, such as internal auditors, audit committees, boards of directors, or executive management. Secondly, this research uses a cross-sectional design, so future studies could employ longitudinal approaches to better understand how changes in external auditor characteristics affect internal audit quality over time. Lastly, since this research focuses on banks in Iran and Iraq, the generalizability of the findings is somewhat limited. Further research could be conducted in other countries and industries to expand on these results.

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References

- Abbott, L. J., Parker, S., & Peters, G. F. (2012). Audit fee reductions from internal audit-provided assistance: The incremental impact of internal audit characteristics. *Contemporary Accounting Research*, 29(1), 94–118. [CrossRef]
- Abdi, H., & Williams, L. J. (2010). Principal component analysis. *Wiley Interdisciplinary Reviews: Computational Statistics*, 2(4), 433–459. [CrossRef]
- Abdullah, R., Ismail, Z., & Smith, M. (2018). Audit committees' involvement and the effects of quality in the internal audit function on corporate governance. *International Journal of Auditing*, 22(3), 385–403. [CrossRef]
- AL Fayi, S. M. (2022). Internal audit quality and resistance to pressure. *Journal of Money and Business*, 2(1), 57–69. [CrossRef]
- ALbawwat, I. E., AL-HAJAIA, M. E., & AL FRIJAT, Y. S. (2021). The Relationship Between Internal Auditors' Personality Traits, Internal Audit Effectiveness, and Financial Reporting Quality: Empirical Evidence from Jordan. *The Journal of Asian Finance, Economics and Business*, 8(4), 797–808.
- Alhazmi, A. H. J., Islam, S., & Prokofieva, M. (2024). The Impact of Changing External Auditors, Auditor Tenure, and Audit Firm Type on the Quality of Financial Reports on the Saudi Stock Exchange. *Journal of Risk and Financial Management*, 17(9), 407. [CrossRef]
- Aliu, M., Okpanachi, J., & Mohammed, N. (2018). Auditor's independence and audit quality: An empirical study. *Accounting and Taxation Review*, 2(2), 15–27.
- Al-Olimat, N. H., & Al Shbail, M. O. (2021). The mediating effect of external audit quality on the relationship between corporate governance and creative accounting. *International Journal of Financial Research*, 12(1), 149–157. [CrossRef]
- Andiola, L. M., Downey, D. H., & Westermann, K. D. (2020). Examining climate and culture in audit firms: Insights, practice implications, and future research directions. *Auditing: A Journal of Practice & Theory*, 39(4), 1–29.
- Appelbaum, D. A., Kogan, A., & Vasarhelyi, M. A. (2018). Analytical procedures in external auditing: A comprehensive literature survey and framework for external audit analytics. *Journal of Accounting Literature*, 40(1), 83–101. [CrossRef]
- Arel, B., Beaudoin, C. A., & Cianci, A. M. (2012). The impact of ethical leadership, the internal audit function, and moral intensity on a financial reporting decision. *Journal of Business Ethics*, 109(2012), 351–366. [CrossRef]
- Bae, G. S., Choi, S. U., Lamoreaux, P. T., & Lee, J. E. (2021). Auditors' fee premiums and low-quality internal controls. *Contemporary Accounting Research*, 38(1), 586–620. [CrossRef]
- Basel Committee. (2012). The Internal Audit Function in Bank-Basel Committee on Banking Supervision. Bank for International Settlements. Available online: <http://www.bis.org/publ/bcbs223.pdf> (accessed on 1 February 2024).
- Boskou, G., Kirkos, E., & Spathis, C. (2019). Classifying internal audit quality using textual analysis: The case of auditor selection. *Managerial Auditing Journal*, 34(8), 924–950. [CrossRef]
- Deribe, W. J., & Regasa, D. G. (2014). Factors determining internal audit quality: Empirical evidence from Ethiopian commercial banks. *Research Journal of Finance and Accounting*, 5(23), 86–95.
- Erasmus, L., & Coetzee, P. (2018). Drivers of stakeholders' view of internal audit effectiveness: Management versus audit committee. *Managerial Auditing Journal*, 33(1), 90–114. [CrossRef]
- Gramling, A. A., & Vandervelde, S. D. (2006). Assessing internal audit quality. *Internal Auditing*, 21(3), 26.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–152. [CrossRef]
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. [CrossRef]

- Hamza, M., & Damak-Ayadi, S. (2023). The perception of audit quality among financial statements users, preparers and auditors, in Tunisia. *Accounting and Management Information Systems*, 22(2), 202–224. [CrossRef]
- Hazaea, S. A., Tabash, M. I., Khatib, S. F., Zhu, J., & Al-Kuhali, A. A. (2020). The impact of internal audit quality on financial performance of Yemeni commercial banks: An empirical investigation. *The Journal of Asian Finance, Economics and Business*, 7(11), 867–875. [CrossRef]
- Herdiati, M. F., Yusnaini, Y., & Wahyudi, T. (2023). The Effect of Independence, Role Conflict, and Internal-External Auditor Relationship on Audit Quality: Case at Universities in Indonesia. *Journal of Economics, Finance and Management Studies*, 6(7), 3197–3205. [CrossRef]
- Jiang, L., André, P., & Richard, C. (2018). An international study of internal audit function quality. *Accounting and Business Research*, 48(3), 264–298. [CrossRef]
- Jöreskog, K. G. (1970). A general method for estimating a linear structural equation system. *ETS Research Bulletin Series*, 1970(2), i-41. [CrossRef]
- Khalil, S., & Nehme, R. (2023). Performance evaluations and junior auditors' attitude to audit behavior: A gender and culture comparative study. *Meditari Accountancy Research*, 31(2), 239–257. [CrossRef]
- KPMG. (2014). *Guide to audit quality and the external auditor*. KPMG. Available online: <https://assets.kpmg.com/content/dam/kpmg/pdf/2014/08/KPMG-NZ-Guide-to-audit-quality-and-external-auditor.pdf> (accessed on 1 February 2024).
- Lenz, R., & Hahn, U. (2015). A synthesis of empirical internal audit effectiveness literature pointing to new research opportunities. *Managerial Auditing Journal*, 30(1), 5–33. [CrossRef]
- Mansouri, A., Pirayesh, R., & Salehi, M. (2009). Audit competence and audit quality: Case in emerging economy. *International Journal of Business and Management*, 4(2), 17–25. [CrossRef]
- Mashayekhi, B., Ghasemi Dashtaki, S., & Ahmadi, H. (2024). Banks' financial performance analysis: An experience from an Islamic economy. *Journal of Islamic Accounting and Business Research*. [CrossRef]
- Mashayekhi, B., Jalali, F., & Rezaee, Z. (2022). The role of stakeholders' perception in internal audit status: The case of Iran. *Journal of Accounting in Emerging Economies*, 12(4), 589–614. [CrossRef]
- Mashayekhi, B., Samavat, M., & Jahangard, A. (2023). Reviewing the Internal Audit Literature in the Public Sector: A Bibliometrics Analysis. *Governmental Accounting*, 9(2), 207–226.
- Mat Zain, M., Zaman, M., & Mohamed, Z. (2015). The Effect of Internal Audit Function Quality and Internal Audit Contribution to External Audit on Audit Fees. *International Journal of Auditing*, 19(3), 134–147. [CrossRef]
- Mazza, T., & Azzali, S. (2015). Effects of internal audit quality on the severity and persistence of controls deficiencies. *International Journal of Auditing*, 19(3), 148–165. [CrossRef]
- Messier, W. F., Jr., Reynolds, J. K., Simon, C. A., & Wood, D. A. (2011). The effect of using the internal audit function as a management training ground on the external auditor's reliance decision. *The Accounting Review*, 86(6), 2131–2154. [CrossRef]
- Noordin, N. A., Hussainey, K., & Hayek, A. F. (2022). The use of artificial intelligence and audit quality: An analysis from the perspectives of external auditors in the UAE. *Journal of Risk and Financial Management*, 15(8), 339. [CrossRef]
- Nurdiono, N., & Gamayuni, R. R. (2018). The effect of internal auditor competency on internal audit quality and its implication on the accountability of local government. *European Research Studies Journal*, 21(4), 426–434. [CrossRef]
- Okechukwu, O., & Ene, E. C. (2023, February). *Effect of auditor's independence on audit quality of quoted consumer goods companies in Nigeria* [Conference session]. 7th Annual International Academic Conference on Accounting and Finance Disruptive Technology: Accounting Practices, Financial and Sustainability Reporting, RIVERS State University of Science and Technology, Port Harcourt, Nigeria.
- Pizzini, M., Lin, S., & Ziegenfuss, D. E. (2015). The impact of internal audit function quality and contribution on audit delay. *Auditing*, 34(1), 25–58. [CrossRef]
- Prawitt, D. F., Smith, J. L., & Wood, D. A. (2009). Internal audit quality and earnings management. *Accounting Review*, 84(4), 1255–1280. [CrossRef]
- Rezaee, Z. (2005). Causes, consequences, and deterrence of financial statement fraud. *Critical Perspectives on Accounting*, 16(3), 277–298. [CrossRef]
- Rogers, S., & Johnson, J. (2023). Auditors Abound: The Differences Between Internal and External Audit. Available online: <https://www.jgacpa.com/auditors-abound> (accessed on 1 February 2024).
- Samagaio, A., & Felício, T. (2023). The determinants of internal audit quality. *European Journal of Management and Business Economics*, 32(4), 417–435. [CrossRef]
- Saporta, G., & Keita, N. N. (2009). Principal component analysis: Application to statistical process control. *Data Analysis*, 1–23.
- Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of market research* (pp. 587–632). Springer.
- Stewart, J., & Subramaniam, N. (2010). Internal audit independence and objectivity: Emerging research opportunities. *Managerial Auditing Journal*, 25(4), 328–360. [CrossRef]

- The Institute of Internal Auditors (IIA). (2015). Global Internal Audit Competency Framework. Institute of Internal Auditors (IIA). Available online: <https://docs.ifaci.com/wp-content/uploads/2018/03/the-iaa-global-internal-audit-competency-framework-2013.pdf> (accessed on 1 March 2024).
- The Institute of Internal Auditors (IIA). (2024). Quality Assessment Manual: Chapter 4. Available online: <https://www.theiia.org/globalassets/documents/quality/quality-assessment-manual-chapter-4.pdf> (accessed on 1 March 2024).
- Usman, R., Rohman, A., & Ratmono, D. (2023). The relationship of internal auditors' characteristics with external auditors' reliance and its impact on audit efficiency: Empirical evidence from Indonesian government institutions. *Cogent Business & Management*, 10(1), 2191781.
- Waheed, A. A., & Sfan, A. M. D. (2024). Evaluating Internal Audit Quality (Evidence From Iraq). *International Journal of Economics, Management and Accounting*, 1(4), 230–257. [CrossRef]
- Wehrhahn, C., & Velte, P. (2024). The relationship between audit committees, external auditors, and internal control systems: A literature review and a research agenda. *Journal of Financial Reporting and Accounting*. ahead-of-print. [CrossRef]
- Zhang, C., Shah, S., Lau, Y. W., & Ngalim, S. M. (2024). The impact of independence, auditors' competence and information technology usage on internal audit quality: Empirical evidence from chinese commercial banks. *Corporate Ownership & Control*, 21(3), 18–30.

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Article

The Role of Technological Readiness in Enhancing the Quality of Audit Work: Evidence from an Emerging Market

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Abstract: This study examines the impact of remote audit quality (RAQ) on the quality of audit work (QAW). Further, it explores the moderating effect of both client technological readiness (CLTR) and auditor technology readiness (ADTR) on the link between RAQ and QAW. Data were collected through a questionnaire survey distributed to all external auditors working in Egypt. The final sample consists of 280 auditors. The data were analyzed with smart partial least squares (Smart-PLS) software. The results showed that RAQ has a positive and significant impact on QAW. Moreover, the results revealed that CLTR and ADTR moderate the relationship between RAQ and QAW. CLTR was found to have a positive moderating role, as CLTR was found to strengthen the relationship between RAQ and QAW, while ADTR was found to have a negative moderating role, as ADTR was found to weaken the relationship between RAQ and QAW. The findings can provide a pivotal yardstick for guiding companies, auditing firms, auditing professional bodies, and regulators in the Egyptian context. Positioned as one of the early studies to concentrate on the moderating role of CLTR and ADTR in the relationship between RAQ and QAW, this research suggests insights within an emerging market context.

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Keywords: remote audit; audit quality; technological readiness; emerging economy; Egypt

1. Introduction

In recent years, businesses have increasingly turned to advanced technologies to manage their operations and financial activities (Kayed Abdelazeem Mohamed and Metwally 2024). This shift was accelerated by the widespread adoption of remote work during the COVID-19 pandemic, which forced industries across the board to undergo significant digital transformations (Metwally et al. 2022). Organizations that had already invested in robust IT infrastructure were better positioned to transition smoothly to teleworking (Metwally et al. 2020). These companies not only navigated the challenges of the pandemic with greater flexibility but also saw stronger financial performance due to the more effective implementation of recovery strategies (Naseeb et al. 2020; Naseeb and Metwally 2022).

Due to this digital transformation, auditors face new challenges due to the increasingly sophisticated IT environments; on the other hand, these systems offer opportunities for faster audits, improved internal controls, broader audit coverage, and other potential advantages that remain underexplored in auditing research (Shin et al. 2013; Silva et al. 2023). The role of auditors has undergone significant changes due to the evolving nature of business models, particularly as auditing has increasingly shifted toward a risk-based

approach. This shift is driven by adopting advanced systems, which come with various risks, including cybersecurity threats and other security concerns (Metwally and Diab 2023; Naseeb and Metwally 2022).

Remote auditing (RA), which proved to be both effective and practical during the pandemic, is now a permanent option for many accounting firms, with some allowing auditors to work remotely indefinitely (Kostem 2021). Many studies in the literature have defined RA as the audits done out of the client site, which implies that hybrid audits can be divided into RA and on-site audits (Alma'aitah et al. 2024; Li et al. 2023). The wide spread of RA is due to the benefits achieved by auditors. These benefits include saving time and costs (Serag and Daoud 2021). It also promotes a better work–life balance (Grant et al. 2013; Lorentzon et al. 2024). With remote access, auditors can reach clients and data from anywhere in the world.

Despite these benefits, questions remain about remote audit quality (RAQ), and its impact on the overall quality of audit work (QAW). For this study, we differentiate between audit firm overall audit quality, referred to as QAW, and the remote audit processes and their quality, referred to as RAQ. This differentiation is crucial as the growing amount of RA will not impact only the quality of the remote audit, but also will directly impact the audit firm's overall audit quality and the audit firm's reputation in the long run.

The RA literature has reported mixed results as some researchers suggest that RA positively influences audit quality and effectiveness (Barretto et al. 2022; Alma'aitah et al. 2024; Serag and Daoud 2021; Saputro and Mappanyukki 2022; Farcane et al. 2023). On the contrary, other studies found that RA introduces risks, such as the increased likelihood of fraud due to lack of physical interaction, altered records, and missing key information, which can negatively affect QAW (Picciotti 2020). Serag and Daoud (2021) highlight additional challenges, including high costs, the need for advanced technology, inexperienced auditors, and communication difficulties, all raising the risk of fraud and undermining audit quality. Finally, Albitar et al. (2021) noted that the shift to RA during COVID-19 negatively impacted auditors' mental health, diligence, staffing, and fees, which could degrade the QAW.

RA relies heavily on the availability of advanced technology and skilled personnel to be effective (Farcane et al. 2023). Picciotti (2020) highlights that RA can be costly and requires expertise in handling sophisticated tech tools. Companies should ensure secure working environments for remote auditors and provide proper training, equipment, and IT resources for their teams. The ability of both the auditor and the client to use these technologies efficiently is a key factor in determining the success of RA (Alma'aitah et al. 2024). Agustin (2021) stresses that the RAQ can suffer without adequate technological readiness from both sides. However, little is known about how technology readiness influences QAW. Understanding the impact of a company's tech preparedness on the audit process could reveal whether it enhances or hinders the outcomes of remote auditing. There is little literature on this subject, except for Alma'aitah et al. (2024) who highlighted the positive and significant impact of CLTR on the relationship between RA and QAW in Jordan.

The contradictory results regarding the impact of RA on QAW and the scarcity of studies that have concentrated on technological readiness (both client and auditors) guided us to conduct this study to enhance our understanding regarding the factors that can affect the QAW in the Egyptian context in the industry 4.0 era. In that sense, the current study extends this early endeavour and examines the impact of RAQ on the QAW. Further, it investigates the moderating role of CLTR and ADTR on the relationship between RAQ and QAW. Although there is a growing body of literature that concentrates on the impact of RA on audit quality, little is known regarding the impact of RAQ on QAW.

In developing the theoretical framework for this study, we incorporated three key theories: agency theory, the technology acceptance model (TAM), and the Technology–Organization–Environment (TOE) framework. The TAM and the TOE framework focus on understanding technological readiness and adoption, providing insight into how orga-

nizations prepare for and integrate new technologies. On the other hand, agency theory is widely used in audit quality research to explain how high-quality audits help reduce agency costs by mitigating conflicts of interest between management and stakeholders. Together, these theories offer a comprehensive perspective on the relationship between technology and audit quality.

Having said this, the current study represents a novel exploration of the relationship between RAQ and QAW within the Egyptian context, through examining the moderating effects of CLTR and ADTR. The research is structured around three primary research questions: (1) Does remote audit quality adoption directly impact the level of the quality of audit work? (2) Does CLTR presence moderate the RAQ-QAW relationship? (3) Does ADTR moderate the RAQ-QAW association? The analysis revealed a positive and significant correlation between RAQ and QAW, CLTR and QAW, and ADTR and QAW, suggesting the existence of RAQ increases the QAW, and that higher levels of technological readiness both in the client company and the audit firm are associated with higher QAW. Furthermore, CLTR presence was found to strengthen this positive association. Interestingly, ADTR was found to weaken this positive association, which implies that in Egyptian context, auditors' technological readiness has reduced the positive impact of RAQ on QAW while the direct relationship is still positive and significant.

In that sense, the current paper seeks to make the following contributions to the existing literature: first, the current study aims to address a critical gap in audit research by focusing on audit practices within an under-researched context of developing economies, with a specific emphasis on Egypt. While most existing research centers on developed countries, little attention has been given to how unique socio-economic and political factors in regions like the Middle East and North Africa (MENA) affect auditing processes (Abdelazim et al. 2023; Ali et al. 2024; Metwally et al. 2024). As a key emerging market in Africa and a major financial hub within the MENA region (Metwally et al. 2021; Metwally 2022), Egypt provides a valuable setting to explore these influences. Its recent economic changes and the aftermath of the Arab Spring highlight parallels with other MENA nations, making the findings potentially applicable to the broader region (Abdelazim et al. 2023).

Second, this research focuses on the interaction between RAQ, CLTR, and ADTR, and how these factors impact QAW. By analyzing these relationships in a developing context which is undergoing significant transitions, the study aims to uncover new insights into how QAW is shaped in such environments. Third, the results are expected to enhance our understanding of auditing in emerging economies with similar political and economic ramifications. Fourth, the research aims to provide practical recommendations, encouraging auditors in developing countries to invest in technological advancements, thereby improving efficiency and QAW. Finally, the current research has implications for policy makers and regulators as it will enhance their ability to better understand the impact of RAQ on QAW and the importance that technological readiness plays in enhancing or diminishing the QAW, which in return may affect their decision-making regarding expanding or diminishing RA implementation. The structure of the rest of this research is organized as follows: Section 2 provides a background on the Egyptian audit market. Section 3 introduces the theoretical framework underpinning the study. Section 4 combines a review of the relevant literature with theoretical basis, leading to the development of hypotheses. Section 5 explains the research design and methodology used. Section 6 presents empirical results and offers analysis. Lastly, Section 7 concludes the study by discussing the implications of the findings.

2. Contextual Ramifications

The Egyptian market is an intriguing subject for research due to its unique characteristics (Elbayoumi et al. 2019). These include various regulatory and structural changes that could affect the impact of RAQ on QAW and the role of TR. Since the 1990s, Egypt has undergone significant economic transformation, moving from a centrally planned economy with heavy government control to one that embraces economic reforms, privatization,

and open-market policies (Abdelazim et al. 2023; Ali et al. 2024). This period also saw improvements in the country's accounting standards, particularly in the late 1990s, aimed at enhancing the quality of financial reporting within the stock exchange (Metwally et al. 2021; Metwally 2022). However, unlike more developed markets that have widely adopted international standards, Egypt still faces challenges from government interventions and regulatory constraints, which hinder its full alignment with global practices despite ongoing development efforts (Hassan 2008; Diab et al. 2023; Diab and Metwally 2020).

Other factors that may make Egypt an interesting environment for examining our research problem include its legal framework, corporate governance, and culture. Egypt is categorized as a code-law nation, meaning that businesses there are typically financed by banks with regular access to financial and non-financial data. French civil law serves as the foundation for Egyptian law. However, Anglo-American common-law ideas are dominant in the capital markets (ROSC 2004). Regarding corporate governance, Egypt differs from other developed countries in its voluntary basis without any requirements for public companies to justify any failure in following corporate governance code. This system is not like the mandatory basis applied in countries such as USA nor does it adopt the comply-or-explain basis applied in countries like the UK (El-Sayed Ebaid 2011). It is unclear how auditors would respond to a customers' voluntary acceptance of corporate governance procedures in an institutional context like Egypt, where adoption and oversight of these practices are not required (Sharma et al. 2008). Culturally, Egypt offers an interesting environment for our research area as it has higher degrees of power distance and uncertainty avoidance, leading to a high degree of secrecy (Ahmed Saad Abdelwahed et al. 2024; Dahawy et al. 2011). Many Egyptian directors suppose that full disclosure may harm their companies with regard to tax authorities and competitors (Dahawy and Conover 2007).

There are several hurdles in the Egyptian auditing sector. According to Wahdan et al. (2006), these include the degree of market concentration, audit engagement violating relevant laws, lack of experience and expertise among auditors, current untrained auditors which should be given some appropriate training, as well as that potential future auditors may not have an adequate foundation in accounting and auditing. This is supported by the results of Mohamed and Habib (2013), who found that Egyptian auditors are not independent. These are just some of the issues that put audit engagements at risk, contrary to what is otherwise expected. For instance, auditors had no quality at Accountability State Authority (ASA) or Big Four audit companies (El-Dyasty and Elamer 2021). Eldaly et al. (2022) concluded that the influx of foreign direct investment (FDI) has resulted in several positive changes within the Egyptian audit market. The Egyptian audit market experienced an improvement in local accounting and auditing standards, stricter regulatory inspections of audit firms, and a keener application of regulatory sanctions. However, Eldaly et al. (2022) noted the need for reform in the audit market.

3. Theoretical Framework

In order to provide a better understanding of the relationship between RAQ, TR, and QAW, we merge agency theory with technology acceptance model (TAM) and the Technology–Organization–Environment (TOE) framework. Triangulating themes from those theories together will provide a better understanding the impact of RAQ on QAW and the moderating role of CTR and ADTR on this relationship. Empirical research can next validate, refine, and test research hypotheses, thereby contributing to a deeper understanding of RAQ and TR and their implications for QAW.

Auditors play a crucial role in reducing agency costs, which arise from information asymmetry and conflicting interests between shareholders and managers. Due to these imbalances, agency theory—focused on the oversight and information disparity between owners and management—often serves as the theoretical foundation for explaining the importance of audits in today's business environment. This theory helps justify why audits are essential for ensuring transparency and accountability in modern companies (Jensen and Meckling 1976).

Generally, auditors should assure the integrity of financial statements through their audit reports. These reports rely mainly on information obtained from the client who has better knowledge of corporate circumstances, and the surrounding operations. This represent a huge part of the information asymmetry problem. Transparency should be more necessary while making remote audits compared to onsite audits (Lin 2018; Komal et al. 2022; Usman et al. 2023). Improving transparency through technical knowledge, communication skills, and professional skepticism may mitigate the asymmetry problem and enhance RAQ (Al Shbail et al. 2024). Moreover, an external audit can mitigate the agency problem as it provides third-party assurance on compliance, reliability, and integrity of financial information (Raimo et al. 2021). What remains of utmost importance, however, is the provision of a high degree of assurance and the maintenance of QAW (Salem et al. 2023; Usman et al. 2023).

According to Knechel et al. (2013), audit quality is the auditor's ability to provide reasonable assurance that the financial statements are free from errors or inaccuracies and have been prepared in accordance with prevailing accounting standards. The QAW in RA context may be threatened by challenges, hence, there is a need for synergy and alignment in interests between audit teams and auditee personnel to achieve the highest level of QAW and financial reporting confidence (Castka et al. 2020). When management believes that remote auditing (RA) will help reduce information asymmetry and the related agency problem, they are more likely to minimize conflicts of interest with auditors to improve QAW (Alma'aitah et al. 2024; Farcane et al. 2023; Figa et al. 2023).

In the current study, TOE framework helps in understand how TR within organizations affect QAW (Tornatzky and Fleischer 1990). TR can be used as an index to measure auditors' and clients' ability to effectively use digital platforms and tools required to perform RA. This index takes into account the availability of resources such as skilled human resources in using remote communication tools, data security, and software for analysis. The availability of these resources are crucial for the integrity and confidentiality of performed audits. Hence, the TOE framework suggests that audit firms with mature technology infrastructure and competent IT auditors are well-positioned to address RA challenges leading to improved QAW (Manita et al. 2020). Similarly, clients using technology are able to communicate directly with auditors through different online channels that render better accuracy of financial reporting leading to a secure and effective way to increase QAW (Siew et al. 2020; Li et al. 2023; Awa et al. 2015).

The technology acceptance model (TAM) represents the most integral part in our model, as it concentrates on the individual intention to adopt or resist new technology. Whether a person accept or reject a new deployed technology is significantly influenced by two primary factors: the perceived usefulness and the perceived ease of use (Davis 1989). Essentially, if users believe that a particular technology will enhance their performance or efficiency, they are more likely to express a willingness to adopt it. Similarly, if they perceive the technology as easy to navigate and operate, this positive perception further strengthens their intention to utilize it (Alma'aitah et al. 2024).

Given the vast benefits auditors and firms get from being digitally transformed, RA became a reality that is increasing gradually in the audit market (Shin et al. 2013; Silva et al. 2023). As auditors recognize the usefulness and simplicity of RA, they are likely to become more adept and experienced with its methods and skills. Therefore, the TAM underscores the importance of both the perceived benefits of the technology and the ease with which it can be integrated into users' routines, in shaping their behavior towards adopting new technological solutions (Davis 1989). To sum up, the more auditors find RA useful and easy to use, the better they will get with those techniques for RA. The greater use of RA will further help improve QAW by providing reasonable assurance over financial reports. Given the crucial role of technology in everyday audit work, it is assumed that both TR and RAQ will greatly influence QAW.

4. Literature Review and Hypotheses Development

4.1. RAQ and QAW

There has been a notable shift in how businesses manage their operations and financial activities in recent years, with an increasing reliance on advanced digital technologies to optimize efficiency and performance (Kayed Abdelazeem Mohamed and Metwally 2024). The widespread adoption of digital transformation in corporate environments has introduced opportunities and challenges within auditing. Auditors now face increasingly sophisticated and complex IT systems, which require advanced skill sets and a deeper understanding of digital infrastructures. These technological advancements present potential hurdles, particularly in understanding and assessing the intricate systems underpinning modern business processes. However, they also offer a range of opportunities that have yet to be fully explored in academic research and practical application (Shin et al. 2013; Silva et al. 2023).

A significant transformation in the field is the shift toward RA. This advancement represents a departure from traditional audit practices, which are more retrospective in nature. The introduction of RA has prompted considerable academic inquiry into its impact on audit protocols and overall audit quality. However, the rapid adoption of these advanced technologies also raises questions regarding their implications for the traditional audit framework, including concerns about maintaining audit independence, ensuring the reliability of automated processes, and safeguarding against cyber threats (Alma'aitah et al. 2024; Li et al. 2023). Having said this, the QAW literature includes mixed results regarding how RA impacts the QAW

Many studies have pointed out the advantages of RA and how it can improve QAW and efficiency of audits. For instance, Li et al. (2023) and Saputro and Mappanyukki (2022) reported that RA improves audit effectiveness, while Christ et al. (2021) stated that the transition from traditional auditing to RA has not reduced internal audit quality. Furthermore, Butarbutar and Pesak (2021) and Lorentzon et al. (2024) found that compared to auditors who work on-site, remote work provides flexibility, job satisfaction, and improved work–life balance, thereby reducing the effort consumption and working hours of auditors as demonstrated by increased performance metrics and QAW. In addition, RA helps encourage better management of time and lower audit expenses (Hannon 2020), improved job productivity (Farcane et al. 2023; Barretto et al. 2022), enhanced job satisfaction (Farcane et al. 2023), and improved QAW (Maharaja et al. 2022; Rachmad et al. 2023).

On the contrary, some studies reported that stakeholder trust in audit evidence quality does not significantly differ between methods (Jin et al. 2022; Eulerich et al. 2022). RA does not reduce the professional skepticism and ethics for the audit engagement (Julianti and Muhyarsyah 2023; Ovaska and Murphy 2022). Castka et al. (2021) found that rates of submission (compliance reports) did not change. According to Saputro and Mappanyukki (2022), RA does not moderate the influence of professional skepticism on QAW. Other studies in the literature have reported the negative impact of RA on QAW. RA was found to reduce efficiency and overall QAW (Thompson 2022; Jin et al. 2022), as auditors must have access to all companies' files and data, which add time pressure as they need to review many records and datasets. Additionally, relying only on RA is not applicable in auditing as reviewing data remotely limits the auditor's ability to obtain enough evidence, which may cause them to draw inappropriate inferences (Albitar et al. 2021; Saleem 2021; Thompson 2022).

In the Egyptian context, many studies have concentrated on issues that may hinder achieving higher levels of QAW in the Egyptian audit market, such as a dearth of skilled auditors, lack of auditors' independence, market concentration degree, and non-compliance with appropriate laws during audit engagement (Wahdan et al. 2006; Elmashtawy et al. 2023; Mohamed and Habib 2013). Moreover, other studies have highlighted that the QAW problem is not in small and medium audit firms only, as it is extended to include the Big Four audit firms working in Egypt as well as governmental auditors and authorities, which represent a severe problem in the auditing profession in Egypt (El-Dyasty and Elamer 2021). Contrary to these negative results, some studies like Eldaly et al. (2022) and Elmashtawy

et al. (2023) have discussed the recent changes in the Egyptian regulations, opening the market to foreign investment, and governmental controls has led to higher levels of audit quality in the market. These changes, along with the changes in the governmental version 2030 that concentrate on digital transformation of all aspects of the governmental and economic transactions, require study to understand how they may impact the overall QAW in the Egyptian context (Elgohary and Abdel-Aziz 2023).

Theoretically, QAW has been examined through various frameworks in the literature. Most studies have applied agency theory, arguing that enhanced audit quality is crucial for resolving the principal-agent problem, as higher QAW leads to greater transparency, reducing both information asymmetry and agency costs (Elmashtawy et al. 2023). Simultaneously, resource dependence theory suggests that auditor effectiveness and remote protocols can equip audit teams with the necessary knowledge and resources, and provide advisory services to inform strategic decisions, thereby improving QAW. Additionally, stakeholder and stewardship theories have been proposed to explain how QAW can meet the diverse expectations of the company's stakeholders (Handayati et al. 2022; Kusumawati and Syamsuddin 2018).

To sum up, much of the existing research has been focused on either the relationship between remote auditing (RA) and remote audit quality (RAQ) or the impact of RA on the quality of audit work (QAW). However, there remains a significant gap in understanding how the quality of remote audits (RAQ) directly influences the overall quality of audit engagements within audit firms (QAW). Given that RA has become an integral component of audit procedures for many firms, it is crucial to acknowledge that RAQ can substantially affect the overall audit outcomes and the audit firm's reputation for quality work. Despite the clear and growing shift towards RA as a prominent method in the audit process, this crucial link between RAQ and the overall QAW has been relatively neglected in academic research. Therefore, we propose the following hypothesis:

H1. *There is a positive association between RAQ and QAW.*

4.2. Technology Readiness Moderating Role

Many researchers outline the necessity of technological readiness (TR) for auditors and their clients to ensure higher levels of QAW (Alma'aitah et al. 2024; Li et al. 2023). A key aspect of this readiness is the availability of adequate technological infrastructure, including the right tools, equipment, and software, and the systems necessary for efficient communication and data management. These factors are critical in determining whether remote auditing can be effectively implemented (Eulerich et al. 2022). Hannon (2020) further emphasizes that having the necessary technological skills and providing ongoing technical training and familiarity with technology are equally crucial for ensuring that audits are conducted successfully. Therefore, the technical capabilities of the audit team, in combination with their technological proficiency, play a pivotal role in determining the quality and efficiency of the audit process (Alma'aitah et al. 2024).

Technological competency is essential for auditors to fully leverage from the new technologies, ultimately leading to enhanced audit outcomes and greater efficiency in auditing tasks. However, for these benefits to be realized, both the auditors and their clients must be well-versed in using these technologies. Without the appropriate knowledge and skills, the potential advantages of advanced audit tools remain untapped, potentially compromising the overall QAW (Castka et al. 2020; Farcane et al. 2023). Moreover, the technological infrastructure must be robust enough to support the needs of auditors while performing the audit engagement (Alma'aitah et al. 2024; Li et al. 2023).

A well-established technological infrastructure enhances the accuracy of auditing and accounting activities and reduces the likelihood of errors by the audit staff, contributing to more reliable and accurate audit results. This, in turn, improves overall audit quality by streamlining the process, minimizing human errors, and increasing the precision of audit outcomes (Saleem and Oleimat 2020). Therefore, the seamless integration of technology

into the auditing process is fundamental to achieving higher QAW and ensuring the effectiveness of the audit process (Alma'aitah et al. 2024).

If technology is not effectively integrated into the auditing process, the likelihood of audit risks rises substantially, placing greater responsibility on auditors to mitigate these challenges (Li et al. 2023). Inadequate application of technological tools can lead to errors in data interpretation, miscommunication, and ultimately affect the accuracy of audit findings, thereby compromising QAW. Furthermore, the auditor's capacity to detect discrepancies or irregularities may be hindered, especially in a remote environment where reliance on digital tools is essential for gathering and assessing financial data (Alma'aitah et al. 2024).

However, these risks are significantly reduced when technology is utilized to its full potential. Optimally applied technological solutions enhance audit accuracy, improve data flow, and allow auditors to execute their tasks more precisely and quickly. This leads to better audit results and a reduction in the overall audit risk, reinforcing the auditor's ability to deliver high-quality outcomes even in a remote setting (Jin et al. 2022). The use of advanced technology in audits not only supports the accuracy of the audit process but also strengthens the reliability of findings, ultimately enhancing the audit's trustworthiness in the stakeholders' eyes (Alma'aitah et al. 2024).

Regarding client TR, companies must have advanced systems like ERP to enhance its operations and have proper internal controls that reduce the number of errors and frauds in their operations (Kayed Abdelazeem Mohamed and Metwally 2024). This will reduce the audit risk for auditors and reduce the amount of audit evidence needed for the audit engagement (Alma'aitah et al. 2024). Having said this, client TR will help auditors to reach evidence faster, reducing the amount of time consumed to analyze evidence collected as many analytical procedures may be done electronically in no time (Shin et al. 2013; Silva et al. 2023).

In that sense, it is apparent that technological readiness for both auditors and their clients is crucial for reaching higher levels of QAW. As previously mentioned, a robust technological infrastructure and the competency of the auditors play key roles in realizing the benefits of these tools. Without proper implementation, however, technology may become a source of risk rather than an asset. Thus, successful auditing hinges on the effective application of digital tools, which, when combined with the necessary skills and infrastructure, can result in improved QAW through reaching a reduced number of errors, and increased confidence in the audit process. This creates a clear link between technological efficiency, audit risk, and the overall success of audits. Finally, this link is also supported theoretically by the TOE model, which firms use to assess readiness for technology adoption (Tornatzky and Fleischer 1990).

For any new technology to be embedded in place, we need to understand how the community and people will respond to it, as in many studies in the literature resistance has been reported to any sort of change to the known norms of community (Diab and Metwally 2020; Metwally and Diab 2021). This is why we need theories that can help us understand and explain how technologies can be accepted and embedded in place to implement these new technologies smoothly. Having the TAM model in our theoretical framework is useful to explain the perceptions of users affected by the technologies and their intention to use it, which results in actual usage in the long run (Davis 1989).

H2. *There is a positive relationship between client TR and QAW.*

H3. *There is a positive relationship between audit firm TR and QAW.*

H4. *Client TR moderates the relationship between RAQ and QAW.*

H5. *Audit firm TR moderates the relationship between RAQ and QAW.*

5. Materials and Methods

5.1. Study Measures and Data Collection Method

A cross-sectional quantitative approach was conducted to obtain and analyze the required data. The required data was gained through developing a self-structured questionnaire. The questionnaire was designed to include two distinctive sections. The first section collects the participant's demographic characteristics (i.e., name, age, education level, number of experience years, the existence of professional certifications, the audit firm size), and the second section was developed to collect data regarding the study of main constructions.

To obtain the required data, a convenience sampling approach was selected, targeting auditors actively engaged within audit firms across Egypt. The research population consisted of professionals occupying various hierarchical positions in the audit process, including audit managers, audit partners, senior auditors, auditors, and assistant auditors. This demographic diversity was crucial for ensuring a representative sample from the auditing sector. The data collection phase commenced in June 2024 and continued over a span of three months. Throughout this period, a total of 400 surveys were disseminated to the identified participants. Of these, 280 responses were successfully completed and returned, resulting in a commendable response rate of 70%; it is noteworthy that no data was missing from the returned questionnaires, which strengthens the reliability and validity of the dataset for subsequent analysis.

We reviewed the previous literature to operationalize the study constructs to find valid and reliable measures. Five variables were employed to measure RAQ derived from Li et al. (2023); participants were asked how regularly they performed the following practices during RA: (1) "welcome weak client explanations"; (2) "conduct superficial reviews of client documents"; (3) "failed to research an accounting principle"; (4) "reduced the amount of work performed on an audit to less than reasonable time"; and (5) "signed off on an audit program step without completing the work or noting the omissions". We employed a five-point Likert scale where "1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; and 5 = Nearly always". To measure QAW, we employed a scale of 15 variables derived from the previous studies of Sulaiman (2013), Saiewitz and Kida (2018), Castka et al. (2021), Wojcak et al. (2016), Jin et al. (2022), Lugli and Bertacchini (2023), Farcane et al. (2023), Serag and Daoud (2021), Albitar et al. (2021), and Figa et al. (2023). TR was measured with 11 variables, 5 variables was employed to measure client technological readiness, while 6 variables were employed to measure audit firm technological readiness based on the studies of Picciotti (2020), Saleem and Oleimat (2020), Hannon (2020), Castka et al. (2021), Chan et al. (2018), and Farcane et al. (2023). All study variables are shown in Appendix A.

5.2. Demographic Analysis

Table 1 shows the demographics of the study participants. Statistics regarding firm type show that most employees work in local medium and small firms (67%), whereas the smallest respondents' percentage was from the Big Four audit companies (13%). Statistics pertaining to respondents' positions indicate that the largest respondents' percentage was from auditors (38%), followed by assistant auditors (26%), then senior auditors (19%) and audit managers (12%), whereas the lowest percentage was from audit partners (5%). Participants' experience in years show that most responses were from less experienced employees (91% for employees with 1–5 and 6–10 years of experience, at 42% and 49% respectively), whereas 7% of respondents have 11–15 years of experience, and only 2% of respondents have more than 15–15 years of experience. This is normal, as the largest percentage of respondents work in local medium and small firms. Finally, regarding professional certification, statistics show that a high percentage of respondents hold the Egyptian Certified Public Accountant (ECPA) certificate (36%), followed by a big difference with the CMA (11%), then the CPA (9%) and ACCA (2%). Eighteen percent of respondents have other professional certifications, e.g., CIA, CERT IFR, dipifr, CFE, CFA, or CFM. Nevertheless, a significant percentage of respondents (24%) do not have any professional certifications.

Table 1. Respondents’ profile (n = 280).

Variable	Classification	Number	%
Firm Type	Big Four	36	13%
	Local large firm	67	24%
	Local medium and small firms	177	63%
Position	Assistant auditor	73	26%
	Auditor	106	38%
	Senior auditor	53	19%
	Audit manager	34	12%
	Audit partner	14	5%
	Experience	1 to 5 years	117
Experience	6 to 10 years	138	49%
	11 to 15 years	20	7%
	>15 years	5	2%
	Professional certification	ECPA	101
Professional certification	CPA	25	9%
	ACCA	5	2%
	CMA	32	11%
	Other, e.g., CIA, CERT IFR, dipifr, CFE, CFA, CFM	49	18%
	None	68	24%

5.3. Dealing with Common Method Variance

In behavioral and social science studies, the existence of “common method variance” (CMV) in the employed measures can cause a severe threat to the validity of study results [88]. This issue (CMV) has the ability to influence variables’ reliability, change the variation between latent variables, and subsequently impact the structural path (Jagpal 1982). To address this issue, we adopted the recommendations of Podsakoff et al. (2003), using Harman’s one-factor test in EFA where all variables were set to load on only one construct and the results indicate that this one variable explains only 41% of variation, indicating that CMV did not significantly impact the outcomes of this study.

5.4. Data Analysis Methods

Smart partial least squares (Smart-PLS v4) software was utilized to evaluate the research model. Smart-PLS is a nonparametric method developed to examine latent factors that cannot be observed directly. Henseler et al. (2015). Smart-PLS is highly recognized in the context of social sciences for its capacity to create reliable results, specifically when testing interrelationships between various variables (Wetzels et al. 2009). It is specifically well-fitted for research that target to predict the dependent variables rather than confirm an existing theory (Hair et al. 2019). The analysis followed a two-phase procedure per Leguina’s criteria (Leguina 2015). In the initial phase, the main focus was on validating the convergent and discriminant validity, while the subsequent stage was exclusively dedicated to investigating the hypotheses put forth in the research.

6. Results

6.1. Outer Measurement Model Assessment

Several criteria were employed to evaluate the measurement model as recommended by Hair et al. (2019). First, factor loadings should be more 0.5; as shown in Table 2, all factor loadings significantly surpassed the minimum recommended 0.5 value. Second, the

calculated “Composite Reliability” (CR) values should exceed 0.70; as shown in Table 2, all CR values ranged from 0.936 to 0.94, and indicated a high level of internal reliability for all reflective factors. Third, the “Average Variance Extracted” (AVE) scores should exceed the value of 0.05, to approve convergent validity; all value of AVE ranged from 0.0608 to 0.806 and exceeded the suggested value of 0.50, approving convergent validity. Finally, the variables’ internal reliability, as signaled by “Cronbach’s Alpha” (α), consistently surpassed the minimum value of 0.70, and ranged from 0.916 to 0.957, confirming the robustness and consistency of the study measures as shown in Table 2. Moreover, to evaluate the factors discriminant validity, Fornell and Larcker (1981)’s criterion (Table 3) and the cross-loading (Table 4) were calculated and inspected.

Table 2. Validity and reliability of study measures.

Factors/Items	Factor Loadings	t	α	CR	AVE	VIF
Audit Firm Technological Readiness			0.916	0.936	0.711	
AFTR_1	0.910	50.759				3.062
AFTR_2	0.937	68.751				4.020
AFTR_3	0.873	34.427				3.971
AFTR_4	0.892	38.237				3.900
AFTR_5	0.698	20.257				3.770
AFTR_6	0.718	12.870				1.767
Quality of Audit Work			0.957	0.959	0.608	
QAW1	0.693	11.103				1.886
QAW10	0.800	17.571				4.987
QAW11	0.873	18.250				4.577
QAW12	0.781	26.865				3.571
QAW13	0.774	16.698				2.864
QAW14	0.750	16.336				4.462
QAW15	0.787	14.240				4.553
QAW2	0.693	16.771				3.212
QAW3	0.738	17.609				3.419
QAW4	0.743	19.730				4.495
QAW5	0.880	19.944				4.818
QAW6	0.872	26.569				4.497
QAW7	0.787	24.689				4.689
QAW8	0.741	16.437				2.452
QAW9	0.755	14.224				4.288
Client Technological Readiness			0.939	0.950	0.790	
CTR_1	0.888	14.649				4.647
CTR_2	0.895	29.483				3.164
CTR_3	0.894	30.236				2.522
CTR_4	0.892	31.369				2.239
CTR_5	0.876	39.211				1.608
Remote Auditing Quality			0.941	0.954	0.806	
RAQ1	0.837	33.559				1.362
RAQ2	0.857	25.849				2.512
RAQ3	0.884	26.844				4.179
RAQ4	0.956	27.226				4.240
RAQ5	0.948	120.829				4.457

Table 3. Fornell and Larcker criterion—discriminant validity.

	1	2	3	4
1—Audit Firm Technological Readiness	0.843			
2—Quality of Audit Work	0.494	0.780		
3—Client technological Readiness	0.351	0.537	0.889	
4—Remote Auditing Quality	0.152	0.295	0.557	0.898

Table 4. Cross-loading scores.

	Audit Firm Technological Readiness	Quality of Audit Work	Client Technological Readiness	Remote Auditing Quality
AFTR_1	0.910	0.445	0.308	0.123
AFTR_2	0.937	0.428	0.308	0.097
AFTR_3	0.873	0.410	0.235	0.108
AFTR_4	0.892	0.390	0.288	0.056
AFTR_5	0.698	0.471	0.392	0.207
AFTR_6	0.718	0.309	0.200	0.172
QAW1	0.554	0.693	0.487	0.322
QAW10	0.228	0.800	0.340	0.132
QAW11	0.262	0.873	0.386	0.227
QAW12	0.316	0.781	0.332	0.174
QAW13	0.241	0.774	0.328	0.137
QAW14	0.244	0.750	0.321	0.066
QAW15	0.244	0.787	0.336	0.104
QAW2	0.547	0.693	0.480	0.321
QAW3	0.586	0.738	0.557	0.369
QAW4	0.580	0.743	0.559	0.372
QAW5	0.253	0.880	0.368	0.218
QAW6	0.249	0.872	0.360	0.200
QAW7	0.304	0.787	0.337	0.156
QAW8	0.220	0.741	0.294	0.102
QAW9	0.241	0.755	0.332	0.076
CTR_1	0.265	0.374	0.888	0.461
CTR_2	0.281	0.399	0.895	0.485
CTR_3	0.268	0.403	0.894	0.491
CTR_4	0.358	0.575	0.892	0.501
CTR_5	0.350	0.556	0.876	0.522
RAQ1	0.079	0.191	0.503	0.837
RAQ2	0.190	0.219	0.430	0.857
RAQ3	0.188	0.194	0.442	0.884
RAQ4	0.130	0.331	0.558	0.956
RAQ5	0.115	0.325	0.543	0.948

The off-diagonal scores (in bold) in Table 3: “Fornell and Larcker criterion” are the square root of AVE and should exceed the shared scores between the study factors (below the bold values) (Hair et al. 2019) to approve discriminant validity. As shown in Table 3 the study measures have adequate discriminant validity. Cross-loading (Table 4) further approves discriminant validity where each variable signals a high correlation to its predetermined factor as compared to any other factors employed.

6.2. Hypotheses Results (Structural Model Evaluation)

Before testing the research hypotheses using the PLS-SEM method, the researchers must first address any collinearity issue as Hair et al. (2019) suggested to confirm the results’ validity [2021].

To inspect the existence of collinearity, the tolerance levels were inspected by the value VIF (Variance Inflation Factor) which should be below 5.00; as shown in Table 4, collinearity is not a problem in our model. Furthermore, it is essential to assess the predictive power of the proposed model before testing the study hypotheses (Leguina 2015; Sarstedt et al. 2021; Chin 1998; Hair et al. 2014), the values of R², and Q² effect sizes were inspected. Our study’s endogenous variable is QAW, which shows a high R² value of 0.464 and the Q² value equals 0.425, which proves that the model has a high predictive power.

The bootstrapping technique with 5000 subsamplings was run to evaluate the significance of the path coefficients, and the related t values to accept or reject the proposed hypotheses in the tested model, as shown in Table 5.

Table 5. Hypotheses evaluation.

Hypotheses	β	T	p	Result
RAQ -> QAW	0.180	2.465	0.014	Supported
Client technological Readiness -> QAW	0.546	8.386	0.000	Supported
Audit Firm Technological Readiness -> QAW	0.273	4.486	0.000	Supported
Moderating effects				
Client technological Readiness x RAQ -> QAW	0.228	5.247	0.000	Supported
Audit Firm Technological Readiness x RAQ -> QAW	-0.140	2.775	0.006	Supported

The study has five predetermined and justified hypotheses, three direct and two moderations, as pictured in Figure 1. As shown in Figure 1, RAQ was found to have a positive and significant impact of QAW with a path coefficient of 0.180, a t-statistic of 2.465, and a p-value below 0.05, supporting Hypothesis 1 (H1). Similarly, for Hypothesis 2 (H2), a positive and significant impact of client technological readiness on QAW was noted ($\beta = 0.546, t = 8.386, p < 0.001$), supporting H2. This result is consistent with the findings of Jin et al. (2022), Alma’aitah et al. (2024), and Sigle et al. (2024). Hypothesis 3 (H3) was also confirmed, indicating a positive and significant impact of audit firm technological readiness on QAW. The path evaluation showed a path coefficient of 0.273, a t-statistic of 4.486, and a p-value below 0.001. This finding is confirmed by the results reported by Saleem and Oleimat (2020), Li et al. (2023), Alma’aitah et al. (2024), and Sigle et al. (2024).

For moderating analysis, the PLS-SEM findings showed that the positive impact of RAQ on QAW was strengthened with the moderation effect of client technological readiness ($\beta = 0.228, t = 5.247, p < 0.001$), accepting H4 as shown in Figure 2a; one standard deviation below the average (the red line) is negative and goes down, but one standard deviation above the average (green line) shows a slope that is steeply positive, which indicates that the relationship between RAQ and QAW is amplified with the moderating effect of client technological readiness. However, the positive impact of RAQ on QAW was dampened with the moderation effect of audit firm technological readiness ($\beta = -0.140, t = 2.775, p < 0.01$), accepting H5 as shown in Figure 2b, which implies that the positive and significant impact of RAQ on QAW is still positive and significant after the moderation

while its positive impact is weaker on the dependant variable. This unique result can be explained contextually, as most of the audit firms in our sample were small and medium audit firms, who may not be aware about the importance of TR to audit firms, or may be lacking the needed skills to use the sudden increase in the use of technologies in their audit procedures. This result, affirm early findings in the Egyptian context that discussed the lack of skills and training in many audit firms in Egypt, which was one of the main reasons for lower QAW (Wahdan et al. 2006; Elmashtawy et al. 2023; Mohamed and Habib 2013). Theoretically, TAM was useful in this regard as imposing new technologies due to the acceleration of remote audits and teleworking in recent years has led to implicit resistance, which is apparent in the negative impact. Finally, the study model demonstrates a high level of quality and explanatory proportion, which were able to explain 46.4% of the variance in QAW.

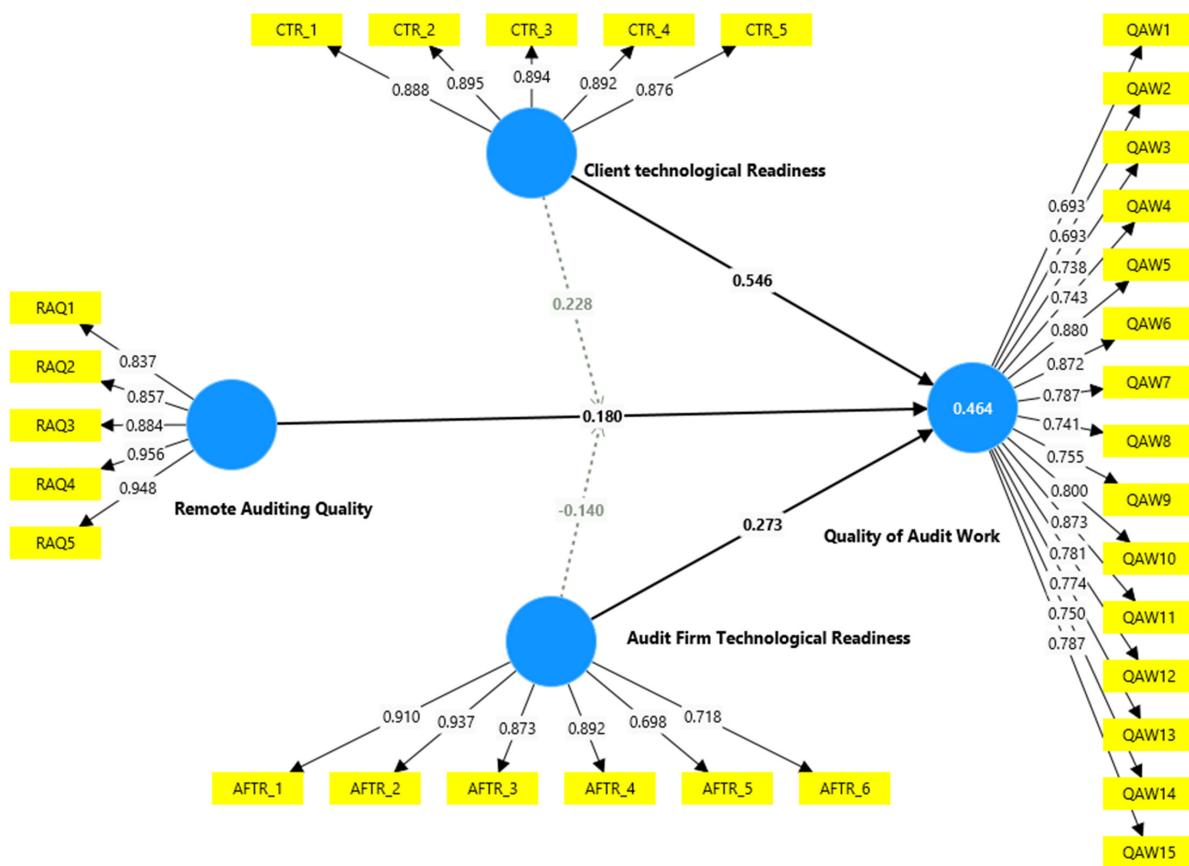


Figure 1. PLS-SEM model findings.



Figure 2. Slope analysis for the moderating effects. (a) Client technological readiness x RAQ; (b) audit firm technological readiness x RAQ.

7. Discussion and Conclusions

This study examines the impact of RAQ on QAW. Further, it examines the moderating effect of both CLTR and ADTR on the relationship between RAQ and QAW. Data was collected through a questionnaire survey distributed to all external auditors working in Egypt. The final sample consists of 280 auditors. The results revealed that RAQ has a positive and significant impact on QAW. This result represents one of the main significant contributions of the current study, as the RAQ was found to positively and significantly enhance the overall QAW in the Egyptian context. This result is different from what early studies have concluded as some studies found that RA, not RAQ, positively impacts QAW (Alma'aitah et al. 2024; Hawkins 2017; Picciotti 2020; Butarbutar and Pesak 2021; Serag and Daoud 2021; Maharaja et al. 2022; Saputro and Mappanyukki 2022; Figa et al. 2023; Farcane et al. 2023; Li et al. 2023; Lorentzon et al. 2024). Also, our results are different from studies that reported no or negative relationship between RA and QAW (Hannon 2020; Castka et al. 2021; Eulerich et al. 2022; Julianti and Muhyarsyah 2023; Castka et al. 2021; Saleem 2021; Jin et al. 2022; Thompson 2022).

Moreover, our study results affirmed H2, which implies that client TR has a positive and significant impact on QAW. This result is consistent with the findings of Jin et al. (2022), Alma'aitah et al. (2024), and Sigle et al. (2024). In addition, Hypothesis 3 (H3) was also confirmed, indicating a positive and significant impact of audit firm technological readiness on QAW. This finding is confirmed by the results reported by Saleem and Oleimat (2020), Li et al. (2023), Alma'aitah et al. (2024), and Sigle et al. (2024). These findings are important indications of the importance of investing in technology, as it is found to be important to both clients and audit firms. Technology importance also was prevalent in enhancing QAW, which in return can be explained theoretically by reducing the agency costs and information asymmetry (Lin 2018; Komal et al. 2022; Usman et al. 2023). Hence, we can infer that advancing client and audit firm TR will directly enhance audit quality and indirectly reduce agency cost and information asymmetry (Salem et al. 2023; Usman et al. 2023).

Moreover, the results revealed that CLTR and ADTR moderate the relationship between RAQ and QAW, affirming both H4 and H5. CLTR was found to have a positive moderating role as CLTR was found to strengthen the relationship between RAQ and QAW. Meanwhile, ADTR was found to have a negative significant impact on the relationship between RAQ and QAW. The positive moderating impact of CLTR can be explained through the TOE framework, as the existence of mature technological infrastructure that interacts with the surrounding environment intra- or /and inter-organization helps in enhancing the internal control systems and increasing the accuracy of operations, which in return increases the overall QAW (Alma'aitah et al. 2024).

Regarding ADTR's moderating role, the negative moderating impact the results revealed indicate that the positive and significant impact of RAQ on QAW remains positive even after the moderation effect is applied. However, this effect appears to weaken the positive influence on the dependent variable (i.e, QAW). This result can be contextually explained by the fact that most of the audit firms included in the sample were small- and medium-sized, which may not fully appreciate the critical importance of technological readiness (TR) to audit firms. Furthermore, these firms may lack the necessary skills to effectively integrate the sudden surge in technological use within their auditing procedures. This explanation aligns with earlier studies in the Egyptian context, such as those by Wahdan et al. (2006), Elmashtawy et al. (2023), and Mohamed and Habib (2013), which identified gaps in skill development and training within many audit firms in Egypt as a significant barrier to achieving higher QAW.

Theoretically, the technology acceptance model (TAM) has been instrumental in understanding this phenomenon. The introduction of new technologies, accelerated by the recent shift toward remote audits and teleworking, has likely encountered implicit resistance within these firms. This resistance is evident in the observed weakening of the positive impact of RAQ on QAW. The lack of technological competence, particularly among smaller

firms, has led to difficulties in adapting to remote auditing practices, thus reducing the overall effectiveness of audit quality despite the potential benefits of RAQ.

8. Implication, Limitations and Future Research

This research offers important theoretical insights by developing a conceptual framework that investigates the interplay between remote audit quality (RAQ), client technological readiness (CLTR), auditor technological readiness (ADTR), and quality audit work (QAW). Unlike earlier studies, which may have explored these variables in isolation, this study uniquely examines how CLTR and ADTR act as moderating factors influencing the relationship between RAQ and QAW. One of the study's key contributions lies in its focus on the critical role of RAQ in shaping overall QAW, highlighting the significance of technological readiness on both the client and auditor sides in determining audit effectiveness.

On the practical side, the current study recommends that in developing contexts like Egypt, auditors and clients should give priority to investing in proper technological infrastructure as it impacts their operations and the overall audit quality, as if technological infrastructure quality becomes lower, auditors will not perform their job successfully. Hence, in order to protect their reputation in the market and to reduce any possibility of frauds and misstatements in the client operations, proper technologies should be in place. Moreover, auditors should invest more on training programs to make their staff ready for this digital transformation and be able to implement remote audits more effectively.

Grounded in agency theory, the current study supports early findings in the literature that the increased audit quality will lead to reduced information asymmetry and consequently reduced agency costs (Alma'aitah et al. 2024; Castka et al. 2020; Farcane et al. 2023; Salem et al. 2023). In that sense, the implementation of remote auditing equipped with proper technologies by both the audit firm and the client will mitigate the agency problem as it will lead to higher levels of audit quality. Further, the current study results support the Technology–Organization–Environment (TOE) theory in many instances. As technological readiness represents an important aspect that affects organizations engaged in the audit process, it also affects the surrounding environment through changing the way of processing, and how information is communicated to interested parties.

Finally, we cannot ignore the importance of the technology acceptance model (TAM) in explaining the results, as technology acceptance is built in theory on perceived usefulness and ease-of-use. The first is already apparent, as auditors will benefit from implementing new technologies and adopting remote audits (Alma'aitah et al. 2024; Awa et al. 2015). However, perceived ease-of-use will vary depending on the contextual ramifications and audit firm size. Having advanced technologies and heavy training programs on these technologies is very expensive, and not all audit firms will find the cost–benefit analysis in favor of having these technologies. Having said this, in the Egyptian market, most of the audit firms are small or medium, which will find that moving to remote audits is not worth it in terms of the benefits they will gain in light of the huge cost they will pay. This explains the negative moderating impact of ADTR on the relationship between RAQ and QAW.

This study presents important findings, but several limitations need to be acknowledged. First, the use of cross-sectional data restricts the ability to make broad generalizations. Future research would benefit from utilizing longitudinal or panel data to better capture the evolving nature of the relationships between the variables studied. Additionally, expanding the scope of the research to include diverse settings, cultures, and countries could offer a more holistic perspective on the RAQ-QAW relationship. Qualitative approaches like interviews and quantitative data could yield deeper insights and enhance future studies. Moreover, examining the role of institutional pressures as a mediator between RAQ and QAW would be a valuable direction for future research. It would also be beneficial to investigate how remote audits affect audit efficiency and auditors' job satisfaction. Finally, it would be beneficial to investigate the implementation of certain technologies like blockchain and digital twins by clients as aspects of technological readiness and how they impact the audit quality. These avenues would provide a more

nuanced understanding of the subject, offering richer insights that quantitative methods alone might overlook.

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Data Availability Statement: Data are available upon request from researchers who meet the eligibility criteria. Kindly contact the corresponding author privately through e-mail.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Abbreviation	Variables	Sources
	Quality of audit work	Adopted from Saiewitz and Kida (2018), Castka et al. (2021), Sulaiman (2013), Wojcak et al. (2016), Jin et al. (2022), Lugli and Bertacchini (2023), Farcane et al. (2023), Serag and Daoud (2021), Albitar et al. (2021), and Figa et al. (2023)
QAW1	The audit is carried out in accordance with auditing standards (i.e., ethical standards, quality control standards).	
QAW2	The auditor provides good value for money to the audit client.	
QAW3	The audit work undertaken is based primarily on an assessment of the risks associated with the client 's financial statements.	
QAW4	The audit work is determined by a proper planning process.	
QAW5	The auditor does sufficient work to obtain sufficient evidence to support an audit opinion.	
QAW6	The role of the audit partner is at the centre of the audit process.	
QAW7	The work done in carrying out the audit is subject to review before the audit is completed.	
QAW8	The auditor reports the correct audit opinion on the financial statements.	
QAW9	The auditor is technically competent.	
QAW10	The auditor is independent.	
QAW11	The audit meets the quality standards applied internally by the audit firm.	

Abbreviation	Variables	Sources
QAW12	The audit is completed in a timely manner.	
QAW13	The auditor maintains a high level of documentation in the completed audit files.	
QAW14	The auditor maintains effective communication and interaction with the audit committee.	
QAW15	The audit firm is free from negative findings in inspection reports.	
Remote audit quality (during RA, how regularly they performed the following practices)		Adopted from Li et al. (2023)
RAQ1	Welcome weak client explanations	
RAQ2	Conduct superficial reviews of client documents	
RAQ3	Failed to research an accounting principle	
RAQ4	Reduced the amount of work performed on an audit to less reasonable time	
RAQ5	Signed off on an audit program step without completing the work or noting the omissions	
Technological readiness (TR)		Adopted from Picciotti (2020), Saleem and Oleimat (2020), Hannon (2020), Castka et al. (2021), Chan et al. (2018), Farcane et al. (2023).
Client technological readiness		
CTR_1	Technological proficiency in RA	
CTR_2	Technological infrastructure for RA	
CTR_3	Protocols to safeguard data security and privacy	
CTR_4	Anxiety to perform audit tasks remotely	
CTR_5	Network strength and stability	
Audit firm technological readiness		
AFTR_1	Adequate technology investment for RA	
AFTR_2	Audit team technological knowledge and skills for RA	
AFTR_3	Effective use of technology that improves the audit's outcomes	
AFTR_4	Continuous development for audit staff on emerging technologies	
AFTR_5	Protocols to safeguard the security and privacy of data	
AFTR_6	Network strength and stability	

References

- Abdelazim, Samir I., Abdelmoneim B. M. Metwally, and Saleh A. S. Aly. 2023. Firm characteristics and forward-looking disclosure: The moderating role of gender diversity. *Journal of Accounting in Emerging Economies* 13: 947–73. [CrossRef]
- Agustin, Fransisca. 2021. Internal audit response during and after COVID 19. *Akuntabilitas* 15: 293–306. [CrossRef]
- Ahmed Saad Abdelwahed, Ahmad Abd El Salam Abu-Musa, Hebatallah Abd El Salam Badawy, and Hosam Moubarak. 2024. Investigating the impact of adopting big data and data analytics on enhancing audit quality. *Journal of Financial Reporting and Accounting, ahead-of-print*.
- Albitar, Khaldoon, Ali M. Gerged, Hassan Kikhia, and Khaled Hussainey. 2021. Auditing in times of social distancing: The effect of COVID-19 on auditing quality. *International Journal of Accounting & Information Management* 29: 169–78. [CrossRef]
- Ali, Mohamed A. S., Saleh A. S. Aly, Samir I. Abdelazim, and Abdelmoneim B. M. Metwally. 2024. Cash holdings, board governance characteristics, and Egyptian firms' performance. *Cogent Business & Management* 11: 2302205.
- Alma'aitah, Ruba T., Krayyem Al-Hajaya, Nedal Sawan, and Abdulaziz Alzeban. 2024. The impact of remote auditing on audit quality: The moderating role of technology readiness. *Managerial Auditing Journal, ahead-of-print*.

- Al Shbail, Mohannad Obeid, Zaid Jaradat, Ahmad Al-Hawamleh, Allam Hamdan, and Abdalmuttaleb M. A. Musleh Alsartawi. 2024. Enhancing audit quality in non-Big 4 firms: The role of remote auditing and audit staff capabilities. *Journal of Financial Reporting and Accounting, ahead-of-print*. [CrossRef]
- Awa, Hart O., Ojiabo Ukoha Ojiabo, and Bartholomew Chinweuba Emecheta. 2015. Integrating TAM, TPB and TOE frameworks and expanding their characteristic constructs for e-commerce adoption by SMEs. *Journal of Science & Technology Policy Management* 6: 76–94.
- Barretto, C. R., G. M. Drumond, and M. P. Mexas. 2022. Remote audit in the times of COVID-19: A successful process safety initiative. *Brazilian Journal of Operations and Production Management* 19: e20221309. [CrossRef]
- Butarbutar, Tarida Elisa, and Pricilia Joice Pesak. 2021. Pengaruh Work from Home Dan Independensi Terhadap Kualitas Audit Internal Aparat Inspektorat Dalam Pengawasan Keuangan Daerah Kota Manado Selama Masa Pandemi (Studi Empiris Pada Inspektorat Kota Manado). *Jurnal Riset Akuntansi Dan Auditing, Goodwill* 12: 366–76.
- Castka, Pavel, Cory Searcy, and Sönke Fischer. 2020. Technology-enhanced auditing in voluntary sustainability standards: The impact of COVID-19. *Sustainability* 12: 4740. [CrossRef]
- Castka, P., X. Zhao, P. Bremer, M. Miroso, and L. Wood. 2021. RA and assessment during the COVID-19 pandemic in New Zealand and China. *Learnings from the Food Industry and Guidance for the Future*. pp. 1–24. Available online: <https://ir.canterbury.ac.nz/server/api/core/bitstreams/e3690f70-94d7-48d7-affc-9535b19254cf/content> (accessed on 27 September 2024).
- Chan, David Y., Victoria Chiu, and Miklos A. Vasarhelyi. 2018. New perspective: Data analytics as a precursor to audit automation. In *Continuous Auditing (Rutgers Studies in Accounting Analytics)*. Edited by David Y. Chan, Victoria Chiu and Miklos A. Vasarhelyi. Bingley: Emerald Publishing, pp. 315–22.
- Chin, W. Wynne. 1998. The partial least squares approach to structural equation modeling. In *Modern Methods for Business Research/Lawrence Erlbaum Associates*. Mahwah: Lawrence Erlbaum Associates Inc.
- Christ, Margaret H., Marc Eulerich, Ronja Krane, and David A. Wood. 2021. New Frontiers for Internal Audit Research. *Accounting Perspectives* 20: 449–75. [CrossRef]
- Dahawy, Khaled, and Teresa Conover. 2007. Accounting disclosure in companies listed on the Egyptian stock exchange. *Middle Eastern Finance and Economics* 1: 5–20.
- Dahawy, Khaled M., Nermeen F. Shehata, and Tad D. Ransopher. 2011. The state of accounting in Egypt: A case. *Journal of Business Cases and Applications* 3: 1–12.
- Davis, Fred D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 13: 319–40. [CrossRef]
- Diab, Ahmed, and Abdelmoneim B. M. Metwally. 2020. Institutional complexity and CSR practices: Evidence from a developing country. *Journal of Accounting in Emerging Economies* 10: 655–80. [CrossRef]
- Diab, Ahmed, Samir. I. Abdelazim, and Abdelmoneim B. M. Metwally. 2023. The impact of institutional ownership on the value relevance of accounting information: Evidence from Egypt. *Journal of Financial Reporting and Accounting* 21: 509–25. [CrossRef]
- El-Sayed Ebaid, Ibrahim. 2011. Corporate governance and investors' perceptions of earnings quality: Egyptian perspective. *Corporate Governance* 13: 261–73. [CrossRef]
- Elbayoumi, Ahmed F., Emad A. Awadallah, and Mohamed A. K. Basuony. 2019. Development of accounting and auditing in Egypt: Origin, growth, practice and influential factors. *The Journal of Developing Areas* 53: 205–20. [CrossRef]
- Eldaly, Mohamed Khaled, Ahmed A. Elamer, and Magdy Abdel-Kader. 2022. The influence of foreign direct investment on the Egyptian audit market: What do Big 4 partners' perceptions tell us? *Journal of Financial Reporting and Accounting* 22: 1039–61. [CrossRef]
- El-Dyasty, Mohamed M., and Ahmed A. Elamer. 2021. The effect of auditor type on audit quality in emerging markets: Evidence from Egypt. *International Journal of Accounting & Information Management* 29: 43–66. [CrossRef]
- Elgohary, Esam Mohamed, and Reham Oncy Abdel-Aziz. 2023. The effect of digital transformation on employment in Egypt: An applied study using ARDL model. *The Electronic Journal of Information Systems in Developing Countries* 89: e12240. [CrossRef]
- Elmashtawy, Ahmed, Mohd Hassan Che Haat, Shahnaz Ismail, and Faozi A. Almaqtari. 2023. Audit committee effectiveness and audit quality: The moderating effect of joint audit. *Arab Gulf Journal of Scientific Research, ahead-of-print*. [CrossRef]
- Eulerich, Marc, Martin Wagener, and David A. Wood. 2022. Evidence on internal AQ from transitioning to remote audits because of COVID-19. *Journal of Information Systems* 36: 219–34. [CrossRef]
- Farcane, Nicoleta, Ovidiu Constantin Bunget, Rodica Blidisel, Alin Constantin Dumitrescu, Delia Deliu, Oana Bogdan, and Valentin Burca. 2023. Auditors' perceptions on work adaptability in RA: A COVID-19 perspective. *Economic Research-Ekonomska Istraživanja* 36: 422–59. [CrossRef]
- Figa, Auli, Santy Santy, Selly Selly, and Jenny Jenny. 2023. The impact of the implementation of key audit matters in the 2022 independent auditor report of PT Bank Amar Indonesia TBK. *International Journal of Social Science, Education, Communication and Economics (SINOMICS JOURNAL)* 1: 831–36. [CrossRef]
- Fornell, Claes, and David F. Larcker. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research* 18: 39–50. [CrossRef]
- Grant, Christine A., Louise M. Wallace, and Peter C. Spurgeon. 2013. An exploration of the psychological factors affecting remote e-worker's job effectiveness, well-being and work-life balance. *Employee Relations* 35: 527–46. [CrossRef]

- Hair, Joe. F., Jr., Marko Sarstedt, Lucas Hopkins, and Volker. G. Kuppelwieser. 2014. Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review* 26: 106–21. [CrossRef]
- Hair, Joseph F., Jeffrey J. Risher, Marko Sarstedt, and Christian M. Ringle. 2019. When to use and how to report the results of PLS-SEM. *European Business Review* 31: 2–24. [CrossRef]
- Handayati, Puji, Yeut Hong Tham, Yuni Yuningsih, Sulis Rochayatun, and Meldona. 2022. Audit quality, corporate governance, firm characteristics and CSR disclosures—Evidence from Indonesia. *Journal of Corporate Accounting and Finance* 33: 65–78. [CrossRef]
- Hannon, Megan. 2020. The challenges of RA faced by the pharmaceutical industry. *Level 3* 15: 1–22.
- Hassan, Mostafa. Kamal. 2008. The development of accounting regulations in Egypt: Legitimizing the international accounting standards. *Managerial Auditing Journal* 23: 467–84. [CrossRef]
- Hawkins, Erin Michelle. 2017. When Auditors’ Skeptical Judgments Do Not Lead to Skeptical. Doctoral dissertation, University of South Carolina, Columbia, SC, USA.
- Henseler, Jörg, Christian M. Ringle, and Marko Sarstedt. 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science* 43: 115–35. [CrossRef]
- Jagpal, Harsharanjeet S. 1982. Multicollinearity in structural equation models with unobservable variables. *Journal of Marketing Research* 19: 431–39. [CrossRef]
- Jensen, Michael C., and William H. Meckling. 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3: 305–60. [CrossRef]
- Jin, Yige, Gaoliang Tian, Donghui Wu, and Xiangang Xin. 2022. RA and AQ: Evidence from the Field. Available online: <https://ssrn.com/abstract=4076612> (accessed on 25 September 2024). [CrossRef]
- Julianti, Pujihastuti Dwi, and Muhyarsyah Muhyarsyah. 2023. The effect of auditor ethics and auditor professional skepticism on aqwith remote audit as a moderation variable. *Journal of Social Research* 2: 3727–41. [CrossRef]
- Kayed Abdelazeem Mohamed, Mostafa, and Abdelmoneim Bahyeldin Mohamed Metwally. 2024. Technical Reserves Audit Challenges and Opportunities with the Emergence of ERP: Investigating Egyptian Auditors Perceptions. *Scientific Journal for Financial and Commercial Studies and Researches (SJFCSR)* 5: 443–82. [CrossRef]
- Knechel, W. Robert, Gopal V. Krishnan, Mikhail Pevzner, Lori B. Shefchik, and Uma K. Velury. 2013. Audit quality: Insights from the academic literature. *Auditing: A Journal of Practice and Theory* 32: 385–421. [CrossRef]
- Komal, Bushra, Chengang Ye, and Rami Salem. 2022. The impact of audit committee effectiveness on firms’ outcomes in China: A systematic review. *International Journal of Accounting and Information Management* 30: 583–99. [CrossRef]
- Kostem, Dilek. 2021. How the Auditing Profession Is Transforming to Meet Future Challenges. Available online: https://www.ey.com/en_ie/assurance/how-the-auditing-profession-is-transforming-to-meet-future-challenges (accessed on 25 September 2024).
- Kusumawati, A., and S. Syamsuddin. 2018. The effect of auditor quality to professional skepticism and its relationship to audit quality. *International Journal of Law and Management* 60: 998–1008. [CrossRef]
- Leguina, Adrian. 2015. A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). *International Journal of Research & Method in Education* 38: 220–21. [CrossRef]
- Li, Yueqi, Sanjay Goel, and Kevin Williams. 2023. Impact of remote audit on audit quality, audit efficiency, and auditors’ job satisfaction. *International Journal of Auditing* 27: 130–49. [CrossRef]
- Lin, Yu-Chun. 2018. The consequences of audit committee quality. *Managerial Auditing Journal* 33: 192–216. [CrossRef]
- Lorentzon, Johan Ingemar, Lazarus Elad Fotoh, and Tatenda Mugwira. 2024. Remote auditing and its impacts on auditors’ work and work-life balance: Auditors’ perceptions and implications. *Accounting Research Journal* 37: 1–18. [CrossRef]
- Lugli, Ennio, and Federico Bertacchini. 2023. Audit quality and digitalization: Some insights from the Italian context. *Meditari Accountancy Research* 31: 841–60. [CrossRef]
- Maharaja, Deswi Angeliney She, Ida Bagus Anom Yasa, and Paulus Subiyanto. 2022. Going concern assessment on audit quality during the covid-19 pandemic (case study at public accountant firm in Bali province). *Journal of Applied Sciences in Accounting, Finance and Tax* 5: 180–88. [CrossRef]
- Manita, Riadh, Najoua Elommal, Patricia Baudier, and Lubica Hikkerova. 2020. The digital transformation of external audit and its impact on corporate governance. *Technological Forecasting and Social Change* 150: 119751. [CrossRef]
- Metwally, Abdelmoneim, Abdelnasser Mohamed, and Salah Ali. 2021. The management report usefulness in lending decision: Investigating Egyptian credit managers perceptions. *Scientific Journal for Financial and Commercial Studies and Researches (SJFCSR)* 2: 1–53. [CrossRef]
- Metwally, Abdelmoneim B. M. 2022. The Materiality of Corporate Governance Report Disclosures: Investigating the Perceptions of External Auditors working in Egypt. *Scientific Journal for Financial and Commercial Studies and Researches (SJFCSR)* 3: 547–82. [CrossRef]
- Metwally, Abdelmoneim B. M., Ahmed A. M. Elsharkawy, and Mohamed I. Salem. 2024. The impact of corporate social responsibility on operating cash flow opacity: The moderating role of tax avoidance. *Cogent Business & Management* 11: 2390692.
- Metwally, Abdelmoneim B. M., Ahmed Diab, and Mostafa K. Mohamed. 2022. Telework operationalization through internal CSR, governmentality and accountability during the COVID-19: Evidence from a developing country. *International Journal of Organizational Analysis* 30: 1441–64. [CrossRef]
- Metwally, Abdelmoneim B. M., and A. Diab. 2023. An institutional analysis of the risk management process during the COVID-19 pandemic: Evidence from an emerging market. *Journal of Accounting & Organizational Change* 19: 40–62.

- Metwally, Abdelmoneim B. M., and Ahmed Diab. 2021. Risk-based management control resistance in a context of institutional complexity: Evidence from an emerging economy. *Journal of Accounting & Organizational Change* 17: 416–35. [CrossRef]
- Metwally, Abdelmoneim B. M., Salah A. M. Ali, and Abdelnasser T. I. Mohamed. 2020. Resilience and Agility as Indispensable Conditions for Sustaining Viable Supply Chain During Pandemics: The Case of Bahrain. Paper presented at the 2020 International Conference on Data Analytics for Business and Industry: Way Towards a Sustainable Economy (ICDABI), Sakheer, Bahrain, October 26–27; pp. 1–5.
- Mohamed, Diana Mostafa, and Magda Hussien Habib. 2013. Auditor independence, audit quality and the mandatory auditor rotation in Egypt. *Education, Business and Society* 6: 116–44. [CrossRef]
- Naseeb, Hala, Ahmed A. Diab, and Abdelmoneim Metwally. 2020. The impact of the COVID-19 pandemic on medical and travel insurance pricing and fraud risks: An exploratory study. *Journal of Risk Management in Financial Institutions* 14: 59–71. [CrossRef]
- Naseeb, Hala, and Abdelmoneim Metwally. 2022. Outsourcing insurance in the time of COVID-19: The cyber risk dilemma. *Journal of Risk Management in Financial Institutions* 15: 155–60. [CrossRef]
- Ovaska, S., and M. Murphy. 2022. A Needed Push into Remote Auditing. *Journal of Accountancy*. Available online: www.journalofaccountancy.com/news/2022/may/needed-push-into-remote-auditing.htm (accessed on 7 September 2024).
- Piccotti, Daniella. 2020. Remote quality management system audits: An ISO 9001 auditor's perspective and lessons learned. *Quality* 59: 52–55.
- Podsakoff, Philip M., Scott B. MacKenzie, Jeong-Yeon Lee, and Nathan P. Podsakoff. 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology* 88: 879. [CrossRef] [PubMed]
- Rachmad, Yoesoep Edhie, Hedar Rusman, Samuel PD Anantadjaya, Moch Arif Hernawan, and Diksi Metris. 2023. The role of computer assisted audit techniques, professional skepticism and remote auditing on quality of audit in public accountant office. *Journal of Economic, Business and Accounting (COSTING)* 6: 2180–92. [CrossRef]
- Raimo, Nicola, Filippo Vitolla, Arcangelo Marrone, and Michele Rubino. 2021. Do audit committee attributes influence integrated reporting quality? An agency theory viewpoint. *Business Strategy and the Environment* 30: 522–34. [CrossRef]
- ROSC. 2004. *Egypt—Report on the Observance of Standards and Codes, Corporate Governance Country Assessment*. Washington, DC: World Bank Group, pp. 1–41.
- Saiewitz, Aaron, and Thomas Kida. 2018. The effects of an auditor's communication mode and professional tone on client responses to audit inquiries. *Accounting, Organizations and Society* 65: 33–43. [CrossRef]
- Saleem, Khalil. 2021. The impact of the coronavirus pandemic on auditing quality in Jordan. *International Journal of Innovation, Creativity and Change* 15: 31–40.
- Saleem, Khalil, and Ibrahim M. Oleimat. 2020. The impact of computerized auditing in reducing audit risks in Jordan. *International Journal of Academic Research in Business and Social Sciences* 10: 284–98. [CrossRef]
- Salem, Rami Ibrahim A., Musa Ghazwani, Ali Meftah Gerged, and Mark Whittington. 2023. Anti-corruption disclosure quality and earnings management in the United Kingdom: The role of audit quality. *International Journal of Accounting & Information Management* 31: 528–63.
- Saputro, Kristiyanto Bayu, and Ratna Mappanyukki. 2022. The effect of skepticism, time pressure, and remote audit during the COVID-19 pandemic on audit quality: A study of auditors' perception. *Jurnal Tata Kelola Dan Akuntabilitas Keuangan Negara* 8: 81–98. [CrossRef]
- Sarstedt, Marko, Christian M. Ringle, and Joseph F. Hair. 2021. Partial least squares structural equation modeling. In *Handbook of Market Research*. Cham: Springer International Publishing, pp. 587–632.
- Serag, Asmaa Abd El-moneim, and Mona Mohammed Daoud. 2021. Remote Auditing: An Alternative Approach to Face the Internal Audit Challenges During The COVID-19 Pandemic. *Journal of Accounting Thought* 25: 228–59. [CrossRef]
- Sharma, Divesh S., El'fred Boo, and Vineeta D. Sharma. 2008. The impact of non-mandatory corporate governance on auditors' client acceptance, risk and planning judgments. *Accounting and Business Research* 38: 105–20. [CrossRef]
- Shin, Il-hang, Myung-gun Lee, and Woojin Park. 2013. Implementation of the continuous auditing system in the ERP-based environment. *Managerial Auditing Journal* 28: 592–627. [CrossRef]
- Siew, Eu-Gené, Khairina Rosli, and Paul H. P. Yeow. 2020. Organizational and environmental influences in the adoption of computer-assisted audit tools and techniques (CAATs) by audit firms in Malaysia. *International Journal of Accounting Information Systems* 36: 100445. [CrossRef]
- Sigle, Maarten, Stephan Muehlbacher, Lisette E. C. J. M. van der Hel, and Erich Kirchler. 2024. Tax Audit Quality: The Role of Experience and Technology Readiness in a Digitalized World (16 April 2024). WU International Taxation Research Paper Series No. 2024-02. Available online: <https://ssrn.com/abstract=4796000> (accessed on 7 September 2024).
- Silva, Tiago, Rui Pedro Marques, and Graça Azevedo. 2023. The Impact of ERP Systems in Internal Auditing: The Portuguese Case. *Procedia Computer Science* 219: 963–70. [CrossRef]
- Sulaiman, Noor Adwa. 2013. Audit Quality in Practice: A Study of Perceptions of Auditors, Audit Committee Members and Quality Inspectors. Doctoral dissertation, University of Manchester, Manchester, UK.
- Thompson, Kristen. 2022. Out of Office: Examining How Remote Auditing Can Affect Audit Quality. Ph.D dissertation, University of South Carolina, Columbia, SC, USA.
- Tornatzky, Louis G., and Mitchell Fleischer. 1990. *The Processes of Technological Innovation*. Lexington: Lexington Books.

- Usman, Muhammad, Jacinta Nwachukwu, Ernest Ezeani, Rami Ibrahim A. Salem, Bilal Bilal, and Frank Obenpong Kwabi. 2023. Audit quality and classification shifting: Evidence from UK and Germany. *Journal of Applied Accounting Research*, ahead-of-print. [CrossRef]
- Wahdan, M. A., P. H. M. Spronck, H. F. Ali, E. Vaassen, and H. J. Van den Herik. 2006. Auditing in Egypt: A study of the legal framework and professional standards. In *International Management Development Research Yearbook: Technology, Structure, Environment, and Strategy Interfaces in a Changing Global Business Arena*. Edited by E. Kaynak and T. D. Harcar. Lausanne: The International Management Development Association, pp. 106–13. Available online: <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=63114b7928b23eda98a6250497091a6ff682d01c> (accessed on 27 September 2024).
- Wetzels, Martin, Gaby Odekerken-Schröder, and Claudia Van Oppen. 2009. Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly* 33: 177–95. [CrossRef]
- Wojcak, Emil, Lubica Bajzikova, Helena Sajgalikova, and Michaela Polakova. 2016. How to achieve sustainable efficiency with teleworkers: Leadership model in telework. *Procedia—Social and Behavioral Sciences* 229: 33–41. [CrossRef]

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Article

Informativeness of Performance Measures: Coefficients or R-Squareds?

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Abstract: Measuring the informativeness of earnings is of fundamental importance to accounting research. Both coefficients and R-squareds have been proposed as candidates for measuring the informativeness of earnings. However, recent research has focused substantially more on using coefficients, rather than R-squareds, to draw inferences. This paper first documents in a small theoretical model that under some circumstances, R-squareds map more closely to informativeness than coefficients. Second, this paper documents that in archival data, coefficients and R-squareds can draw opposite inferences regarding the informativeness of earnings and other performance measures up to 50% of the time. Third, this paper proposes an approach to provide statistical inference using R-squareds. Taken together, this paper suggests that rather than solely relying on coefficients, as is common in prior literature, R-squareds can also be used to measure the informativeness of earnings and other performance measures.

Keywords: earnings response coefficients; earnings–return relation; capital markets; financial accounting; earnings announcements

1. Introduction

Measuring the informativeness of earnings is of fundamental importance to accounting research. Such measures, commonly referred to as earnings response coefficients (ERCs), have been widely used to draw inferences on topics ranging from audit to governance quality to earnings management (Dechow et al. 2010).¹ In the literature, both coefficients and R-squareds have been proposed as candidates to measure the informativeness of earnings (Greene 2018). However, recent research has focused substantially more on coefficients than R-squareds. This paper proceeds in three steps. First, this paper illustrates the conceptual difference between R-squareds and coefficients using a small theoretical model and shows that that under some circumstances, R-squareds have a closer mapping to earnings informativeness than coefficients. Second, this paper documents using archival data that R-squareds and coefficients can draw opposite inferences about the informativeness of earnings and other performance measures and, in some cases, up to 50% of the time. Finally, this paper proposes a methodology to estimate two-way cluster robust standard errors for R-squareds, which permits statistical inferences to be made about R-squareds in future applications.

This paper begins by illustrating the conceptual difference between R-squareds and coefficients in measuring earnings informativeness using a small theoretical model. Intuitively, it is possible for coefficients and R-squareds to draw opposite inferences because they capture different aspects of a firm's valuation. For example, for an industry with a high price–earnings ratio, the coefficient may be high because an additional unit of earnings translates into incrementally higher prices on average (e.g., Kothari and Zimmerman 1995). However, firms in industries with high price–earnings ratios may not necessarily have informative earnings, for example, because fundamentals are driven by other performance measures (e.g., Sloan 1996). Thus, it is possible for firms with low earnings informativeness

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to have high coefficients in ERC regressions. In contrast to coefficients, R-squareds directly measure the proportion of variance in returns explained by earnings. In other words, the R-squared is a type of signal-to-noise ratio that can potentially be a valid measure of the informativeness of earnings (e.g., Lambert and Larcker 1987). This paper formalizes this intuition in a small theoretical model.

The main idea of the model is that in a mean-variance framework, an investor prefers payoffs with lower variance, all else being equal. Thus, the value of a signal, such as earnings, is directly related to its ability to reduce the variance of the final payoff, such as the future firm value or future cash flows, conditional on the value of the signal. This paper shows that under this framework, the R-squared of a payoff (e.g., returns) regressed on a signal (e.g., earnings surprise) directly captures the variance reduction in the payoff conditional on the signal. In addition, the R-squared value is invariant to arbitrary scaling of the signal (e.g., multiplying the signal value by 2). In contrast, the coefficient on the signal in the regression varies according to arbitrary scaling and can sometimes draw opposite conclusions as the R-squared value. In other words, for two signals A and B, it is possible for the coefficient on signal A to be larger than the coefficient on signal B when the R-squared for signal A is smaller than the R-squared for signal B. However, in all cases, the R-squared value aligns with the amount of variance reduction in the payoff conditional on the signal. Thus, R-squareds map more closely to informativeness in a mean-variance framework. This paper then confirms the predictions of the theoretical model with simulated data.

Next, this paper documents the extent to which coefficients and R-squareds draw opposite inferences in archival data. This is important because although coefficients and R-squareds could draw opposite inferences theoretically, the extent to which this occurs in archival data is not known. The archival tests begin with comparing coefficients and R-squareds across Fama–French 48 industries. This corresponds to the empirical question of whether earnings are more informative in certain industries than in other industries. Although the coefficient measure is standardized in the literature, there is less standardization of the R-squared measure. Thus, this paper examines four different R-squared measures that have potential theoretical appeal: R-squared, adjusted R-squared, incremental R-squared, and incremental adjusted R-squared. In sum, this paper compares the inferences drawn by five candidate measures.

This paper also estimates specifications with and without controls. For the without controls specification, this paper regresses earnings announcement period returns on earnings surprises. For the controls specification, return on assets, size, book to market, revenue, cash flows from operations, revenue surprises, and cash flows from operations surprises are included as controls. The measure of the extent to which coefficients and R-squareds draw opposite inferences regarding the informativeness of earnings is *Disagreement*, the average percentage of the time that two measures being compared draw opposite inferences regarding the informativeness of earnings for two different Fama–French 48 industries. This paper also examines revenue surprises and cash flows from operations surprises in addition to earnings surprises because of the increasing focus on performance measures that are alternatives to earnings (e.g., Sloan 1996; Jegadeesh and Livnat 2006).

In the specification without controls, this paper finds that coefficients and the various R-squared measures draw opposite inferences 14.9–15.3 percent of the time. For revenue surprises and cash flows from operations surprises, coefficients and the various R-squared measures draw opposite inferences 14.7–16.6 percent and 19.8–20.2 percent of the time, respectively. This suggests that there is a non-trivial percentage of cases in which coefficients and R-squareds draw opposite inferences regarding the informativeness of earnings and other performance measures for different industries. This is important because it suggests that for up to 20 percent of all comparisons across industries, coefficients and R-squareds draw opposite conclusions about the informativeness of earnings, revenues, and cash flows.

In the specification with controls, the divergence between coefficients and R-squareds is even greater. For earnings surprises, coefficients and R-squareds draw opposite infer-

ences 13.3–42.6 percent of the time. For revenue surprises and cash flows from operations surprises, coefficients and R-squareds draw opposite inferences 22.0–48.8 percent and 46.8–56.7 percent of the time, respectively. Thus, when controls are included, in some cases, it is possible for coefficients and R-squareds to draw opposite conclusions about earnings and other performance measures up to and around 50 percent of the time. These findings suggest that coefficients and R-squareds can draw opposite inferences for a substantial proportion of cases in certain archival settings. Combined with the theoretical model intuition that R-squareds can more closely map to informativeness than coefficients under certain frameworks, this paper suggests not solely relying on coefficients and also considering R-squareds as an additional candidate to assess the informativeness of earnings.

In the final part of this paper, this paper proposes a method to estimate standard errors for R-squareds. This is important because standard errors are a standard for inferences in accounting and finance research. This task is made more challenging because of the necessity of considering two-way cluster robust standard errors in standard panel data in accounting and finance research. Whereas there has been substantial research on and application of the calculation of two-way cluster robust standard errors for coefficients, there is far less such research and application for R-squareds. This paper proposes an estimation methodology based on bootstrapping. This paper first validates that bootstrapped standard errors for coefficients are similar to standard errors calculated using the standard analytical approach and then presents the methodology and findings for R-squareds.

This paper contributes to the literature in three ways. First, this paper provides a conceptual illustration of how coefficients and R-squareds can be different in the context of measuring the informativeness of earnings. It shows that under some circumstances, R-squareds map more closely to informativeness than coefficients. Although most archival research focuses on coefficients, this paper suggests that R-squareds can be an important metric in assessing the informativeness of earnings and other performance measures.

Second, this paper documents the extent to which coefficients and R-squareds can provide different inferences. Because most recent literature uses coefficients and not R-squareds to draw inferences, the extent to which coefficients and R-squareds can provide different inferences is largely unknown. This paper documents that coefficients and R-squareds can draw opposite inferences up to 50 percent of the time in certain archival settings. Thus, this paper documents that examining R-squareds can provide substantially different results from examining coefficients. Future research may consider examining both coefficients and R-squareds in assessing the informativeness of earnings and other performance measures.

Finally, this paper proposes an approach for estimating two-way cluster robust standard errors for R-squareds. Whereas there has been substantial research on and application of the calculation of two-way cluster robust standard errors for coefficients, there is far less such research and application for R-squareds. Thus, this approach could help future research to provide statistical inferences regarding R-squareds.

This paper is not suggesting that all future research should focus on R-squareds to the exclusion of coefficients. Rather, this paper suggests that in addition to coefficients, R-squareds could be considered as an additional candidate to measure the informativeness of earnings and other performance measures. If coefficients and R-squareds draw opposite inferences regarding the informativeness of a performance measure in a particular setting, such a disagreement may warrant a more careful examination of the inference.

This paper does not resolve other longstanding debates on ERCs, such as developing the correct earnings expectation and the correct functional form. In other words, this paper does not provide a solution regarding the correct expectation for earnings or the correct functional form of the ERC. Although this paper does not provide solutions regarding these issues, the findings in this paper can potentially be complementary to solutions regarding these issues. For example, given a more accurate proxy for earnings expectations, the idea that R-squareds can be used to assess the informativeness of earnings can still be applied in conjunction with the more accurate earnings expectations. Similarly, given a

more appropriate functional form, R-squareds can be used to assess the informativeness of earnings, especially when coefficients may not be well-defined under certain functional forms. An example of this could be a functional form that includes both a linear term and a squared term for earnings. Comparing coefficients across two industries or other subsample types may be more difficult than in a specification with only a linear term. For example, examining coefficients could be inconclusive if one industry has a larger coefficient on the linear term but a smaller coefficient on the squared term. In contrast, the (incremental) R-squared is a single value that captures the (incremental) explanatory power of both terms.

Section 2 discusses the background and develops the model. Section 3 presents the empirical research design. Section 4 describes the sample and data. Section 5 presents the findings. Section 6 proposes the approach to estimate standard errors for R-squareds. Section 7 concludes.

2. Model and Background

2.1. Model of Conceptual Differences Between Coefficients and R-Squareds

Because regression coefficients and R-squareds do not measure the same quantity, it is possible for them to be different. In fact, they will not be equal to each other in general. In linear regression, the coefficient measures the relation between the outcome and the independent variable of interest, whereas the R-squared measures the strength of the fit (Greene 2018). Coefficients are more useful for the interpretation of the relationship between variables, whereas R-squareds focus on the goodness of fit of the empirical model.

In a standard accounting and finance context, a risk-averse investor with mean-variance preferences has a greater preference for higher mean returns and lower variances (Huang and Litzenberger 1988). Lower variances directly map to R-squared but not directly to coefficients. This paper illustrates using a small theoretical model below in which R-squared maps directly to informativeness, whereas coefficients do not. The main intuition is that coefficients can be arbitrary based on the scaling of independent variables, whereas R-squared values are invariant to the scaling of independent variables.

Consider an investor with mean-variance preferences with risk aversion coefficient A . The investor's utility over a particular portfolio P is $E[P] - 0.5 \times A \times \text{Var}(P)$ (Huang and Litzenberger 1988). Consider an investor of an asset X with the following payoff:

$$X = u + e$$

as well as two signals Y or Z with values given by

$$Y = u + d$$

$$Z = 2 \times Y$$

where

$$u \sim N(\mu, \sigma_u^2)$$

$$e \sim N(0, \sigma_e^2)$$

$$d \sim N(0, \sigma_d^2)$$

and u , e , and d are independent. Intuitively, both Y and Z provide information about the realization of u with noise, which is informative to an investor of X . In fact, Z provides the exact same information as Y because the realization of Z is simply double the value of the realization of Y . Writing out the distributions more fully:

$$X \sim N(\mu, \sigma_u^2 + \sigma_e^2)$$

$$Y \sim N(\mu, \sigma_\mu^2 + \sigma_d^2)$$

$$Z \sim N(2\mu, 4\sigma_\mu^2 + 4\sigma_d^2)$$

Also, for notational simplicity, let $\sigma_X^2 = \sigma_\mu^2 + \sigma_e^2$, $\sigma_Y^2 = \sigma_\mu^2 + \sigma_d^2$, and $\sigma_Z^2 = 4\sigma_\mu^2 + 4\sigma_d^2$.

Now, consider an investor of X that learns about the realization of Y . This could be motivated by X being future profit, firm value, or another quantity the investor cares about and Y being current earnings or another performance measure that the investor learns. Because Y reveals u with noise, an investor of X that learns the realization of Y will update beliefs about the distribution of X because Y contains information about the realization of u . For an investor of X that learns the value of Y , the expected value and variance of X is as follows:

$$E[X | Y = y] = \mu + \rho_{XY} \sigma_X / \sigma_Y (y - \mu)$$

$$\text{Var}(X | Y = y) = \sigma_X^2 (1 - \rho_{XY}^2)$$

where $\rho_{XY} = \sigma_\mu^2 / \sigma_X \sigma_Y$ is the correlation between X and Y .

Now, for an investor that only learns about the value of Z , the expected value and variance of X is as follows:

$$E[X | Z = z] = \mu + \rho_{XZ} \sigma_X / \sigma_Z (z - 2\mu) = \mu + \rho_{XY} \sigma_X / 2\sigma_Y (2y - 2\mu) = \mu + \rho_{XY} \sigma_X / \sigma_Y (y - \mu)$$

$$\text{Var}(X | Z = z) = \sigma_X^2 (1 - \rho_{XZ}^2) = \sigma_X^2 (1 - \rho_{XY}^2)$$

where ρ_{XZ} is the correlation between X and Z . The previous line follows because of the following:

$$\rho_{XZ} = \text{Cov}(X, Z) / \sigma_X \sigma_Z = 2\text{Cov}(X, Y) / 2\sigma_X \sigma_Y = \text{Cov}(X, Y) / \sigma_X \sigma_Y = \rho_{XY}$$

As can be seen above, the conditional expected value and the conditional variance of X are the same for an investor who learns the value of Y and an investor who learns the value of Z . That is,

$$E[X | Y = y] = E[X | Z = z]$$

$$\text{Var}(X | Y = y) = \text{Var}(X | Z = z)$$

If the investor of X has mean-variance utility, the investor equally prefers learning about Y and learning about Z .

Thus far, this model illustrates that the investor of X has the same preference over the signals Y and Z . However, the next part of this model illustrates that when comparing regressions of X on Y and X on Z , Z has a smaller coefficient than Y . In contrast, when R-squared is used as the metric, a regression of X on Y and a regression of X on Z have the same R-squared. In this model, the R-squared is invariant to scale transformations of variables, whereas the coefficient is sensitive to such transformations.

A regression of X on Y would give a coefficient on Y of $\rho_{XY} \sigma_X / \sigma_Y$ because it measures how $E[X | Y = y]$ varies with y . This is interpreted as the coefficient on Y :

$$\text{Coef}_X(Y) = \rho_{XY} \sigma_X / \sigma_Y$$

The R-squared of a regression of X on Y is calculated as $1 - (\text{Var}(X | Y = y) / \text{Var}(X)) = 1 - \sigma_X^2 (1 - \rho_{XY}^2) / \sigma_X^2 = \rho_{XY}^2$:

$$R^2_X(Y) = \rho_{XY}^2$$

Similarly, a regression of X on Z would give a coefficient on Z of

$$\text{Coef}_X(Z) = \rho_{XY} \sigma_X / 2\sigma_Y$$

Note that this is half of the coefficient on Y :

$$\frac{1}{2} \times \text{Coef}_X(Y) = \text{Coef}_X(Z)$$

The R-squared of a regression of X on Z is calculated as ρ_{XZ}^2 :

$$R^2_{X(Z)} = \rho_{XZ}^2$$

Note that the R-squared of regressing X on Y and the R-squared of regressing X on Z are the same:

$$R^2_{X(Y)} = R^2_{X(Z)}$$

In summary, although Y and Z have the same value to an investor of X , Z has a smaller coefficient than Y but the same R-squared as Y . Thus, under a mean-variance framework, the R-squared maps more closely to informativeness than the coefficient.

2.2. Simulation

Based on the above conceptual difference, this paper provides a simulation in which coefficients and R-squareds can provide different or opposite inferences regarding the informativeness of earnings. The simulation can help to confirm the results of the theoretical model in the previous section. To generate values for the simulation, this paper follows the above example and generates $u \sim N(\mu, \sigma^2)$, $e \sim N(0, \sigma^2)$, and $d \sim N(0, \sigma^2)$, and u , e , and d are independent. Then, this implies the following:

$$\sigma_X^2 = \text{Var}(u + e) = \text{Var}(u) + \text{Var}(e) = \sigma^2 + \sigma^2 = 2\sigma^2$$

$$\sigma_Y^2 = \text{Var}(u + e) = \text{Var}(u) + \text{Var}(d) = \sigma^2 + \sigma^2 = 2\sigma^2$$

$$\sigma_Z^2 = 4\sigma_Y^2 = 8\sigma^2$$

In addition,

$$\text{Cov}(X, Y) = \text{Cov}(u + e, u + d) = \text{Cov}(u, u) = \text{Var}(u) = \sigma^2$$

$$\rho_{XY} = \text{Cov}(X, Y) / \sigma_X \sigma_Y = 1/2$$

$$\text{Var}(X | Y = y) = \sigma_X^2(1 - \rho_{XY}^2) = 4\sigma^2$$

$$\text{Cov}(X, Z) = \text{Cov}(X, 2Y) = \text{Cov}(u + e, 2u + 2d) = \text{Cov}(u, 2u) = 2 \times \text{Cov}(u, u) = 2 \times \text{Var}(u) = 2\sigma^2$$

$$\rho_{XZ} = \text{Cov}(X, Z) / \sigma_X \sigma_Z = 2\sigma^2 / \sqrt{2\sigma^2 \times 8\sigma^2} = 1/2$$

$$\text{Var}(X | Z = z) = \sigma_X^2(1 - \rho_{XZ}^2) = 4\sigma^2$$

To generate values for the simulation, assume $\mu = \sigma^2 = 1$.

This setup implies that $\sigma_X^2 = 2$, $\sigma_Y^2 = 2$, $\sigma_Z^2 = 8$, $\rho_{XY} = 1/2$. In addition,

$$\text{Coef}_X(Y) = \rho_{XY} \sigma_X / \sigma_Y = 1/2$$

$$R^2_{X(Y)} = \rho_{XY}^2 = 1/4$$

$$\text{Coef}_X(Z) = \rho_{XZ} \sigma_X / \sigma_Z = 1/2 \times \sqrt{2\sigma^2} / \sqrt{8\sigma^2} = 1/4$$

$$R^2_X(Z) = \rho_{XZ}^2 = 1/4$$

This numerical example is consistent with the conceptual difference described in Section 2.1, in which Y and Z provide the same information, but Z has a smaller coefficient and the same R-squared as Y . In fact, it is possible to have a situation in which the coefficient and the R-squared draw opposite conclusions. For example, consider a signal Z^* which is on a smaller scale than Y and has a slightly larger variance. The smaller scale will translate to a larger coefficient than Y , whereas the larger variance will translate to a smaller R-squared than Y .

$$Z^* = 0.5 \times Y + h = 0.5 \times u + 0.5 \times d + h$$

where $h \sim N(0, 0.25)$.

The coefficient and R-squared for Z^* are given by the following:

$$\sigma_{Z^*}^2 = \text{Var}(0.5 \times u + 0.5 \times d + h) = 0.25 + 0.25 + 0.25 = 0.75$$

$$\text{Cov}(X, Z^*) = \text{Cov}(u + e, 0.5 u + 0.5 d + h) = 0.5 \text{Cov}(u, u) = 0.5 \text{Var}(u) = 0.5$$

$$\rho_{XZ^*} = \text{Cov}(X, Z^*) / \sigma_X \sigma_{Z^*} = 0.5 / \sqrt{2 \times 0.75} = 0.5 / \sqrt{1.5}$$

$$\text{Coef}_X(Z^*) = \rho_{XZ^*} \sigma_X / \sigma_{Z^*} = 0.5 / \sqrt{1.5} \times \sqrt{2} / \sqrt{0.75} = 0.5 \times \sqrt{16/9} = 2/3$$

$$R^2_X(Z^*) = \rho_{XZ^*}^2 = 0.25/1.5 = 1/6$$

The above shows that $\text{Coef}_X(Z^*) > \text{Coef}_X(Y)$, but $R^2_X(Z^*) < R^2_X(Y)$. Thus, this is a case in which the coefficient and the R-squared can provide opposite inferences. An example of this could be two industries that differ in terms of earnings multiples and earnings smoothness. An industry with high average earnings multiples could have a higher coefficient than an industry with low multiples. However, if the same industry with high average earnings multiples has low earnings smoothness, it could have lower R-squareds than an industry with high earnings smoothness.

To generate data for the simulation, this paper generates all random variables (i.e., u , e , d , and h) using a sample size of 10,000 and computes X , Y , Z , and Z^* . Table 1 presents the results of the simulation for regressions of X on Y (Panel A), X on Z (Panel B), and X on Z^* (Panel C). As expected, the regression coefficients are highly similar to the theoretical coefficients. A comparison of Panels A and B reveals that as predicted, the coefficient on Y (0.50 theoretical, 0.51 estimated) is larger than the coefficient on Z (0.25 theoretical, 0.25 estimated). However, both Y and Z have the same R-squareds (0.25 theoretical, 0.26 estimated). A comparison of Panels A and C reveals that also as predicted, the coefficient on Y is smaller than the coefficient on Z^* , but the R-squared of Y is larger than the R-squared of Z^* . Thus, it is possible for the coefficient and the R-squared to draw opposite conclusions. As in the small theoretical model in Section 2.1, under a mean-variance framework, the R-squared more closely matches informativeness than the coefficient.

Table 1. Simulation comparison of coefficients and R-squareds. This table presents simulation results of regressing X , a normally distributed random variable that represents future value, on normally distributed signals Y , Z , and Z^* . Y is a signal that contains information about X . Z is also a signal that contains information about X and has a realization that is exactly two times the realization of Y . Z^* is half the realization of Y plus normally distributed random noise.

	Predicted	Estimate	(t-Stat)
Panel A: Regression of X on Y			
Intercept	0.00	−0.01	(−0.92)
Y	0.50	0.51	(58.96)
R2	0.25	0.26	
N		10,000	
Panel B: Regression of X on Z			
Intercept	0.00	−0.01	(−0.92)
Z	0.25	0.25	(58.96)
R2	0.25	0.26	
N		10,000	
Panel C: Regression of X on Z^*			
Intercept	0.00	−0.01	(−0.71)
Z^*	0.67	0.68	(45.47)
R2	0.17	0.17	
N		10,000	

2.3. Coefficients and R-Squareds in Archival Research

Despite the conceptual difference described in the previous subsections, many papers focus on coefficients and not R-squareds.² To examine the prevalence of the use of coefficients and R-squareds in the literature, this paper reviews papers published from 1990–2023 in *Journal of Accounting and Economics*, *Journal of Accounting Research*, and *The Accounting Review*.³ The search criteria are all papers with at least one of the following keywords: ERC, ERCs, earnings response coefficient, and earnings response coefficients. The paper must also be an archival paper and have at least one regression of returns on earnings surprises. This resulted in a total of 34 papers reviewed. Appendix A lists the papers reviewed. Of the papers reviewed, all papers use coefficients to examine the informativeness of earnings, and nine papers (26%) use R-squareds to examine the informativeness of earnings. Perhaps interestingly, of the more recent papers published from 2000–2023 (19 papers), only 3 papers (16%) use R-squareds to examine the informativeness of earnings. This review suggests that the recent literature on ERCs has focused substantially more on coefficients than R-squareds. Thus, it is important to next document the extent to which coefficients and R-squareds can draw opposite inferences in archival data.

3. Empirical Research Design

This paper assesses the extent to which coefficients and R-squareds draw opposite inferences regarding the informativeness of earnings and related performance measures in archival data. This is important because although coefficients and R-squareds can draw opposite inferences theoretically, the extent to which this occurs in archival data is largely unknown. Although the coefficient measure is common and standardized in the literature, this is not the case for R-squareds. Thus, this paper examines four different measures of R-squareds: R-squared, adjusted R-squared, incremental R-squared, and incremental adjusted R-squared. Each of these measures has potential theoretical appeal. R-squared captures the proportion of variation in the dependent variable that is explained by the independent variables. Adjusted R-squared adjusts the R-squared value to penalize the inclusion of irrelevant independent variables. Incremental (adjusted) R-squared, which is calculated as the difference between the (adjusted) R-squared of a regression with the independent variable of interest and the (adjusted) R-squared of a regression without the

independent variable of interest, captures the proportion of variation in the dependent variable explained by the independent variable of interest that is incremental to other independent variables in the regression (adjusted for the adjusted R-squared penalties).⁴ In total, this paper examines five different measures of informativeness.

To assess the extent to which coefficients and R-squareds draw opposite inferences, this paper estimates the following equation by Fama–French 48 industries:

$$CAR[-1,+1] = \beta_0 + \beta_1 EARN_SURP + \gamma Controls + \varepsilon \quad (1)$$

Variables are defined in Appendix B. $CAR[-1,+1]$ is the announcement period return, $EARN_SURP$ is the earnings surprise, γ is a vector of coefficients on controls, and $Controls$ is a vector of control variables.⁵ This paper estimates Equation (1) both without and with control variables. When estimating control variables, this paper includes control variables that are common in ERC regressions in prior literature (e.g., Teoh and Wong 1993; Lobo et al. 2017). Control variables include return on assets (ROA), size ($SIZE$), book to market (BM), revenues (REV), cash flows from operations (CFO), asset growth (AG), revenue surprise (REV_SURP), cash flows from operations surprise (CFO_SURP), and year fixed effects.

This paper estimates Equation (1) separately by Fama–French 48 industries to draw comparisons between industries. This corresponds to the empirical question of whether earnings are more informative in certain industries than in other industries. For example, consider two hypothetical industries, Industry A and Industry B. If the coefficient on earnings in Industry A is larger (smaller) than the coefficient on earnings in Industry B, then the coefficient test would conclude that earnings are more (less) informative for Industry A firms than Industry B firms. Similarly, if the R-squared of the regression in Industry A is larger (smaller) than the R-squared of the regression in Industry B, then the R-squared test would conclude that earnings are more (less) informative for Industry A firms than Industry B firms.

For each Fama–French 48 industry pair (48 choose 2 = 1128 possible pairs), this paper computes a measure, *Disagree*, an indicator variable that takes a value of 1 if two measures (e.g., coefficients and R-squareds) draw opposite inferences and a value of 0 if the two measures draw the same inference. Using the same example, if both the coefficient and the R-squared in the regression for Industry A are greater than their respective counterparts for Industry B, then the coefficient and R-squared draw the same inference. In other words, they both suggest that earnings are more informative for Industry A firms than Industry B firms. In this case, *Disagree* would take a value of 0. However, if hypothetically, the coefficient for Industry A firms is greater than the coefficient for Industry B firms, but the R-squared for Industry A firms is less than the R-squared for Industry B firms, then the coefficient and R-squared do not agree because they draw opposite inferences about the informativeness of earnings. The coefficient value would suggest that earnings are more informative for Industry A firms, whereas the R-squared value would suggest earnings are more informative for Industry B firms. In this case, *Disagree* would take a value of 1 for the two industries being compared, Industry A and Industry B.

Then, this paper computes *Disagreement* as the average percentage of the time that two measures being compared draw opposite inferences about two different Fama–French 48 industries (i.e., the average value of *Disagree* across all 1128 possible industry pairs). Intuitively, *Disagreement* measures the extent to which two measures (e.g., coefficients and R-squareds) draw opposite inferences about the informativeness of earnings in archival data.

In addition to examining earnings as a performance measure, this paper also examines two other performance measures, revenue surprise (REV_SURP) and cash flows from operations surprises (CFO_SURP). This is important given the increasing focus on performance measures that are alternatives to earnings (e.g., Sloan 1996; Jegadeesh and Livnat 2006). For regressions with no controls, $EARN_SURP$ in Equation (1) is replaced with either REV_SURP for revenue surprises or CFO_SURP for cash flows from operations surprises. For regressions with controls, this paper examines the same Equation (1), but rather than

examining the coefficient, R-squared, adjusted R-squared, incremental R-squared, and incremental adjusted R-squared values for *EARN_SURP*, the metrics for *REV_SURP* and *CFO_SURP* are examined.⁶

4. Data

The sample in this paper contains 97,472 observations in the intersection of Compustat and CRSP from 1989–2021. This paper requires all main and control variables so that the number of observations is the same for all analyses. Thus, the sample begins in 1989 because it is the first full year in which the statement of cash flows is a required disclosure. The sample ends in 2021 because data were collected in 2023, and thus 2021 is the latest full year of available data. All continuous variables are winsorized at the 1st and 99th percentiles to mitigate the impact of outliers on estimation results.

Table 2 presents descriptive statistics and Table 3 presents correlations. Mean ROA is -0.01 , consistent with the proliferation of loss firms in recent years. $CAR[-1,+1]$ and *EARN_SURP* are positively correlated (Pearson corr. 0.07, Spearman corr. 0.09). Similarly, $CAR[-1,+1]$ has positive correlations with both *REV_SURP* and *CFO_SURP*. Also, *EARN_SURP*, *REV_SURP*, and *CFO_SURP* are all pairwise positively correlated, consistent with correlation in fundamentals.

Table 2. Descriptive statistics. This table presents descriptive statistics for the 97,472 observations in the sample from 1989–2021. Variables are defined in Appendix B.

Variable	Mean	SD	p25	p50	p75
$CAR[-1,+1]$	0.00	0.09	-0.04	0.00	0.04
<i>EARN_SURP</i>	-0.02	0.25	-0.03	0.00	0.03
<i>REV_SURP</i>	0.04	0.48	-0.01	0.04	0.14
<i>CFO_SURP</i>	0.00	0.20	-0.03	0.01	0.04
ROA	-0.01	0.20	-0.01	0.03	0.08
SIZE	3222	9970	73	335	1599
BM	0.63	0.59	0.27	0.50	0.83
REV	1.10	0.91	0.43	0.93	1.51
CFO	0.05	0.17	0.01	0.07	0.14
AG	0.14	0.39	-0.02	0.06	0.19

Table 3. Correlations. This table presents correlations for the 97,472 observations in the sample from 1989–2021. Pearson (Spearman) correlations are above (below) the main diagonal. Variables are defined in Appendix B.

Variable	$CAR[-1,+1]$	<i>EARN_SURP</i>	<i>REV_SURP</i>	<i>CFO_SURP</i>	ROA	SIZE	BM	REV	CFO	AG
$CAR[-1,+1]$		0.07	0.03	0.03	0.06	-0.01	0.03	0.03	0.05	0.00
<i>EARN_SURP</i>	0.09		0.16	0.21	0.22	0.02	-0.13	0.05	0.07	0.07
<i>REV_SURP</i>	0.06	0.26		0.12	0.12	0.00	-0.12	0.24	0.05	0.24
<i>CFO_SURP</i>	0.05	0.26	0.16		0.07	0.01	-0.03	0.02	0.21	0.01
ROA	0.07	0.35	0.27	0.14		0.13	0.02	0.27	0.79	-0.01
SIZE	0.02	0.04	-0.01	0.02	0.31		-0.15	-0.08	0.13	0.00
BM	0.02	-0.07	-0.02	-0.02	-0.20	-0.38		-0.08	-0.02	-0.15
REV	0.03	0.10	0.36	0.06	0.41	-0.12	-0.11		0.25	0.18
CFO	0.06	0.16	0.13	0.38	0.67	0.31	-0.20	0.37		-0.03
AG	0.03	0.15	0.41	0.05	0.39	0.18	-0.21	0.19	0.21	

5. Results

Table 4 presents the five measures that correspond to estimating Equation (1) for the full sample and by each Fama–French 48 industry. Table values are multiplied by 100 for presentation purposes. When examining coefficients, the findings corroborate several prior findings. For the full sample (“All” row), the coefficient is 2.6 (0.026 when unscaled), which is similar to the coefficient reported in Table 1 by Lipe et al. (1998). The R-squared

value is 0.6%, which is lower than the 0.8% reported by Lipe et al. (1998).⁷ The lower R-squared value could be attributable to this paper using a more recent sample period that ends in 2021 compared to a sample that ends in 1995 in Lipe et al. (1998) because of the well-documented decline in the relevance of earnings over time (e.g., Lev 1989; Collins et al. 1997; Brown et al. 1999; Core et al. 2003; and Lev and Gu 2016).

Table 5 documents *Disagreement*, the percentage of time that two measures being compared draw opposite conclusions when comparing two different subsamples. Panel A examines *Disagreement* for earnings surprises and reveals that coefficients and R-squared values disagree 14.9 percent of the time. *Disagreement* is slightly greater between coefficients and adjusted R-squareds, as they disagree 15.3 percent of the time. Incremental R-squared and incremental adjusted R-squared are the same as R-squared and incremental R-squared because there are no control variables, so they have the same respective *Disagreement* with coefficients. The findings suggest that it is possible for coefficients and R-squareds to draw opposite inferences about the informativeness of earnings approximately 15 percent of the time.

Table 4. ERC regressions by Fama–French 48 industries with no controls. This table presents regression results for the following equation for each Fama–French 48 industry and for all firms: $CAR[-1,+1] = \beta_0 + \beta_1 EARN_SURP + \varepsilon$. $CAR[-1,+1]$ is market-adjusted return during the earnings announcement period. $EARN_SURP$ is earnings surprise. Variables are defined in Appendix B. All table values are multiplied by 100 for presentation purposes. *Coef* is the coefficient of earnings surprise. *R2* is the R-squared of the regression, *AdjR2* is the adjusted R-squared of the regression, *IncrR2* is the incremental R-squared of $EARN_SURP$, and *IncrAdjR2* is the incremental adjusted R-squared of $EARN_SURP$.

IND	Name	Coef	R2	AdjR2	IncrR2	IncrAdjR2
1	Agric	−1.4	0.2	−0.2	0.2	−0.2
2	Food	1.5	0.1	0.0	0.1	0.0
3	Soda	4.3	1.3	1.0	1.3	1.0
4	Beer	−0.1	0.0	−0.3	0.0	−0.3
5	Smoke	6.8	2.1	1.3	2.1	1.3
6	Toys	4.1	1.5	1.4	1.5	1.4
7	Fun	2.6	0.6	0.6	0.6	0.6
8	Books	4.4	2.4	2.3	2.4	2.3
9	Hshld	0.7	0.0	0.0	0.0	0.0
10	Clths	3.4	0.8	0.8	0.8	0.8
11	Hlth	3.2	0.9	0.9	0.9	0.9
12	MedEq	4.4	0.8	0.7	0.8	0.7
13	Drugs	2.6	0.4	0.3	0.4	0.3
14	Chems	2.6	0.4	0.3	0.4	0.3
15	Rubbr	0.4	0.0	−0.1	0.0	−0.1
16	Txtls	3.6	1.8	1.6	1.8	1.6
17	BldMt	4.7	2.0	2.0	2.0	2.0
18	Cnstr	1.4	0.2	0.1	0.2	0.1
19	Steel	4.6	2.4	2.3	2.4	2.3
20	FabPr	6.6	3.9	3.6	3.9	3.6
21	Mach	3.3	0.8	0.8	0.8	0.8
22	ElcEq	4.6	1.3	1.2	1.3	1.2
23	Autos	2.4	0.6	0.6	0.6	0.6
24	Aero	4.2	0.9	0.7	0.9	0.7
25	Ships	2.6	0.9	0.4	0.9	0.4
26	Guns	−9.5	4.7	4.2	4.7	4.2
27	Gold	4.5	2.2	1.9	2.2	1.9
28	Mines	1.6	0.3	0.1	0.3	0.1
29	Coal	6.1	7.1	6.4	7.1	6.4
30	Oil	1.3	0.2	0.2	0.2	0.2
31	Util	3.4	1.5	1.4	1.5	1.4
32	Telcm	1.9	0.6	0.6	0.6	0.6
33	PerSv	2.1	0.4	0.3	0.4	0.3
34	BusSv	2.5	0.4	0.4	0.4	0.4
35	Comps	0.8	0.0	0.0	0.0	0.0
36	Chips	0.9	0.0	0.0	0.0	0.0
37	LabEq	3.1	0.5	0.4	0.5	0.4
38	Paper	1.4	0.2	0.1	0.2	0.1
39	Boxes	−0.9	0.0	−0.3	0.0	−0.3
40	Trans	2.3	0.7	0.6	0.7	0.6
41	Whlsl	4.8	1.7	1.6	1.7	1.6
42	Rtail	2.6	0.6	0.6	0.6	0.6
43	Meals	2.4	0.6	0.6	0.6	0.6
44	Banks	3.7	2.3	2.3	2.3	2.3
45	Insur	2.3	0.5	0.5	0.5	0.5
46	REst	1.8	0.6	0.5	0.6	0.5
47	Fin	2.9	0.9	0.9	0.9	0.9
48	Other	3.1	0.8	0.5	0.8	0.5
	All	2.6	0.6	0.6	0.6	0.6

Table 5. Disagreement of coefficients and R-squareds with no controls. This table presents the extent to which coefficients and several measures of R-squareds draw opposite inferences regarding the informativeness of earnings and other performance measures. Table values represent *Disagreement*, the average percentage of the time that two measures being compared draw opposite inferences about the informativeness of earnings surprise, revenue surprise, or cash flows from operations surprise for two different Fama–French 48 industries in regressions with no control variables. *EARN_SURP* is earnings surprise. *REV_SURP* is revenue surprise. *CFO_SURP* is cash flows from operations surprise. Variables are defined in Appendix B. *Coef* is the coefficient on the variable of interest. *R2* is the R-squared of the regression, *AdjR2* is the adjusted R-squared of the regression, *IncrR2* is the incremental R-squared of the variable of interest, and *IncrAdjR2* is the incremental adjusted R-squared of the variable of interest.

	<i>R2</i>	<i>AdjR2</i>	<i>IncrR2</i>	<i>IncrAdjR2</i>
Panel A: <i>EARN_SURP</i>				
<i>Coef</i>	14.9	15.3	14.9	15.3
<i>R2</i>		5.5	0.0	5.5
<i>AdjR2</i>			5.5	0.0
<i>IncrR2</i>				5.5
Panel B: <i>REV_SURP</i>				
<i>Coef</i>	16.6	14.9	16.6	14.9
<i>R2</i>		11.4	0.0	11.4
<i>AdjR2</i>			11.4	0.0
<i>IncrR2</i>				11.4
Panel C: <i>CFO_SURP</i>				
<i>Coef</i>	19.8	20.2	19.8	20.2
<i>R2</i>		19.1	0.0	19.1
<i>AdjR2</i>			19.1	0.0
<i>IncrR2</i>				19.1

The consistent level of discrepancies between coefficients and R-squareds documented in Table 5 and the low level of R-squareds documented in Table 4 is part of a longstanding puzzle of the inability of fundamental information to explain returns, even ex-post (Roll 1988). These findings suggest that not all influential variables are captured by the standard ERC model. Future research could explore additional variables or statistical techniques to account for these inconsistencies.

Panels B and C reveal similar levels of *Disagreement* between coefficients and R-squareds for revenue surprises and cash flows from operations surprises. *Disagreement* between coefficients and the four R-squared measures ranges from 14.9–16.6 percent for revenue surprises and 19.8–20.2 percent for cash flows from operations surprises. Overall, the findings from Table 5 suggest that there is a non-trivial number of instances in which coefficients and R-squareds draw opposite inferences regarding the informativeness of earnings and other performance measures.⁸

Table 6 presents coefficients and R-squared values when Equation (1) is estimated with controls. Perhaps unsurprisingly, average R-squared values across industries are larger in Table 6 than in Table 4 (8.9 vs. 1.1, untabulated), which reflects the additional explanatory power from including control variables. However, average incremental R-squared values are smaller in Table 6 than in Table 4 (0.8 vs. 1.1, untabulated), which reflects the fact that earnings surprises contain less incremental information after considering the information in control variables.

Table 6. ERC regressions by Fama–French 48 industries with controls. This table presents regression results for the following equation for each Fama–French 48 industry: $CAR[-1,+1] = \beta_0 + \beta_1 EARN_SURP + \gamma Controls + \varepsilon$. $CAR[-1,+1]$ is market-adjusted return during around earnings announcement period. $EARN_SURP$ is earnings surprise. Controls include return on assets (ROA), size (SIZE), book to market (BM), revenues (REV), cash flows from operations (CFO), asset growth (AG), revenue surprise (REV_SURP), cash flows from operations surprise (CFO_SURP), and year fixed effects. Variables are defined in Appendix B. All table values are multiplied by 100 for presentation purposes. *Coef* is the coefficient of earnings surprise. *R2* is the R-squared of the regression, *AdjR2* is the adjusted R-squared of the regression, *IncrR2* is the incremental R-squared of *EARN_SURP*, and *IncrAdjR2* is the incremental adjusted R-squared of *EARN_SURP*.

IND	Name	Coef	R2	AdjR2	IncrR2	IncrAdjR2
1	Agric	−2.3	20.7	5.9	0.4	0.1
2	Food	1.3	3.8	1.0	0.1	0.0
3	Soda	4.2	18.2	6.7	1.0	0.8
4	Beer	1.7	17.1	3.6	0.1	−0.3
5	Smoke	7.1	34.4	3.1	1.2	0.7
6	Toys	5.0	9.9	4.6	1.7	1.7
7	Fun	3.4	6.2	3.0	0.9	0.8
8	Books	4.3	9.3	4.7	1.5	1.5
9	Hshld	−0.6	3.8	1.3	0.0	0.0
10	Clths	2.5	5.5	1.7	0.3	0.3
11	Hlth	3.8	3.5	1.4	1.1	1.1
12	MedEq	4.1	3.5	2.2	0.6	0.5
13	Drugs	2.1	1.8	0.9	0.2	0.2
14	Chems	1.7	3.7	1.5	0.1	0.1
15	Rubbr	1.6	9.0	3.7	0.2	0.1
16	Txtls	4.0	10.3	1.4	1.4	1.3
17	BldMt	3.9	5.4	3.2	1.0	1.0
18	Cnstr	2.3	6.3	2.7	0.4	0.4
19	Steel	5.4	6.7	3.8	2.1	2.1
20	FabPr	7.9	9.9	−2.3	3.2	3.3
21	Mach	3.2	2.8	1.6	0.6	0.5
22	ElcEq	5.9	5.3	3.4	1.5	1.5
23	Autos	2.6	3.9	1.1	0.5	0.5
24	Aero	5.5	11.3	3.7	1.3	1.2
25	Ships	3.3	23.7	5.1	0.7	0.4
26	Guns	−16.2	26.3	4.6	8.7	10.5
27	Gold	4.1	15.9	0.6	1.1	0.9
28	Mines	0.7	13.9	4.5	0.0	−0.2
29	Coal	0.6	39.9	9.4	0.0	−1.1
30	Oil	0.8	1.4	0.9	0.0	0.0
31	Util	3.6	4.3	2.9	1.2	1.2
32	Telcm	1.2	3.7	1.9	0.2	0.1
33	PerSv	1.9	4.8	0.9	0.2	0.1
34	BusSv	2.7	1.6	1.2	0.4	0.3
35	Comps	0.3	2.1	0.7	0.0	0.0
36	Chips	0.2	1.3	0.5	0.0	0.0
37	LabEq	2.7	2.3	0.2	0.2	0.2
38	Paper	0.8	3.7	−0.4	0.0	−0.1
39	Boxes	1.1	31.0	20.1	0.0	−0.3
40	Trans	1.9	2.9	0.9	0.3	0.3
41	Whlsl	5.0	3.2	2.1	1.5	1.5
42	Rtail	3.1	2.5	1.7	0.7	0.7
43	Meals	2.5	2.7	0.8	0.5	0.4
44	Banks	3.5	5.7	5.2	1.6	1.6
45	Insur	2.0	2.5	1.2	0.3	0.3
46	RIEst	1.0	5.0	−0.9	0.2	0.0
47	Fin	2.6	2.5	1.2	0.6	0.6
48	Other	2.1	12.9	3.6	0.3	0.1

In untabulated analyses, the coefficients and R-squared values for Equation (1) estimated with controls are compared for *EARN_SURP*, *ROA*, *SIZE*, *BM*, *REV*, *CFO*, *AG*, *REV_SURP*, and *CFO_SURP*. As expected, *EARN_SURP* has the highest average incremental R-squared (0.8), as earnings surprises have traditionally been the focus during earnings announcement periods. Perhaps surprisingly, *BM* has the second highest incremental R-squared (0.5), which reflects the strength of the value premium (e.g., Fama and French 1993). *REV_SURP*, *ROA*, and *AG* are the next highest in terms of incremental R-squareds (0.3 for all three variables). This reflects the focus on revenue surprises during earnings announcements, the profitability premium, and the asset growth premium (e.g., Fama and French 2015). Within particular industries, *EARN_SURP* and *CFO_SURP* appear to at least partially be substitutes. The correlation between the incremental R-squareds for *EARN_SURP* and *CFO_SURP* across the Fama–French 48 industries is -0.07 . This is consistent with market participants reacting more strongly to cash flow surprises in industries in which they react less to earnings surprises. Perhaps interestingly, the correlation between the incremental R-squareds for *EARN_SURP* and each of *ROA*, *SIZE*, and *BM* are positive. This suggests that earnings surprises are more informative in industries in which the profitability, size, and value factors have greater associations with returns.

Table 7 documents *Disagreement* corresponding to estimating Equation (1) with controls. Panel A reveals that *Disagreement* between coefficients and R-squareds ranges from 13.3–42.6 percent for earnings surprises. Panels B and C reveal that disagreement between coefficients and R-squareds can be even greater for revenue surprises and cash flows from operations surprises, ranging from 22.0–48.8 percent and 46.8–56.7 percent, respectively. Overall, Table 7 suggests that in some cases, there can be a substantial number of instances in which coefficients and R-squareds draw opposite inferences about the informativeness of earnings and other performance measures.

Table 7. Disagreement of coefficients and R-squareds with control variables. This table presents the extent to which coefficients and several measures of R-squareds draw opposite inferences regarding the informativeness of earnings and other performance measures when control variables are included. Table values represent *Disagreement*, the average percentage of the time that two measures being compared draw opposite inferences about the informativeness of earnings surprise, revenue surprise, or cash flows from operations surprise for two different Fama–French 48 industries in regressions with control variables. *EARN_SURP* is earnings surprise. *REV_SURP* is revenue surprise. *CFO_SURP* is cash flows from operations surprise. Variables are defined in Appendix B. *Coef* is the coefficient on the variable of interest. *R2* is the R-squared of the regression, *AdjR2* is the adjusted R-squared of the regression, *IncrR2* is the incremental R-squared of the variable of interest, and *IncrAdjR2* is the incremental adjusted R-squared of the variable of interest.

	<i>R2</i>	<i>AdjR2</i>	<i>IncrR2</i>	<i>IncrAdjR2</i>
Panel A: <i>EARN_SURP</i>				
<i>Coef</i>	42.6	42.3	13.3	15.7
<i>R2</i>		23.8	38.4	43.5
<i>AdjR2</i>			36.4	39.5
<i>IncrR2</i>				5.5
Panel B: <i>REV_SURP</i>				
<i>Coef</i>	43.4	48.8	22.0	31.1
<i>R2</i>		23.8	30.3	47.5
<i>AdjR2</i>			39.2	42.6
<i>IncrR2</i>				19.5
Panel C: <i>CFO_SURP</i>				
<i>Coef</i>	51.8	56.7	46.8	47.9
<i>R2</i>		23.8	33.7	52.1
<i>AdjR2</i>			32.7	41.6
<i>IncrR2</i>				20.2

6. Bootstrapped Standard Errors

This section proposes a bootstrapping approach to estimate two-way cluster robust standard errors for R-squareds. Although this paper proposes a greater focus on examining R-squareds as a measure of the informativeness of earnings, the calculation of standard errors for R-squareds is far less common in the literature than such calculation for coefficients. The calculation of standard errors, particularly two-way cluster robust standard errors, could help researchers draw statistical inferences using R-squared values.

The bootstrapping approach proposed in this paper is based approach of Ohtani (2000), Cameron et al. (2008), Gow et al. (2010), and Cameron et al. (2011). Ohtani (2000) develops a bootstrapping approach to estimate standard errors for R-squareds. Cameron et al. (2008) developed a bootstrapping approach to estimate clustered standard errors. Cameron et al. (2011) and Gow et al. (2010) develop and apply an approach for multi-way clustering of standard errors. This paper follows these approaches to estimate standard errors for R-squareds.

The approach begins with nonoverlapping block bootstrapping by firm and by year to simulate one-way clustering. For a bootstrapped sample by firm (year), this paper samples firms (years) from the data, with replacement, until the same number of firms (years) as the number of firms (years) in the data is sampled. This paper then includes all firm–years that correspond to the sampled firms (years) as the bootstrapped sample by firm (year). Bootstrapping is performed 100 times by firm and another 100 times by year. This results in 100 R-squared values for bootstrapped samples by firm and 100 R-squared values for bootstrapped samples by year. This paper further computes 100 R-squared values for 100 bootstrapped samples by firm–year, in which this paper randomly selects firm–years with replacement from the data set until the same number of firm–years as the number of firm–years in the data is sampled. This paper then computes $v = v_i + v_t - v_{it}$, where v_i is the variance of the R-squared values for the bootstrapped samples by firm, v_t is the variance of the R-squared values for the bootstrapped samples by year, and v_{it} is the variance of the R-squared values for the bootstrapped samples by firm–year. The standard error is the square root of the bootstrapped variance estimate v .

To assess the validity of this method, this paper first uses this approach to estimate the standard error of coefficients rather than R-squareds. This paper compares the bootstrapped standard errors to analytically estimated standard errors based on the approach of Gow et al. (2010). As a benchmark, this paper computes analytical standard errors using both two-way clustering and no clustering. If bootstrapped standard errors are accurate, they should resemble two-way clustered analytical standard errors more than non-clustered analytical standard errors. After assessing the validity of this method for coefficients, this paper then uses this approach to estimate bootstrapped standard errors for R-squared values.

Table 8 presents standard error estimates for coefficients and R-squareds for Equation (1) estimated with no controls for each Fama–French 48 industry. For coefficients, no clustering analytical standard errors, two-way cluster-robust analytical standard errors, and two-way cluster-robust bootstrapped standard errors are presented. As expected, the mean standard error across industries is larger for two-way cluster-robust approaches than for no clustering because it is reasonable to expect correlation in error terms both across firms and over time. Furthermore, two-way cluster-robust analytical standard errors and two-way cluster-robust bootstrapped standard errors resemble each other more than they resemble standard errors with no clustering (mean standard errors of 1.7 and 1.8, compared to 1.2 for no clustering). There is also considerable variation across industries in the difference between no clustering standard errors and cluster-robust standard errors. Whereas these standard errors are similar in certain industries, cluster-robust standard error values are double the no clustering standard error values in other industries.

Table 8. Analytical and bootstrapped standard errors for ERC regressions. This table presents analytical and bootstrapped standard errors for ERC regressions with no controls for each Fama–French 48 industry. No cluster refers to analytically calculated standard errors with no clustering. Analytical refers to two-way cluster robust standard errors calculated analytically. Bootstrap refers to two-way cluster robust standard errors estimated using bootstrapping.

IND	Name	Coefficient			R2
		No Cluster	Analytical	Bootstrap	Bootstrap
1	Agric	1.8	2.2	1.7	0.7
2	Food	1.1	2.3	2.6	0.6
3	Soda	2.1	1.2	2.5	1.0
4	Beer	2.5	1.5	2.2	0.3
5	Smoke	4.1	6.0	8.2	5.9
6	Toys	1.2	1.4	1.3	0.9
7	Fun	0.9	1.4	1.5	0.7
8	Books	1.0	1.2	1.2	1.2
9	Hshld	0.8	1.4	1.5	0.4
10	Clths	1.1	1.9	2.0	1.2
11	Hlth	0.7	1.0	1.0	0.6
12	MedEq	0.9	0.9	0.9	0.3
13	Drugs	0.7	0.8	0.9	0.2
14	Chems	1.0	1.9	1.9	0.7
15	Rubbr	1.1	1.6	1.8	0.4
16	Txtls	1.2	1.6	1.7	1.7
17	BldMt	0.8	1.1	1.2	1.1
18	Cnstr	0.9	1.8	1.5	0.6
19	Steel	0.8	1.4	1.4	1.6
20	FabPr	1.8	2.1	2.5	2.9
21	Mach	0.6	1.4	1.4	0.7
22	ElcEq	0.9	1.2	1.2	0.7
23	Autos	0.8	1.2	1.2	0.5
24	Aero	1.9	3.6	4.0	1.7
25	Ships	1.9	2.5	2.9	2.2
26	Guns	3.2	4.4	4.6	5.1
27	Gold	1.8	2.7	4.0	3.6
28	Mines	1.4	2.5	2.1	1.1
29	Coal	2.0	2.3	3.3	5.8
30	Oil	0.4	0.5	0.5	0.1
31	Util	0.5	0.9	1.3	1.0
32	Telcm	0.5	0.8	0.9	0.5
33	PerSv	1.0	1.5	1.6	0.6
34	BusSv	0.4	0.6	0.6	0.2
35	Comps	0.7	0.9	1.0	0.2
36	Chips	0.6	0.9	1.0	0.1
37	LabEq	1.0	1.3	1.1	0.4
38	Paper	1.0	2.0	2.0	0.9
39	Boxes	2.4	2.4	2.7	0.9
40	Trans	0.6	0.7	1.1	0.6
41	Whlsl	0.6	0.7	0.5	0.4
42	Rtail	0.5	0.9	1.0	0.4
43	Meals	0.7	1.0	1.4	0.8
44	Banks	0.3	0.8	0.9	1.0
45	Insur	0.6	1.3	1.3	0.6
46	RIEst	0.9	1.7	1.2	0.6
47	Fin	0.5	1.4	1.3	0.9
48	Other	1.7	2.3	2.6	0.9
Mean		1.2	1.7	1.8	1.2

Table 9 presents Pearson and Spearman correlations for the three standard error measures for coefficients and also an *Agreement* measure, which is calculated as one minus

Disagreement. *Agreement* measures the proportion of time that two measures draw the same inferences about whether the standard error is larger in one Fama–French 48 industry than in another Fama–French 48 industry.

Table 9. Comparison of standard error estimation approaches. This table presents comparisons of standard error estimation approaches for coefficients on earnings surprises (*EARN_SURP*) for ERC regressions for each Fama–French 48 industry. Pearson is Pearson correlation. Spearman is Spearman correlation. Agreement is the average percentage of the time that two measures being compared draw the same inferences about whether the standard error is larger in one Fama–French 48 industry than in another Fama–French 48 industry. No clustering refers to analytically calculated standard errors with no clustering. Analytical refers to two-way cluster robust standard errors calculated analytically. Bootstrap refers to two-way cluster robust standard errors estimated using bootstrapping.

Clustering Methods	Pearson	Spearman	Agreement
Analytical and Bootstrap	95.7	93.0	90.8
Analytical and No clustering	90.2	87.3	85.6
Bootstrap and No clustering	87.5	84.9	84.7

Table 9 reveals that two-way cluster-robust analytical and two-way cluster-robust bootstrapped standard errors are highly correlated and have high *Agreement* (Pearson corr. = 95.7, Spearman corr. = 93.0, *Agreement* = 90.8). In contrast, both have lower correlation and lower *Agreement* with analytical standard errors with no clustering (Pearson corr., Spearman corr., and *Agreement* range from 84.7–90.2 percent). Thus, Tables 8 and 9 suggest that two-way cluster robust analytical and two-way cluster robust bootstrapped standard errors produce highly similar results. Table 8 then presents a two-way cluster of robust bootstrapped standard errors for R-squared values. Thus, this methodology permits the ability to draw statistical inferences for R-squared values that are robust to two-way clustering of error terms.

7. Conclusions

This paper examines coefficients and R-squareds as candidates for drawing inferences about the informativeness of earnings. Although both have been proposed as candidates, research has focused far more on coefficients than R-squareds. This paper first illustrates using a small theoretical model that under some circumstances, R-squareds map more closely to informativeness than coefficients. This paper then documents that coefficients and R-squareds can draw opposite inferences up to and around 50 percent of the time in certain archival settings. This paper then proposes a methodology to provide statistical inference by estimating two-way cluster robust standard errors for R-squareds. Overall, this paper suggests that future research can consider examining both coefficients and R-squareds as candidates for drawing inferences on the informativeness of earnings.

There may be several directions for future research. The model is limited by simplifying assumptions, such as the normality of variable distributions. These assumptions may not reflect the real complexity of financial markets or empirical data. Future research could explore different sets of assumptions or relax these assumptions. In addition, the model could be extended to take into account macroeconomic factors, such as inflation, GDP growth, or interest rates. These additional factors could improve the explanation of variation in returns. The advantages and shortcomings of coefficients and R-squareds can be explored in future research. For example, R-squared can be influenced by model complexity and coefficients can be affected by collinearity between variables.

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Appendix A. List of Earnings Response Coefficients Papers Reviewed

This appendix lists the papers reviewed to document the prevalence of the use of coefficients and R-squareds in the literature to draw inferences on the informativeness of earnings. The papers are published from 1990–2023, and the journals reviewed are *Journal of Accounting and Economics*, *Journal of Accounting Research*, and *The Accounting Review*. The search criteria are all papers with at least one of the following keywords: ERC, ERCs, earnings response coefficient, and earnings response coefficients. The paper must also be an archival paper and have at least one regression of returns on earnings surprises. This resulted in a total of 34 papers reviewed. Of the papers reviewed, all papers examine coefficients, and nine papers (26%) examine R-squareds.

Ahmed (1994)
Baik et al. (2022)
Bandyopadhyay (1994)
Billings (1999)
Chi and Shanthikumar (2017)
Core and Schrand (1999)
Core et al. (2002)
Cready et al. (2001)
Dechow and You (2012)
DeFond and Park (2001)
Dhaliwal and Reynolds (1994)
Ettredge et al. (2005)
Fang et al. (2017)
Ferri et al. (2018)
Francis et al. (2002)
Geng et al. (2023)
Gu and Xue (2008)
Hayn (1995)
Imhoff and Lobo (1992)
Jame et al. (2016)
Kallapur (1994)
Kerstein and Kim (1995)
Kothari and Zimmerman (1995)
Lipe et al. (1998)
Lobo et al. (2017)
Nelson et al. (2008)
Orpurt and Zang (2009)
Penman (1992)
Soo and Soo (1994)
Teets and Wasley (1996)
Teoh and Wong (1993)
Tucker and Zarowin (2006)
Williams (2015)
Wilson (2008)

Appendix B.

Table A1. Variable Definitions.

Variable	Definition
CAR[−1,+1]	Market-adjusted return during [−1,+1] days around the earnings announcement period
EARN_SURP	(Earnings—lagged earnings)/Market value of equity
REV_SURP	(Revenues—lagged revenues)/Market value of equity
CFO_SURP	(Cash flow from operations—Lagged cash flow from operations)/Market value of equity
ROA	Earnings/Lagged assets
SIZE	Market value of equity
BM	Book value of equity/Market value of equity
REV	Revenues/Lagged assets
CFO	Cash flow from operations/Lagged assets
AG	(Assets—Lagged assets)/Lagged assets
YEAR	Fiscal year
IND	Fama–French 48 industries

Notes

- ¹ Dechow et al. (2010) note that investors respond to information that has value implications and that a stronger relation between value and earnings suggests earnings better reflect fundamental performance.
- ² The literature commonly uses coefficients to examine the informativeness of earnings. For example, to examine whether the earnings of firms with Big N auditors are more informative, Teoh and Wong (1993) run regressions of earnings announcement period returns on earnings surprises and control variables and compare the coefficients on earnings surprises for firms with Big N auditors and firms with non-Big N auditors. Teoh and Wong (1993) find that the coefficient on earnings surprises is higher for firms with Big N auditors and conclude that earnings are more informative for such firms. More generally in the literature, the coefficients on earnings surprises in two groups of firms are compared, either through an interaction term or separate regressions, to assess whether earnings are more informative for a certain group of firms. See Appendix A for a list of papers reviewed.
- ³ These journals are selected based on the University of Texas, Dallas, UTD24 database of leading business journals. Future research could examine a broader set of journals to capture a more comprehensive view of the evolution and trends in the field.
- ⁴ Incremental R-squareds and incremental adjusted R-squareds are helpful in regressions with multiple independent variables (e.g., control variables) because they capture the incremental explanatory power of the variable of interest instead of the total explanatory power of all variables in the regression.
- ⁵ In this paper, *EARN_SURP* is calculated as the change in earnings deflated by the market value of equity. Because the market value of equity is the product of share price and number of shares outstanding, this is analogous to deflating surprise in earnings per share-by-share price, which is common in the literature (see Appendix A). Similarly, *REV_SURP* and *CFO_SURP* in this paper use the market value of equity as a deflator.
- ⁶ For regressions with controls, the R-squared and adjusted R-squared values for the regression do not change when examining *REV_SURP* and *CFO_SURP* compared to when examining *EARN_SURP* because they reflect the overall explanatory power of the regression.
- ⁷ Because there are no control variables, the incremental R-squared values are the same as the R-squared values, and the incremental adjusted R-squared values are the same as the adjusted R-squared values.
- ⁸ It may be possible for some small or negative coefficients to be insignificant. An additional (untabulated) analysis that examines only specifications that have coefficients with *p*-values below 0.10 reveals similar results. Disagreement is 21.3–21.4 percent for *EARN_SURP*, 15.5 percent for *REV_SURP*, and 15.3–16.8 percent for *CFO_SURP* without controls (corresponding to Table 5) and 18.0–36.2 percent for *EARN_SURP*, 28.0–43.4 percent for *REV_SURP*, and 40.0–50.0 percent for *CFO_SURP* with controls (corresponding to Table 7).

References

- Ahmed, Anwer S. 1994. Accounting earnings and future economic rents. *Journal of Accounting and Economics* 17: 377–400. [CrossRef]
- Baik, Bok, Katherine A. Gunny, Boochun Jung, and Duri Park. 2022. Income smoothing through R&D management and earnings informativeness. *The Accounting Review* 97: 25–49.
- Bandyopadhyay, Sati P. 1994. Market reaction to earnings announcements of successful efforts and full cost firms in the oil and gas industry. *The Accounting Review* 69: 657–74.

- Billings, Bruce K. 1999. Revisiting the relation between the default risk of debt and the earnings response coefficient. *The Accounting Review* 74: 509–22. [CrossRef]
- Brown, Stephen, Kin Lo, and Thomas Lys. 1999. Use of R2 in accounting research: Measuring changes in value relevance over the last four decades. *Journal of Accounting and Economics* 28: 83–115. [CrossRef]
- Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller. 2008. Bootstrap-based improvements for inference with clustered errors. *The Review of Economics and Statistics* 90: 414–27. [CrossRef]
- Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller. 2011. Robust inference with multiway clustering. *Journal of Business & Economic Statistics* 29: 238–49.
- Chi, Sabrina S., and Devin M. Shanthikumar. 2017. Local bias in Google search and the market response around earnings announcements. *The Accounting Review* 92: 115–43. [CrossRef]
- Collins, Daniel W., Edward L. Maydew, and Ira S. Weiss. 1997. Changes in the value-relevance of earnings and book values over the past forty years. *Journal of Accounting and Economics* 24: 39–67. [CrossRef]
- Core, John E., and Catherine M. Schrand. 1999. The effect of accounting-based debt covenants on equity valuation. *Journal of Accounting and Economics* 27: 1–34. [CrossRef]
- Core, John E., Wayne R. Guay, and Andrew Van Buskirk. 2003. Market valuations in the new economy: An investigation of what has changed. *Journal of Accounting and Economics* 34: 43–67. [CrossRef]
- Core, John E., Wayne R. Guay, and S. P. Kothari. 2002. The economic dilution of employee stock options: Diluted EPS for valuation and financial reporting. *The Accounting Review* 77: 627–52. [CrossRef]
- Cready, William M., David N. Hurtt, and Jim A. Seida. 2001. Applying reverse regression techniques in earnings-return analyses. *Journal of Accounting and Economics* 30: 227–40. [CrossRef]
- Dechow, Patricia M., and Haifeng You. 2012. Analysts' motives for rounding EPS forecasts. *The Accounting Review* 87: 1939–66. [CrossRef]
- Dechow, Patricia, Weili Ge, and Catherine Schrand. 2010. Understanding earnings quality: A review of the proxies, their determinants and their consequences. *Journal of Accounting and Economics* 50: 344–401. [CrossRef]
- DeFond, Mark L., and Chul W. Park. 2001. The reversal of abnormal accruals and the market valuation of earnings surprises. *The Accounting Review* 76: 375–404. [CrossRef]
- Dhaliwal, Dan S., and Stanley S. Reynolds. 1994. The effect of the default risk of debt on the earnings response coefficient. *The Accounting Review* 69: 412–19.
- Ettredge, Michael L., Soo Young Kwon, David B. Smith, and Paul A. Zarowin. 2005. The impact of SFAS No. 131 Business Segment Data on the market's ability to anticipate future earnings. *The Accounting Review* 80: 773–804. [CrossRef]
- Fama, Eugene F., and Kenneth R. French. 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33: 3–56. [CrossRef]
- Fama, Eugene F., and Kenneth R. French. 2015. A five-factor asset pricing model. *Journal of Financial Economics* 116: 1–22. [CrossRef]
- Fang, Vivian W., Allen H. Huang, and Wenyu Wang. 2017. Imperfect accounting and reporting bias. *Journal of Accounting Research* 55: 919–62. [CrossRef]
- Ferri, Fabrizio, Ronghuo Zheng, and Yuan Zou. 2018. Uncertainty about managers' reporting objectives and investors' response to earnings reports: Evidence from the 2006 executive compensation disclosures. *Journal of Accounting and Economics* 66: 339–65. [CrossRef]
- Francis, Jennifer, Katherine Schipper, and Linda Vincent. 2002. Expanded disclosures and the increased usefulness of earnings announcements. *The Accounting Review* 77: 515–46. [CrossRef]
- Geng, Heng, Cheng Zhang, and Frank S. Zhou. 2023. Financial reporting quality and myopic investments: Theory and evidence. *The Accounting Review* 98: 223–51. [CrossRef]
- Gow, Ian D., Gaizka Ormazabal, and Daniel J. Taylor. 2010. Correcting for cross-sectional and time-series dependence in accounting research. *The Accounting Review* 85: 483–512. [CrossRef]
- Greene, William H. 2018. *Econometric Analysis*. New York: Pearson Education.
- Gu, Zhaoyang, and Jian Xue. 2008. The superiority and disciplining role of independent analysts. *Journal of Accounting and Economics* 45: 289–316. [CrossRef]
- Hayn, Carla. 1995. The information content of losses. *Journal of Accounting and Economics* 20: 125–53. [CrossRef]
- Huang, Chi-fu, and Robert H. Litzenberger. 1988. *Foundations for Financial Economics*. New York: North-Holland.
- Imhoff, Eugene A., Jr., and Gerald J. Lobo. 1992. The effect of ex ante earnings uncertainty on earnings response coefficients. *The Accounting Review* 67: 427–39.
- Jame, Russell, Rick Johnston, Stanimir Markov, and Michael C. Wolfe. 2016. The value of crowdsourced earnings forecasts. *Journal of Accounting Research* 54: 1077–110. [CrossRef]
- Jegadeesh, Narasimhan, and Joshua Livnat. 2006. Revenue surprises and stock returns. *Journal of Accounting and Economics* 41: 147–71. [CrossRef]
- Kallapur, Sanjay. 1994. Dividend payout ratios as determinants of earnings response coefficients: A test of the free cash flow theory. *Journal of Accounting and Economics* 17: 359–75. [CrossRef]
- Kerstein, Joseph, and Sungsoo Kim. 1995. The incremental information content of capital expenditures. *The Accounting Review* 70: 513–26.

- Kothari, Sriprakash P., and Jerold L. Zimmerman. 1995. Price and return models. *Journal of Accounting and Economics* 20: 155–92. [CrossRef]
- Lambert, Richard A., and David F. Larcker. 1987. An analysis of the use of accounting and market measures of performance in executive compensation contracts. *Journal of Accounting Research* 25: 85–125. [CrossRef]
- Lev, Baruch. 1989. On the usefulness of earnings and earnings research: Lessons and directions from two decades of empirical research. *Journal of Accounting Research* 27: 153–92. [CrossRef]
- Lev, Baruch, and Feng Gu. 2016. *The End of Accounting and the Path Forward for Investors and Managers*. Hoboken: John Wiley & Sons, Inc.
- Lipe, Robert C., Lisa Bryant, and Sally K. Widener. 1998. Do nonlinearity, firm-specific coefficients, and losses represent distinct factors in the relation between stock returns and accounting earnings? *Journal of Accounting and Economics* 25: 195–214. [CrossRef]
- Lobo, Gerald J., Minsup Song, and Mary Harris Stanford. 2017. The effect of analyst forecasts during earnings announcements on investor responses to reported earnings. *The Accounting Review* 92: 239–63. [CrossRef]
- Nelson, Karen K., Richard A. Price, and Brian R. Rountree. 2008. The market reaction to Arthur Andersen's role in the Enron scandal: Loss of reputation or confounding effects? *Journal of Accounting and Economics* 46: 279–93. [CrossRef]
- Ohtani, Kazuhiro. 2000. Bootstrapping R^2 and adjusted R^2 in regression analysis. *Economic Modelling* 17: 473–83. [CrossRef]
- Orpurt, Steven F., and Yoonseok Zang. 2009. Do direct cash flow disclosures help predict future operating cash flows and earnings? *The Accounting Review* 84: 893–935. [CrossRef]
- Penman, Stephen H. 1992. Financial statement information and the pricing of earnings changes. *The Accounting Review* 67: 563–77.
- Roll, Richard. 1988. R^2 . *Journal of Finance* 43: 541–66. [CrossRef]
- Sloan, Richard G. 1996. Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review* 71: 289–315.
- Soo, Billy S., and Lisa Gilbert Soo. 1994. Accounting for the multinational firm: Is the translation process valued by the stock market? *The Accounting Review* 69: 617–37.
- Teets, Walter R., and Charles E. Wasley. 1996. Estimating earnings response coefficients: Pooled versus firm-specific models. *Journal of Accounting and Economics* 21: 279–95. [CrossRef]
- Teoh, Siew Hong, and Tak J. Wong. 1993. Perceived auditor quality and the earnings response coefficient. *The Accounting Review* 68: 346–66.
- Tucker, Jennifer W., and Paul A. Zarowin. 2006. Does income smoothing improve earnings informativeness? *The Accounting Review* 81: 251–70. [CrossRef]
- Williams, Christopher D. 2015. Asymmetric responses to earnings news: A case for ambiguity. *The Accounting Review* 90: 785–817. [CrossRef]
- Wilson, Wendy M. 2008. An empirical analysis of the decline in the information content of earnings following restatements. *The Accounting Review* 83: 519–48. [CrossRef]

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Article

Driving Venture Capital Interest: The Influence of the Big 4 Audit Firms on IPOs

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Abstract: This paper investigated how hiring one of the Big 4 auditing firms helps initial public offering (IPO) owners attract venture capitalists' (VCs) backing when going public to address the gap in auditing and venture capital literature. For this, the paper examined a large dataset from 1995 to 2019 consisting of 33,536 IPO firms from 22 countries with diverse socioeconomic, political, and cultural contexts. The study found that hiring Big 4 auditors increases IPO owners' chances of recruiting VCs by up to 50%. The analysis also supports prior findings, which state that IPO owners strategically choose Big 4 audit firms to lower agency costs and send quality signals to improve openness and disclosure as well as boost VCs' confidence in the IPO market. This research offers multiple benefits to academics, policymakers, investors, and issuers.

Keywords: Big 4 auditors; venture capitalists; signalling; agency cost; IPOs

1. Introduction

This study sought to fill a research gap in auditing and venture capital literature by investigating the impact of hiring one of the Big 4 auditing firms on helping initial public offering (IPO) owners to attract venture capitalists' (VCs) backing during their decision to go public. Research has confirmed that VCs are essential for guiding a firm towards a successful IPO (Amini et al. 2022; Copley et al. 2021). VCs supply the essential funding, strategic advice, and industry contacts that may assist companies in expanding quickly and reaching a point where they are prepared to become publicly traded (De Carvalho et al. 2020). Usually, they are long-term investors who are prepared to assist the firm throughout its development stages after the IPO, when the firm can encounter heightened scrutiny and expectations from public shareholders (Bernstein et al. 2017; Svetek 2022). Their ongoing support may contribute to stabilising the price of the company's shares and ensuring a smooth transfer to the public markets (Copley et al. 2021; Liu et al. 2021). Moreover, research also indicates that IPO owners are eager to attract VCs when they choose to become publicly traded (Amini et al. 2022; Liu et al. 2021). Nevertheless, the question is how IPO owners can attract VCs to participate when they decide to go public.

A thoughtful strategic move that IPO businesses may make to increase financial dependability, transparency, and reliability might involve hiring a reputable audit firm as part of the IPO process (Beatty 1989; Gao et al. 2011; Gompers et al. 2020), which could drive investor trust and have a positive influence over VCs' backing (Copley et al. 2021; Cumming and Johan 2008; De Carvalho et al. 2020). Auditing research suggests that the Big 4 audit firms, namely Deloitte, PricewaterhouseCoopers (PwC), Ernst & Young (EY), and KPMG, have a strong market reputation among IPOs in the auditing business (Agrawal and Cooper 2010; Beatty 1989; Gao et al. 2011; Joshi et al. 2022; Reiff and Tykvoová 2021). They may play a significant role in attracting VCs to participate in an IPO. The Big 4 firms are renowned in the accounting and auditing industry for their proficiency in auditing, accounting, and consulting services (De Franco et al. 2011; Jacob et al. 2019); therefore, engaging a Big 4 audit firm while preparing for an IPO may improve the firm's

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financial legitimacy (Cohen and Dean 2005), transparency (Johl et al. 2021), and adherence to regulatory norms (Islam and Hossain 2017), making it more appealing to VCs. Moreover, an audit's clearance by the Big 4 may boost VC investors' faith in the firm's financial stability and reporting integrity (Colombo 2021). Engaging a Big 4 audit firm can also bring several advantages in drawing VCs to an IPO. For instance, choosing a Big 4 audit firm tells VCs that a business' financial statements have undergone a thorough examination and audit by a respected and impartial third party, thus increasing trust and confidence in the IPO prospectus (Connelly et al. 2011). Furthermore, the Big 4 audit firms are known for their strict audit procedures and compliance with audit standards (Lawrence et al. 2011), so engaging a Big 4 company allows IPOs to signal a dedication to financial openness and honesty (Jamaani and Alidarous 2022), which are crucial factors for VCs assessing investment prospects. Additionally, as VCs carefully evaluate investment risks (Kaiser et al. 2007a), the participation of a Big 4 audit firm may reduce risks associated with financial inaccuracies, fraud, and failure to meet regulatory standards (Khurana and Raman 2004), offering more confidence to VCs.

The correlation between engaging the Big 4 auditing firms and IPO companies has garnered significant scholarly interest because of the recent auditing scandals associated with IPOs (Abbott et al. 2023; De Franco et al. 2011; Sundarasan et al. 2021). This is because the frequency of auditing scandals involving IPOs has raised doubts about the effectiveness of audits carried out by major companies, such as the Big 4 (Chen et al. 2022; Toms and Lin 2023). For instance, Enron, an energy corporation, saw a substantial decline in 2001 after the exposure of its participation in widespread accounting fraud (Haswell and Evans 2018), and a prominent accounting firm by the name Arthur Andersen conducted an audit of Enron's IPO (Cahan et al. 2009). According to Gilson and Villalonga (2007), Adelphia Communications' collapse in 2002 was attributed to fraudulent accounting practices, and its founder and executives were convicted of fraud and securities fraud. Moreover, auditing company Deloitte & Touche settled litigation related to the issue by paying USD 167.5 million (CFO Magazine 2007). Furthermore, in 2009, Satyam Computer Services, a leading Indian IT company, admitted to a major accounting fraud (Bhasin 2013). Ramalinga Raju, the CEO and creator of the business, was sentenced to seven years in jail, whereas the accounting and auditing firm PwC was fined USD 6 million by Indian authorities (Reuters 2015). Additionally, in 2015, the Japanese international corporation Toshiba was involved in an accounting controversy where it was found that the firm had overstated its earnings by USD 1.2 billion over many years (Reuters 2015). Ernst & Young ShinNihon conducted an audit of the company's IPO as reported by Reuters (2015). Finally, Deliveroo's IPO in 2021 received significant investor backlash due to worries about the company's recruiting practices and valuation (Insider 2021), and PwC, the firm's auditor, received criticism for its role in the IPO (Alidarous 2024).

Indeed, audit scandals linked to IPOs have eroded trust in the accuracy and dependability of financial reporting, causing investors to be more cautious and sceptical when considering participation in IPOs (Agrawal and Cooper 2010; Petra and Spieler 2020). This growing scepticism has led to a more careful attitude towards IPO investments, with VCs increasingly demanding more extensive due diligence and stronger supervision (Beatty et al. 2013). The identification of financial misconduct, fraud, and significant inaccuracies in IPOs underscores the need for further examination of the relationship between Big 4 audit firms' involvement and the capacity of IPOs to attract VCs' backing. This need aims to understand how audit quality, accountability, and governance processes influence VCs' attitudes in the IPO market. Examining the impact of audit firm choice on IPOs' likelihood of VC backing can add to the auditing and venture capital literature by revealing the factors that affect VC confidence, risk evaluation, and IPO valuation (Amini et al. 2022; Beatty 1989; Certo et al. 2001; Chan et al. 2021; Firth and Liao-Tan 1998; Liu et al. 2021). Moreover, given the recent audit scandals and the shifting nature of the capital markets, understanding the relationship among VCs, the Big 4 audit firms, and the success of IPOs is of utmost importance for auditing and venture capital research (Agrawal and Cooper 2010; Petra and

Spieler 2020). The present study furthers previous auditing and venture capital research, which has solely focused on auditing quality and the involvement of VCs in IPO outcomes independently (Amini et al. 2022; Beatty 1989; Certo et al. 2001; Chan et al. 2021; Firth and Liao-Tan 1998; Liu et al. 2021). To the best of my knowledge, no study thus far has examined the role of the Big 4 auditing firms in improving IPO firms' ability to attract VCs; therefore, by addressing the research gap concerning this significant yet untested correlation, this paper can contribute to policy deliberations, regulatory adjustments, and optimal methodologies that seek to promote openness, responsibility, and safeguarding for investors in the IPO market.

This study used principal agent theory (PAT) and signalling theory (ST) to examine the link between the Big 4 audit companies and VC investors in the IPO market (Beatty 1989; Busenitz et al. 2005; Chan et al. 2021; Colombo 2021; De Carvalho et al. 2020; Kaplan and Strömberg 2001). A conventional IPO might include VCs (i.e., principals) backing and the firm's management team (i.e., agents) in return for ownership holdings (Liu et al. 2021). VCs rely on management to make decisions in the best interests of investors (Joshi et al. 2022). However, contrasting motivations between VCs and firm management might cause IPO conflicts of interest (Cumming and Johan 2008). For example, VCs emphasise profits on their investments and value information transparency, whereas firm management may prioritise personal benefit or corporate development (Gompers et al. 2020). Therefore, by hiring a Big 4 audit firm, IPOs could signal accountability, transparency, and good governance (Burke et al. 2019). This is because reputable audit firms such as the Big 4 can verify the firm's financial statements, internal controls, and accounting practices (Gao et al. 2011). The hiring of the Big 4 may reduce information asymmetry between VCs and corporate management, thereby lowering agency costs (Beatty 1989; Cumming and Johan 2008; DeFond 1992; Gao et al. 2011). VCs may also trust the audit report audited by the Big 4 firms to verify the company's accounting information in the IPO prospectus (Huang et al. 2020). Further, using a Big 4 auditing service may help align VC and corporate interests throughout the IPO process (Gompers 1995; Huang et al. 2020; Joshi et al. 2022; Liu et al. 2021). Additionally, the Big 4 auditing firms' strict audit processes and standards can signal to VCs that the company values corporate governance and financial integrity, while unbiased confirmation and certification from the Big 4 audit firms may enable VCs and business management to trust each other, thereby lowering agency expenses and any conflicts of interest (Arthurs and Busenitz 2003; Cumming and Johan 2008; Hope et al. 2012). Additionally, due to the transparent nature and scrutiny of Big 4 audits, VCs may become more interested in investment IPOs audited by the Big 4. Thus, the study hypothesis that renowned auditing service by the Big 4 firms may increase openness, reduce information asymmetry, and align stakeholder interests, making IPO businesses more appealing to VC investors. Consequently, investors' confidence and VCs flow are expected to increase when IPO companies hire Big 4 audit firms to review their financial statements and signal their commitment to good governance.

The study analysed 33,536 IPOs occurring between 1995 and 2019 in 22 countries with varied socioeconomic, legislative, and cultural backgrounds, and the results confirm that the hiring of the Big 4 auditors' firms significantly enhances the likelihood of IPO owners attracting VC participation by as much as 50% in the IPO market. The findings align with those of previous studies that suggest IPO owners strategically select Big 4 audit firms to reduce agency costs, improve transparency and disclosure, and enhance investor trust in the IPO market (Cumming and Johan 2008; Iatridis 2012; Jamaani and Alidarous 2022; Obeng et al. 2021). Moreover, IPO owners signal their commitment to robust governance practices, instil trust with VCs, and enhance their standing in the market through the utilisation of PAT and ST, which enhances their capacity to attract VC investments and achieve a successful IPO (Chan et al. 2021; Colombo 2021). External monitoring and assurance from the Big 4 auditing firms play a vital role in reducing information asymmetry, aligning the goals of VCs and business management, and fostering positive relationships that encourage VCs to participate in IPOs (Gompers 1995; Huang et al. 2020; Joshi et al. 2022; Liu et al. 2021).

The results of this study confirm that the utilisation of the PAT and ST can be an effective strategy for evaluating the influence of involving Big 4 audit firms in attracting VCs for IPOs. This is accomplished by transmitting a high-quality signal that minimises the costs associated with the relationship between IPO owners and VCs. It also strengthens the trust of VCs while simultaneously improving transparency and disclosure in the IPO prospectus.

This study makes valuable contributions to scholars, policymakers, investors, and issuers in several ways. First, this research contributes to auditing and venture capital research by enhancing the understanding of information asymmetry and signalling mechanisms in the IPO market. This study investigates how the hiring of an audit firm might impact VCs' investment choices in a company's IPO by contributing to prior research that has focused on auditing quality and the involvement of VCs in IPO outcomes independently (Amini et al. 2022; Beatty 1989; Certo et al. 2001; Chan et al. 2021; Firth and Liao-Tan 1998; Liu et al. 2021). Moreover, the research on information asymmetry and ST enhances auditing and venture capital literature focused on addressing the agency issue between agents (IPO firms) and principals (VCs). The PAT and ST in the IPO market elucidate the linkages and dynamics among important participants in the IPO process and could serve as an effective framework for researchers to comprehend the impact of engaging the Big 4 audit firms on recruiting VCs to IPO businesses. Thus, the study is timely, relevant, and important to scholars due to recent audit scandals that have caused concerns regarding audit quality and transparency in the IPO market. Second, policymakers can employ the findings to shape laws and regulations concerning auditing standards, corporate governance procedures, and investor protection in the IPO market. This study may emphasise the significance of accountability, transparency, and quality assurance in drawing VC investments and promoting IPO market integrity; therefore, legislators should explore ways to encourage corporations to choose trustworthy audit firms to boost VCs' trust and lower agency costs. Third, VCs and other investors may obtain insights by analysing how employing the Big 4 audit firms affects IPO businesses' capacity to seek investment. This study may assist investors in making better judgments by understanding the importance of quality auditing services and corporate governance standards offered by the Big 4 auditing firms when assessing possible investments in IPOs. Finally, IPO owners can leverage the findings of this study to strategically position themselves to appeal to VCs and other investors. Issuers may increase their likelihood of attracting investment and accomplishing successful IPOs by understanding the importance of employing the Big 4 audit firms to enhance transparency and credibility. This study may also assist issuers in adopting optimal strategies in financial reporting, company governance, and investor relations to establish confidence and credibility with prospective investors in the IPO market. Exploring the experiences of IPOs within the VC investment process through ST can enhance their ability to attract VC investments. Thus, comprehending the signals goes beyond mere recognition to interpreting them for the IPO owners' advantage, enhancing the IPO experience throughout the investment process.

The remainder of the paper is structured as follows: Section 2 provides an overview of the literature, which is followed by the development of theory and hypotheses in Section 3. Next, Sections 4 and 5 present the empirical results, data, and methods. Finally, Section 6 concludes the study.

2. Literature Review

2.1. The Relationship between VCs and IPOs

VCs, as defined by Busenitz et al. (2005), are a group of financial intermediaries who solicit capital from other investors to invest directly in new enterprises. In order to fully understand the appropriate correlation between VCs and IPOs, it is imperative to grasp the underlying reasons that prompt VCs to invest in IPOs in the first instance. VC firms may choose to invest in IPOs for several reasons. Firstly, this relationship may exist owing to the potential for substantial returns. VCs provide funds to invest in early-stage startups and rapidly expanding corporations, anticipating substantial financial gains from their

investments. VC firms may potentially achieve substantial returns by investing in IPOs, since they have the chance to benefit from the company's rising stock price after going public and therefore receive a share of its higher value. Research documents indicate that the average first-day return ranges from 27.7% to 43.90% in the global IPO market (Boulton et al. 2010; Zhang and Neupane 2024). Therefore, considering that venture capitalists invest in the early phases of an IPO business with discounted share prices, VCs may generate substantial returns at the debut of the IPO and in the post-IPO period when the firm's share prices spike on the secondary market a couple of years after trading. Secondly, this association may be attributed to the advantage of liquidity. VCs often adhere to a predetermined schedule for their investments and actively look for chances to divest their holdings in order to create liquidity for their investors (Nguyen and Vo 2021). Investing in an IPO enables VC companies to sell their ownership share in a business to the general public, allowing them to turn their investment into cash. Thirdly, this association may be attributed to the advantage of portfolio diversity. VCs oversee diverse portfolios of assets in order to distribute risk and optimize profits (Knill 2009). VC firms may diversify their portfolios by investing in IPOs, which involves adding publicly listed businesses to their existing private assets. Diversifying investments may effectively mitigate the overall risk of a portfolio and minimize exposure to a particular asset class or market sector (Knill 2009). Furthermore, this association may be attributed to the advantage of increased visibility and brand awareness. VCs frequently want to establish their credibility and draw in exceptional investment opportunities from entrepreneurs and companies (Joshi et al. 2022). Investing in well-known IPOs may enhance the prominence and reputation of VC companies in the market, demonstrating their history of successful investments and their ability to discover potential businesses (Joshi et al. 2022). Consequently, VC investors place a greater emphasis on early-stage ventures owing to the heightened expenses and uncertainties associated with investments (Drover et al. 2017), which distinguishes this form of VC financing from crowd fund (CF¹) investment, private equity (PE²) investment, and angel investing (AI³) investment, where the latter three traditionally contribute their own funds to the former (Busenitz et al. 2004). Private company owners can secure substantial capital from the general public via IPOs (Jamaani and Alidarous 2019; Ritter and Welch 2002). However, an obstacle that IPOs encounter in securing this capital is the information asymmetry that exists between owners of IPOs and the investors in the IPO market (Jamaani and Alidarous 2019; Jamaani and Ahmed 2020). Prior research has demonstrated that the IPO market is characterised by substantial information uncertainty, which contributes to a high degree of information asymmetry and heightened susceptibility to earnings management (DuCharme et al. 2001; Jamaani and Alidarous 2022). The assessment of IPO firms' investment potential by investors and analysts becomes problematic due to the absence of historical trading records for the stock's price (Boulton et al. 2010). The exclusive source that provides information that analysts and investors can rely on to assess the quality of accounting information contained in business prospectuses is under the authority of the entity issuing the prospectus (Jamaani and Alidarous 2019). Additionally, the issue of informational investment uncertainty between the issuance and investors, including VCs, is further compounded by this exclusivity (Cohen and Dean 2005; Habib and Ljungqvist 2001; Jamaani and Ahmed 2020; Ritter 2013); consequently, VCs are compelled to depend on quality signals of IPO companies (Cohen and Dean 2005), which consist of particular attributes, approaches, judgments, or actions that serve as signs of the companies' prospects (Bergh et al. 2014; Colombo 2021).

By recognising the persistent agency issue between VCs (i.e., principals) and the IPO owner (i.e., agents) (Liu et al. 2021), the research on signals in IPO markets initially focused on the reliable signals of a company's scientific and engineering capabilities, such as intellectual property and product development metrics companies (Cohen and Dean 2005). The literature discussed the impact of venture officers on signalling, including managerial teams (Cohen and Dean 2005) and members of the board (Certo et al. 2001). Moreover, in current research, there has been a growing focus on the communication functions between

IPO owners and potential IPO investors such as VCs (Kaiser and Kuckertz 2023; Pollock et al. 2010). Business owners seek to persuade VCs, who are potential investors, of their company's qualities through the process of new-venture financing. VCs' decisions to invest are influenced by the receivers' judgment basis and the evidence they find relevant (Chen et al. 2009). Multiple studies have recognised and examined various signals for effectively transporting valuable information to VCs (Cohen and Dean 2005). In business literature, a distinction has been made between information signals, which communicate the potential success of a business, and interpersonal signals, which reflect the business owner's behaviour and capacity to cooperate with others (Huang and Knight 2017). Several factors play a crucial role in VC financing, including human capital, readiness, social capital, technological innovations, government funding, and affiliations with third parties such as hiring reputable underwriters and auditors (Colombo 2021; Sundarasan et al. 2018). Interpersonal signals in entrepreneurship include enthusiasm for the business (Chen et al. 2009), personal dedication to the venture (Busenitz et al. 2005), and the coachability of the business owner (Ciuchta et al. 2018). Furthermore, static signals like the entrepreneur's educational attainment and the company's market share offer investors insights into the potential returns on their investments (Colombo 2021). Notably, the findings of previous research highlight the impact of multiple variables on signalling power in VC financing (Bergh et al. 2014; Busenitz et al. 2005; Ciuchta et al. 2018; Cohen and Dean 2005).

The literature emphasises the importance of third-party affiliation in enhancing signalling effectiveness (Colombo 2021; Plummer et al. 2016). Signals such as human capital can be difficult for external investors to assess, leading to lower levels of attention (Zane 2023). Nevertheless, when associated with a reputable third party, the signal gains validation and reliability (Connelly et al. 2011). Plummer et al. (2016) demonstrated this effect by illustrating how being associated with a well-known investment organisation validates a business owner's assertions regarding their past managerial abilities, consequently confirming the organisation's positive reputation. Having a third-party affiliation can also enhance a product's market value and assist external investors in differentiating between poor-quality and top-notch ventures (Bergh et al. 2014). Plummer et al. (2016) also demonstrated empirical evidence supporting the assumption that the effectiveness of entrepreneurial commitment is enhanced by a third-party affiliation. Additionally, investors' significant status is a significant factor that acts as a form of certification, thus enhancing the trustworthiness of signals (Ko and McKelvie 2018). Thus far, scholars have explored various signals used by IPO firms to address the agency problem with VCs, aiming to minimise the information asymmetry gap and attract investment when going public. However, no study has investigated the connection between IPO owners hiring one of the Big 4 auditing firms and their ability to attract VCs.

2.2. Hiring Big 4 Auditors and IPO Audit Quality

Within publicly traded companies, the issue of whether Big 4 auditors provide better audit quality is being extensively researched (Alidarous 2024; Francis and Wang 2008; Gao et al. 2011; Huang et al. 2020; Khurana and Raman 2004). As per the theory proposed by DeAngelo (1981), Big 4 auditing companies are expected to provide higher audit quality due to their focus on reputation and increased independence compared to non-Big-4 auditors. The auditors for the Big 4 are becoming more concerned about legal action as they have a lot at stake because of their significant financial resources and the efforts put into building their reputation (Khurana and Raman 2004; Palmrose 1988). Along with this, Big 4 auditors are considered more efficient due to their larger size, which enables them to attract and retain higher-quality human resources (Gao et al. 2011). Research on publicly traded companies suggests that Big 4 auditing firms provide higher audit quality compared to non-Big-4 auditing firms (Becker et al. 1998; Defond et al. 2018).

With their significant experience in auditing, the Big 4 auditors might excel in auditing IPOs (Jamaani and Alidarous 2022; Jamaani and Alawadhi 2023). These auditors possess extensive global networks, consulting services, and a multitude of specialised regulations

specialists (Jacob et al. 2019). This information can assist in identifying audit alterations or anticipating and addressing Security Exchange Commission (SEC) accounting comments (Johnson et al. 2023). It should also be noted that the Big 4 auditing companies charge higher fees for IPO audits compared to the non-Big-4 auditors, which allows them to allocate more resources to these audits (Chan et al. 2021). Legal action related to IPOs and worries about reputation suggests that the Big 4 auditing companies are motivated to provide top-notch services (Gao et al. 2011; Khurana and Raman 2004). Due to the presence of lawsuit risk acts in many countries, IPO auditors need to have strong lawsuit motivation (Khurana and Raman 2004; Lin et al. 2013). Participating in IPO audits can offer significant financial benefits, the opportunity for ongoing work in the IPO sector, and increased visibility to potential clients, potentially enhancing the auditor's standing in the industry (Sundarasan et al. 2018).

During the IPO listing process, IPO companies typically hire an external auditor to conduct due diligence and validate financial statements in the prospectus before listing the company on the IPO market (Alidarous 2024; Beatty 1989; Jamaani and Alidarous 2022). Investors, including VCs, can carefully analyse the IPO prospectus to determine whether to invest in the IPO company or not (Chang et al. 2008; Copley et al. 2021). The inclusion of accounting and financial information in the prospectuses of company documents helps to minimise information disparities between IPO founders and shareholders including VCs (Masulis and Nahata 2009). The Big 4 audit reports play a crucial role in ensuring the authenticity and transparency of information provided, thereby supporting a healthy IPO market (Francis and Wang 2008). Studies have demonstrated that IPO investors rely on leading auditing firms, particularly the Big 4, for high-quality audits and ethical practices (Alidarous 2024; Khurana and Raman 2004; Lawrence et al. 2011).

Auditing companies' reputations are crucial for enhancing quality and minimising information asymmetry among investors and owners of IPO companies (Sundarasan et al. 2018). Moreover, audit firms such as the Big 4 play a crucial role in clarifying and reducing uncertainties about the accounting and financial data included in IPO prospectuses (Sundarasan et al. 2021). Investors prefer cautiously audited prospectuses because they perceive them as less hazardous, leading to reduced compensation for ex-ante uncertainty risk (Vinten 2005). This helps to decrease the information disparity between potential IPO shareholders and entrepreneurs (Wang and Song 2021). According to Beatty (1989) and Beatty et al. (2013), reputable auditing firms such as the Big 4 are anticipated to decrease the chances of fraudulent prospectuses, thereby maximising the possibility of successful IPO listing.

Furthermore, research confirms a correlation between engaging the services of the Big 4 auditing firms and reducing the underpricing of IPOs (Khurana and Raman 2004; Sundarasan et al. 2021). According to ST, signals can expose hidden qualities of owners, reducing information asymmetry between investors and issuers and increasing successful IPO offerings (Badru et al. 2019; Connelly et al. 2011; Welch 1989). Based on signalling research, the quality of the signal can impact the likelihood of agency problems between potential IPO investors such as VCs (i.e., principals) and the issuers of IPOs (i.e., agents) (Colombo 2021). Investors in IPOs rely on signals from the companies going public to guide their investment choices. Studies have demonstrated that engaging Big 4 audit firms can help establish credibility, especially when dealing with the risks associated with being a new player in the market (Certo et al. 2001; Certo 2003; Colombo 2021). Further, Big 4 auditors at an IPO may signal a company's strong auditing standards and reliable financial data (Burke et al. 2019).

2.3. Research Motivation

The literature on IPOs has predominantly examined the effects of Big 4 auditing firms on different aspects of IPOs, such as underpricing, long-term performance, withdrawal, and earnings management. Various studies (Alidarous 2024; Beatty 1989; Chen et al. 2005; Francis and Wang 2008; Jamaani and Alidarous 2022; Lee et al. 2006) have focused on

this topic and highlighted the numerous benefits associated with engaging Big 4 auditors. There is a lack of comprehensive knowledge on the impact of engaging auditors from the four largest accounting firms (Big 4) on the ability of IPO owners to attract VCs when they choose to make their company public. Therefore, this limited comprehension serves as the foundation for a strong research motivation to conduct a study that addresses a gap in the literature on auditing and venture capital. The study aims to examine the influence of engaging one of the Big 4 auditing firms on the ability of IPO owners to attract support from VCs when deciding to go public.

3. Theory and Hypothesis Development

This study utilised two theoretical models—namely, the PAT and ST—both of which offer important perspectives into how IPO owners employ the Big 4 audit firms to appeal to VCs (Beatty 1989; Busenitz et al. 2005; Chan et al. 2021; Colombo 2021; De Carvalho et al. 2020; Kaplan and Strömberg 2001). This is achieved by minimising agency costs, increasing transparency, boosting investor confidence, tackling information disparities, and signalling that the company is trustworthy to prospective investors. Moreover, PAT and ST can work together effectively to illustrate the significance of IPO firms hiring a Big 4 audit firm to appeal to VCs. By examining the interaction between the principal (i.e., VC) and the agent (i.e., IPO), PAT delves into concepts such as information asymmetry, monitoring, and control mechanisms (Chan et al. 2021; Gompers 1995). On the other hand, ST explores how the actions of the IPO firm can communicate important information to external parties such as VCs regarding its integrity, trustworthiness, and motives (Colombo 2021).

Some scholars have utilised PAT as a theoretical framework to explore the relationship between business owners and VCs in financial contracting, as demonstrated by Gompers (1995), Brav and Gompers (1997), and Kaplan and Strömberg (2001). According to Ross (1973), an agency connection is established when one party, known as the agent, represents or acts on behalf of another party, known as the principal, in a specific area of decision-making. It is common to perceive the VC as the principal and the business owner as the contracting agent in their relationship with one another (Gompers 1995). Notably, the VCs are not granted any personal advantages from control, while the business owner gains non-monetary benefits from establishing an autonomous company (Gompers 1995; Kaplan and Strömberg 2001). Due to the inability of the VC to directly measure the owner's level of effort, the dynamic of their relationship is affected by asymmetrical information, such as the business owner possessing greater information concerning the business compared to the VC (Cumming and Johan 2008). As a consequence, two issues could surface: (1) adverse selection, and (2) moral hazard (Kaiser et al. 2007b). Adverse selection is a result of asymmetrical information distribution (Kaiser et al. 2007b). For instance, in the dynamic between the VC and the business owner, the VC is unable to access the identical information as the business owner unless a formal agreement is established between them. Moral hazard is connected to adverse selection and arises due to challenges in monitoring the business owner's efforts (Kaiser et al. 2007b; Schnitzer and Watzinger 2022). Therefore, the VC cannot ensure that the business owner is acting optimally or if the business owner may be gaining personal advantages from undisclosed actions (Kaiser et al. 2007a, 2007b). These factors can negatively impact the VC and the collective reward, as referenced in Kaiser et al. (2007b). Here, the VC is likened to an external stakeholder who meticulously watches the firm to assess its business prospective and oversee the business owner's actions to guard against opportunism (Arthurs and Busenitz 2003).

To address the conflict that researchers face, three main solutions have been identified: pre-investment deal screening, structuring financial contracts, and post-investment monitoring (Kaplan and Strömberg 2001). In a study by Kaiser et al. (2007b), the PAT is illustrated through the agency relationship in VC finance. The study identifies three key connections, where the VC (a) employs monitoring tactics to address the business owner's information advantage, (b) seeks to influence the business owner's decisions, and (c) establishes a reward system to prevent the business owner from neglecting responsibilities.

Empirical studies have demonstrated the effectiveness of using these approaches as mitigation tools (Gompers 2022; Hallen et al. 2014). For instance, a study conducted by Kaplan and Strömberg (2001) showed that VCs strategically distribute various rights, such as cash flow, liquidation, and voting rights, as a crucial aspect of their financing deals. Moreover, numerous scholars have noted the significant utilisation of deal screening during the pre-investment stage (Gompers et al. 2020; Sharma 2015). It has also been established that the VC actively participates in post-investment monitoring and advising, frequently by joining the board or deploying the invested capital (Joshi et al. 2022; Sweeting and Wong 1997).

ST can serve as an invaluable instrument in addressing information asymmetry, as suggested by Bergh et al. (2014). ST is a commonly employed concept in auditing, business, and finance research across various applications (Badru et al. 2019; Connelly et al. 2011; Drover et al. 2018; Welch 1989; Yasar et al. 2020), which was once more employed when Zhang and Wiersema (2009) demonstrated how chief executives employ the quality of their financial statements as a signal to investors about the quality of their firm, consequently lowering the information disparity between executive management and investors. ST comprises three key components: the signaller, the signal, and the receiver (Connelly et al. 2011; Spence 2002). When there is asymmetry of information, the signaller (i.e., company owners) possesses more information than the other party, including external shareholders such as VCs. The parties will possess knowledge concerning the value they can add to each other, their capacity for impact, and their prospective quality (Svetek 2022; Taj 2016). Moreover, insiders with exclusive information, whether favourable or unfavourable, can influence perceptions of their credibility by providing signals about the information they possess (Connelly et al. 2011; Spence 2002). Signals refer to messages transmitted by one party to another to reduce information asymmetry and impact the situation in their favour (Svetek 2022; Taj 2016). These may vary in characteristics that set them apart, such as objectivity or subjectivity, positivity or negativity, complementarity or substitutability, absolute and relative cost, and signal flexibility (Svetek 2022).

Colombo (2021) pointed out that in the context of the relationship between the business owner and VC, research has predominantly focused on the business owner as the signaller and the VC as the receiver. This is because venture financing is perceived as the business owner's effort to convince VCs of their firm's qualities and its prospects for the future to attract potential investors (Taj 2016). Business owners offer various signals to VCs to demonstrate the quality of their ventures and assure VCs of having the appropriate team to achieve the vision (Colombo 2021). However, when there is information asymmetry favouring the business owner, Svetek (2022) identified firm- and individual-level signals for investors to evaluate. Signals at a firm level may consist of public funding, investments made by the business owner, previous funding from outside sources, affiliations and partnerships such as hiring reputable underwriters and auditors, and the number of trademarks or the quality of prototypes produced (Jamaani and Alidarous 2022; Sundarasan et al. 2018; Svetek 2022). The dedication of the founding team to a specific early-stage venture also serves as an indicator for prospective investors regarding the venture's potential (Bernstein et al. 2017). On an individual level, signals may consist of the individual's educational and professional background, personal social resources, and visible characteristics (Svetek 2022). Spence (2002) proposed that signals are costly in his influential work on ST. In simple terms, the signal transmitted by the more informed party must come at a cost to be effective⁴ (Connelly et al. 2011; Sundarasan et al. 2018; Yasar et al. 2020). When examining the signals business owners convey to prospective investors, Huang and Knight (2017) identified two distinct kinds of signals: informational signals convey messages about the business owners' quality concerning various aspects such as preparedness, social capital, technological competency, government grants, and affiliations such as hiring reputable underwriters and auditors (Sundarasan et al. 2018), whereas interpersonal signals indicate the signaller's potential behaviour in interactions, including the business owner's passion, personal dedication to the venture, and flexibility to coaching (Colombo 2021).

The PAT and ST, therefore, are an important principle that applies to accounting, economics, and finance research, along with being frequently utilised in many situations such as the IPO market (Beatty 1989; Busenitz et al. 2005; Chan et al. 2021; Colombo 2021; De Carvalho et al. 2020; Kaplan and Strömberg 2001). The PAT and ST in the IPO market elucidate the linkages and dynamics among many stakeholders participating in the IPO process and could serve as an effective framework for comprehending the impact of engaging the Big 4 audit firms on recruiting VCs to IPO businesses via various means.

First, employing the Big 4 audit firms could potentially reduce agency costs (DeFond 1992; Hope et al. 2012; Iatridis 2012; Obeng et al. 2021). Agency costs in IPOs represent conflicts of interest and information asymmetry between VCs (i.e., principals) and IPO owners (i.e., agents) (Cumming and Johan 2008). Hiring a Big 4 auditing company allows the IPO firm to implement an external system for monitoring and supervision (Fan and Wong 2005). The thorough audit processes carried out by the Big 4 companies provide an impartial evaluation of the firm's financial statements and internal controls (Abid et al. 2018). Moreover, this external verification decreases the likelihood of agency costs resulting from opportunistic actions by business executives or falsification of accounting information, thus improving the trustworthiness and dependability of the financial disclosures in the IPO process (Huang et al. 2020). Furthermore, by enlisting a well-known Big 4 audit firm, IPO owners signal their dedication to transparency and strong corporate governance (Husnin et al. 2016; Jamaani and Alidarous 2022), which contributes to minimising agency costs by offering impartial confirmation that financial statements are trustworthy and precise, thereby lessening the information disparity between owners and prospective investors.

Second, engaging the Big 4 audit firms could enhance transparency and disclosure (Chen et al. 2022; Francis and Wang 2008; Johl et al. 2021). The Big 4 audit companies are renowned for their proficiency in financial reporting and commitment to professional standards (Lawrence et al. 2011), and by participating in the IPO preparation process, they guarantee that the firms' financial statements adhere to the accounting standards and are correctly presented (Chen et al. 2005; Jamaani and Alidarous 2022). VCs depend on the clarity and precision of accounting information to make well-informed investment choices (Joshi et al. 2022; Reiff and Tykvová 2021). The Big 4 audit firms' validation of the financial statements improves the quality of information accessible to venture capitalists, decreasing ambiguity and bolstering confidence in the companies' financial status and future potential (Gao et al. 2011; Jacob et al. 2019). Additionally, by enlisting the services of these companies, IPO owners signal a dedication to transparency and disclosure (Chen et al. 2022; Francis and Wang 2008; Johl et al. 2021). Thus, enhancing the credibility of financial information via the hiring of the Big 4 audit firms can help VCs make more informed investment decisions by reducing uncertainty and increasing transparency.

Third, hiring Big 4 audit firms can improve VCs' confidence (Chang et al. 2008; Khurana and Zhao 2019). VCs are experienced investors looking for attractive returns while also being cautious regarding the risks involved in funding startups (Gompers et al. 2020). A Big 4 audit company may indicate quality and dependability to prospective VCs (Copley et al. 2021). VCs perceive businesses audited by Big 4 firms as having been rigorously examined and carefully evaluated, which may inspire trust in the IPO firm's financial well-being and governance procedures (Lee and Masulis 2011). Investor trust is essential for securing VC investment in IPOs since VCs look for firms with solid foundations and clear operations (Amini et al. 2022; Copley et al. 2021; Liu et al. 2021). Further, external validation from the Big 4 audit firm may address doubts about the accuracy of financial information, thereby promoting VC participation in the company's IPO (Lee and Masulis 2011). Thus, by selecting a Big 4 audit firm, IPO owners signal their dedication to offering trustworthy financial information and enhancing investor trust in the business's future and leadership disclosure (Chen et al. 2022; Francis and Wang 2008; Johl et al. 2021). This may foster a deeper sense of confidence between IPO owners and VCs, thereby increasing the likelihood of VCs investing in the IPO.

In conclusion, IPO owners can strategically utilise the Big 4 audit firms to lower agency costs, boost transparency and disclosure, and increase confidence for VCs (Cumming and Johan 2008; Iatridis 2012; Obeng et al. 2021). Moreover, by utilising PAT and ST, IPO owners may signal their dedication to superior governance practices, establish confidence with VCs, and cultivate a favourable reputation in the market, eventually improving their ability to draw in investment and accomplish a successful IPO (Chan et al. 2021; Colombo 2021). Furthermore, the audit firm's external monitoring and assurance are crucial in decreasing information asymmetry, aligning the objectives of venture capitalists and business management, and promoting favourable relationships that support VC involvement in IPOs (Gompers 1995; Huang et al. 2020; Joshi et al. 2022; Liu et al. 2021). Based on the PAT and ST, this study posited the hypothesis that the involvement of the Big 4 audit firms in the IPO process has a positive impact on the appeal of a company to VCs, which is achieved through the promotion of transparency, mitigation of information asymmetry, and alignment of stakeholder interests. It is anticipated that IPO companies that retain the services of the Big 4 audit firms at the time of offering will signal their quality and enhance the credibility as well as dependability of their financial statements through external scrutiny and demonstration of dedication to sound governance. This, in turn, will likely bolster investor confidence and facilitate the inflow of venture capital to IPOs. Thus, the study examined the following hypothesis:

H1: *The hiring of the Big 4 auditing firms improves the ability of IPO firms to attract VCs in the IPO market.*

4. Data and Methodology

The study examined a large dataset consisting of 33,536 IPOs that took place between 1995 and 2019 across the Group of Twenty (G20) nations with diverse socioeconomic statuses, legislative frameworks, and cultural settings (Jamaani and Ahmed 2020; The World Bank 2016). These IPOs are from the G20 nations, which consist of Japan, South Korea, Indonesia, Saudi Arabia, France, Turkey, Italy, India, Argentina, Mexico, Canada, Australia, China, Germany, Japan, South Korea, Russia, South Africa, and the US (Ministry of External Affairs 2024). The G20 countries were chosen based on their large and varied dataset, which included a variety of national settings distinguished by unique legal systems, cultural norms, and economic structures (Jamaani and Ahmed 2020, 2022; The World Bank 2016). The research hypothesis was rigorously tested with the use of this selection of countries. Due to the G20 countries' significant influence on the course of the global economy, this group of nations is of particular interest to academics and professionals around the world (Jamaani and Ahmed 2020; Jamaani and Alawadhi 2023; Jamaani and Alidarous 2024). According to data from the International Monetary Fund (2022), since 1995, the G20 stock markets have contributed significantly to the global IPO market. Moreover, as per studies on IPO, the G20 nations accounted for nearly 81% of all IPOs registered globally up to 2019 (Jamaani and Ahmed 2020, 2022; Jamaani and Alidarous 2022, 2024; Jamaani and Alawadhi 2023). Furthermore, around 82% of the aggregate value of all companies that were registered was represented by these IPOs listed in the G20 countries (Jamaani and Alidarous 2022; Jamaani and Alawadhi 2023). As a result, analysing the G20 countries allows for a more thorough analysis of an entire dataset, which includes a variety of established and developing stock markets (Jamaani and Alidarous 2024). Notably, following IPO research (Alidarous 2024; Butler et al. 2014), I excluded American depositary receipts (ADRs), specific-purpose companies, rights offerings, mutual funds, and real estate investment trusts. For this study, I began the examination starting from the year 1995. The total count of IPOs that were listed in the G20 nations during the period from 1985 to 1995 was a mere 846. However, it is important to note that there is a substantial amount of missing information for the majority of variables included in the study for this time frame. The year 2019 is selected as the endpoint because it provides a substantial timeframe for

study that is not influenced by the COVID-19 pandemic and its subsequent repercussions (Zhang and Neupane 2024).

In the cross-sectional probit model, VC participation is denoted by the binary value y . If VCs participate, the value is 1; otherwise, it is 0. The fundamental model is represented by Equation (1), which is as follows:

$$P = Pr (y_j = 1 | x_j) = x' \beta \tag{1}$$

As Table 1 shows, $F(x' \beta)$ equals $x' \beta$ for the independent variables, including the main independent variable: the hiring of the Big 4 auditing firms. The employment of the Big 4 is represented by the binary variable y in the probit model. When a Big 4 auditing firm is employed, the assigned value is 1. To accommodate the nature of the binary dependent variable, I used a cross-sectional probit regression to examine the impact of Big 4 auditing firms on the capacity of IPO owners to attract VCs when companies choose to go public following previous research (Jamaani and Alawadhi 2023; Jamaani and Alidarous 2024; Tam et al. 2023). The cumulative distribution function for the standard normal distribution is $F(x' \beta)$, as represented by Equation (2), which is as follows:

$$F(x' \beta) = \Phi (x' \beta) = \int_{-\infty}^{x' \beta} \Phi(Z) dz \tag{2}$$

Table 1. Definitions and measurements of employed variables.

Variables	Description	Source of Data
Dependent variable		
VC participation (VCP)	VC participation is denoted by the binary value y in the probit model. If VCs participate in the IPO, the value is 1; otherwise, it is 0.	Bloomberg Database (BD)
Main variable		
The Big 4	The main binary independent variable is the Big 4 firms, which have a value of 1 if the IPO business hires one of Deloitte, PricewaterhouseCoopers, Ernst & Young, or KPMG at the time of offering and 0 otherwise.	BD
Controlling variables		
Accounting ratio characteristics		
Current ratio (CR)	It is a liquidity metric used to assess the adequacy of resources possessed by an IPO company to satisfy its immediate financial commitments at the moment of offering. It evaluates the relationship between a company's current assets and obligations.	BD
Asset to equity ratio (AER)	It is a liquidity ratio that assesses a company's leverage at the time of offering. It is computed by dividing the IPO firm's total assets by the equity held by shareholders.	BD
Return on common equity (ROE) ratio	It is a profitability ratio used to calculate the return on investment for common shareholders in IPOs. It is computed by taking the net income, or profits before interest and taxes, and dividing it by the average amount of common stock in the business at the time of offering.	BD
Dividend payout ratio (DPR)	It is a profitability ratio between the total dividends given to shareholders and the IPO company's net income. It represents the portion of profits distributed to shareholders as dividends at the time of offering.	BD

Table 1. *Cont.*

Variables	Description	Source of Data
IPO firm characteristics		
Offer price (OP)	It represents the IPO firm’s offering price, which is expressed in US dollars in the prospectuses.	BD
Offer size (OS)	It represents offering proceeds.	BD
Primary shares offered (PSO)	It shows the proportion of newly issued shares—created by IPO owners straight from the IPO—that is offered to IPO investors as a percentage of all outstanding shares.	BD
Secondary shares offered (SSO)	It denotes the proportion of the existing ownership stake held by IPO founders that is made available to IPO investors, relative to the total number of shares outstanding at the time of the offering.	BD
Underwriting fees (UF)	It denotes the proportion of fees requested by underwriters during the offering, calculated as a percentage of the total total proceeds obtained from the offering.	BD
Integer (I)	It is a binary variable with a value of 1 in the event that the IPO company has an offer price with an integer value and a value of 0 in the event that the offer price has a fractional offer value at the time of offering.	BD
Price above the range (PAR)	It is a binary variable that has a value of 1 at the time of offering if the IPO businesses have an offer price that is higher than the range of offering price recommended by the underwriting bank; otherwise, it has a value of 0.	BD
Technology (T)	This variable is binary. It is set to 1 in the event that the IPO business is classified as a technology firm and to 0 for all other types of firms.	BD
Retail subscription ratio (RSR)	It represents the proportion of retail investors who have subscribed to the offering out of all the subscribers to the offering.	BD
Corporate governance characteristics		
Audit committee meetings (ACM)	It represents the number of audit committee meetings that took place during initial IPOs.	BD
CEO duality (CEOD)	It is a binary variable that has a value of 1 if the chief operational officer (CEO) of the IPO company is also the chairman at the time of offering and 0 otherwise.	BD
Female on board of management (FOBD)	It represents the number of female directors present on the board of directors of the IPO firm at the time of offering.	BD
Independent directors on board of management (IDOBM)	It represents the number of independent directors present on the board of directors of the IPO firm at the time of offering.	BD
IPO market characteristics		
Hot market (HM)	It is a binary variable that shows a value of 1 if an IPO occurs in a year with a listing volume that is above average and 0 otherwise.	The World Bank (TWB)
IPO volume (IPOV)	It represents the total number of IPOs that occur each year in each of the sample countries.	TWB
Pre stock market volatility (PSMV)	It shows the local stock market price index’s standard deviation 15 days before the IPO offering data.	Calculated using DataStream
Macroeconomic characteristics		
Inflation rate (IR)	It displays the average yearly inflation rate for every country between 1995 and 2019.	TWB
Foreign direct investment inflow (FDII)	It represents the yearly net inflows of foreign investment as a proportion of GDP between 1995 and 2019.	TWB

Table 1. *Cont.*

Variables	Description	Source of Data
Tax rate (TR)	It shows the annual business tax rate set by local governments between 1995 and 2019.	TWB
Gross Domestic Product (GDP)	It shows the GDP per capita increase per year for each of the countries in the study group from 1995 to 2019.	TWB
Common law English origin (CLEO)	This is a binary variable that takes the value of 1 if the IPO takes place in a common law English jurisdiction and the value of 0 otherwise. The US, UK, South Africa, and Australia retain the English common law heritage.	Lin et al. (2013)
Fixed effect dummies (FED)	It is a binary variable that adjusts for variations in the year-effect (YE), country-effect (CE), and industry-effect (IE).	Self-constructed variable
Additional controlling variables for robustness testing		
Shadow economy (SE)	It is an annual measure that gauges the shadow economy of a nation, often known as the informal economy, underground economy, or black market. The shadow economy is not reported in official statistics and has been measured annually between 1995 and 2019. These activities generally entail unreported, untaxed, or unlawful transactions. Through a project that is commissioned by the International Monetary Fund (IMF), Medina and Schneider (2018) have extensively examined and established techniques to evaluate the size and dynamics of the shadow economy. Currency demand, power usage, and other indirect measures have been suggested for measuring the shadow economy in different nations. This approach estimates the size of the shadow economy using tax revenue, labour market, and other economic factors, and it is updated annually. Moreover, the data are publicly available through the IMF. Medina and Schneider (2018) note that the shadow economy may diminish tax revenues, skew economic data, and complicate government policy and regulation.	Medina and Schneider (2018)
Strength of auditing and reporting (SAR)	It is a set of annual statistics based on the weighted average of survey responses pertinent to the accounting question that is asked to respondents and covers the years 1995 through 2019. How strict are the requirements for financial reporting and audits in your nation? (1 = extreme inferiority; 7 = enormous power)	Global Competitiveness Report (2019)
Enforcement of securities regulation (ESR)	This is a dataset consisting of yearly data points that assess the enforcement of securities laws from 1995 to 2019. The index undertakes an analysis of annual advancements in global securities exchange regulation. The assessment of the efficacy of securities regulatory enforcement in a nation is measured on a scale ranging from 0 to 7.	Global Competitiveness Report (2019)
Rule of law (RL)	The dataset comprises yearly data points spanning from 1995 to 2019, assessing people’s levels of belief and adherence to societal norms concerning property rights, contract enforcement, law enforcement, judicial systems, and crime and violence prevention.	Global Competitiveness Report (2019)
Control of corruption (CC)	The dataset consists of yearly data points spanning from 1995 to 2019. It quantifies the extent to which public authority is used for personal gain, covering both minor and major forms of corruption.	Global Competitiveness Report (2019)
Transparency of government policymaking (TGP)	The dataset consists of yearly data points spanning from 1995 to 2019. The transparency of government policymaking was assessed by calculating the average of the weighted scoring results obtained from a survey. This was achieved by posing the following question: To what extent may companies within your jurisdiction readily get information about changes in legislation that impact their operations? (1 = highly challenging; 7 = highly manageable)	Global Competitiveness Report (2019)

Table 1. *Cont.*

Variables	Description	Source of Data
Developing capital markets (DCM)	The variable is binary, with the value being 1 if the IPO business is listed in a developing nation and 0 if the IPO is listed in a developed country. Capital markets may be classified into two distinct categories, namely, developing and developed, as stated by Morgan Stanley Capital International (2020). The latter has a higher level of development in its capital markets. Based on IPO research, it has been observed that developing IPO markets demonstrate suboptimal resource allocation, less stringent regulatory frameworks, notable fluctuations in value, restricted variety within financial markets, and substantial information asymmetry when compared to developed ones (Jamaani and Alidarous 2022, 2024; Jamaani and Alawadhi 2023). Nations in the dataset, including Canada, the US, Australia, Germany, Denmark, Greece, France, Japan, the UK, Italy, South Africa, and Sweden, are considered to be part of developed capital markets. The set of developing capital markets includes Indonesia, Saudi Arabia, Turkey, South Korea, Brazil, Russia, China, India, Poland, and Mexico.	Self-constructed variable
Domestic market size (DMS)	The dataset comprises annual data points from 1995 to 2019, which provide an annual index assessing the total GDP and net imports of services and products. The index is standardised using a scale ranging from 1 to 7.	Global Competitiveness Report (2019)
Ethical behaviour of firms (EBF)	The dataset comprises annual data points reflecting the weighted average of opinion polls that address the following inquiry, covering the period from 1995 to 2019. How can one evaluate an organisation's corporate ethics in their nation, specifically in terms of their ethical interactions with government officials, political leaders, and other businesses? (1 = very impoverished and ranking among the lowest globally; 7 = exceptional and ranking among the highest)	Global Competitiveness Report (2019)
Gray's secrecy test (GST)	The dataset comprises time-invariant data points from 1995 to 2019, which are used to establish the financial secrecy rating using a technique created by Gray and Vint (1995). Financial secrecy may be calculated by adding uncertainty avoidance and power distance and then subtracting individuality using Hofstede (2001) cultural dimensions variables. When a country exhibits a high level of cultural secrecy, it is often associated with a high level of financial secrecy, and vice versa.	Gray and Vint (1995)
Prestigious underwriting banks (PUB)	The variable PUB is a binary indicator that distinguishes between IPOs underwritten by prestigious and non-prestigious underwriting banks. I replicate the binary variable "renowned underwriter" from IPO literature using the grading method created by Carter and Manaster (1990). According to Jamaani and Alidarous (2024), an underwriter company may be considered one of the top 100 worldwide licensed underwriters based on its market share in the Bangladeshi market. Alternatively, the value is 0.	BD

In order to avoid omitted variable bias, IPO research often controls for a variety of IPO-specific factors, particularly in cross-country testing research. Therefore, in accordance with earlier IPO research, I control for several aspects, including deal-related, accounting-related, market-related, and country-related factors (Alidarous 2024; Beatty 1989; Chang et al. 2008; Jamaani and Alidarous 2022; Lee and Masulis 2011). Table 1 offers detailed descriptions and reference measurements for each parameter included in the research.

5. Empirical Findings

5.1. Statistical Output

Table 2 presents the outcomes of the Pearson correlation matrix, which measures the linear association between variables. The variance inflation factor (VIF) test is used to verify the absence of multicollinearity in the employed regression models presented later in empirical results section. According to research by Cazavan-Jeny and Jeanjean (2007) and Premti and Smith (2020), if a regression model's mean VIF value is less than 5, multicollinearity between the independent variables is not present. The last round of empirical testing presents the mean VIF test for each model. The mean VIF value of each of these models is below the 5-point cut-off, indicating that there are no problems with multicollinearity in the models. The data indicate that the participation of VCs rises in correlation with the hiring of Big 4 auditors, technology-focused business, current ratio, IPO volume, percentage of primary and secondary shares sold, offer price exceeding the price range, retail subscription ratio, pre-IPO stock market volatility, COE duality, percentage of independent directors, presence of women on the board of directors, GDP growth, and tax rate. Moreover, this table also demonstrates that the involvement of VCs is inversely related to the asset-to-equity ratio, return on equity, dividend payout ratio, offer price, offer size, gross spread, integer offer price dummy, number of audit committee meetings, hot market periods, inflation rate, foreign direct investment inflow, and civil law origin.

Table 2 also presents a descriptive analysis of the examined dataset. Statistics indicate that the average VC participation rate in the sample is 7.50%, with the Big 4 auditing firms making up an average of 19.10% of companies preparing to go public. In addition, 3.50% of IPO owners sell their shares as secondary shares, whereas 22.70% sell them as primary shares. Approximately 11% of IPOs belong to the technology sector, with an average pre-IPO stock market volatility of 2%. Besides, the average underwriting fees amount to 3.70% of IPO proceeds. On average, 51 IPOs are listed annually, with 39% of them being launched during periods of high market growth. In the sample, the average number of independent directors is 8, and CEO duality is present in only 5.30% of IPOs. Upon listing, the average interest rate stands at 10.30%, with inflation at 2.60%. Further, on average, IPO proceeds amount to USD 108 million, with retail investors representing 94% of all IPOs.

Table 3 presents the distribution of VCs' precipitation and Big 4 auditors' hiring across different countries, years, and industries. China has the highest VC precipitation at 19.60%, whereas South Korea has the highest reported existence of Big 4 auditing firms at 43%. In 2015, the highest recorded the existence of Big 4 auditors was 23.90%, dropping to 14.40% in 2008. Similarly, the VC precipitation rate peaked at 12.10% in 2014, compared to a low rate of 4.10% in 2005. Within the consumer non-cy sector, the VC precipitation rate is 11.80%, compared to 1.40% in the fund sector. Additionally, the fund sector has a higher proportion of Big 4 auditors hiring at 57.70% than the 12.80% in the basic materials sector.

5.2. Regression Results

Table 4 presents the findings from seven distinct models, with Model 1 only incorporating the variable under investigation: the hiring of the Big 4 auditors. Models 2 to 7 entailed additional controlling variables to account for variations in industry, year, and country impacts, along with company-related, market-related, accounting-ratio-related, macroeconomics-related, and corporate-governance-related factors. The results related to the Big 4 variable, which examines the impact of hiring Big 4 auditors on the capacity of IPO owners to attract VC involvement, are consistent in all models. Model 1 indicates that the coefficient is statistically significant when the significance level is set at 1%, and hiring one of the Big 4 auditors significantly increases the likelihood of IPO owners attracting VC involvement by up to 50% throughout the whole IPO market. This confirms the correctness of the hypothesis. After adjusting for several factors such as company-related, market-related, accounting-ratio-related, macroeconomic-related, and corporate-governance-related variables in Models 2 to 7, the coefficients remain statistically significant at the 1% level, ranging from 29% to 33%.

Table 2. Pearson correlation matrix and descriptive statistics.

	Averages	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27			
1	VCP	0.07																													
2	The Big	0.19	1.00																												
3	CI	0.58	0.03	0.01	1.00																										
4	AVR	0.32	0.01	0.01	0.01	1.00																									
5	DOE	-0.04	0.01	0.01	0.01	0.01	1.00																								
6	DIR	0.19	-0.01	0.01	0.01	0.01	0.01	1.00																							
7	CP	16.60	-0.02	0.01	0.01	0.01	0.01	0.01	1.00																						
8	OS	165.00	-0.01	0.10	0.01	0.01	0.01	0.01	0.01	1.00																					
9	PSO	0.22	0.03	0.14	-0.01	0.01	0.01	0.01	0.01	0.01	1.00																				
10	UF	0.04	-0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00																			
11	PAR	0.68	0.01	0.07	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00																		
12	T	0.05	0.07	0.11	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00																	
13	RSK	0.11	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00																
14	RSK	0.95	0.25	-0.06	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00															
15	PSMV	0.02	0.09	0.05	-0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00														
16	SSO	0.04	0.05	0.07	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00													
17	ACM	9.00	0.01	0.09	-0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00												
18	CEOD	0.05	0.01	0.08	-0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00											
19	FORB	2.00	0.01	0.08	-0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00										
20	IDOBMI	8.00	0.04	0.16	-0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00									
21	HM	0.38	-0.11	-0.01	-0.02	0.00	-0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00								
22	IFOV	51.00	0.01	-0.10	0.01	-0.02	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00							
23	IR	0.05	-0.02	-0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00						
24	FDI	0.02	0.01	-0.05	0.01	-0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00				
25	TK	0.53	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00		
26	GDP	0.05	0.10	-0.08	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00
27	CLEO	0.53	-0.05	-0.02	0.01	-0.01	0.01	-0.06	-0.04	0.36	-0.09	0.06	0.11	0.01	-0.15	-0.25	0.01	-0.06	-0.03	-0.06	0.02	0.11	0.05	-0.18	0.04	0.15	-0.01	0.01	0.01	0.01	1.00

Table 3. Statistical distributions of the dependent and main independent variables.

Industries	VCP	The Big 4	Countries	VCP	The Big 4	Years	VCP	The Big 4
Funds	1.4%	57.7%	Australia	0.7%	15.0%	1995	7.4%	21.2%
Financial	1.6%	23.9%	Brazil	3.4%	38.2%	1996	7.8%	21.2%
Basic Materials	3.7%	12.8%	Canada	0.8%	15.9%	1997	7.6%	19.8%
Energy	4.6%	18.7%	China	19.6%	14.3%	1998	7.0%	19.5%
Consumer cyclicals	5.0%	17.3%	Denmark	4.3%	17.4%	1999	5.6%	18.9%
Utilities	5.5%	19.1%	France	4.1%	2.5%	2000	5.6%	18.5%
Industrial	8.5%	15.1%	Germany	0.9%	2.9%	2001	4.3%	18.2%
Diversified	8.9%	16.2%	Greece	0.3%	6.3%	2002	4.8%	23.8%
Technology	9.1%	19.0%	India	1.7%	4.6%	2003	5.9%	19.7%
Communications	9.6%	17.5%	Indonesia	1.0%	3.3%	2004	5.8%	17.8%
Consumer non-cyclicals	11.8%	23.8%	Italy	1.0%	20.6%	2005	4.1%	18.9%
			Japan	2.8%	18.6%	2006	4.5%	18.1%
			Mexico	2.0%	10.3%	2007	4.9%	16.7%
			Poland	0.6%	1.7%	2008	4.9%	14.4%
			Russia	3.0%	16.2%	2009	9.4%	16.1%
			Saudi Arabia	3.0%	18.5%	2010	7.8%	18.4%
			South Africa	0.3%	11.5%	2011	7.2%	16.4%
			South Korea	3.5%	42.9%	2012	7.3%	20.4%
			Sweden	8.5%	17.6%	2013	7.6%	22.2%
			Turkey	0.3%	2.3%	2014	12.1%	20.7%
			United Kingdom	1.9%	13.2%	2015	10.8%	23.9%
			United States	11.2%	31.9%	2016	10.2%	18.6%
						2017	10.3%	17.1%
						2018	6.7%	18.3%
						2019	9.3%	19.1%

Table 4. Main regression testing. Model 1 is the basic model; Model 2 adds year-, industry-, and country-fixed effects; Model 3 adds accounting ratio characteristics; Model 4 adds IPO firm characteristics; Model 5 adds corporate governance characteristics; Model 6 adds IPO market characteristics; and Model 7 adds macroeconomic characteristics. The significance level for 0.10, 0.05, and 0.01 is represented by the symbols *, **, and ***, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Main independent variable							
The Big 4	0.50 *** [21.7]	0.33 *** [13.9]	0.29 *** [11.4]	0.33 *** [11.7]	0.29 *** [10.3]	0.30 *** [10.4]	0.33 *** [10.9]
Accounting ratio characteristics							
CR			0.010 ** [2.25]	0.012 *** [3.88]	0.012 *** [3.97]	0.012 *** [3.95]	0.012 *** [3.28]
AER			−0.010 [−0.46]	−0.010 [−0.59]	−0.010 [−0.64]	−0.010 [−0.54]	−0.010 [−1.05]
ROE			−0.010 * [−1.67]	−0.05 [−0.98]	−0.012 [−1.50]	−0.013 [−1.40]	−0.017 ** [−2.47]
DPR			−0.023 [−1.49]	−0.036 [−1.36]	−0.040 [−1.40]	−0.042 [−1.40]	−0.060 [−1.44]
IPO firm characteristics							
OP				−0.015 *** [−3.71]	−0.013 *** [−3.50]	−0.013 *** [−3.48]	−0.017 *** [−3.75]
OS				−0.018 *** [−3.19]	−0.021 *** [−3.40]	−0.021 *** [−3.37]	−0.024 *** [−3.25]
PSO				0.025 *** [14.4]	0.024 *** [13.6]	0.020 *** [14.2]	0.036 *** [15.9]

Table 4. Cont.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
SSO				0.040 *** [8.43]	0.034 *** [8.36]	0.034 *** [8.10]	0.025 *** [4.44]
UF				0.020 *** [3.87]	0.017 *** [3.64]	0.017 *** [3.63]	0.023 *** [4.01]
I				0.24 *** [7.08]	0.25 *** [7.25]	0.25 *** [7.25]	0.26 *** [7.27]
PAR				0.55 *** [9.67]	0.54 *** [9.33]	0.53 *** [9.30]	0.49 *** [8.47]
T				0.17 *** [3.67]	0.17 *** [3.64]	0.17 *** [3.59]	0.15 *** [3.13]
RSR				0.024 *** [18.3]	0.025 *** [18.4]	0.025 *** [18.3]	0.022 *** [16.6]
Corporate governance characteristics							
ACM					−0.019 *** [−2.80]	−0.020 *** [−2.95]	−0.014 ** [−1.98]
COED					−0.050 [−0.84]	−0.055 [−0.92]	−0.056 [−0.95]
FOBD					−0.045 ** [−2.01]	−0.046 ** [−2.03]	−0.050 ** [−2.23]
IDOBM					0.068 *** [8.82]	0.069 *** [8.93]	0.063 *** [7.64]
IPO market characteristics							
HM						−0.023 [−0.67]	−0.092 ** [−2.43]
IPOV						0.022 *** [3.12]	−0.022 ** [−2.41]
PSMV						0.19 *** [11.4]	0.12 *** [6.62]
Macroeconomic characteristics							
IR							−0.052 *** [−5.29]
FDII							0.024 ** [1.99]
TR							0.010 [0.87]
GDP							0.11 *** [16.2]
CLEO							−0.18 *** [−4.76]
FED		YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE
Constant	−1.60 *** [−128]	−2.78 *** [−61.3]	−2.74 *** [−52.8]	−3.45 *** [−46.0]	−3.51 *** [−46.0]	−3.53 *** [−41.4]	−4.08 *** [−33.1]
Observations	33,536	33,536	27,183	27,182	27,182	27,182	27,182
Adjusted R ²	0.026	0.12	0.13	0.20	0.21	0.21	0.23
Mean VIF value	1.1	1.2	1.32	1.42	1.47	1.48	1.56

5.3. Discussion of Results

The results align with previous findings, which revealed that IPO owners strategically choose Big 4 audit firms to reduce agency costs, enhance transparency and disclosure, and improve investor trust in the IPO market (Cumming and Johan 2008; Iatridis 2012; Jamaani and Alidarous 2022; Obeng et al. 2021). By using PAT and ST, IPO owners signal their commitment to high governance standards, build trust with VCs, and enhance their image in the market, ultimately increasing their capacity to attract investment and achieve

a successful IPO (Chan et al. 2021; Colombo 2021). External monitoring and assurance by the Big 4 audit firms are also essential for reducing information disparities, along with fostering positive relationships that encourage VC participation in IPOs, aligning the goals of VCs and business management (Gompers 1995; Huang et al. 2020; Joshi et al. 2022; Liu et al. 2021).

The findings also indicate that the PAT and ST in the IPO market reveal the connections and changes among various parties involved in the IPO procedure (Beatty 1989; Busenitz et al. 2005; Chan et al. 2021; Colombo 2021; De Carvalho et al. 2020; Kaplan and Strömberg 2001). Furthermore, the results confirm that the PAT and ST might be used effectively to examine how hiring Big 4 audit firms influences the attraction of VCs for IPOs via three channels.

First, Big 4 audit firms may lower agency costs (DeFond 1992; Hope et al. 2012; Iatridis 2012; Obeng et al. 2021). IPO agency costs comprise conflicts of interest and information asymmetry between VCs (i.e., principals) and IPO owners (i.e., agents) (Cumming and Johan 2008). The IPO firm may build an external monitoring and supervision system by hiring a Big 4 auditing firm (Fan and Wong 2005), as Big 4 audits provide an objective assessment of the company's financial statements and internal controls (Abid et al. 2018). External verification reduces agency costs from firm management opportunistic activities or accounting information manipulation, making IPO financial disclosures more trustworthy (Huang et al. 2020). IPO owners signal their commitment to transparency and corporate governance by hiring a Big 4 audit firm (Husnin et al. 2016; Jamaani and Alidarous 2022). Offering unbiased assurance that financial statements are trustworthy and exact reduces agency costs by reducing the knowledge gap between IPO owners and potential VCs.

Second, hiring Big 4 audit firms may improve transparency and disclosure (Chen et al. 2022; Francis and Wang 2008; Johl et al. 2021) as they are known for their financial reporting skills and professionalism (Lawrence et al. 2011). They also ensure that the company's financial statements meet accounting standards and are properly presented by participating in IPO preparation. VCs need clear and accurate accounting data to make informed investment decisions (Joshi et al. 2022; Reiff and Tykvová 2021), and they tend to have more trust in the company's financial position and prospects when the Big 4 audit firm validates the financial statements (Gao et al. 2011; Jacob et al. 2019). Thus, IPO owners signal transparency and disclosure by hiring Big 4 audit firms to improve financial information credibility, which may help VCs make better investment choices by decreasing uncertainty and boosting transparency (Chen et al. 2022; Francis and Wang 2008; Johl et al. 2021).

Finally, hiring Big 4 audit firms may boost VC confidence (Chang et al. 2008; Khurana and Zhao 2019). As VCs are highly experienced investors who seek high profits while minimising startup risks (Gompers et al. 2020), a reputable Big 4 audit firm may reassure potential VCs (Copley et al. 2021). Big 4 audits can also strengthen VCs' confidence in the IPO firm's financial health and governance (Lee and Masulis 2011). IPOs need investor confidence since VCs prefer startups with strong foundations and transparent operations (Amini et al. 2022; Copley et al. 2021; Liu et al. 2021). Financial information may be verified by the Big 4 audit firm, thus encouraging VC involvement in the company's IPO (Lee and Masulis 2011). IPO owners choose a Big 4 audit firm to signal their commitment to providing reliable financial information and building investor confidence in the business's future and leadership (Chen et al. 2022; Francis and Wang 2008; Johl et al. 2021).

5.4. Tests for Robustness

Literature suggests that variations in the formal and informal institutional settings of a country may impact the role of intermediaries such as the Big 4 auditing firms and VCs in equity markets (Aggarwal and Goodell 2009; Alidarous 2024; Jamaani and Alidarous 2021; Jamaani and Ahmed 2022; Khurana and Raman 2004). Scholars have argued that the influence of reputable intermediaries such as the Big 4 auditing firms and VCs on the success of IPOs can differ based on factors such as economic development, stock

market development, accounting expertise, ethical business practices, legal frameworks, and cultural environments at the national level.

Previous studies have argued that countries with weak (or strong) stock market development, economic development, accounting profession, ethical business behaviour, law enforcement, and cultural environments tend to have less (or more) sophisticated investors and equity markets, lower (or higher) corporate governance standards and compliance, weaker (or stricter) investor protection and legal structures, and fewer (or more limited) government interventions (Hope 2003; Jamaani and Alidarous 2021, 2024; Jamaani and Ahmed 2022; Jamaani and Alawadhi 2023; Sundarassen et al. 2018, 2021). As a result, the role of well-established intermediaries such as the Big 4 can vary due to anticipated conflicts of interest and information imbalances between VCs (i.e., principals) and IPO owners (i.e., agents) in the global IPO market.

I validated the hypothesis by examining variations in the level of the stock market and economic advancements. This was achieved by factoring in four variables, which included disparities in developed and developing equity markets, the size of the domestic market, the extent of enforcement of security market regulations, and the existence of a shadow economy in the countries I analysed following previous literature (Hope 2003; Jamaani and Alidarous 2021, 2024; Jamaani and Ahmed 2022; Jamaani and Alawadhi 2023; Sundarassen et al. 2018, 2021). Controlling for variations across nations in the level of the strength of auditing and reporting standards and ethical behaviour of businesses has the additional effect of capturing the level of the accounting profession as well as the degree of business ethics, respectively (Hope 2003; Jamaani and Alidarous 2021, 2024; Jamaani and Ahmed 2022; Jamaani and Alawadhi 2023; Sundarassen et al. 2018, 2021). By adjusting for variations across nations in the degree of rule of law and control of corruption, it is possible to capture disparities in the legal system (Jamaani and Alidarous 2021; Jamaani et al. 2022). Finally, the financial secrecy index, which was established by Gray (1988) to account for variations in cultural secrecy, was used to capture the disparities in the cultural setting (Jamaani et al. 2021).

The findings from Models 4–22 consistently support and reaffirm the research hypothesis. The findings regarding the Big 4 variable, which concerns the influence of hiring Big 4 auditors on the ability of IPO owners to attract VC involvement, were consistently observed across all models. Moreover, all models collectively show that the coefficients are statistically significant when the significance level is set at 1%. Engaging the services of the Big 4 auditors greatly enhances the chances of IPO owners attracting VC participation in the IPO market. This positive effect remains consistent even when accounting for various factors such as economic development, stock market development, accounting expertise, ethical business practices, legal frameworks, and cultural environments at the national level.

A last robustness test was carried out to address potential endogeneity in the model. I evaluated endogeneity by utilising the Habib and Ljungqvist (2001) method and the Hausman (1978) endogeneity test. Furthermore, I employed the two-stage least squares (2SLS) method of estimation with robust standard errors to investigate the potential endogeneity issue between the decision of IPO owners to employ a reputable underwriter and the error terms when IPO issuers choose one of the Big 4 auditing firms during the offering. Previous studies on IPOs have shown that the accuracy of study results might be affected by the potential existence of endogeneity in the probit regression model (Jamaani and Ahmed 2020; Jamaani and Alidarous 2021). Furthermore, Jamaani and Alidarous (2021) discovered that the selection of reputable or non-reputable underwriting companies in IPOs may have been influenced by external factors, thereby causing a biased regression analysis. Endogeneity implies that IPO owners may attract VCs by engaging prestigious underwriting firms, even without the help of Big 4 auditing firms. If insignificant results are achieved for the variable Big 4 after accounting for endogeneity, it indicates that the endogenous decision made by IPO owners to engage reputable underwriting banks is responsible for attracting the participation of VCs, with no help from the Big 4 auditing firms in enhancing the ability of IPO owners to attract VCs.

According to Sanderson and Windmeijer (2016), research must utilize a robust instrumental variable (IV) to reduce the possibility of endogeneity and prevent the development of an identical bias that may result from using a weak IV. According to Hausman (1978), a robustness indicator is an instrument that shows a significant correlation with the discovered endogenous part but does not show any correlation with error terms. The use of weak instruments has piqued the attention of researchers (Cameron and Miller 2015). Regarding the best instruments to use, there is barely any agreement in the IPO literature. Return on assets and profits per share are used by Habib and Ljungqvist (2001) and Alavi et al. (2008), while total proceeds and the number of IPO companies are used by Chahine (2008) and Jones and Swaleheen (2010), respectively. I use IV in accordance with Jamaani and Ahmed (2021), which is calculated by dividing the percentage of the average proceeds from all underwritten IPOs by the total number of IPOs that each underwriter has underwritten in that specific nation. Reputable underwriters often oversee a sizable number of IPOs while maintaining their dominating position in the IPO market, which is the justification for using this IV (Jamaani and Ahmed 2021). I use a weak instrument test following Boulton et al. (2017), improving upon the work of Cragg and Donald (1993), in order to assess the robustness of the chosen IV. This test's null hypothesis is that the instrument is weak. In Table 5, Model 11 consistently shows that the coefficient of the Big 4 is statistically significant at a 1% significance level. Hence, hiring the Big 4 auditors significantly increases the likelihood of IPO owners receiving VC investment in the IPO market by 26%, even when considering endogeneity issues using 2SLS estimation.

Table 5. Robustness testing. Model 1 controls for SE; Model 2 controls for SAR; Model 3 controls for ESR; Model 4 controls for RL; Model 5 controls for CC; Model 6 controls for TPG; Model 7 controls for DCM; Model 8 controls for DMC; Model 9 controls for EBF; Model 10 controls for GST; and Model 11 controls for PUB using 2SLS to control endogeneity. The significance level for 0.10, 0.05, and 0.01 is represented by the symbols *, **, and ***, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Main independent variable											
The Big 4	0.31 *** [9.1]	0.34 *** [10.7]	0.33 *** [10.9]	0.34 *** [11.0]	0.34 *** [11.0]	0.33 *** [10.8]	0.34 *** [11.0]	0.34 *** [11.1]	0.34 *** [11.0]	0.34 *** [11.0]	0.24 *** [7.72]
Accounting ratio characteristics											
CR	0.02 *** [3.60]	0.012 *** [4.60]	0.013 *** [3.31]	0.016 *** [3.36]	0.017 *** [3.59]	0.016 *** [3.35]	0.019 *** [3.47]	0.017 *** [3.66]	0.018 *** [3.36]	0.061 *** [3.38]	0.076 *** [3.78]
AER	-0.012 [-0.44]	-0.010 [-0.43]	-0.018 [-1.03]	-0.018 [-1.03]	-0.017 [-0.97]	-0.018 [-1.03]	-0.017 [-0.99]	-0.015 [-0.85]	-0.018 [-1.03]	-0.018 [-1.12]	-0.015 [-0.90]
ROE	-0.018 [-2.19]	-0.016 [-2.09]	-0.017 [-2.46]	-0.017 [-2.46]	-0.016 [-2.37]	-0.016 [-2.40]	-0.016 [-2.39]	-0.017 [-2.55]	-0.017 [-2.46]	-0.018 [-2.61]	-0.020 [-2.90]
DPR	-0.060 [-1.40]	-0.063 [-1.42]	-0.060 [-1.44]	-0.060 [-1.45]	-0.060 [-1.47]	-0.060 [-1.45]	-0.060 [-1.47]	-0.063 [-1.48]	-0.060 [-1.45]	-0.066 [-1.41]	-0.074 [-1.54]
IPO firm characteristics											
OP	-0.010 * [-1.98]	-0.010 * [-1.96]	-0.017 *** [-3.72]	-0.016 *** [-3.71]	-0.015 *** [-3.46]	-0.016 *** [-3.68]	-0.015 *** [-3.47]	-0.015 *** [-3.56]	-0.016 *** [-3.71]	-0.014 *** [-3.55]	-0.015 *** [-3.65]
OS	-0.025 *** [0.51]	-0.027 *** [0.51]	-0.024 *** [4.58]	-0.024 *** [4.74]	-0.024 *** [4.90]	-0.024 *** [4.40]	-0.024 *** [5.03]	-0.025 *** [5.37]	-0.024 *** [4.74]	-0.025 *** [4.74]	-0.033 *** [4.20]
PSO	-0.016 *** [5.11]	0.017 *** [7.11]	0.034 *** [15.9]	0.073 *** [16.1]	0.034 *** [14.8]	0.035 *** [15.3]	0.036 *** [15.5]	0.038 *** [16.3]	0.037 *** [16.1]	0.050 [1.56]	0.037 *** [14.7]
SSO	0.050 [0.51]	0.059 [0.91]	0.027 *** [4.58]	0.028 *** [4.74]	0.027 *** [4.90]	0.025 *** [4.40]	0.028 *** [5.03]	0.082 *** [5.37]	0.028 *** [4.74]	-0.013 [-1.60]	0.025 *** [4.20]
UF	0.0043 [1.54]	0.0051 [1.64]	0.023 *** [3.97]	0.022 *** [3.95]	0.020 *** [3.67]	0.022 *** [3.92]	0.020 *** [3.68]	0.020 *** [3.77]	0.022 *** [3.95]	0.019 *** [3.74]	0.020 *** [3.88]
I	0.24 *** [6.72]	0.28 *** [7.72]	0.26 *** [7.28]	0.25 *** [7.21]	0.26 *** [7.48]	0.26 *** [7.35]	0.26 *** [7.41]	0.25 *** [6.93]	0.25 *** [7.21]	0.20 *** [5.49]	0.23 *** [6.41]
PAR	0.50 *** [6.74]	0.51 *** [8.74]	0.50 *** [8.49]	0.50 *** [8.51]	0.51 *** [8.66]	0.50 *** [8.52]	0.50 *** [8.62]	0.51 *** [8.66]	0.50 *** [8.51]	0.47 *** [8.09]	0.43 *** [7.31]
T	0.13 *** [2.58]	0.14 *** [2.88]	0.15 *** [3.10]	0.15 *** [3.09]	0.14 *** [2.99]	0.15 *** [3.06]	0.14 *** [3.01]	0.14 *** [2.86]	0.15 *** [3.09]	0.15 *** [3.21]	0.14 *** [2.95]
RSR	0.024 *** [12.0]	0.020 *** [15.0]	0.022 *** [16.6]	0.022 *** [16.6]	0.023 *** [16.8]	0.023 *** [16.7]	0.023 *** [16.7]	0.022 *** [16.7]	0.022 *** [16.6]	0.022 *** [16.3]	0.021 *** [15.7]

Table 5. Cont.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Corporate governance characteristics											
ACM	−0.014 **	−0.017 **	−0.014 **	−0.014 **	−0.016 **	−0.015 **	−0.016 **	−0.018 **	−0.014 **	−0.017 **	−0.016 **
	[−2.26]	[−2.36]	[−2.01]	[−2.04]	[−2.23]	[−2.10]	[−2.19]	[−2.48]	[−2.04]	[−2.42]	[−2.23]
COED	−0.081 [−1.14]	−0.085 [−1.44]	−0.056 [−0.95]	−0.054 [−0.92]	−0.064 [−1.09]	−0.060 [−1.02]	−0.061 [−1.03]	−0.064 [−1.08]	−0.054 [−0.92]	−0.089 [−1.52]	−0.070 [−1.19]
FOBD	−0.051 **	−0.055 **	−0.050 **	−0.050 **	−0.052 **	−0.051 **	−0.051 **	−0.049 **	−0.050 **	−0.039 *	−0.053 **
IDOBM	[−2.30] 0.052 *** [6.14]	[−2.40] 0.059 *** [7.14]	[−2.23] 0.063 *** [7.64]	[−2.21] 0.063 *** [7.63]	[−2.29] 0.064 *** [7.86]	[−2.26] 0.063 *** [7.75]	[−2.26] 0.044 *** [7.83]	[−2.26] 0.064 *** [7.86]	[−2.17] 0.063 *** [7.63]	[−2.21] 0.058 *** [7.11]	[−1.71] 0.060 *** [7.31]
IPO market characteristics											
HM	−0.090 **	−0.080 **	−0.095 **	−0.097 **	−0.10 ***	−0.099 ***	−0.10 ***	−0.12 ***	−0.097 **	0.019	−0.093 **
	[−2.18]	[−2.08]	[−2.53]	[−2.56]	[−2.67]	[−2.60]	[−2.68]	[−3.18]	[−2.56]	[0.50]	[−2.45]
IPOV	−0.020 ***	−0.029 ***	−0.023 **	−0.023 **	−0.024 ***	−0.023 **	−0.022 **	−0.026 ***	−0.023 **	−0.032 ***	−0.020 **
	[−3.14]	[−3.04]	[−2.49]	[−2.51]	[−2.60]	[−2.43]	[−2.43]	[−2.77]	[−2.51]	[−3.52]	[−2.20]
PSMV	0.070 *** [5.15]	0.078 *** [4.15]	0.125 *** [6.65]	0.124 *** [6.73]	0.0114 *** [6.32]	0.124 *** [6.51]	0.115 *** [6.13]	0.119 *** [6.34]	0.126 *** [6.73]	0.035 * [1.86]	0.19 *** [5.79]
Macroeconomic characteristics											
IR	0.010	0.012	−0.052 ***	−0.053 ***	−0.041 ***	−0.046 ***	−0.041 ***	−0.039 ***	−0.053 ***	−0.019 *	−0.048 ***
	[1.00]	[1.05]	[−5.22]	[−5.42]	[−4.06]	[−4.34]	[−3.91]	[−3.88]	[−5.42]	[−1.74]	[−4.82]
FDII	−0.014 [−1.50]	−0.015 [−1.10]	0.021 * [1.65]	0.019 [1.49]	0.010 [0.77]	0.020 [1.64]	0.012 [0.95]	0.013 [1.05]	0.019 [1.49]	0.051 *** [3.48]	0.026 ** [2.09]
TR	0.040 [0.95]	0.052 [0.85]	0.042 [0.87]	0.043 [0.85]	0.044 [0.85]	0.041 [0.85]	0.047 [0.85]	0.049 [0.93]	0.042 [0.85]	0.036 [0.81]	0.069 [1.06]
GDP	0.14 *** [12.4]	0.11 *** [15.6]	0.11 *** [12.1]	0.12 *** [14.3]	0.13 *** [15.2]	0.12 *** [13.6]	0.12 *** [15.0]	0.13 *** [16.5]	0.12 *** [14.3]	0.018 * [1.88]	0.10 *** [15.2]
CLEO	−0.25 *** [−6.51]	−0.34 *** [−7.71]	−0.19 *** [−4.88]	−0.20 *** [−5.31]	−0.26 *** [−6.67]	−0.21 *** [−5.26]	−0.24 *** [−6.33]	−0.26 *** [−6.64]	−0.20 *** [−5.31]	−0.29 *** [−6.67]	−0.14 *** [−3.62]
Additional controlling variables for robustness testing											
SE	−0.067 *** [−16.4]										
SAR		0.038 [0.96]									
ESR			0.088 ** [2.27]								
RL				11.5 *** [4.89]							
CC					0.092 *** [4.19]						
TPG						0.09 *** [4.29]					
DCM							0.29 *** [8.57]				
DMS								0.088 ** [2.27]			
EBF									0.64 *** [13.6]		
GST										−0.015 [−0.51]	
PUB											−0.096 ***
											[−15.0]
FED	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE	YE & CE & IE
Constant	−3.34 *** [−10.2]	−4.30 *** [−15.2]	−4.56 *** [−17.8]	−4.17 *** [−33.6]	−4.04 *** [−33.4]	−4.17 *** [−32.9]	−5.54 *** [−23.9]	−4.56 *** [−17.8]	−7.01 *** [−26.6]	−4.23 *** [−32.6]	−3.99 *** [−17.3]
Observations	27,182	27,182	27,182	27,182	27,182	27,182	27,182	27,182	27,182	27,182	27,182
Adjusted R ²	0.25	0.23	0.23	0.24	0.23	0.24	0.24	0.23	0.25	0.25	0.23
Mean VIF value	1.94	1.97	1.84	1.99	2.11	1.94	1.84	1.96	1.95	1.81	2.10
Wu–Hausman F statistics											4.81 ***
Cragg–Donald Wald partial F statistic											219 ***

6. Conclusions

6.1. Research Summary

This study investigated how hiring Big 4 auditing firms help IPO owners attract VC funding when going public in the global IPO market. VCs carefully evaluate IPO investment risks (Kaiser et al. 2007a), and the participation of a Big 4 audit firm may reduce risks associated with financial inaccuracies, fraud, and failure to meet regulatory standards (Khurana and Raman 2004), offering more confidence to VCs. In recent times, audit scandals connected to IPOs have reduced confidence in financial reporting, making VC investors wary of IPOs (Agrawal and Cooper 2010; Petra and Spieler 2020). Moreover, scepticism related to audit scandals has made VCs more cautious about IPO investments, requesting greater due diligence and tougher monitoring (Beatty et al. 2013). Financial misbehaviour, fraud, and large mistakes in IPOs highlight the need to examine Big 4 audit firms' role in IPOs' ability to attract VCs. In this context, studying how audit firm selection affects IPOs' VC backing can enhance the auditing and venture capital literature by revealing factors affecting VC confidence and risk evaluation (Amini et al. 2022; Beatty 1989; Certo et al. 2001; Chan et al. 2021; Firth and Liao-Tan 1998; Liu et al. 2021). To the best of my knowledge, no current study has empirically examined how hiring Big 4 auditing firms helps IPO businesses attract VCs. Addressing the research gap concerning this unexplored association may inform policy discussions, regulatory changes, and best practices to improve transparency, accountability, and investor protection in the IPO market.

6.2. Summary of Findings

The results of this study validate that hiring Big 4 auditors substantially boosts the chances of IPO owners attracting VC participation by up to 50% in the global IPO market. The findings support prior studies, which indicated that owners of IPOs deliberately choose Big 4 audit firms to lower agency costs, increase openness and disclosure, and boost investor confidence in the IPO market (Cumming and Johan 2008; Iatridis 2012; Jamaani and Alidarous 2022; Obeng et al. 2021). Building on the foundations of the PAT and ST, this research confirms that IPO owners signal their dedication to strong governance practices, establish confidence with VCs, and improve their reputation in the market. This, in turn, boosts their ability to attract investments and accomplish a successful IPO (Chan et al. 2021; Colombo 2021). Moreover, external monitoring and assurance provided by the Big 4 audit firms are crucial for minimising information asymmetries, aligning the objectives of VCs and business management, and cultivating favourable relationships that promote VC involvement in IPOs (Gompers 1995; Huang et al. 2020; Joshi et al. 2022; Liu et al. 2021). The study also found that the PAT and ST in the IPO market explain the relationships and developments among important parties involved in the IPO process (Amini et al. 2022; Beatty 1989; Certo et al. 2001; Chan et al. 2021; Firth and Liao-Tan 1998; Liu et al. 2021). Furthermore, the findings validate that using the PAT and ST may effectively assess the impact of engaging Big 4 audit firms on attracting VCs for IPOs, which is achieved by sending a quality signal that reduces agency costs between IPO owners and VCs, enhancing VC trust and increasing transparency and disclosure in the IPO prospectus.

6.3. Limitations and Future Research Directions

This research has several limitations that can be improved for future research directions. First, a research limitation of the study in question is that some researchers claim that VCs are selected several years before the auditors, suggesting that causality may be reversed⁵ (Drover et al. 2017). One method to address this problem is to examine the impact of employing the Big 4 auditors on VCs supporting IPOs for both new startups and well-established IPOs. Unfortunately, the data from this research do not include such a dataset. Therefore, future research might enhance the empirical outcomes of this study by examining the impact of employing the Big 4 auditors on venture capitalists supporting startup IPOs compared to well-established IPOs.

Second, the study is limited to studying the role of the Big 4's involvement in IPOs on the ability of IPO owners to attract VC investment. VC investors prioritize early-stage ventures due to the increased costs and uncertainties involved in these investments (Drover et al. 2017). This sets VC financing apart from CF investment, PE investment, and AI investment, as the latter three typically rely on their own funds (Busenitz et al. 2004). Further research could be conducted to examine the connection between hiring one of the Big 4 audit firms and the capacity of IPO owners to attract CF, PE, and AI investors. For example, the significance of this future research stems from the distinctions between VCs and PE investors within the context of IPO owners (Bruton et al. 2010; Chahine et al. 2007; Tykvová 2018). First, there is a distinction between the investment stage and size. Typically, VCs invest smaller amounts in startups and early-stage companies, aiming to support their growth and potential for a profitable exit (Tykvová 2018). In contrast, PE investors usually make substantial investments in well-established companies, often through leveraged buyouts, recapitalisations, or growth capital (Chahine and Saade 2011). Thus, the primary focus is on optimising operational effectiveness, profitability, and growth to generate returns. Additionally, there is a distinction in the investment horizon (Bruton et al. 2010), as investors in the VC industry typically have a longer-term perspective, patiently waiting for their investments to expand and potentially undergo an IPO or acquisition (Tykvová 2018). On the other hand, PE investors typically maintain a long-term investment horizon, although they may have a more expedited timeframe for accomplishing their return targets (Chahine and Saade 2011). These objectives might involve options such as an IPO, sale to another company, or other exit strategies (Chahine and Saade 2011). Additionally, VCs and PEs differ in risk tolerance. VCs are well-versed in taking on higher levels of risk by investing in fledgling companies that have yet to establish a clear path to success (Metrick and Yasuda 2011). In contrast, PE investors typically prioritise more mature companies that have established cash flows and market positions (Metrick and Yasuda 2011). These types of investments generally carry lower risk compared to early-stage investments. Another important aspect to consider is the distinction between involvement and control between VCs and PEs. VCs typically offer mentorship, strategic guidance, and networking opportunities to businesses they invest in without actively pursuing operational control (Payne et al. 2009), whereas PE investors adopt a proactive approach and typically aim for a substantial level of influence over their invested companies (Bedford and Ditillo 2022; Payne et al. 2009), applying operational enhancements, strategic adjustments, and governance frameworks (Bedford and Ditillo 2022).

Third, this research does not account for some of VCs' characteristics, including VC style-drift⁶. Koenig and Burghof (2022) demonstrate that the most frequent VC fund structure is an independent private partnership involving limited partners (LPs) giving cash and general partners (GPs) managing it. The interaction among the many participants engaged as VCs may be described in a simple manner as follows: VCs are financial intermediaries that secure cash from investors, such as pension funds or family offices, who operate as LPs (Koenig and Burghof 2022). GPs, who are often venture capital firms, contribute a small portion of the fund's capital and invest all the money into entrepreneurial enterprises on behalf of their LPs (Cumming et al. 2009). The remuneration of GPs comprises a predetermined management fee that is determined by the value of the assets they oversee as well as a carried interest that functions similarly to an option, entitling them to a portion of the fund's profits (Buzzacchi et al. 2015). The objective of the fund is to enhance the value of the invested money over the duration of the fund. This is accomplished by divesting from its portfolio firms after significantly enhancing their value, and then returning the fund's cash to the investors. Cumming et al. (2009) and Buzzacchi et al. (2015) show that many LPs worry about investing style drifts. Thus, why GP and LP seldom guarantee investing style is odd. The LP's sole indicator of a fund's risk-return profile is an implied investing style agreement. To achieve their preferred risk-return allocation, LPs choose funds depending on their predicted investing style (Cumming et al. 2009). A fund invests in entrepreneurial projects based on their growth stage, location, and industry. LPs and GPs

constitute a conventional principal-agent relationship since LPs have little impact on investment choices beyond their first capital commitment and must trust GPs to operate in their best interest (Buzzacchi et al. 2015). LPs cannot generally withdraw funds to rebalance their risk–return profile when GPs deviate from their planned investing approach (Cumming et al. 2009). Koenig and Burghof (2022) argue that this might cause agency conflict. Thus, future research can account for VC-style drift, which may boost Big 4 auditor demand.

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Notes

- ¹ CF investing is a strategy for generating funds by mobilizing a substantial number of people, usually via online platforms (Drover et al. 2017). CF enables entrepreneurs, companies, or projects to get capital from a wide range of individuals, with each person making tiny contributions. CF investing is the process of collecting small sums of money from a large group of individuals, often in return for prizes, ownership shares, or borrowed funds. It is frequently employed for projects, goods, or innovative undertakings in their first stages (Drover et al. 2017).
- ² PE investment involves investing in privately held firms or publicly traded corporations that are later taken off the stock market (Tykvová 2018). The purpose is to reorganize or expand these companies before ultimately selling them for a financial gain. Therefore, PE investments are often made in firms that are more developed and have well-established business concepts. They often strive to enhance the company's operations, reduce expenses, and boost profitability before to divesting from the venture (Tykvová 2018).
- ³ AIs are wealthy investors who invest money in a new firm, often in return for convertible debt or ownership stock (Drover et al. 2017). They frequently provide capital to nascent enterprises and provide their specialized knowledge and extensive connections in addition to financial support. AIs are often people who use their own funds to invest in startups or small enterprises. AIs frequently take part in the first phases of a company's growth and can supply both financial backing as well as mentoring and direction (Drover et al. 2017).
- ⁴ This research contends that by enlisting the services of a Big 4 audit firm, IPO owners are signalling to the market their readiness to bear the expenses linked with appointing a respected auditor to offer unbiased validation of their financial statements. This high-level communication can assist in reducing information disparities and instilling trust in investors regarding the accuracy of the financial information disclosed by the company (Colombo 2021; Drover et al. 2018; Firth and Liao-Tan 1998).
- ⁵ This study appreciates the anonymous reviewer for highlighting the issue of reverse causality, which enables this research to address this limitation and suggest it for future research endeavors.
- ⁶ This study acknowledges the anonymous reviewer for bringing attention to the problem of VC style-drift. This allows the research to address this constraint and propose it as a topic for future research attempts.

References

- Abbott, Lawrence J., Russell Barber, William L. Buslepp, and Pradeep Sapkota. 2023. Is Audit Partner Identification Useful? Evidence from the KPMG "Steal the Exam" Scandal. *Auditing: A Journal of Practice & Theory* 42: 1–22.
- Abid, Ammar, Muhammad Shaique, and Muhammad Anwar ul Haq. 2018. Do big four auditors always provide higher audit quality? Evidence from Pakistan. *International Journal of Financial Studies* 6: 58. [CrossRef]
- Aggarwal, Raj, and John W. Goodell. 2009. Markets and institutions in financial intermediation: National characteristics as determinants. *Journal of Banking & Finance* 33: 1770–80. [CrossRef]
- Agrawal, Anup, and Tommy Cooper. 2010. Accounting scandals in IPO firms: Do underwriters and VCs help? *Journal of Economics & Management Strategy* 19: 1117–81.
- Alavi, Arash, Peter Kien Pham, and Toan My Pham. 2008. Pre-IPO ownership structure and its impact on the IPO process. *Journal of Banking & Finance* 32: 2361–75.
- Alidarous, Manal. 2024. Can the Presence of Big 4 Auditors in IPO Prospectus Reduce Failure Risk? *Journal of Risk and Financial Management* 17: 234. [CrossRef]
- Amini, Shima, Abdulkadir Mohamed, Armin Schwienbacher, and Nicholas Wilson. 2022. Impact of venture capital holding on firm life cycle: Evidence from IPO firms. *Journal of Corporate Finance* 74: 102224. [CrossRef]
- Arthurs, Jonathan D., and Lowell W. Busenitz. 2003. The boundaries and limitations of agency theory and stewardship theory in the venture capitalist/entrepreneur relationship. *Entrepreneurship Theory and Practice* 28: 145–62. [CrossRef]
- Badru, Bazeet Olayemi, Nurwati A. Ahmad-Zaluki, and Wan Nordin Wan-Hussin. 2019. Signalling IPO quality through female directors. *International Journal of Managerial Finance* 15: 719–43. [CrossRef]

- Beatty, Anne, Scott Liao, and Jeff Jiewei Yu. 2013. The spillover effect of fraudulent financial reporting on peer firms' investments. *Journal of Accounting and Economics* 55: 183–205. [CrossRef]
- Beatty, Randolph P. 1989. Auditor reputation and the pricing of initial public offerings. *Accounting Review* 64: 693–709.
- Becker, Connie L., Mark L. DeFond, James Jiambalvo, and K. Subramanyam. 1998. The effect of audit quality on earnings management. *Contemporary Accounting Research* 15: 1–24. [CrossRef]
- Bedford, David S., and Angelo Ditillo. 2022. From governing to managing: Exploring modes of control in private equity relationships. *European Accounting Review* 31: 843–75. [CrossRef]
- Bergh, Donald D., Brian L. Connelly, David J. Ketchen, Jr., and Lu M. Shannon. 2014. Signalling theory and equilibrium in strategic management research: An assessment and a research agenda. *Journal of Management Studies* 51: 1334–60. [CrossRef]
- Bernstein, Shai, Arthur Korteweg, and Kevin Laws. 2017. Attracting early-stage investors: Evidence from a randomized field experiment. *The Journal of Finance* 72: 509–38. [CrossRef]
- Bhasin, Madan Lal. 2013. Corporate accounting fraud: A case study of Satyam Computers Limited. *Open Journal of Accounting* 2: 26–38. [CrossRef]
- Boulton, Thomas J., Scott B. Smart, and Chad J. Zutter. 2010. IPO underpricing and international corporate governance. *Journal of International Business Studies* 41: 206–22. [CrossRef]
- Boulton, Thomas J., Scott B. Smart, and Chad J. Zutter. 2017. Conservatism and international IPO underpricing. *Journal of International Business Studies* 48: 763–85. [CrossRef]
- Brav, Alon, and Paul A. Gompers. 1997. Myth or reality? The long-run underperformance of initial public offerings: Evidence from venture and nonventure capital-backed companies. *The Journal of Finance* 52: 1791–821.
- Bruton, Garry D., Igor Filatotchev, Salim Chahine, and Mike Wright. 2010. Governance, ownership structure, and performance of IPO firms: The impact of different types of private equity investors and institutional environments. *Strategic Management Journal* 31: 491–509. [CrossRef]
- Burke, Jenna J., Rani Hoitash, and Udi Hoitash. 2019. Audit partner identification and characteristics: Evidence from US Form AP filings. *Auditing: A Journal of Practice & Theory* 38: 71–94.
- Busenitz, Lowell W., James O. Fiet, and Douglas D. Moesel. 2004. Reconsidering the venture capitalists' "value added" proposition: An interorganizational learning perspective. *Journal of Business Venturing* 19: 787–807. [CrossRef]
- Busenitz, Lowell W., James O. Fiet, and Douglas D. Moesel. 2005. Signaling in venture capitalist—New venture team funding decisions: Does it indicate long-term venture outcomes? *Entrepreneurship Theory and Practice* 29: 1–12. [CrossRef]
- Butler, Alexander W., Michael O'Connor Keefe, and Robert Kieschnick. 2014. Robust determinants of IPO underpricing and their implications for IPO research. *Journal of Corporate Finance* 27: 367–83. [CrossRef]
- Buzzacchi, Luigi, Giuseppe Scellato, and Elisa Ughetto. 2015. Investment stage drifts and venture capital managerial incentives. *Journal of Corporate Finance* 33: 118–28. [CrossRef]
- Cahan, Steven F., David Emanuel, and Jerry Sun. 2009. Are the reputations of the large accounting firms really international? Evidence from the Andersen-Enron affair. *Auditing: A Journal of Practice & Theory* 28: 199–226.
- Cameron, A. Colin, and Douglas L. Miller. 2015. A practitioner's guide to cluster-robust inference. *Journal of Human Resources* 50: 317–72. [CrossRef]
- Carter, Richard, and Steven Manaster. 1990. Initial public offerings and underwriter reputation. *The Journal of Finance* 45: 1045–67. [CrossRef]
- Cazavan-Jeny, Anne, and Thomas Jeanjean. 2007. Levels of voluntary disclosure in IPO prospectuses: An empirical analysis. *Review of Accounting and Finance* 6: 131–49. [CrossRef]
- Certo, S. Trevis. 2003. Influencing initial public offering investors with prestige: Signaling with board structures. *Academy of Management Review* 28: 432–46. [CrossRef]
- Certo, S. Trevis, Jeffrey G. Covin, Catherine M. Daily, and Dan R. Dalton. 2001. Wealth and the effects of founder management among IPO-stage new ventures. *Strategic Management Journal* 22: 641–58. [CrossRef]
- CFO Magazine. 2007. Deloitte to Pay \$167.5M in Adelpia Case. Available online: <https://www.cfo.com/news/deloitte-to-pay-1675-m-in-adelphia-case/674196/> (accessed on 1 March 2024).
- Chahine, Salim. 2008. Underpricing versus gross spread: New evidence on the effect of sold shares at the time of IPOs. *Journal of Multinational Financial Management* 18: 180–96. [CrossRef]
- Chahine, Salim, and Samer Saade. 2011. Shareholders' rights and the effect of the origin of venture capital firms on the underpricing of US IPOs. *Corporate Governance: An International Review* 19: 601–21. [CrossRef]
- Chahine, Salim, Igor Filatotchev, and Mike Wright. 2007. Venture capitalists, business angels, and performance of entrepreneurial IPOs in the UK and France. *Journal of Business Finance & Accounting* 34: 505–28.
- Chan, K. Hung, Phyllis Lai Lan Mo, and Weiyin Zhang. 2021. Do abnormal IPO audit fees signal IPO audit quality and post-IPO performance? A principal-agent analysis based on evidence from China. *Journal of International Accounting Research* 20: 1–29. [CrossRef]
- Chang, Xin, André F. Gygas, Elaine Oon, and Hong Feng Zhang. 2008. Audit quality, auditor compensation and initial public offering underpricing. *Accounting & Finance* 48: 391–416. [CrossRef]
- Chen, Jengfang, Ni-Yun Chen, Liyu He, and Chris Patel. 2022. The effect of ownership structure on disclosure quality and credit ratings in family firms: The moderating role of auditor choice. *Family Business Review* 35: 140–58. [CrossRef]

- Chen, Ken Y., Kuen-Lin Lin, and Jian Zhou. 2005. Audit quality and earnings management for Taiwan IPO firms. *Managerial Auditing Journal* 20: 86–104. [CrossRef]
- Chen, Xiao-Ping, Xin Yao, and Suresh Kotha. 2009. Entrepreneur passion and preparedness in business plan presentations: A persuasion analysis of venture capitalists' funding decisions. *Academy of Management Journal* 52: 199–214. [CrossRef]
- Ciuchta, Michael P., Chaim Letwin, Regan Stevenson, Sean McMahon, and M. Nesij Huvaj. 2018. Betting on the coachable entrepreneur: Signaling and social exchange in entrepreneurial pitches. *Entrepreneurship Theory and Practice* 42: 860–85. [CrossRef]
- Cohen, Boyd D., and Thomas J. Dean. 2005. Information asymmetry and investor valuation of IPOs: Top management team legitimacy as a capital market signal. *Strategic Management Journal* 26: 683–90. [CrossRef]
- Colombo, Oskar. 2021. The use of signals in new-venture financing: A review and research agenda. *Journal of Management* 47: 237–59. [CrossRef]
- Connelly, Brian L., S. Trevis Certo, R. Duane Ireland, and Christopher R. Reutzel. 2011. Signaling theory: A review and assessment. *Journal of Management* 37: 39–67. [CrossRef]
- Copley, Paul, Edward Douthett, and Suning Zhang. 2021. Venture capitalists and assurance services on initial public offerings. *Journal of Business Research* 131: 278–86. [CrossRef]
- Cragg, John G., and Stephen G. Donald. 1993. Testing identifiability and specification in instrumental variable models. *Econometric Theory* 9: 222–40. [CrossRef]
- Cumming, Douglas, and Sofia Johan. 2008. Information asymmetries, agency costs and venture capital exit outcomes. *Venture Capital* 10: 197–231. [CrossRef]
- Cumming, Douglas, Grant Fleming, and Armin Schwienbacher. 2009. Style drift in private equity. *Journal of Business Finance & Accounting* 36: 645–78.
- De Carvalho, Antonio Gledson, Roberto B. Pinheiro, and Joelson Oliveira Sampaio. 2020. The dynamics of earnings management in IPOs and the role of venture capital. *Research in International Business and Finance* 51: 101084. [CrossRef]
- De Franco, Gus, Ilanit Gavious, Justin Y. Jin, and Gordon D. Richardson. 2011. Do private company targets that hire Big 4 auditors receive higher proceeds? *Contemporary Accounting Research* 28: 215–62. [CrossRef]
- DeAngelo, Linda Elizabeth. 1981. Auditor size and audit quality. *Journal of Accounting and Economics* 3: 183–99. [CrossRef]
- DeFond, Mark L. 1992. The association between changes in client firm agency costs and auditor switching. *Auditing: A Journal of Practice & Theory* 11: 16.
- Defond, Mark L., Jere R. Francis, and Nicholas J. Hallman. 2018. Awareness of SEC enforcement and auditor reporting decisions. *Contemporary Accounting Research* 35: 277–313. [CrossRef]
- Drover, Will, Lowell Busenitz, Sharon Matusik, David Townsend, Aaron Anglin, and Gary Dushnitsky. 2017. A review and road map of entrepreneurial equity financing research: Venture capital, corporate venture capital, angel investment, crowdfunding, and accelerators. *Journal of Management* 43: 1820–53. [CrossRef]
- Drover, Will, Matthew S. Wood, and Andrew C. Corbett. 2018. Toward a cognitive view of signalling theory: Individual attention and signal set interpretation. *Journal of Management Studies* 55: 209–31. [CrossRef]
- DuCharme, Larry L., Paul H. Malatesta, and Stephan E. Sefcik. 2001. Earnings management: IPO valuation and subsequent performance. *Journal of Accounting, Auditing & Finance* 16: 369–96.
- Fan, Joseph P. H., and Tak Jun Wong. 2005. Do external auditors perform a corporate governance role in emerging markets? Evidence from East Asia. *Journal of Accounting Research* 43: 35–72. [CrossRef]
- Firth, Michael, and Chee Keng Liau-Tan. 1998. Auditor quality, signalling, and the valuation of initial public offerings. *Journal of Business Finance & Accounting* 25: 145–65. [CrossRef]
- Francis, Jere R., and Dechun Wang. 2008. The joint effect of investor protection and Big 4 audits on earnings quality around the world. *Contemporary Accounting Research* 25: 157–91. [CrossRef]
- Gao, Yanmin, Karim Jamal, Qiliang Liu, and Le Luo. 2011. Does Reputation Discipline Big 4 Audit Firms? Paper presented at the CAAA Annual Conference, Toronto, ON, Canada, January 28, paper no. 2013-1006.
- Gilson, Stuart, and Belén Villalonga. 2007. Adelphia Communications Corp.'s Bankruptcy. Harvard Business School Case, 208-071. Available online: <https://www.hbs.edu/faculty/Pages/item.aspx?num=35079> (accessed on 4 July 2024).
- Global Competitiveness Report. 2019. World Economic Forum. Available online: <https://www.weforum.org/reports/how-to-end-a-decade-of-lost-productivity-growth> (accessed on 30 December 2021).
- Gompers, Paul. 1995. Optimal Investment, Monitoring, and the Staging of Venture Capital. *Journal of Finance* 50: 1461–89. [CrossRef]
- Gompers, Paul A. 2022. Optimal investment, monitoring, and the staging of venture capital. In *Venture Capital*. New York: Routledge, pp. 285–313.
- Gompers, Paul A., Will Gornall, Steven N. Kaplan, and Ilya A. Strebulaev. 2020. How do venture capitalists make decisions? *Journal of Financial Economics* 135: 169–90. [CrossRef]
- Gray, Sidney J. 1988. Towards a theory of cultural influence on the development of accounting systems internationally. *Abacus* 24: 1–15. [CrossRef]
- Gray, Sidney J., and Hazel M. Vint. 1995. The impact of culture on accounting disclosures: Some international evidence. *Asia-Pacific Journal of Accounting* 2: 33–43. [CrossRef]
- Habib, Michel A., and Alexander P. Ljungqvist. 2001. Underpricing and entrepreneurial wealth losses in IPOs: Theory and evidence. *The Review of Financial Studies* 14: 433–58. [CrossRef]

- Hallen, Benjamin L., Riitta Katila, and Jeff D. Rosenberger. 2014. How do social defenses work? A resource-dependence lens on technology ventures, venture capital investors, and corporate relationships. *Academy of Management Journal* 57: 1078–101. [CrossRef]
- Haswell, Stephen, and Elaine Evans. 2018. Enron, fair value accounting, and financial crises: A concise history. *Accounting, Auditing & Accountability Journal* 31: 25–50.
- Hausman, Jerry A. 1978. Specification tests in econometrics. *Econometrica: Journal of the Econometric Society* 46: 1251–71.
- Hofstede, Geert. 2001. *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations across Nations*. Newbury Park: Sage Publications.
- Hope, Ole-Kristian. 2003. Disclosure practices, enforcement of accounting standards, and analysts' forecast accuracy: An international study. *Journal of Accounting Research* 41: 235–72. [CrossRef]
- Hope, Ole-Kristian, John Christian Langli, and Wayne B. Thomas. 2012. Agency conflicts and auditing in private firms. *Accounting, Organizations and Society* 37: 500–17. [CrossRef]
- Huang, Laura, and Andrew P. Knight. 2017. Resources and relationships in entrepreneurship: An exchange theory of the development and effects of the entrepreneur-investor relationship. *Academy of Management Review* 42: 80–102. [CrossRef]
- Huang, Pingsun, Yi-Chieh Wen, and Yan Zhang. 2020. Does the monitoring effect of Big 4 audit firms really prevail? Evidence from managerial expropriation of cash assets. *Review of Quantitative Finance and Accounting* 55: 739–68. [CrossRef]
- Husnin, Azrul Ihsan, Anuar Nawawi, and Ahmad Saiful Azlin Puteh Salin. 2016. Corporate governance and auditor quality—Malaysian evidence. *Asian Review of Accounting*. [CrossRef]
- Iatridis, George Emmanuel. 2012. Audit quality in common-law and code-law emerging markets: Evidence on earnings conservatism, agency costs and cost of equity. *Emerging Markets Review* 13: 101–17. [CrossRef]
- Insider. 2021. Amazon-Backed Deliveroo Heads to Its \$2.5 Billion IPO Facing Rider Strikes and Investor Snubs over Its Business Model. Available online: <https://www.businessinsider.com/deliveroo-ipo-beset-by-criticism-over-worker-pay-profitability-2021-3> (accessed on 1 March 2024).
- International Monetary Fund. 2022. The IMF and the Group of Twenty. Available online: <https://www.imf.org/en/Research/IMFandG20> (accessed on 19 March 2024).
- Islam, Majidul, and Ashrafee Tanvir Hossain. 2017. Compliance with accounting standards by financial Institutions: Some evidence from Bangladesh. *Research in Accounting Regulation* 29: 145–51. [CrossRef]
- Jacob, Joshy, Naman Desai, and Sobhesh Kumar Agarwalla. 2019. An examination of factors driving big 4 audit fee premiums: Evidence from India's audit market. *Accounting Horizons* 33: 43–58. [CrossRef]
- Jamaani, Fouad, and Abdullahi D. Ahmed. 2020. Simultaneous effects of clustering and endogeneity on the underpricing difference of IPO firms: A global evidence. *Research in International Business and Finance* 54: 101250. [CrossRef]
- Jamaani, Fouad, and Abdullahi D. Ahmed. 2021. Modifier effects of country-level transparency on global underpricing difference: New hierarchical evidence. *International Review of Financial Analysis* 74: 101667. [CrossRef]
- Jamaani, Fouad, and Abdullahi D. Ahmed. 2022. The psychological and economic roles of culture on global underpricing difference: A new hierarchical evidence. *Journal of Behavioral and Experimental Finance* 33: 100615. [CrossRef]
- Jamaani, Fouad, and Abdullah M. Alawadhi. 2023. Inflation and stock market growth: The case of IPO withdrawal. *International Journal of Emerging Markets*. [CrossRef]
- Jamaani, Fouad, and Manal Alidarous. 2019. Review of theoretical explanations of IPO underpricing. *Journal of Accounting, Business and Finance Research* 6: 1–18. [CrossRef]
- Jamaani, Fouad, and Manal Alidarous. 2021. The short-and long-lived effects of IFRS mandate on IPO firms in emerging market economies. *Journal of Financial Reporting and Accounting* 20: 953–78. [CrossRef]
- Jamaani, Fouad, and Manal Alidarous. 2022. Does the appointment of the three musketeers reduce IPO underpricing? Global evidence. *Eurasian Business Review* 13: 887–929. [CrossRef]
- Jamaani, Fouad, and Manal Alidarous. 2024. The impact of prestigious attorneys on IPO withdrawal in the global primary market. *Financial Innovation* 10: 13. [CrossRef]
- Jamaani, Fouad, Manal Alidarous, and Abdullah Al-Awadhi. 2021. The Early Impact of Government Financial Intervention Policies and Cultural Secrecy on Stock Market Returns During the COVID-19 Pandemic: Evidence from Developing Countries. *International Journal of Financial Research* 12: 401–16. [CrossRef]
- Jamaani, Fouad, Manal Alidarous, and Esraa Alharasis. 2022. The combined impact of IFRS mandatory adoption and institutional quality on the IPO companies' underpricing. *Journal of Financial Reporting and Accounting, ahead-of-print*. [CrossRef]
- Johl, Shireenjit K., Mohammad Badrul Muttakin, Dessalegn Getie Mihret, Samuel Cheung, and Nathan Gioffre. 2021. Audit firm transparency disclosures and audit quality. *International Journal of Auditing* 25: 508–33. [CrossRef]
- Johnson, Bret A., Ling Lei Lisic, Joon Seok Moon, and Mengmeng Wang. 2023. SEC comment letters on form S-4 and M&A accounting quality. *Review of Accounting Studies* 28: 862–909.
- Jones, Travis L., and Mushfiq Swaleheen. 2010. Endogenous examination of underwriter reputation and IPO returns. *Managerial Finance* 36: 284–93. [CrossRef]
- Joshi, Kshitija, Deepak Chandrashekar, and Bala Subrahmanya. 2022. Monitoring and value-add by venture capital firms in investee firms: The case of foreign VCs operating in India. *International Journal of Entrepreneurial Venturing* 14: 202–29.

- Kaiser, Dieter G., Rainer Lauterbach, and Denis Schweizer. 2007a. Total loss risk in European versus US-based venture capital investments. In *Venture Capital in Europe*. Amsterdam: Elsevier, pp. 371–87.
- Kaiser, Dieter G., Rainer Lauterbach, and Jan Klaas Verweyen. 2007b. Venture capital financing from an entrepreneur's perspective. *The International Journal of Entrepreneurship and Innovation* 8: 199–207. [CrossRef]
- Kaiser, Manuel, and Andreas Kuckertz. 2023. Emotional robustness in times of crisis: The effects of venture funding on the digital communication styles of entrepreneurs. *Journal of Small Business and Enterprise Development* 30: 828–50. [CrossRef]
- Kaplan, Steven N., and Per Strömberg. 2001. Venture capitalists as principals: Contracting, screening, and monitoring. *American Economic Review* 91: 426–30. [CrossRef]
- Khurana, Inder K., and K. Raman. 2004. Litigation risk and the financial reporting credibility of Big 4 versus non-Big 4 audits: Evidence from Anglo-American countries. *The Accounting Review* 79: 473–95. [CrossRef]
- Khurana, Inder K., and Lei Zhao. 2019. Does the JOBS Act reduce compliance costs of emerging growth companies? Theory and evidence. *Auditing: A Journal of Practice & Theory* 38: 151–75.
- Knill, April. 2009. Should venture capitalists put all their eggs in one basket? Diversification versus pure-play strategies in Venture Capital. *Financial Management* 38: 441–86. [CrossRef]
- Ko, Eun-Jeong, and Alexander McKelvie. 2018. Signaling for more money: The roles of founders' human capital and investor prominence in resource acquisition across different stages of firm development. *Journal of Business Venturing* 33: 438–54. [CrossRef]
- Koenig, Lukas, and Hans-Peter Burghof. 2022. The Investment Style Drift Puzzle and Risk-Taking in Venture Capital. *Review of Corporate Finance* 2: 527–85. [CrossRef]
- Lawrence, Alastair, Miguel Minutti-Meza, and Ping Zhang. 2011. Can Big 4 versus non-Big 4 differences in audit-quality proxies be attributed to client characteristics? *The Accounting Review* 86: 259–86. [CrossRef]
- Lee, Gemma, and Ronald W. Masulis. 2011. Do more reputable financial institutions reduce earnings management by IPO issuers? *Journal of Corporate Finance* 17: 982–1000. [CrossRef]
- Lee, Philip J., Sarah J. Taylor, and Stephen L. Taylor. 2006. Auditor conservatism and audit quality: Evidence from IPO earnings forecasts. *International Journal of Auditing* 10: 183–99. [CrossRef]
- Lin, Hui Ling, Kuntara Pukthuanthong, and Thomas John Walker. 2013. An international look at the lawsuit avoidance hypothesis of IPO underpricing. *Journal of Corporate Finance* 19: 56–77. [CrossRef]
- Liu, Qigui, Jinghua Tang, and Gary Tian. 2021. Monitoring or colluding: The role of venture capital investors in the IPO process. *Accounting & Finance* 61: 1017–46.
- Masulis, Ronald W., and Rajarishi Nahata. 2009. Financial contracting with strategic investors: Evidence from corporate venture capital backed IPOs. *Journal of Financial Intermediation* 18: 599–631. [CrossRef]
- Medina, Leandro, and Friedrich Schneider. 2018. *Shadow Economies Around the World: What Did We Learn over the Last 20 Years?* Washington, DC: International Monetary Fund.
- Metrick, Andrew, and Ayako Yasuda. 2011. Venture capital and other private equity: A survey. *European Financial Management* 17: 619–54. [CrossRef]
- Ministry of External Affairs, Government of India. 2024. About G20. Available online: <https://www.g20.in/en/about-g20/about-g20.html> (accessed on 19 March 2024).
- Morgan Stanley Capital International. 2020. MSCI Announces the Results of the 2020 Annual Market Classification Review. Available online: <https://www.msci.com/market-classification> (accessed on 3 December 2021).
- Nguyen, Giang, and Vinh Vo. 2021. Asset liquidity and venture capital investment. *Journal of Corporate Finance* 69: 101963. [CrossRef]
- Obeng, Victoria A., Kamran Ahmed, and Steven F. Cahan. 2021. Integrated reporting and agency costs: International evidence from voluntary adopters. *European Accounting Review* 30: 645–74. [CrossRef]
- Palmrose, Zoe-Vonna. 1988. An analysis of auditor litigation and audit service quality. *Accounting Review* 63: 55–73.
- Payne, G. Tyge, Justin L. Davis, Curt B. Moore, and R. Greg Bell. 2009. The deal structuring stage of the venture capitalist decision-making process: Exploring confidence and control. *Journal of Small Business Management* 47: 154–79. [CrossRef]
- Petra, Steven, and Andrew C. Spieler. 2020. Accounting scandals: Enron, Worldcom, and global crossing. In *Corporate Fraud Exposed*. Emerald Publishing Limited, pp. 343–60. Available online: <https://www.emerald.com/insight/content/doi/10.1108/978-1-7897-3-417-120201022/full/html> (accessed on 4 July 2024).
- Plummer, Lawrence A., Thomas H. Allison, and Brian L. Connelly. 2016. Better together? Signaling interactions in new venture pursuit of initial external capital. *Academy of Management Journal* 59: 1585–604. [CrossRef]
- Pollock, Timothy G., Guoli Chen, Eric M. Jackson, and Donald C. Hambrick. 2010. How much prestige is enough? Assessing the value of multiple types of high-status affiliates for young firms. *Journal of Business Venturing* 25: 6–23. [CrossRef]
- Premti, Arjan, and Garrett Smith. 2020. Earnings management in the pre-IPO process: Biases and predictors. *Research in International Business and Finance* 52: 101120. [CrossRef]
- Reiff, Annika, and Tereza Tykvová. 2021. IPO withdrawals: Are corporate governance and VC characteristics the guiding light in the rough sea of volatile markets? *Journal of Corporate Finance* 67: 101908. [CrossRef]
- Reuters. 2015. Toshiba Inflated Profits by \$1.2 Billion with Top Execs' Knowledge: Investigation. Available online: <https://www.reuters.com/article/us-toshiba-accounting-idUSKCN0PU0E920150720> (accessed on 3 March 2024).
- Ritter, Jay R. 2013. Re-energizing the IPO market. *Journal of Applied Finance* 24: 37–48. [CrossRef]

- Ritter, Jay R., and Ivo Welch. 2002. A review of IPO activity, pricing, and allocations. *The Journal of Finance* 57: 1795–828. [CrossRef]
- Ross, Stephen A. 1973. The economic theory of agency: The principal's problem. *The American Economic Review* 63: 134–39.
- Sanderson, Eleanor, and Frank Windmeijer. 2016. A weak instrument F-test in linear IV models with multiple endogenous variables. *Journal of Econometrics* 190: 212–21. [CrossRef] [PubMed]
- Schnitzer, Monika, and Martin Watzinger. 2022. Measuring the spillovers of venture capital. *Review of Economics and Statistics* 104: 276–92. [CrossRef]
- Sharma, A. K. 2015. Venture capitalists' investment decision criteria for new ventures: A review. *Procedia-Social and Behavioral Sciences* 189: 465–70.
- Spence, Michael. 2002. Signaling in retrospect and the informational structure of markets. *American Economic Review* 92: 434–59. [CrossRef]
- Sundarasan, Sheela Devi, Afzal Khan, and Nakiran Rajangam. 2018. Signalling roles of prestigious auditors and underwriters in an emerging IPO market. *Global Business Review* 19: 69–84. [CrossRef]
- Sundarasan, Sheela, Kamilah Kamaludin, Izani Ibrahim, Usha Rajagopalan, and Nevi Danila. 2021. Auditors, underwriters, and firm owners' interaction in an IPO environment: The case of OECD Nations. *Sustainability* 13: 6281. [CrossRef]
- Svetek, Mojca. 2022. Signaling in the context of early-stage equity financing: Review and directions. *Venture capital* 24: 71–104. [CrossRef]
- Sweeting, Robert C., and Christine F. Wong. 1997. A UK Hands-off Venture Capital Firm and the Handling of Post-investment Investor--Investee Relationships. *Journal of Management Studies* 34: 125–52. [CrossRef]
- Taj, Saud A. 2016. Application of signaling theory in management research: Addressing major gaps in theory. *European Management Journal* 34: 338–48. [CrossRef]
- Tam, Kinsun, Qiao Xu, Guy Fernando, and Richard A. Schneible. 2023. "Tone at the top": Management's discussion and analysis and audit quality. *Managerial Auditing Journal* 38: 602–33. [CrossRef]
- The World Bank. 2016. The World Bank Group's Support to Capital Market Development. Available online: <https://documents1.worldbank.org/curated/en/349861476995767563/pdf/The-World-Bank-Group-s-support-to-capital-market-development.pdf> (accessed on 6 March 2024).
- Toms, Steven, and Chieh Lin. 2023. Economic freedom, financial development and the determinants of fraud and scandal: The United Kingdom, 1900–2010. *Business History* 1–28. [CrossRef]
- Tyková, Tereza. 2018. Venture capital and private equity financing: An overview of recent literature and an agenda for future research. *Journal of Business Economics* 88: 325–62. [CrossRef]
- Vinten, Gerald. 2005. Audit expectation-performance gap in the United Kingdom in 1999 and comparison with the gap in New Zealand in 1989 and in 1999. *Managerial Auditing Journal* 20: 561–62. [CrossRef]
- Wang, Xin, and Di Song. 2021. Does local corruption affect IPO underpricing? Evidence from China. *International Review of Economics & Finance* 73: 127–38.
- Welch, Ivo. 1989. Seasoned offerings, imitation costs, and the underpricing of initial public offerings. *The Journal of Finance* 44: 421–49. [CrossRef]
- Yasar, Burze, Thomas Martin, and Timothy Kiessling. 2020. An empirical test of signalling theory. *Management Research Review* 43: 1309–35. [CrossRef]
- Zane, Lee J. 2023. Intellectual capital and the acquisition of human capital by technology-based new ventures. *Journal of Intellectual Capital* 24: 780–98. [CrossRef]
- Zhang, Yan, and Margarethe F. Wiersema. 2009. Stock market reaction to CEO certification: The signaling role of CEO background. *Strategic Management Journal* 30: 693–710. [CrossRef]
- Zhang, Zikai, and Suman Neupane. 2024. Global IPO underpricing during the COVID-19 pandemic: The impact of firm fundamentals, financial intermediaries, and global factors. *International Review of Financial Analysis* 91: 102954. [CrossRef]

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Article

Cost–Benefit Analysis of International Financial Reporting Standard and Russian Accounting Standard Integration: What Does Comparability Cost?

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Abstract: In Russia, firms with consolidated financial statements must produce financial statements in both RAS (Russian accounting standards) and IFRS (international financial reporting standards). Unconsolidated SMEs are only required to use RAS. Using hand-collected data from 2010–2013 (pre- and post-IFRS adoption periods), we find income measures under RAS are converging to income measures under IFRS. The quality of earnings exhibits no change under IFRS, while RAS earnings are being managed upward for firms that have adopted IFRS and downward for firms that have not adopted IFRS. The relative variation in market and book values differs more widely under IFRS when compared to RAS, implying more volatility and risk under IFRS. We attribute our findings to a monitoring effect derived from IFRS.

Keywords: Russian public companies; Russian accounting standards; IFRS; taxation; convergence; emerging market

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1. Introduction

The importance of business legitimacy in an increasingly globalized world is an important issue. In emerging markets, where legal enforcement is weak, the legitimacy of organizations' transactions becomes highly relevant (Wieland and Fischer 2020). As Wieland and Fischer (2020) note, a clear distinction exists between business legitimacy and legality. Legitimacy is determined by ethical expectations, while legality refers to public regulation. Something may be legal but not legitimate. In this paper, we examine whether earnings reported under domestic GAAP (Russian accounting standards (RAS)) are converging to earnings reported under international financial reporting standards (IFRS). We bring together two streams of literature: IFRS vs. local GAAP comparability and the tax impact of IFRS adoption in one of the leading emerging markets—the Russian Federation.

Russia provides a unique setting because publicly traded Russian companies with consolidated financial statements have, since 2012, been required to produce two sets of financial statements—one using IFRS and another using domestic GAAP. In Russia, firms without consolidated financial statements, generally small and medium-sized enterprises (SMEs), are permitted to file using only RAS. Although only former Soviet Bloc countries allow for dual accounting regime reporting, our findings are generalizable to other emerging markets because academics, regulators, and institutions involved in the process for implementing IFRS in emerging markets can directly observe over a much longer period of time how accounting information in different types of firms adapts to the adoption of IFRS.

Comparability between RAS and IFRS improves accounting information quality because of higher disclosure quality. Turner et al. (2024) find an increase in the quality of accounting practices, a knowledge transfer, when developed countries (the US and Canada) have trade surpluses with a developing country (Mexico). They find that for-

eign investors demand comparability between the accounting regimes of all the countries involved. Ho et al. (2023) state:

*[C]omparability can promote the transmission of information and assist investors and other stakeholders in analyzing, comparing, and predicting a company's financial status, operating performance, and prospects **without needing to conduct research** (emphasis added). . . [C]omparability enables stakeholders to fully understand a company's status and to make practical decisions regarding optional projects, thereby increasing the usefulness of accounting information in decision-making and enabling the optimal allocation of resources. (p. 222)*

The success of capital markets depends on the legitimacy of the financial information. This is especially true for emerging markets.

Adopting IFRS, however, is not without costs. We examine one aspect of these costs—higher income taxes because of higher reported-income measures. In Russia, income taxes are accrued based on RAS net income figures. IFRS net income is not used to compute tax expenses. IFRS are, instead, adopted for public reporting and financial purposes and to encourage foreign direct investment (Kim 2013). The Russian cultural environment accepts behaviors that exhibit elements of official corruption, self-dealing, limited transparency, and a “black market” (off-the-books transactions), which may be considered as being unethical and inappropriate in other countries (Preobragenskaya and McGee 2003; Chui et al. 2020; Black et al. 2000; Bagaeva 2009). The resulting concealment of profits serves to limit tax burdens (Preobragenskaya and McGee 2003). Sucher and Bychkova (2001) document that the concealment of profits is mostly unchecked because the fines associated with misstated RAS financial statements are very low. Diversity of accounting and legal systems, political and economic environments, and the flow of information impact the comparability of reported financial information (Joos and Lang 1994; Abdel-Khalik et al. 1999; Ball et al. 2000; El-Gazzar and El-Sadek 2001; Cascino and Gassen 2015). We add to the literature by examining the impacts of broad internationalization on domestic customs and practices and, more specifically, whether convergence takes place despite an increase in corporate income taxes.

This paper explores the dichotomy between those who view financial statements as providing statistical data for tax purposes and those who see financial statements as providing information to external users/investors/creditors. There is a gap in the literature in this area. Ilaboya et al. (2016) highlight that studies on tax planning and firm value in a developing country context are next to non-existent and note that tax planning and firm value exhibit a significant negative relationship. We find a similar gap in the tax literature for most developing countries, despite the fact that taxes are a large source of revenue for governments and can drastically affect profitability for companies. Although one would not expect the tax base to be the focus of investors' attention, Ilaboya et al. (2016) posit that the negative relationship between tax planning and firm value is because of shareholders not valuing tax planning; investors do, however, care about net earnings measures (such as earnings per share), which are affected by tax expenses. Statutory corporate income tax rates impact business activity, acting as an incentive or obstacle to business investment (Stamatopoulos et al. 2019). On the other hand, most foreign investors would gravitate toward the use of IAS accounting numbers vs. domestic GAAP because of the perceived legitimacy of IFRS. Thus, there is a tension between decreasing firm value through tax avoidance (via reduced RAS income) and increasing firm value via higher IFRS income.

We examine balance sheet items and income statement items and construct several ratios to test comparability both before and after the adoption of IFRS in Russia. We find convergence in only limited areas, primarily those dealing with the “bottom line”. We find that measures of income (operating income, ordinary income, and net income), book value, and return on equity are significantly higher under IFRS when compared to RAS accounting measures. We generally do not find convergence for balance sheet items concerning assets and liabilities, only equity. We find that income and equity measures, measures that are

important to investors, are converging between RAS and IFRS while other accounting measures are not.

So which accounting regime is converging to the other, or are they both changing? We also examine how IFRS adoption has affected different types of firms. Some firms adopted IFRS early (before 2012), and other firms were mandatory adopters (after 2012). Still, other firms were never required to adopt IFRS (and have chosen not to). The data are unique because they are hand-collected for three types of Russian firms (voluntary adopters, mandatory adopters, and never-adopters). Legal enforcement is weaker for statements prepared using RAS when compared to legal enforcement for statements prepared using IFRS (Chui et al. 2020). We find no change in the earnings management for IFRS during the period under study. On the other hand, we find that there are statistically significant differences in the level of earnings under RAS when comparing 2011 to 2013. For firms required to use both RAS and IFRS, we find that earnings have been managed upward. For firms using only RAS, we find that earnings have been managed downward. We also find that the statistical differences in the level of earnings management, when comparing IFRS to RAS, have disappeared. This suggests that convergence has been achieved in terms of earnings quality. This also implies that RAS is converging to IFRS, not the other way around. These changes in discretionary accruals occur despite there being no major changes to accounting rules during this time period (2010–2013).

Next, we examine the relevance of the financial reporting in terms of the book versus the market values of shareholders' equity because investors rely on information incorporated in the book value of the equity (Kim 2013). Our results show that the gap between the book and market values narrows between IFRS and RAS, which provides evidence for increasing convergence between those two accounting regimes. The relative variations in the market and book values differ more widely under IFRS when compared to RAS, implying more volatility and risk under IFRS.

This is the first research, of which we are aware, to examine this question of comparability in the context of IFRS adoption in a large emerging market over an extended period (4 years), where audited financial statements are available in two accounting regimes. Callao et al. (2007) use quarterly reports; and Abedana et al. (2016) rely on restatements in a single tax year for 22 firms in Ghana, and Hung and Subramanyam (2007) use one year of restatements for 88 German firms. Our sample is able to make comparisons for a larger sample of audited financial statements, where comparisons of IFRS to RAS were available for 2–4 years. The data collection process involves the manual collection of data from financial statements in both IFRS and RAS, primarily in the native Russian tongue, for 358 firms. With these data, we are able to examine the effects of both mandatory and voluntary adoption of IFRS in an emerging market over an extended period (4 years), as well as the effect of IFRS adoption on domestic GAAP, using both firms that adopted IFRS and firms that never adopted IFRS. We separate our sample into three datasets. The first set includes 56 firms (224 IFRS and Russian firm years) that employ RAS and IFRS throughout the entire period (Vol.). The second group includes 99 firms (332 RAS firm years with 176 IFRS firm years) that employed IFRS after 2012 (Man.). The third group includes 203 firms that never used IFRS. In Russia, companies that do not have consolidated financial statements are not required to produce financial statements using IFRS. Following Callao et al. (2007), 14 balance sheet and income statement items along with 9 common financial ratios were collected. We hand-collected stock market information from the Moscow Stock Exchange.

The results of our study are important for several reasons. First, they provide information to standard setters about the costs and benefits of the adoption of IFRS as it relates to income tax costs, a seldom-researched topic. Our study contributes to the literature by providing evidence of different levels of convergence between local GAAP and IFRS by testing how IFRS adoption has exerted its effect on RAS. The different levels of convergence persist over time despite tax regulators having access to both sets of audited financial statements. Second, we add to the literature by finding that publicly traded firms choose to avoid large

IFRS-to-domestic-GAAP differences, even when this choice leads to higher income tax expenses because of higher reported corporate income under RAS because of its convergence to higher income reported using IFRS. Third, using a unique set of hand-collected data, we directly evaluate the impact of IFRS on domestic GAAP by both adopters and non-adopters over extended pre- and post-adoption periods. We attribute our findings to a monitoring effect derived from IFRS in that publicly traded firms are constrained from reporting RAS numbers that differ significantly from IFRS numbers, even when this results in higher income taxes. Firms that do not produce IFRS financial statements are not converging to IFRS and, as a result, are managing their earnings downward to lower their income taxes. This should be of great concern to tax authorities in Russia, given that tax revenues comprise about 13% of the GDP (Russia is ranked 5th for top ten GDP countries in the percentage of tax revenues to GDP, <https://taxfoundation.org/corporate-tax-rates-by-country-2021/>, retrieved 29 December 2022).

The remainder of this paper is organized as follows. The Section 2 presents the prior literature and hypothesis development, including a look at key differences between IFRS and RAS. The Section 3 describes the sample and methods. This is followed by the results of our study on how differences between IFRS and RAS impact financial comparability, quality of earnings, and book-to-market values. The Section 5 presents our conclusions and suggestions for future research.

2. Literature Review and Hypothesis Development

2.1. Adoption and Convergence—Effect on local GAAP

In response to increased economic globalization, there have been calls to develop a single set of acceptable high-quality financial reporting standards. The International Accounting Standards Board (IASB) has responded to that call with the development of IFRS. The IASB Chairman Hans Hoogervorst (2015) describes the IASB mission thusly:

Our mission is to develop standards that bring transparency, accountability, and efficiency to financial markets around the world. Our work serves the public interest by fostering trust, growth, and long-term financial stability in the global economy.

In Russia, the state has historically determined and regulated the financial reporting framework rather than allowing for its development by professional bodies (Deloitte IASPlus 2018). Russian accounting standards were, therefore, primarily created for taxation purposes rather than to provide information to managers, creditors, investors, and other interested parties (Alon 2013).

After the Russian privatization process of 1991, and the resulting creation of shareholders and reductions in state ownership, financial reporting needed to pivot from a state-run (central planning) economy to a market economy (Vysotskaya and Prokofieva 2013; Enthoven 1999; Berglof and Lehmann 2008; Golubeva 2023). To attract foreign investors and to satisfy their demands for IFRS financial statements, Russian federal law 208-FZ was passed (effective 27 July 2010), which states that accounting standards as promulgated by the IASB are endorsed for adoption in Russia (Golubeva 2023). Burgstahler et al. (2006) find that demands from investors provide incentives for higher-quality financial reporting. Any amended IFRS (including interpretations) will be examined by the National Accounting Standards Board (NSFO), designated by the Ministry of Finance, and based on the results of that examination, the ministry will issue decisions on endorsement.

Knowing where to invest internationally is challenging. Among the world's fastest growing emerging markets are the BRICs: Brazil, Russia, India, and China (<https://brics2023.gov.za/>, accessed on 6 February 2024). Indexes, such as *Economic Freedom*, provide measures concerning property rights, judicial effectiveness, government integrity, and tax burden, as well as measures of regulatory efficiency and open markets. BRIC countries rank in the mostly unfree range (59.9–50, the higher the ranking, the freer the market). Currently (2024), Russia is ranked as the highest in economic freedom among the BRIC countries (at 53.8), which is less free than the period under study. In the period under study (2010–2013), it was the lowest-ranked BRIC country (50.3–51.1) in terms of economic

freedom, followed by China (51–52), India (53.8–55.2), and Brazil (55.6–57.9) (<https://indexdotnet.azurewebsites.net/index/ranking>, accessed on 6 February 2024). Studies have shown that in countries that adopt IFRS, firms have increased the value relevance of their financial statements—the value of the legitimacy (Barth et al. 2012). Prior studies have shown how conformity between IFRS and domestic GAAP has affected foreign direct investment (FDI). Conformity between IFRS and domestic GAAP precedes increases in foreign investment (Bradshaw et al. 2004). Dugan et al. (2018) find that foreign investors experienced increased information-processing costs associated with the increased difficulty to judge conformity between IFRS and the domestic GAAP with the elimination of the 20-F reconciliation requirement. Following that loss of information comparability, there was an associated overall decrease in the international asset allocation of US institutional investors in European Union (EU) American depository receipts (ADRs).

Several studies link political and law systems to FDI. La Porta et al. (2006) find that countries with highly concentrated political systems have less developed financial markets. Russia has a code law system heavily influenced by governmental priorities. Information produced by firms located in code law countries has lower value relevance (Ball et al. 2000; Joos and Lang 1994), and emerging markets are characterized by insufficient regulation, market inefficiencies, and the production of financial information that is less value relevant (Abdel-Khalik et al. 1999; El-Gazzar and El-Sadek 2001). La Porta et al. (1998) find that legal enforcement is lower in code law countries than in common law countries, and Bushman et al. (2011) find that firms in countries with a high probability of government interference are unwilling to show high profits and are more likely to expedite bad news. Li et al. (2014) use firm-level data from Brazil, India, China, and Russia to examine the reliability of financial information. Using a revenue–profit model, they find evidence suggesting greater earnings management by firms in Russia. They also find misreporting by Brazilian and Indian firms is not as severe as that of Chinese and Russian firms. They argue this is because of their common legacy of communism and the focus of financial reporting on tax collection. La Porta et al. (2006) find that countries with highly concentrated political systems are linked to less-developed financial markets, while Burgstahler et al. (2006) find that demands from investors provide incentives for higher-quality financial reporting. Soderstrom and Sun (2007) argue that factors such as legal and political systems and financial-reporting incentives can affect earnings quality. Turner et al. (2024) find that trade agreements, in particular, one that produced persistent trade surpluses for an emerging economy (Mexico), are associated with an increase in the quality of accounting practices for the emerging economy. They find the quality of earnings decreased under local GAAP but improved under IFRS. Garanina and Kim (2023) find corporate social responsibility is associated with accounting conservatism. State ownership has a negative moderating effect on the association. The adoption of IFRS offers international legitimacy to emerging economies, such as Russia, through higher-quality accounting information. This has the potential to increase market efficiency (Ho et al. 2023) and, in turn, foreign direct investment (FDI).

The adoption of IFRS was finalized in 2012¹ for publicly listed Russian firms that file consolidated financial statements. Since 2012, IFRS has been required for the consolidated financial statements of entities listed on stock exchanges. This requirement does not, however, remove the requirement that every legal entity registered in Russia prepare standalone RAS financial statements for each fiscal (calendar) year ending 31 December (Deloitte IASPlus 2018). Audits of annual RAS financial statements are mandatory for publicly listed companies, joint stock companies, banks and other financial institutions, and entities with annual revenue exceeding RUB 400 million (12.5 million USD). Russia, therefore, provides us with a unique situation where some traded companies have, since 2012, been required to file financial statements under both IFRS and RAS. No significant changes were made to Russian accounting standards during this period (Deloitte IASPlus 2018). It is also important to note that the corporate tax rate (based on net income) in the period from 2011 to 2013 in Russia was a steady 20% (Trading Economics 2021).

To judge where the differences in accounting numbers and ratios are being generated, we first examine the differences between RAS and IFRS. Deloitte IASPlus (2018) lists the following as significant differences between IFRS and RAS:

- Under RAS, PPE is not impaired, although revaluation to the current replacement cost is allowed. As a result, losses because of impairment will not be recognized under RAS, and NI will be overstated when compared to IFRS. See IAS 36;
- The fair value concept is not applied under RAS;
- The useful life of fixed assets is, under RAS, often in line with the useful life applied for tax purposes;
- Deferred taxes are calculated using the income statement method, although the methodology differs between RAS and IFRS;
- Revenues or expenditures are often recognized in accordance with tax rules. For instance, IAS 18 Revenue Recognition recognizes revenue when the earning process is complete, and benefits are realized or realizable. Under RAS, risk is not considered as it relates to transactions. Rather the key element of revenue recognition is the ownership of goods;
- Complex IFRS topics, such as hedging, pension plans, and joint arrangements, are not covered under RAS. Consolidation and business combination rules are not relevant under RAS because they apply only to standalone financial statements. It is unknown whether firms choose to apply relevant IFRS in these circumstances.

There are additional differences between RAS and IFRS in recognition, measurement, and presentation. Generally, we find income under RAS is lower than under IFRS. Tax authorities and investors have access to both sets of financial statements; however, tax authorities generally only utilize the RAS statements. Foreign investors, although relying primarily on IFRS financial statements, often dislike and decrease investment in international asset allocation, where there is a lack of comparability between domestic GAAP and IFRS (Dugan et al. 2018).

In research that is closely aligned with our current effort, Callao et al. (2007) look for significant differences between accounting numbers and ratios under IFRS and Spanish accounting standards over a six-month period surrounding IFRS adoption. They find that when IFRS was applied, domestic comparability declined, and there was no improvement in the value relevance of financial reporting. Our study adds to the research into these questions by examining comparability over a longer time period (four years as opposed to six months) and by examining audited annual reports rather than interim results (Callao compared pre-adoption quarterly reports to post-adoption annual reports). In addition, we are able to assess contemporaneous reports across standards.

According to the prior research, and the fact that Russia is a code law country with high government involvement and a domestic GAAP focused on tax compliance, we predict that domestic GAAP and IFRS will not be comparable in Russia. Differences in the reported values may, however, converge over time. Thus, we predict that pressures to compete for FDI will result in higher income measures and higher book-to-equity values despite an increase in income tax expenses, and the differences between RAS and IFRS financial information will converge. Our first hypothesis is as follows:

H1: *Accounting variables between IFRS and RAS will converge after the adoption of IFRS.*

2.2. Quality of Earnings

Many studies have examined earnings management using accruals (e.g., Jones 1991; Dechow et al. 1995; Kothari et al. 2005), and several have analyzed earnings management in conjunction with the adoption of IFRS (Barth et al. 2012; Jeanjean and Stolowy 2008). Van Tendeloo and Vanstraelen (2005) examine German firms adopting international accounting standards (IAS is the predecessor to IFRS) and find that IAS firms have an increase in discretionary accruals. Atwood et al. (2011) find that earnings are not more or less persistent, but losses are less persistent. On the other hand, Barth et al. (2008) compare earnings

management for firms that voluntarily switched to IAS with firms that use domestic accounting standards and find greater value relevance for IAS earnings.

More recently, Pelucio-Grecco et al. (2014) examine whether changes in accounting practices brought a reduction in earnings management. They find that the most limiting effect is the regulatory environment. Using a sample of 67 private sector Indian companies, Rudra and Bhattacharjee (2012) find that with the adoption of IFRS, earnings management actually increases. They find that although accounting standards may control earnings management in some cases, that does not necessarily mean less earnings management. In contrast, Palacios Manzano et al. (2014) find that the adoption of IFRS in Mexico is associated with lower earnings management. Turner et al. (2024) find a spillover effect when trade agreements link a developing country (Mexico) with mature economies (US and Canada): Mexico not only experienced economic growth but also an increase in earnings quality. IFRS adoption brought a transfer of accounting knowledge with it. Turner et al. (2024) find the quality of earnings decreased under local GAAP but improved under IFRS.

According to Turner et al. (2024), we examine whether the quality of earnings changes under RAS and IFRS after mandatory IFRS adoption. We predict that earnings will be managed upward under RAS after the adoption of IFRS to eliminate large differences between the two accounting regime numbers despite an increase in taxable income. We expect that SMEs (never-IFRS) will continue to manage earnings downward to achieve lower taxes in the absence of this pressure. We do not expect any changes in discretionary accruals under IFRS. By comparing earnings qualities using RAS in public firms that file in both IFRS and RAS to firms that have never used IFRS, we also eliminate the possibility that these differences are simply mechanical in nature. Our second and third hypotheses are as follows:

H2: *Given that earnings under RAS are lower than earnings under IFRS, voluntary and mandatory IFRS adopters will converge RAS earnings to IFRS earnings by managing RAS earnings upward.*

H3: *Firms that are not required to use IFRS will continue to manage RAS earnings downward.*

2.3. Foreign Direct Investment—Information Incorporated into the Book Value and Market Value of the Equity

One of the goals for adopting international standards is to provide useful information to equity markets. The adoption of IFRS (and any convergence of domestic GAPP to IFRS) would, thus, suggest that the gap between a firm's book and market values of equity should narrow (Callao et al. 2007). Kim (2013) examines value relevance and RAS in the period 1995–2010 and suggests that “mandatory IFRS adoption in Russia that will be incorporated by 2015 is likely to result in improved information quality” (p. 525). Employing returns–earnings (Easton and Harris 1991) and price–earnings models (Burgstahler and Dichev 1997; Ohlson 1995), Kim (2013) finds evidence to suggest Russian firms that list on the London Stock Exchange (and report using IFRS) produce more value-relevant reports when compared to firms that report in RAS only.

In contrast, Garanina and Kormiltseva (2013) examine 67 public Russian firms over the period 2006–2010 and find no evidence of increased value relevance in the financial information after adopting IFRS. They examine the difference between the book and market values of companies and conclude that (1) the costs associated with IFRS disclosure are quite high relative to the benefits, and (2) disclosure is less desirable because it leads to a reduction in the firm's value. Our study is the follow-up to that study, post-IFRS adoption.

We first need to determine whether book-to-market values differ between domestic and international standards. Because traded firms may wish to minimize the differences between IFRS and RAS, we expect to find differences in the relative variance of book-to-market values when comparing RAS for firms that have used IFRS to those that have never used IFRS. This is because we expect the never-IFRS firms to focus on reducing income taxes, while firms using both IFRS and RAS to focus on the comparability of their reported income numbers. If our conjectures are correct, then book-to-market values under

domestic GAPP should converge to book-to-market values under IFRS for the latter group. To examine this issue, we test the following hypothesis:

H4: *There are significant differences between the relative variation in book-to-market values under RAS and IFRS.*

3. Data and Method

3.1. Data—Sample Construction

Russia officially adopted IFRS in 2012 for firms with consolidated financial statements and are listed on stock exchanges. All Russian firms are required to produce financial statements using RAS for tax purposes, allowing two accounting systems to coexist and to be used simultaneously (Alon 2013). IFRS is not required for SMEs (small or medium enterprises) or non-listed domestic companies. To ensure that confounding events do not affect our results, we limit the data collection to 2 years prior to the adoption of IFRS (2010–2011) and 2 years after (2012–2013). The data collection process involved the manual collection of data from financial statements, primarily in the native Russian language, from the Center of Financial Information (2016) at <http://www.e-disclosure.ru/poisk-po-soobshheniyam>, accessed 1 January 2016. We divide our sample into the 3 sets described above, reflecting the extent of the IFRS adoption (Table 1). We examine the financial reports of Russian companies in 17 industries, every industry except banking and investing. Firms with missing data were removed from the sample. Overall, this produced data on 56 voluntary adopters (224 firm years in both RAS and IFRS), 99 mandatory adopters (332 RAS firm years with 176 firm years), and 203 SMEs (780 RAS firm years), for a total of 358 firms (1336 RAS firm years and 400 IFRS firm years). Stock prices were hand-collected from the Moscow Exchange (MOEX) accessed 1 November 2017. All the data are publicly available.

Table 1. Status of adoption of IFRS.

Dataset	Type of Firm	Extent of IFRS Adoption	Number of Firms in Sample	Number of RAS Firm Years	Number of IFRS Firm Years
Vol.	Publicly listed firms with consolidated financial statements	Voluntary adopters (used IFRS before 2012)	56	224	224
Man.	Publicly listed firms with consolidated financial statements	Mandatory adopters (did not use IFRS until after 2011)	99	332	176
Never	SMEs	Not required	203	780	0
Total Number			358	1336	400

3.2. Method

3.2.1. Differences in Accounting Numbers

Russia has a mixed transitional economy. A mixed economy is defined as “a market system of resource allocation, commerce, and trade in which free markets coexist with government intervention” (Young 2016) (International Monetary Fund, Government Finance Statistics Yearbook and data files, and World Bank and OECD GDP Estimates. <https://data.worldbank.org/indicator/GC.TAX.TOTL.GD.ZS>, retrieved 17 February 2024). A transitional economy is one that is making structural adjustments from a state-run (central planning) economy to a market economy (Golubeva 2023). During the period surrounding Russia’s adoption of IFRS, Russia’s rank, based on GDP, rose from #10 to #8. Of the coun-

tries in the top ten based on GDP, all the countries listed, with the exception of the United States, have adopted IFRS or are using domestic standards that are substantially converged to IFRS (n.d.) (e.g., China and India) (<https://www.ifrs.org/use-around-the-world/use-of-ifrs-standards-by-jurisdiction/>, accessed on 6 February 2024). During the same period, Russia has maintained the lowest corporate income tax rate among these countries.

The Russian business environment accepts behaviors that may be considered as being unethical and inappropriate in other countries (Preobragenskaya and McGee 2003; Chui et al. 2020; Black et al. 2000), and tax burdens are often reduced by the concealment of profits (Preobragenskaya and McGee 2003). Furthering such behavior, the fines associated with misstated RAS financial statements are very low and do little to reduce the prevalence of the concealment of profits for tax purposes (Sucher and Bychkova 2001). There are drastically higher penalties for an incorrect IFRS audit opinion, and audit risks are lower for an RAS audit when compared to an IFRS audit. Audit firms see the RAS audit as being less risky and less profitable, and the RAS audit is often viewed simply as being a conduit to the more lucrative and rigorous IFRS audit (Chui et al. 2020).

These characteristics of Russia’s economy (relatively low tax rates, a cultural environment that condones the concealment of income, low fines associated with misstated RAS financial statements and taxes, and the general poor quality of tax administration (Alm et al. 2009)) are important in assessing the cost of legitimacy (Table 2). Taxes are a substantial percentage of the Russian GDP, despite having a low corporate tax rate. Many studies have found that firms’ values across countries are negatively related to effective tax rates. Given that IFRS produces higher income measures when compared to income measures reported under RAS and the constant income tax rate (coupled with no substantial changes to the Russian tax code during this period), Russian publicly listed firms are paying higher income taxes because of the adoption and convergence to IFRS when compared to Russian firms that never adopted IFRS.

Table 2. GDP and corporate tax rates for top ten GDP, current prices.

Country	2010			2011			2012			2013		
	GDP (\$USB)	Corporate Tax Rate	Tax Revenue as Percentage of GDP	GDP (\$USB)	Corporate Tax Rate	Tax Revenue as Percentage of GDP	GDP (\$USB)	Corporate Tax Rate	Tax Revenue as Percentage of GDP	GDP (\$USB)	Corporate Tax Rate	Tax Revenue as Percentage of GDP
US	15,049	39.21	8.6	15,600	39.13	9.5	16,254	39.13	9.8	16,843	39.05	10.5
China	6034	25	10.2	7492	25	10.3	8540	25	10.3	9625	25	9.9
Japan	5759	39.54	n/a	6233	39.54	n/a	6272	39.54	n/a	5212	36.99	n/a
Germany	3402	30.18	11.2	3749	30.18	11.5	3529	30.18	11.6	3734	30.18	11.6
France	2647	34.43	22	2865	36.10	21.8	2685	36.10	22.5	2812	38.00	23.2
UK	2494	29	25.3	2676	26	25.8	2720	24	25.1	2805	23	25.1
Brazil	2209	34	14.2	2614	34	14.9	2464	34	14.3	2472	34	14.1
Italy	2138	31.4	23.7	2295	31.4	23.6	2088	31.29	24.9	2142	31.29	25.1
India	1708	33.99	10.4	1823	32.44	10.2	1828	32.45	10.8	1857	33.99	11
Russia	1633	20	13	2047	20	14	2191	20	13.8	2288	20	12.9
Russian Rank	10	10	5	9	10	5	8	10	5	8	10	5

(Bray 2021; International Monetary Fund n.d.).

According to Callao et al. (2007), the information is analyzed on the basis of the following:

$F_{iRASYear}$ = the value of the variable F_i under RAS annually (2010, 2011, 2012, and 2013);

$F_{iIFRSYear}$ = the value of the variable F_i under IFRS annually (2010, 2011, 2012, and 2013);

where F represents the following accounting numbers and financial ratios. From the balance sheet, we include fixed assets, inventory, receivables, cash, current assets, total assets, equity, long-term liabilities, short-term liabilities, total liabilities, and long-term resources. From the income statement, we include operating income, ordinary income, and net income. Also included are the following financial ratios: current ratio, acid test, cash ratio, solvency, indebtedness, return on assets per operating income, return on assets per ordinary income, return on equity per ordinary income, and return on equity per net income. Stamatopoulos et al. (2019), using a sample of Greek firms (2000–2014), find that financial leverage, firm size (in terms of the total assets), solvency/leverage, and inventories influence the corporate effective tax rate. Appendix A presents the definitions of these accounting numbers and financial ratios. In total, we examine 23 variables measured under two sets of accounting regimes over the 2010–2013 period.

3.2.2. Differences in Earnings Management

We address earnings management by testing for the presence of significant differences in earnings management, as detected by discretionary accruals. We calculate discretionary accruals using RAS and IFRS separately. We then assess whether any differences that exist change over time. Size (measured as the natural log of the total assets) is a significant consideration in evaluating earnings management. Ali et al. (2015) find there is a positive and significant association between firm size and earnings management. We examine earnings management for three sets of Russian firms: voluntary adopters, mandatory adopters, and never-adopters (SMEs). Mandatory adopters and SMEs are quite a bit smaller when compared to voluntary adopters. This is expected, given that mandatory adopters have consolidated financial statements.

We expect that when firms use IFRS, they may manage earnings under RAS to save taxes while converging to IFRS. This trend should develop in the early years of the adoption of IFRS and decrease over time as firms use IFRS for a longer period. Minimizing the differences between IFRS and RAS by converging RAS to IFRS, with the resulting increase in income taxes because of higher income measures, is one of the costs of legitimacy. Firms that do not consolidate (never-IFRS firms), on the other hand, have no such incentive because there is no alternative information to impose a monitoring effect. Instead, these firms would likely manage earnings downward as much as possible to avoid taxation.

The information is analyzed on the basis of the following variables:

$F_{iRASYear}$ = the value of the variable F_i under RAS annually (2011, 2012, and 2013);

$F_{iIFRSYear}$ = the value of the variable F_i under IFRS annually (2011, 2012, and 2013);

where F represents the following figures and ratios (Jones 1991):

$$\text{Total Accruals} = (\Delta CA_t + \Delta CL_t + \Delta \text{Cash}_t + \Delta \text{STD}_t - \text{Dep}) / (TA_{t-1}) \quad (1)$$

where

ΔCA = change in current assets;

ΔCL = change in current liabilities;

ΔCash = change in cash and cash equivalents;

ΔSTD = change in the debt included in current liabilities;

Dep = depreciation and amortization expenses;

TA = total assets.

$$\text{Nondiscretionary Accruals}_t = \alpha_1 (1/TA_{t-1}) + \alpha_2 (\Delta \text{Rev}_t) + \alpha_3 (\text{PPE}_t) \quad (2)$$

where

ΔRev_t = change in revenues from year t to year $t - 1$;
 PPE_t = gross property, plant, and equipment in year t scaled by total assets at $t - 1$;
 TA_{t-1} = total assets at $t - 1$;
 $\alpha_1, \alpha_2, \alpha_3$ = firm-specific parameters.

Estimates of the firm-specific parameters, α_1, α_2 , and α_3 , are generated using the following model for each year:

$$\text{Total Accruals}_t = a_1 (1/TA_{t-1}) + a_2 (\Delta Rev_t) + a_3 (PPE_t) \quad (3)$$

where a_1, a_2 , and a_3 denote the OLS estimates of α_1, α_2 , and α_3 , and Total Accruals is the total accruals scaled by the lagged total assets.

Discretionary accruals (DAccs) are then estimated by subtracting the predicted level of non-discretionary accruals (NDAs) from the total accruals (standardized by the lagged total assets).

$$DAcc_{it} = \text{Total Accruals}_{it} - NDA_{it} \quad (4)$$

We examine the change in the quality of the earnings (based on discretionary accruals) under the two sets of accounting regimes across the 2010–2013 period.

3.2.3. Differences in Book-to-Market Ratios

Finally, we examine the impacts of the standards on the market relevance of Russian financial reporting. When firms disclose comparable information to investors (convergence of domestic standards and international standards), the gap between a firm's book and market values of shareholders' equity should narrow.

Again, as per Callao et al. (2007), we test the market values of Russian firms under IFRS and RAS to see whether the figures differ significantly. The variables are defined as follows:

$$BtM_{iRAS} = \frac{B_{iRAS}}{MV_i} \quad (5)$$

and

$$BtM_{iIFRS} = \frac{B_{iIFRS}}{MV_i} \quad (6)$$

where

BtM_{iRAS} = book-to-market ratio per RAS;

BtM_{iIFRS} = book-to-market ratio per IFRS;

B_{iRAS} = book value per RAS;

B_{iIFRS} = book value per IFRS;

MV_i = market value.

We then test whether the market values evolve over the period, in line with the evolution of book values per international standards, by measuring whether market values are closer to book values under IFRS or under RAS.

The variables are defined as follows:

$$VAR_{iMV} = \left| \frac{MV_{it} - MV_{i,t-1}}{MV_{i,t-1}} \right| \quad (7)$$

$$VAR_{iBRAS} = \left| \frac{B_{iRAS,t} - B_{iRAS,t-1}}{B_{iRAS,t-1}} \right| \quad (8)$$

$$VAR_{iBIFRS} = \left| \frac{B_{iIFRS,t} - B_{iIFRS,t-1}}{B_{iIFRS,t-1}} \right| \quad (9)$$

4. Results and Discussion

4.1. Impact of Adoption on Financial Comparability

The first objectives of our study are to test for the presence of significant differences in key accounting numbers and financial ratios calculated on the basis of RAS and IFRS and to examine whether RAS and IFRS accounting numbers and ratios converge (differences decreasing over time). It is significant to note that we are able to test for the presence of significant differences not only for firms that adopted IFRS (both early and mandatorily) but also for firms that never adopted IFRS. This gives us a clearer and more complete picture of IFRS and RAS integration over the pre- and post-adoption periods. We can thus examine whether RAS is integrating with IFRS for all the firms or only for those firms that are required to employ IFRS.

To test for normality, we use the Shapiro–Wilk test and find that none of the accounting numbers or ratios are normally distributed. Given the results of the Shapiro–Wilk test, we perform non-parametric tests, specifically the Wilcoxon signed-rank (designed for matched or dependent samples) and Kruskal–Wallis tests (which also does not assume a normal distribution of the residuals), to assess the equality of the medians of our variables.

Table 3 presents descriptive statistics for the 56 firms that used RAS and IFRS simultaneously from 2010 to 2013 (voluntary adopters, Vol.). Panel A shows that the median accounting numbers under IFRS are generally greater than those under RAS, except for receivables (2010–2014) and operating income (2011 and 2012). In Panel B, the median current ratio, acid tests (2011 and 2013), solvency (2012–2013), and ROA (based on operating income) are, under RAS, generally greater than under IFRS, while the median cash ratio, indebtedness, ROA (based on ordinary income), ROE (based on ordinary income), and ROE (based on net income) are generally lower under RAS than under IFRS.

Next, we test to see if the differences are statistically significant using the Wilcoxon test, i.e., whether the two samples originate from the same distribution. The results of our tests of comparability (Wilcoxon) are presented in Table 4, Panels A and B. The differences between the current assets and equity are not significantly different across period 2010–2013. We examine the balance sheet items more closely to see what is producing the statistical differences under the two different accounting regimes. All the items of the current assets measured by our study (inventories, receivables, and cash) provide strong evidence (p value < 0.01) that there are statistical differences between accounting numbers under IFRS vs. RAS when examined individually. But when aggregated, the differences between the current assets under IFRS and RAS are not statistically significant. We also find the differences between the total assets measured under IFRS and RAS are highly statistically significant. This implies that any statistical differences are being generated by the long-term assets. This is to be expected because the initial cost of assets under RAS is often lower when compared to the cost of assets under IFRS; impairment is not recognized under RAS, and goodwill is amortized under RAS (it is not under IFRS) (Deloitte IASPlus 2018). We also find that the total liabilities (short- as well as long-term liabilities) provide strong evidence that there are statistical differences between accounting numbers under IFRS vs. RAS across the period.

It is a different story when we examine the measures of the income: operating income, ordinary income, and net income. Operating income refers to income generated to keep the business running. Ordinary income includes income generated by financial items, such as investment income (capital gains/losses, dividends, and interest income), and is taxed at marginal rates. Net income includes not only ordinary income (the effect of taxes) but also the effect of extraordinary items. Across the period of this study, the differences between the operating incomes under RAS and IFRS are not statistically significant. However, the differences between the two income measures, which determine how much the company is taxed at marginal rates, ordinary and net income, are highly statistically significant before the national adoption of IFRS. The differences between ordinary and net incomes lose their statistical significance by 2013. This implies that unlike the balance sheet measures, RAS income measures are converging to IFRS income measures. It is interesting to note

that income measures, which give investors information about net profit and margins (the “bottom line”), are converging RAS to IFRS.

Table 3. Descriptive statistics (billions of rubles) for 56 firms that used RAS and IFRS simultaneously over the 4 years: 2010–2013 (voluntary adopters).

Panel A: Accounting Numbers (Medians)								
Variable	2010		2011		2012		2013	
	IFRS	RAS	IFRS	RAS	IFRS	RAS	IFRS	RAS
Fixed Assets	61.5	49.4	65.8	63.7	71.8	66.4	80.7	72.8
Inventories	5.01	2.06	5.75	2.31	6.48	2.85	6.74	3.95
Receivables	9.83	13.2	13.9	16.9	14.7	20.2	15.0	20.3
Cash	3.88	3.09	5.93	3.75	5.47	4.53	3.57	2.78
Current Assets	22.5	19.5	26.8	29.9	28.8	31.6	30.9	32.1
Total Assets	83.6	71.4	87.9	85.9	93.5	103	104	105
Equity	41.3	40.9	42.6	49.2	48.2	46.9	48.4	51.0
Long-term Liabilities	22.9	16.7	29.7	23.5	26.0	18.3	33.5	26.8
Short-term Liabilities	17.4	14.0	22.2	18.8	26.4	22.2	32.8	25.2
Total Liabilities	40.1	31.1	53.4	42.2	58.1	49.2	63.9	50.5
Long-term Resources	57.8	55.9	65.7	67.9	49.4	72.8	76.1	78.2
Operating Income	11.9	9.59	11.0	12.6	11.0	11.4	16.3	12.3
Ordinary Income	6.57	4.35	6.36	4.90	6.36	5.23	5.06	3.67
Net Income	4.93	3.46	6.08	3.76	5.20	3.73	3.64	2.56

Panel B: Financial Ratios (Medians)								
Variable	2010		2011		2012		2013	
	IFRS	RAS	IFRS	RAS	IFRS	RAS	IFRS	RAS
Current Ratio	1.06	1.34	1.13	1.44	1.03	1.22	1.11	1.30
Acid Test	0.703	0.110	0.883	1.102	0.800	0.708	0.708	1.077
Cash Ratio	0.218	0.192	0.258	0.207	0.229	0.160	0.160	0.163
Solvency	2.09	2.33	2.03	2.24	2.13	2.33	1.87	2.19
Indebtedness	0.870	0.718	0.848	0.758	0.740	0.753	0.924	0.878
ROA (OI)	0.123	0.129	0.122	0.145	0.121	0.121	0.108	0.112
ROA (OrdI)	0.089	0.070	0.088	0.078	0.078	0.049	0.057	0.028
ROE (OrdI)	0.187	0.116	0.190	0.134	0.135	0.103	0.132	0.088
ROE (NI)	0.141	0.099	0.146	0.106	0.105	0.077	0.089	0.064

Income measures under IFRS are generally higher when compared to income measures under RAS. So, if managers are managing earnings under RAS upward to converge with earnings under IFRS, this results in higher income taxes. We attribute our findings to a monitoring effect derived from IFRS that constrains firms from reporting RAS income measures that differ significantly from IFRS measures, even if it results in higher income taxes. The value of the legitimacy from adopting international accounting standards outweighs the resulting income tax costs of the comparability.

Table 4. Test of comparability (Wilcoxon test) IFRS vs. RAS (56 firms).

Panel A: Accounting Numbers								
Variable	2010		2011		2012		2013	
	Statistic Z	Sig.	Statistic Z	Sig.	Statistic Z	Sig.	Statistic Z	Sig.
Fixed Assets	2.937	0.003 ***	2.374	0.018 **	2.170	0.030 **	1.917	0.055 *
Inventories	3.638	0.000 ***	3.108	0.002 ***	3.818	0.000 ***	3.502	0.001 ***
Receivables	−3.540	0.000 ***	−4.911	0.000 ***	−3.760	0.000 ***	−2.659	0.008 ***
Cash	5.110	0.000 ***	4.784	0.000 ***	5.249	0.000 ***	5.102	0.000 ***
Current Assets	0.671	0.8440	1.224	0.221	1.273	0.203	0.168	0.867
Total Assets	3.249	0.001 ***	2.406	0.016 **	2.447	0.014 **	1.868	0.062 *
Equity	1.032	0.302	0.012	0.990	0.791	0.429	0.139	0.890
Long-term Liabilities	3.944	0.000 ***	3.822	0.000 ***	4.723	0.000 ***	3.393	0.001 ***
Short-term Liabilities	2.765	0.006 ***	2.916	0.004 ***	3.092	0.002 ***	2.977	0.003 ***
Total Liabilities	4.258	0.000 ***	3.924	0.000 ***	4.030	0.000 ***	3.964	0.000 ***
Long-term Resources	2.174	0.030 **	1.399	0.162	1.737	0.082 *	0.824	0.410
Operating Income	−0.555	0.579	−0.424	0.671	−0.269	0.788	0.179	0.858
Ordinary Income	3.573	0.000 ***	3.304	0.001 ***	2.223	0.026 **	1.183	0.237
Net Income	3.083	0.002 ***	2.673	0.008 ***	1.705	0.088 *	0.432	0.666
Panel B: Financial Ratios								
Variable	2010		2011		2012		2013	
	Statistic Z	Sig.	Statistic Z	Sig.	Statistic Z	Sig.	Statistic Z	Sig.
Current Ratio	−3.165	0.002 ***	−3.679	0.000 ***	−3.181	0.002 ***	−3.016	0.003 ***
Acid Test	−4.136	0.000 ***	−4.038	0.000 ***	−4.103	0.000 ***	−4.127	0.000 ***
Cash Ratio	1.468	0.142	2.202	0.028 **	2.439	0.015 **	2.651	0.008 ***
Solvency	2.806	0.005 ***	−2.822	0.005 ***	−2.610	0.009 ***	−2.706	0.007 ***
Indebtedness	1.207	0.227	0.848	0.396	−0.547	0.585	0.057	0.955
ROA (OI)	−1.273	0.203	−1.028	0.304	−0.530	0.596	−0.419	0.675
ROA (OrdI)	1.680	0.093 *	1.476	0.140	0.995	0.320	0.352	0.725
ROE (OrdI)	2.537	0.011 *	1.411	0.158	−1.020	0.308	0.620	0.535
ROE (NI)	2.137	0.033	1.131	0.258	−1.419	0.156	0.057	0.955

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

Next, we examine the differences between IFRS and RAS using financial ratios. Ratios help investors to determine financial viability. Investors want assurances that companies are not misrepresenting their financial performance, and foreign investors are generally more familiar with IFRS than RAS. It is important for increasing foreign direct investment that investors are able to compare a company’s financial statements with other companies in the same industry in another country. The ratios dependent on income measures (ROA_OI, ROA_Ord, ROE_Ord, and ROE_NI) become less significantly different (*p*-values are becoming higher) across the population as time passes, especially in 2013. In fact, there is a larger annual change in *p*-values after IFRS is nationally adopted (2012 and 2013) when compared to the annual changes in *p*-values before the national adoption of IFRS, in spite of there being no major accounting rule changes for RAS during this period. The percentage change (measured as $p\text{-value}_{2013} - p\text{-value}_{2010}$ divided by $p\text{-value}_{2010}$) is considerably larger (from 680% to 233%) when comparing ROA_OI to ROA_Ord as time passes. This implies that income measures that more closely coordinate with the marginal income tax rate are converging at a greater rate than those that do not. Ratios that depend on equity as well as income measures adjusted for income taxes (ROE_Ord and ROE_NI) converge at even greater rates (7464% and 2794%, respectively). Once again, the data suggest a

monitoring effect derived from IFRS that constrains firms from reporting RAS income measures that differ significantly from IFRS income measures.

Of the other ratios, indebtedness (total liabilities to equity) is the only ratio that is not significantly different under IFRS and RAS across the period under study (the cash ratio is not statistically different in 2010). Investors rely on measures involving debt because if a company goes out of business, debt holders are paid first before equity holders. Debt also eats up cash and can hinder a company’s ability to meet daily expenses (like payroll) as well as hinder a company’s ability to handle surges in orders or emergency expenses (equipment replacement). The monitoring effect of the adoption of IFRS seems to primarily affect ratios involving income.

The descriptive statistics are contained in Tables 5 and 6.

Table 5. Descriptive statistics (billions of rubles) for mandatory adopters (99 firms) that used RAS (332 firm years) and IFRS (176 firm years) over the 4 years: 2010–2013.

Panel A: Accounting Numbers (Medians)												
Variable	2010		2011		2012		2013					
	IFRS	RAS	IFRS	RAS	IFRS	RAS	IFRS	RAS				
Fixed Assets		3.131		3.298		3.816		2.598		1.192		2.796
Inventories		0.795		0.924		1.070		0.701		0.136		0.469
Receivables		1.964		2.505		1.692		2.211		0.311		2.129
Cash		0.104		0.098		0.221		0.074		0.302		0.074
Current Assets		3.721		4.407		4.298		3.569		1.035		2.865
Total Assets		8.269		9.328		11.496		6.411		2.464		6.143
Equity		2.131		2.517		2.447		2.209		0.149		2.350
Long-term Liabilities		0.671		0.745		1.417		0.864		0.184		0.752
Short-term Liabilities		2.335		3.266		3.177		2.444		0.862		2.268
Total Liabilities		3.959		4.226		5.898		4.139		1.409		3.171
Long-term Resources		4.225		4.586		4.991		4.311		0.886		3.770
Operating Income		1.382		1.489		1.110		1.316		1.354		0.958
Ordinary Income		0.365		0.307		0.316		0.194		0.266		0.165
Net Income		0.270		0.230		0.273		0.166		0.228		0.148
Panel B: Financial Ratios (Medians)												
Variable	2010		2011		2012		2013					
	IFRS	RAS	IFRS	RAS	IFRS	RAS	IFRS	RAS				
Current Ratio		1.342		1.250		0.975		1.225		0.696		1.238
Acid Test		0.998		0.954		0.646		0.909		0.328		0.992
Cash Ratio		0.041		0.041		0.80		0.039		0.016		0.030
Solvency		1.698		1.721		1.639		1.514		1.103		1.568
Indebtedness		1.500		1.126		0.779		1.235		0.237		1.388
ROA (OI)		0.161		0.138		0.111		0.144		0.045		0.132
ROA (OrdI)		0.060		0.059		0.039		0.042		0.016		0.031
ROE (OrdI)		0.139		0.145		0.099		0.104		0.023		0.080
ROE (NI)		0.012		0.111		0.076		0.091		0.012		0.066

Table 6. Descriptive statistics (billions of rubles) for 203 firms (780 firm years) that used RAS only over the 4 years: 2010–2013.

Panel A: Accounting Numbers (Medians)				
Variable	2010	2011	2012	2013
	RAS	RAS	RAS	RAS
Fixed Assets	0.162	0.179	0.163	0.214
Inventories	0.023	0.023	0.017	0.019
Receivables	0.098	0.094	0.094	0.955
Cash	0.0044	0.0067	0.0048	0.0050
Current Assets	0.170	0.228	0.174	0.190
Total Assets	0.492	0.478	0.451	0.424
Equity	0.127	0.148	0.123	0.135
Long-term Liabilities	0.0070	0.0088	0.0074	0.0115
Short-term Liabilities	0.183	0.169	0.153	0.153
Total Liabilities	0.212	0.260	0.209	0.261
Long-term Resources	0.212	0.193	0.221	0.255
Operating Income	0.058	0.063	0.065	0.055
Ordinary Income	0.030	0.028	0.024	0.024
Net Income	0.022	0.018	0.019	0.017
Panel B: Financial Ratios (Medians)				
Variable	2010	2011	2012	2013
	RAS	RAS	RAS	RAS
Current Ratio	1.236	1.229	1.369	1.360
Acid Test	0.949	0.885	0.934	0.982
Cash Ratio	0.049	0.049	0.044	0.046
Solvency	2.054	1.938	1.922	1.788
Indebtedness	0.414	0.622	0.706	0.809
ROA (OI)	0.160	0.161	0.158	0.145
ROA (OrdI)	0.072	0.064	0.053	0.055
ROE (OrdI)	0.132	0.129	0.119	0.130
ROE (NI)	0.097	0.091	0.093	0.095

For our sample of voluntary adopters, the total assets increased from 71.4 billion rubles to 105 billion rubles. The total assets for the mandatory adopters increased before IFRS adoption, dropped in 2012, and increased once again in 2013 (but still lower than they were in 2010). They amounted to 2.5% and 6.1% of the amount of the total assets for the voluntary sample. SMEs are even smaller. SMEs saw decreasing total assets, becoming much smaller after the adoption of IFRS. They amount to 0.69% in 2010 and decrease to 0.40% in 2013.

Next, we look at a measurement of liquidity, the cash ratio. This ratio measures a company’s ability to pay all the current liabilities. If a company’s ratio is less than 1 (the point at which the company has exactly the same amount of current liabilities as it does cash and cash equivalents), it means a firm may have insufficient cash on hand to pay off short-term liabilities or handle positive emergency events (surges in orders) or negative emergency events (breakdowns in equipment). According to the medians, all the firms in our sample suffer from a low cash ratio (the highest median cash ratio is 0.207 for the

voluntary adopters in 2011). The cash ratios for the voluntary adopters, vary from 16.3% to 20.7%, which are much higher than the cash ratios for the mandatory adopters and SMEs. The cash ratios for the mandatory adopters and SMEs are similar, hovering around 4%. This may not be bad if the Russian firms skew toward long-term credit terms with suppliers, very little credit extended to customers, and efficiently managed inventories (Kenton 2022).

According to the medians, voluntary adopters have a safer level of risk based on their reliance on debt when compared to mandatory adopters but a higher level of risk when compared to MSEs. According to the medians, however, all the classes of adopters are not considered as being risky (generally, values of 2 or higher are considered as being risky), but voluntary adopters and SMEs demonstrate rising levels of risk based on indebtedness. Contrary to this, mandatory adopters saw a decrease in risk over the period (there was a rise in 2013 when compared to 2012, but indebtedness is lower than indebtedness in 2010). This, coupled with low cash ratios, also helps to explain that Russian firms possibly tend to skew toward long-term credit terms with suppliers, very little credit extended to customers, and efficiently managed inventories.

Next, we compare ROA_Ord values, which capture how efficiently a company converts invested capital (including any capital borrowed to run operations) into ordinary income. Once again, we use RAS numbers to compare voluntary and mandatory adopters and SME samples. Using RAS, ROA_Ord is 0.070 (0.078, 0.049, and 0.028) for 2010 (2011, 2012, and 2013), respectively. ROA_Ord is lower after the adoption of IFRS. For mandatory adopters and never-IFRS, we see slightly lower returns but a similar pattern (0.060, 0.059, 0.042, and 0.031 for mandatory adopters and 0.072, 0.064, 0.053, and 0.055 for never-IFRS). An ROA of over 5% is generally considered as being good, so the Russian firms, for the most part, are efficient, making adequate returns on assets.

4.2. Impact of Adoption on Earnings Management

Discretionary accruals are a measure of earnings management (Jones 1991). As the magnitude of discretionary accruals decreases, the quality of earnings increases. The question then becomes: is this because of changes in the earnings quality under IFRS or RAS? The next important question is: are earnings being managed for different classes of firms depending on their use of IFRS? If RAS earnings are being managed differently for firms that also use IFRS when compared to firms that only use RAS, this would indicate that the earnings under RAS are perhaps being used to signal quality for those firms using IFRS. This adds to our knowledge of the costs and benefits of IFRS and RAS integration and what Russian managers are willing to spend on the legitimacy that IFRS brings. We have shown that earnings under IFRS are higher and that if RAS is converging to this higher earnings measure, a part of the cost of the legitimacy is higher corporate income taxes. We find that this is, in fact, happening: in Russia, firms are not managing earnings when using IFRS. The same is not true when Russian firms use RAS. For firms that are using both RAS and IFRS, RAS earnings are being managed upward to close the gap between earnings under IFRS and RAS, while firms that are not using IFRS manage their earnings downward to minimize income taxes.

Table 7 presents our tests of the comparability of discretionary accruals for firms using IFRS and RAS simultaneously. Panel A shows that only in 2011 is there strong evidence of differences in discretionary accruals when firms use RAS versus IFRS. When IFRS is adopted, any differences between earnings quality under IFRS and RAS have disappeared. Is this, however, because of changes in the earnings quality under IFRS or RAS?

Table 7. Comparability of discretionary accruals for firms using IFRS and RAS simultaneously (56 firms).

Panel A: RAS Compared to IFRS (Wilcoxon)			
	2011	2012	2013
Difference	0.259 ***	0.032	0.013
Z Statistic	3.067	1.305	0.276
Panel B: IFRS (Wilcoxon) Firms That Have Always Used IFRS throughout the Period			
	2011 vs. 2012	2012 vs. 2013	2011 vs. 2013
Difference	0.027	−0.041	−0.014
Z Statistic	1.517	−1.175	−0.212
Panel C: RAS (Wilcoxon) Firms That Have Always Used IFRS throughout the Period			
	2011 vs. 2012	2012 vs. 2013	2011 vs. 2013
Difference	0.253 ***	−0.021	0.232 ***
Z Statistic	2.977	−0.260	4.952

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

There is not enough evidence to suggest a difference in earnings management under IFRS (Panel B). The results are different when we compare earnings management under RAS from 2011 to 2013 (Panel C). Although there is not enough evidence to suggest a difference in earnings management when comparing 2012 and 2013 (post-finalization period), there are statistically significant differences in the levels of earnings management when comparing 2011 to 2012 and 2011 to 2013 (the differences are significant at the 0.01 level.). This evidence suggests that the convergence of the quality of the earnings since the adoption of IFRS is because of changes in the earnings management under RAS.

Next, we expand the sample to include firms that used RAS and IFRS after 2011 (mandatory adopters) and firms that never used IFRS (SMEs). The results of these tests are presented in Table 8. We combine the sample of 56 firms that used both IFRS and RAS with the 199 mandatory adopters. We calculate the DAcc RAS and DAcc IFRS (discretionary accruals) for the combined set of 255 firms. We also calculate the annual DAcc for the 203 firms that never used IFRS. This gives us a total of 402 firms. The medians are presented in Table 8, Panel A.

In Table 8, Panel B, we present the tests of whether there is any significant change in annual discretionary accruals when using IFRS over time. Comparing consecutive years (from 2011 to 2012 or from 2012 to 2013), the data indicate moderate or weak evidence that the amount of discretionary accruals has changed over time. We do find, however, that when comparing 2011 to 2013, the quality of earnings has not changed. This implies from little to no change in the quality of the earnings when using IFRS after the adoption of IFRS.

When using RAS (Panel C), the data suggest that the level of discretionary accruals did not change the first year after IFRS adoption but did in 2013. The change is positive, meaning the quality of earnings under RAS decreased and that earnings are being managed upward under RAS after the adoption of IFRS. Again, this translates into a higher level of income taxes.

Next, we check to see if the quality of the earnings when using RAS has changed for SMEs that never adopted IFRS (Panel D). As expected, earnings are being managed downward at a higher rate (the magnitude is increasing). These firms are managing earnings downward to avoid taxation.

Table 8. Comparability of discretionary accruals for voluntary, mandatory, and never-IFRS adopters.

Panel A: Medians			
Variable	2011	2012	2013
DAcc IFRS	−0.0454	0.0114	−0.0368
DAcc RAS	−0.0261	−0.0299	0.0137
DAcc Never-IFRS	0.0463	−0.0051	−0.1771
Panel B: IFRS (Wilcoxon) Voluntary and Mandatory Adopters			
	2011 vs. 2012	2012 vs. 2013	2011 vs. 2013
Difference	0.0568 *	−0.0482 **	0.0086
Z Statistic	1.864	−2.229	0.440
Panel C: RAS (Wilcoxon) Voluntary and Mandatory Adopters			
	2011 vs. 2012	2012 vs. 2013	2011 vs. 2013
Difference	−0.0038	0.0436 ***	0.0398 ***
Z Statistic	−0.004	2.784	4.540
Panel D: Never-IFRS (Wilcoxon)			
	2011 vs. 2012	2012 vs. 2013	2011 vs. 2013
Difference	−0.0514	−0.1720 ***	−0.2234 ***
Z Statistic	−1.503	−7.384	−8.481

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

These results demonstrate differences in how earnings are managed for firms in Russia according to which accounting regimes are being utilized. RAS earnings are converging to higher IFRS earnings only for firms that are required to use IFRS. Earnings are being managed downward for firms that only use RAS; RAS earnings are not converging to IFRS for SMEs. Overall convergence to IFRS for all Russian firms is not occurring. Given a cultural environment that condones the concealment of income, coupled with low fines associated with misstated RAS financial statements and taxes and the general poor quality of the tax administration and low tax rates, we find that adopters and never-adopters can pursue two different strategies to increase the firm’s value simultaneously (one that increases the firm’s value by increasing RAS income so that it converges with IFRS income and the other that increases the firm’s value through tax avoidance), in spite of tax authorities having access to IFRS financial statements.

4.3. Impact of Adoption on Book-to-Market Values

Book-to-market values help investors to judge whether a company’s stock is currently under- or overvalued. A market value that is higher than the book value indicates that the company is expected to grow earnings in the future. Large differences between book-to-market RAS values and book-to-market IFRS values imply that those familiar with RAS might know something about the company’s financial position, which differs with what the IFRS numbers are communicating. Large differences, therefore, increase risk. We test to see if the book-to-market values of the firms using RAS are converging to the book-to-market values of the firms using IFRS. To avoid look-ahead bias, we collect market data based on the financial year end of the Russian firms. In this way, accounting data are not lagged behind the market data. Our results are presented in Table 9. We find that differences between book and market values are high under both standards for all the years ($p < 0.01$, untabulated).

Table 9. Comparison of book-to-market values under IFRS and RAS.

Variable	2011	2012	2013
BtM IFRS	0.0015	0.0017	0.0023
BtM RAS	0.0010	0.0015	0.0021
Difference	0.000453 ***	0.000208 **	0.000155 **
Z Statistic	2.990	2.269	2.254

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

We find that the gap between BtM_{iIFRS} and BtM_{iRAS} narrows over time and decreases in statistical significance. The data suggest that the information about book and market values is converging between domestic standards and international standards.

Once again, we check to see if RAS is converging to IFRS or if IFRS is converging to RAS by examining the ratios under each accounting regime across time. We find that the relative variation in book values, depending on the accounting regime, and the observed difference in market values, are significantly different at the 0.01 levels under both accounting regimes (Tables 10 and 11) but are decreasing over time. The book-to-market values are higher and increasing under IFRS. The book-to-market values are much lower under RAS, but they are increasing at a much higher rate (1.1 compared to 0.53) when we look at the values in 2011 and 2013. This implies book-to-market values are adjusting under both accounting regimes, but RAS is actually converging to IFRS values.

Table 10. Relative variation in book values per IFRS and the variation in the market value.

Variable	2011	2012	2013
VAR IFRS	0.1486	0.1075	0.1283
VAR Market	0.3838	0.2186	0.2997
Difference	−0.2352 ***	−0.1111 ***	−0.1713 ***
Z Statistic	−4.134	−1.903	−5.475

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 11. Relative variation in book values per RAS and the variation in the market value.

Variable	2011	2012	2013
VAR RAS	0.1299	0.2099	0.0942
VAR Market	0.3838	0.2186	0.2997
Difference	−0.2540 ***	−0.00867 ***	−0.2054 ***
Z Statistic	−7.321	−2.732	−7.278

*, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

Variance analysis is a way to assess the difference between the estimated and actual financial performances. Our results suggest book-to-market values are converging when comparing IFRS to RAS. The relative variation in the market and book values is generally higher under IFRS when compared to RAS, except in the year of the mandatory adoption (2012). This implies that there is more risk to equity investors when using IFRS. The upside, however, is that higher risk also brings higher returns. It is expected that the market would be a little more uncertain when using a new accounting regime in an emerging market with low information and would be willing to compensate investors for the higher risk. As Ho et al. (2023) noted: “[C]omparability can promote the transmission of information and assist investors and other stakeholders in analyzing, comparing, and predicting a company’s financial status, operating performance, and prospects *without needing to conduct research* (emphasis added)” (p. 222). The difference in the relative variation in book values is decreasing under

both accounting regimes, which implies more favorable tradeoffs between risk and returns. Comparability between the two regimes is starting to eliminate any differences between the information being transmitted by RAS and IFRS financial statements for firms reporting under both regimes.

5. Conclusions and Suggestions for Future Research

Russia provides us with a unique opportunity to study how domestic GAAP may or may not converge to international accounting standards after adoption because financial statements in Russia are prepared using both domestic and international standards. When we examine the comparability of accounting numbers and financial ratios, we find that, for the most part, balance sheet comparability does not exist between RAS and IFRS but is increasing with RAS converging to IFRS. This is especially true with regard to the income statement accounts, with comparability in income measures improving or achieving comparability for firms that adopted IFRS. We also find that comparability has improved or has been achieved for financial ratios involving returns per unit of income. Given that income measures are higher under IFRS when compared to income measures under RAS, Russian firms are apparently willing to pay more in income taxes to strengthen their business legitimacy through comparability with IFRS (Hypothesis 1 holds for income measures). The same cannot be said for balance sheet measures, where statistically significant differences still exist.

We next examined differences in the quality of the earnings, as evidenced by discretionary accruals, and tested whether any differences persist over time. Because IFRS financial statements are viewed as deriving from a quality accounting regime, Russian companies would be expected to adjust their RAS accounting information to conform with IFRS accounting information. A firm's value is derived from comparability with IFRS, even if some of the firm's value is lost because of higher income taxes. Where there are no market incentives (IFRS is not required), Russian firms continue to increase the firm's value by managing earnings downward to avoid taxes. This issue is of regulatory importance in that it examines changes in accounting practices internationally—particularly concerning practices in developing nations as firms adopt IFRS and capital markets become increasingly globalized.

Given the unique situation in Russia, where some firms file financial statements in RAS and IFRS and some firms file financial statements in RAS only, we are able to examine whether RAS is converging to IFRS or vice versa. We find accounting values under IFRS are not changing. They are changing, however, under RAS but only for firms that are required to file under both accounting regimes. This pattern persists over time even though both investors and tax regulators have access to both RAS and IFRS financial statements. We expect that adopters, whether voluntary or mandatory, would manage RAS earnings upward to converge with the higher income measures under IFRS and, thereby, increase the firm's value by strengthening business legitimacy. Without the monitoring effect of IFRS, we expect that firms not using IFRS would continue to manage earnings downward to achieve increased firm value through tax avoidance. We find that there are statistically significant differences in earnings management between RAS and IFRS and that these differences persist over time. We find that earnings management has continued under RAS but remains unchanged under IFRS. Given a cultural environment that condones the concealment of income, we find that adopters and never-adopters can pursue these two divergent strategies simultaneously to increase the firm's value. The consequences (fines and penalties) for misstating earnings on IFRS financial statements are much higher, and IFRS audits are more lucrative and rigorous than RAS audits. Thus, there appears to be little consequence to the lack of comparability between RAS and IFRS at the regulatory level. It appears, therefore, that there is a clear distinction between legitimacy and legality and that there are two different results when we conduct a cost-benefit analysis of IFRS and RAS, i.e., how managers decide to increase the firm's value depends on whether the firms are mandated to use IFRS. Our study suggests that concerns regarding business legitimacy

drive the cost of the convergence, not legality. This supports the hypotheses that earnings management differs when using RAS as compared to IFRS and that earnings management differs for adopters and never-adopters (Hypotheses 2 and 3).

Finally, we examine the gap between the book and market values of the shareholders' equity. We find that the gap between the book-to-market ratios under IFRS and RAS does, indeed, narrow as time progresses. This supports the hypothesis that significant differences exist between the relative variation in the book-to-market values when comparing RAS to IFRS (Hypothesis 4), but it may also be the case that FDI is applying pressure toward comparability between the two accounting regimes. We do find higher variance in market values under IFRS when compared to RAS, except in the year of the mandatory adoption (2012). This is expected because investors are uncertain if IFRS is as dependable at assessing financial risk in Russian firms. After all, RAS has been used for years, and under the efficient markets theory that share prices reflect all the available information, stocks should be fairly priced using RAS. The gaps, however, are closing between the book-to-market ratios under RAS and IFRS, and the differences in the market value variances are also decreasing. This supports our conclusion for increasing convergence between RAS and IFRS in a way that favors the needs of investors and their desire for convergence to a widely accepted system of international accounting standards (legitimacy).

In sum, we attribute our findings to a monitoring effect derived from IFRS. Publicly traded firms are constrained from reporting RAS numbers that differ significantly from IFRS numbers, even when this results in higher income taxes. We add to the literature by examining the impact of broad internationalization on domestic customs and practices and, more specifically, whether convergence takes place despite an increase in corporate income taxes. We also find a difference between earnings management behavior for firms that adopt IFRS and those that do not. Our study suggests that it is RAS that is converging to IFRS, not the other way around. Our results indicate that firms are willing to pay for the cost of legitimacy (comparability) even when it means paying additional income taxes.

As with other studies of comparability and earnings quality, our results should be of interest to institutions interested in harmonizing domestic GAAP and international accounting. Because of the peculiarities of the Russian setting (dual financial statements) and the political situation, we believe some commonalities will exist for those emerging markets, where legal enforcement is weak, and, as a result, when an increase in FDI is desired, the legitimacy of organizations' transactions become highly relevant. Likely, firms will want to converge to IFRS.

Our results may also help Russian standard setters to improve the convergence of RAS to IFRS for all Russian companies. Users of financial statements can also benefit from our findings because they highlight another aspect of the comparability problems and improvements between RAS and IFRS as well as changes in the earnings quality for firms after the adoption of IFRS. Our study adds to the discussion that business legitimacy impacts transaction costs, combining economic theory with ethical expectations (Wieland and Fischer 2020).

Areas for future research include expanding the dataset to later years. RAS has been reformed since 2014, so differences in balance sheet values may reflect IFRS values. It would be interesting to see if balance sheet items under RAS begin to converge to IFRS as time passes for never-adopters, as they feel pressure to increase business legitimacy. Also, using an expanded dataset, it would be interesting to see if our expectations about tax avoidance through RAS are confirmed or not over the passage of time. Future research could also study the effects of the devaluation of the ruble on IFRS adoption as well as the effects of wars and embargos. The cost–benefit analysis of IFRS and RAS integration might change under these circumstances. It would also be interesting to see if other former Soviet bloc countries that file financial statements under both local and international accounting regimes have similar patterns when it comes to convergence, earnings management, and stock price volatility. This stream of research could also be applied to other BRIC countries to see if our findings (convergence to IFRS leads to business legitimacy) are confirmed or

not. There are many possibilities for future research in this area of the cost of local GAAP and IFRS integration in developing countries.

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Appendix A

Table A1. Definitions of Accounting Numbers and Financial Ratios.

Accounting Number	Definition
Operating Income	Operating Income – Operating Expenses
Ordinary Income	Operating Income + Financial Income – Financial Expenses
Net Income	Ordinary Income – Extraordinary Income – Extraordinary Expenses – Taxes
Fixed Assets	Intangible Assets + Property, Plant, and Equipment + Long-term Investments + Goodwill
Inventories	Goods Produced for Sale + Goods in the Process of Production + Materials or Supplies
Receivables	Receivables + Short-term Investments
Cash	Cash + Cash Equivalents
Current Assets	Inventories + Receivables + Cash (as defined above)
Total Assets	Fixed Assets + Current Assets (as defined above)
Equity	Funds Contributed by Shareholders + Retained Earnings + Other Reserves + Net Income + Minority Interest + Deferred Income
Long-term Liabilities	Long-term Creditors + Long-term Provisions
Short-term Liabilities	Short-term Creditors + Short-term Provisions
Total Liabilities	Long-term Liabilities + Short-term Liabilities (as defined above)
Long-term Resources	Equity + Long-term Liabilities (as defined above)
Ratio	
ROA_OI	Operating Income/Total Assets (as defined above)
ROA_Ord	Ordinary Income/Total Assets (as defined above)
ROE_Ord	Ordinary Income/Equity (as defined above)
ROE_NI	Net Income/Equity (as defined above)

Table A1. Cont.

Accounting Number	Definition
Current Ratio	Current Assets/Short-term Liabilities (as defined above)
Acid Ratio	(Receivables + Cash)/Short-term Liabilities (as defined above)
Cash Ratio	Cash/Short-term Liabilities (as defined above)
Solvency	Total Assets/Total Liabilities (as defined above)
Indebtedness	Total Liabilities/Equity (as defined above)

Note

¹ Financial institutions in Russia have been using IFRS since 2005, but we do not include any of these firms in our sample.

References

- Abdel-Khalik, A. Rashad, Kie Ann Wong, and Annie Wu. 1999. The information environment of China's A and B shares: Can we make sense of the numbers? *The International Journal of Accounting* 34: 467–89. [CrossRef]
- Abedana, Virgil Nbellah, Kwame B. Omane-Antwi, and Alexander Owiredo. 2016. The impact of IFRS/IAS adoption on corporate Income taxation in Ghana. *International Journal of Accounting and Financial Reporting* 6: 72–98. [CrossRef]
- Ali, Usman, Muhammad Noor, Muhammad Kashif Khurshid, and Akhtar Mahmood. 2015. Impact of Firm Size on Earnings Management: A Study of Textile Sector of Pakistan. *European Journal of Business and Management* 7: 47–56. [CrossRef]
- Alm, James, Jorge Martinez-Vazquez, and Sally Wallace. 2009. Do tax amnesties work? The revenue effects of tax amnesties during the transition in the Russian Federation. *Economic Analysis and Policy* 39: 235–53. [CrossRef]
- Alon, Anna. 2013. Complexity and dual institutionalality: The case of IFRS adoption in Russia. *Corporate Governance: An International Review* 21: 42–57. [CrossRef]
- Atwood, T. J., Michael S. Drake, James N. Myers, and Linda A. Myers. 2011. Do earnings reported under IFRS tell us more about future earnings and cash flows? *Journal of Accounting and Public Policy* 30: 103–21. [CrossRef]
- Bagaeva, Alexandra. 2009. The IFRS and Accounting Quality in the Transitional Economy: The Case of Russia. Available online: <https://ssrn.com/abstract=1400026> (accessed on 26 January 2024).
- Ball, Ray, S. P. Kothari, and Ashok Robin. 2000. The effect of international institutional factors on properties of accounting earnings. *Journal of Accounting and Economics* 29: 1–51. [CrossRef]
- Barth, Mary E., Wayne R. Landsman, and Mark H. Lang. 2008. International accounting standards and accounting quality. *Journal of Accounting Research* 46: 467–98. [CrossRef]
- Barth, Mary E., Wayne R. Landsman, Mark Lang, and Christopher Williams. 2012. Are IFRS-based and US GAAP-based accounting amounts comparable? *Journal of Accounting and Economics* 54: 68–93. [CrossRef]
- Berglof, Erik, and Alexander Lehmann. 2008. Sustaining Russia's growth: The role of financial reform. *Journal of Comparative Economics* 37: 198–206. [CrossRef]
- Black, Bernard, Reinier Kraakman, and Anna Tarassova. 2000. Russian Privatization and Corporate Governance: What went wrong? *Stanford Law Review* 52: 1731. [CrossRef]
- Bradshaw, Mark T., Brian J. Bushee, and Gregory S. Miller. 2004. Accounting choice, home bias, and U.S. investment in Non-U.S. firms. *Journal of Accounting Research* 42: 795–841. [CrossRef]
- Bray, Sean. 2021. Corporate Tax Rates around the World, 2021. Available online: <https://taxfoundation.org/corporate-tax-rates-by-country-2021/> (accessed on 29 December 2022).
- Burgstahler, David C., and Ilia D. Dichev. 1997. Earnings, adaption, and equity value. *Accounting Review* 72: 187–215.
- Burgstahler, David C., Luzi Hail, and Christian Leuz. 2006. The importance of reporting incentives: Earnings management in european private and public firms. *The Accounting Review* 81: 983–1016. [CrossRef]
- Bushman, Robert M., Joseph D. Piotroski, and Abbie J. Smith. 2011. Capital allocation and timely accounting recognition of economic losses. *Journal of Business Finance & Accounting* 38: 1–33. [CrossRef]
- Callao, Susana, José I. Jarne, and José A. Laínez. 2007. Adoption of IFRS in Spain: Effect on the comparability and relevance of financial reporting. *Journal of International Accounting, Auditing and Taxation* 16: 148–78. [CrossRef]
- Cascino, Stefano, and Joachim Gassen. 2015. What drives the comparability effect of mandatory IFRS adoption? *Review of Accounting Studies* 20: 242–82. [CrossRef]
- Center of Financial Information. 2016. Available online: <http://www.e-disclosure.ru/poisk-po-soobshheniyam> (accessed on 1 January 2016).
- Chui, Lawrence, Oksana Kim, and Byron J. Pike. 2020. The effect of audit duality on audit quality. *Journal of International Accounting Research* 19: 65–89. [CrossRef]
- Dechow, Patricia M., Richard G. Sloan, and Amy P. Sweeney. 1995. Detecting earnings management. *Journal of Accounting Research* 50: 275–334. [CrossRef]

- Deloitte IASPlus. 2018. Available online: <https://www.iasplus.com/en/jurisdictions/europe/russia> (accessed on 26 January 2018).
- Dugan, Michael T., Elizabeth H. Turner, and Clark M. Wheatley. 2018. Liability of foreignness: The impact of elimination of the reconciliation requirement on international asset allocation by U.S. investors. *Journal of International Accounting Research* 17: 75–95. [CrossRef]
- Easton, Peter D., and Trevor S. Harris. 1991. Earnings as an explanatory variable for returns. *Journal of Accounting Research* 29: 19–36. [CrossRef]
- El-Gazzar, Samir M., and Zakaria M. El-Sadek. 2001. The value relevance of accounting information in thin and emerging capital markets: The case of Egypt's equity market. *International Advances in Economic Research* 7: 368. [CrossRef]
- Enthoven, A. 1999. Russia's accounting moves West. *Strategic Finance* 81: 32–37.
- Garanina, Tatiana A., and Oksana Kim. 2023. The relationship between CSR disclosure and accounting conservatism: The role of state ownership. *Journal of International Accounting, Auditing and Taxation* 50: 100522. [CrossRef]
- Garanina, Tatiana A., and Polina S. Kormiltseva. 2013. The effect of international financial reporting standards (IFRS) adoption on the value relevance of financial reporting: A case of Russia. *Accounting in Central and Eastern Europe* 13: 27–60. [CrossRef]
- Golubeva, Olga. 2023. Accounting for transition: A literature review. *Journal of International Accounting, Auditing and Taxation* 51: 100548. [CrossRef]
- Ho, Kung-Cheng, Renji Sun, Lei Yang, and Hui-Min Li. 2023. Information disclosure as a means of minimizing asymmetric financial reporting: The role of market reaction. *Economic Analysis and Policy* 78: 1221–40. [CrossRef]
- Hoogervorst, Hans. 2015. Hans Hoogervorst Speaks about the Reasons behind the IASB's Work. Available online: <https://www.iasplus.com/en/news/2015/04/hoogervorst> (accessed on 23 April 2018).
- Hung, Mingyi, and K. R. Subramanyam. 2007. Financial statement effects of adopting international accounting standards: The case of Germany. *Review of Accounting Studies* 12: 623–57. [CrossRef]
- IFRS. n.d. Who Uses IFRS Accounting Standards? Available online: <https://www.ifrs.org/use-around-the-world/use-of-ifrs-standards-by-jurisdiction/> (accessed on 29 December 2022).
- Ilaboya, Ofuna J., Monday O. Izevbekhai, and Friday I. Ohiokha. 2016. Tax planning and firm value: A review of literature. *Business and Management Research* 5: 81–91. [CrossRef]
- International Monetary Fund. n.d. World Economic Outlook Database. Available online: <https://www.imf.org/en/Publications/WEO/weo-database/2022/October/download-entire-database> (accessed on 29 December 2022).
- Jeanjean, Thomas, and Hervé Stolowy. 2008. Do accounting standards matter? An exploratory analysis of earnings management before and after IFRS adoption. *Journal of Accounting and Public Policy* 27: 480–94. [CrossRef]
- Jones, Jennifer J. 1991. Earnings management during import relief investigations. *Journal of Accounting Research* 29: 193–228. [CrossRef]
- Joos, Peter, and Mark Lang. 1994. The effects of accounting diversity: Evidence from the European Union. *Journal of Accounting Research* 32: 141–68. [CrossRef]
- Kenton, Will. 2022. Cash Ratio: Definition, Formula, and Example. Investopedia. Available online: <https://www.investopedia.com/terms/c/cash-ratio.asp> (accessed on 27 January 2024).
- Kim, Oksana. 2013. Russian accounting system: Value relevance of reported information and the IFRS adoption perspective. *The International Journal of Accounting* 48: 525–47. [CrossRef]
- Kothari, S. P., Andrew J. Leone, and Charles E. Wasley. 2005. Performance matched discretionary accrual measures. *Journal of Accounting and Economics* 39: 163–97. [CrossRef]
- La Porta, Rafael, Florencio Lopez-De-Silanes, and Andrei Shleifer. 2006. What works in securities laws? *The Journal of Finance* 61: 1–32. [CrossRef]
- La Porta, Rafael, Florencio Lopez-De-Silanes, Andrei Shleifer, and Robert W. Vishny. 1998. Law and finance. *Journal of Political Economy* 106: 1113–55. [CrossRef]
- Li, Shaomin, Seung Ho Park, and Rosey Shuji Bao. 2014. How much can we trust the financial report? *International Journal of Emerging Markets* 9: 33–53. [CrossRef]
- Ohlson, James A. 1995. Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research* 11: 661–88. [CrossRef]
- Palacios Manzano, M., I. Martínez Conesa, and H. Garza Sánchez. 2014. Keys to reduce earnings management in emerging markets. *South African Journal of Business Management* 45: 81–96. [CrossRef]
- Pelucio-Grecco, Marta Cristina, Cecília Moraes Santostaso Geron, Gerson Begas Grecco, and João Paulo Cavalcante Lima. 2014. The effect of IFRS on earnings management in Brazilian non-financial public companies. *Emerging Markets Review* 21: 42–66. [CrossRef]
- Preobragenskaya, Galina, and Robert W. McGee. 2003. Auditing in Russia. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=410819 (accessed on 29 December 2023).
- Rudra, Titus, and Dipanjan Bhattacharjee. 2012. Does IFRS influence earnings management? Evidence from India. *Journal of Management Research* 4: 1. [CrossRef]
- Soderstrom, Naomi S., and Kevin Jialin Sun. 2007. IFRS adoption and accounting quality: A review. *European Accounting Review* 16: 675–702. [CrossRef]
- Stamatopoulos, Ioannis, Stamatina Hadjidema, and Konstantinos Eleftheriou. 2019. Explaining corporate effective tax rates: Evidence from Greece. *Economic Analysis and Policy* 62: 236–54. [CrossRef]

- Sucher, Pat, and Svetlana Bychkova. 2001. Auditor independence in economies in transition: A study of Russia. *European Accounting Review* 10: 817–41. [CrossRef]
- Trading Economics. 2021. Russian Corporate Tax Rate. Available online: <https://tradingeconomics.com/russia/corporate-tax-rate> (accessed on 13 May 2021).
- Turner, Elizabeth H., Arturo Pacheco-Paredes, and Clark Wheatley. 2024. Transfer of knowledge: Do trade surpluses foster quality in accounting practices? *Economic Analysis and Policy* 81: 436–51. [CrossRef]
- Van Tendeloo, Brenda, and Ann Vanstraelen. 2005. Earnings management under German GAAP versus IFRS. *European Accounting Review* 14: 155–80. [CrossRef]
- Vysotskaya, Anna, and Maria Prokofieva. 2013. The difficulties of teaching IFRS in Russia. *Issues in Accounting Education* 28: 309–19. [CrossRef]
- Wieland, Josef, and Dominik Fischer. 2020. Transaction Cost Theory and Business Legitimacy. In *Handbook of Business Legitimacy*. Edited by Jacob Dahl Rendtorff. Cham: Springer, pp. 1147–67. [CrossRef]
- Young, Greg. 2016. Mixed Economy. Available online: <https://www.britannica.com/topic/mixed-economy> (accessed on 19 December 2022).

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Article

Do Investment Funds Audited by the Big Four Firms Exhibit Different Performances? Evidence from Brazil

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Abstract: Investment funds manage a portfolio composed of financial instruments; therefore, their accounting reports should undergo a careful process of preparation and auditing. The main purpose of this study is to analyze the effect of being audited by a Big Four audit company on funds' risk-adjusted performance. The database is composed of equity funds from the Brazilian financial market, with daily returns spanning from January 2005 to March 2023. The funds' performance was measured based on three indicators, including the Sharpe Ratio and Jensen's Alpha. Fama and MacBeth regressions were used to test the hypotheses. The main findings indicate that the benefits of audit quality also include a positive effect on the risk-adjusted performance of investment funds, as the coefficient of the variable "Big Four" was positive and significant based on the proxies for risk-adjusted performance. This study advances this area of research by demonstrating the effects of the type of audit on the risk-adjusted performance indicators of investment funds.

Keywords: risk; accounting information; financial instruments; mutual funds; Jensen's Alpha; Sharpe index

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1. Introduction

One of the resources that contributes to an efficient financial market is the quality of accounting information, since investors use financial statements and accounting indicators to make investment decisions. Together with the quality of accounting information, the quality of auditing is considered. "Large accounting firms offer their audit teams national access to technical accounting consultants, staff in multiple locations, and audit efficiencies resulting from unified nationwide training" (Bills et al. 2016, p. 768). Therefore, variables such as size, institutional environment, access to IT platforms, and participation in international accounting networks can affect audit quality (Bills et al. 2016; Mao et al. 2017), which, in turn, indicates that the quality of auditing also varies among audit firms.

The previous studies suggest that audit quality is an important factor for investment decisions. Shahzad et al. (2018) state that auditors help investors make better decisions by presenting an independent opinion on how well a company's financial statements represent its financial position. Christensen et al. (2016) surveyed auditors and investors to learn their perspectives on audit quality. Concerning the investors' responses, about 41% answered that it is always important, or most of the time, one should consider an audit report for investment decisions (Christensen et al. 2016). Therefore, an auditor report can provide assured and reliable information published by listed companies (Felix and Wilford 2023; Chen et al. 2024; Leng and Zhang 2024; Liu et al. 2024), which is related to many decisions made by participants in the financial market (Liu et al. 2024).

Besides audit quality, performance is also among the main aspects considered by investors when choosing a particular investment fund. Therefore, funds with higher past returns tend to attract more investments (Sirri and Tufano 1998; Berk and Green 2004; Ivkovic and Weisbenner 2009). Because of this, in some circumstances, fund managers may use accounting discretion to obtain better return estimations (Chandar and Bricker 2002). For example, funds may have underlying illiquid securities, which, since they are not actively traded and do not have their market prices always available, appear to be more valuable than they actually are, resulting in the funds' returns not fully reflecting the available market information (Getmansky et al. 2004). In this sense, Goldie et al. (2018) argue that investors' confidence in the truthfulness of a fund's performance numbers increases from the instance that fund audits are perceived as high-quality.

Moreover, the portfolios of investment funds are broadly composed of financial instruments, and there are some accounting choices related to the accounting of financial instruments. These accounting choices can affect the quality of accounting information. In the specific case of investment funds, the accounting information is directly related to the number of total net assets and the value of the fund's shares. Hence, the daily, monthly, or yearly returns of an investment fund could present different levels of quality based on the quality of accounting and the auditing of its operations.

Considering this scenario, the aim of this study is to test the effect of audit quality on investment funds' accounting numbers. Since accounting numbers directly affect the risk measures and performance indexes, we analyzed the effect of audit quality on the risk-adjusted performance of investment funds. In this study, the audit quality is represented by a variable related to the Big Four audit firms, in line with previous research (Geiger and Rama 2006; Behn et al. 2008; Chou et al. 2014; Leng and Zhang 2024). Therefore, in this study, the Big Four is a dummy variable that receives a value of one for funds audited by Deloitte, EY, KPMG, or PwC. This study's hypothesis is that investment funds audited by the Big Four auditing firms present better measures of performance and lower levels of risk.

Studies about auditing typically focus on audited firms, not taking into account financial sector institutions, such as investment funds. Even the few studies about the subject that consider some financial institutions usually focus on banking institutions. Therefore, there are research gaps regarding the effects of audit quality on investment funds, and we expect to contribute to this field through this study. In addition, investment funds represent a significant part of the economy, thus being an important object of study (Goldie et al. 2018; Malaquias and Hernandez Júnior 2023).

2. Literature Review

Financial statements represent the main source of information about listed companies. Therefore, in order to be relevant for decision making, financial statements must be, among other factors, reliable. In this sense, Behn et al. (2008) affirm that external auditors may have a key role in firms' financial reporting reliability since they provide an independent evaluation of the financial statements' trustworthiness; in other words, an external audit shows whether a firm's reported information is in accordance with the accounting principles and if it reflects their operation results and cash flows. Moreover, an external audit may work as a corporate governance mechanism that revises and evaluates firms' internal controls and financial reporting, preventing material misstatements (Carcello et al. 2002; Habbash 2010).

Following this reasoning, there is a discussion about audit effectiveness between the so-called high-quality audits and non-high-quality audits. According to Francis (2004), evaluating audit quality is important because since audit quality is negatively related to audit failures, low-quality audits may lead to higher failure rates with possible material economic consequences. Other studies about audit quality consider different factors that define a high-quality audit, such as audit fees (Lennox 1999; O'Sullivan 2000; Hoitash et al. 2007), industry specialization (O'Keefe et al. 1994; Balsam et al. 2003; Dunn and Mayhew

2004), and the Big Four audit firms (Geiger and Rama 2006; Behn et al. 2008; Chou et al. 2014; Leng and Zhang 2024). The literature also analyzes the relationship between the audit fees and variables, such as time pressures (Calabrese 2023); hedge fund activism (Chen et al. 2024); and environmental, social, and governmental (ESG) performance (Song et al. 2023). Table 1 indicates some benefits of high-quality audit services based on empirical evidence.

Table 1. Benefits of high-quality auditing services.

Author(s)	Benefits of High-Quality Audit	Sample
Chou et al. (2014)	Attracts foreign investments and better performance during periods of crisis.	A total of 35,665 worldwide mutual funds with investments in developed markets firms.
Geiger and Rama (2006)	Presents fewer reporting errors.	A total of 1042 manufacturing firms receiving going concern report modifications and 710 financially distressed firms that filed for bankruptcy.
De Franco et al. (2011)	Increases private firms sale proceeds.	U.S. privately held firms with available financial statements and transactional details from 1994 to 2005.
Almeida and Almeida (2009)	Mitigates earnings management practices.	Firms listed on Brazil Stock Exchange with available data.
Lee and Lee (2013)	Improves value relevance of earnings and book value of equity.	Firms listed on Taiwan Securities and Exchange market with available data.
Van Tendeloo and Vanstraelen (2008)	Mitigates earnings management practices.	Privately held firms from 15 countries of the European Union with available data.

Source: own elaboration based on studies mentioned in Figure.

Using a sample of 35,665 mutual funds worldwide, of which 20 were from developed markets and 10 were from emerging markets, with investments in various firms from developed markets over the period between 1998 and 2009, Chou et al. (2014) found evidence that mutual funds increase investments in firms which had hired a Big Four auditor in the previous year. In other words, firms audited by the Big Four audit firms obtained more foreign investments. The main reason attributed to this effect is that the Big Four firms are perceived as high-quality auditors and have higher levels of certifications, which are highly valued by foreign investors. In addition to this, Chou et al. (2014) assert that the importance of auditor choice in mutual fund investment decisions has increased since the 2008 global crisis, such that firms audited by the Big Four outperformed the ones audited by non-Big Four during crisis times.

Geiger and Rama (2006) examined 1042 manufacturing firms receiving going concern report modifications and 710 financially distressed firms that filed for bankruptcy during the period between 1990 and 2001. Their aim was to analyze audit firms' reporting errors, such as ongoing concern-modified audit reports related to firms that did not fail and audit reports without an ongoing concern modification for firms that later went bankrupt. Among the results of the research, the authors found evidence that the Big Four audit firms show lower rates of reporting errors than non-Big Four firms, suggesting higher audit quality from the Big Four firms. According to Geiger and Rama (2006), a possible reason for this may be related to the fact that the Big Four audit firms spend more resources on audit training and technology, which helps them to identify firms that will go bankrupt, thus minimizing reporting errors.

The research conducted by De Franco et al. (2011), using financial statement data and transactional details related to sales of U.S. privately held firms from 1994 to 2005, showed that a high-quality audit impacts sale proceeds. De Franco et al. (2011) found that, for a private seller with a firm value ranging from USD14 to USD18 million, for stock purchases, a decrease in firm value from USD3.9 to USD5.2 million occurs if a Big Four audit firm is not hired. For asset purchases, a private seller with a firm value ranging from USD10 to

USD12 million suffers a decline in value from USD2.6 to USD3.1 million if a Big Four audit firm is not hired. According to De Franco et al. (2011), this happens because buyers believe that Big Four auditors provide high-quality audits, making the due diligence process easier, and also have strong internal controls, qualified accounting personnel, and high-quality advisors, among other qualities.

Similarly, Lee and Lee (2013) studied public companies listed in the Taiwan Securities and Exchange market from 1996 to 2009. Their purpose was to examine the effects of audit quality, proxied by the Big Four audit firms, on the value relevance of financial statements information, specifically earnings and book value of equity. The results presented by Lee and Lee (2013) suggest that accounting measures of earnings and book value of equity are more relevant and better explain variations in stock returns for firms audited by the Big Four than those audited by non-Big Four. In this sense, the accounting information regarding earnings and the book value of equity, audited by the Big Four, are perceived as more relevant and reliable.

According to Almeida and Almeida (2009), a high-quality audit, proxied by Big Four auditing, implies low levels of firm discretionary accruals. This means that firms with high-quality audits have a greater potential to mitigate earnings management practices. To find those results, the above authors analyzed all firms listed on the Brazil Stock Exchange with available data from 1999 to 2005. Almeida and Almeida (2009) affirm that a possible explanation for the findings is based on the expertise of Big Four auditors, which may lead firms to mitigate earnings management practices. It should be emphasized that the findings on the constraints of firms' earnings management practices by the Big Four audits are not unique to developing countries, such as Brazil. Van Tendeloo and Vanstraelen (2008) indicated that European privately held firms audited by the Big Four also exhibit fewer earnings management practices than the ones audited by non-Big Four.

From a theoretical point of view, Kim and Verrecchia (1991) demonstrated that, considering the assumption that investors are risk averse and their preferences correspond to a negative exponential utility function (i.e., the investor's utility increases at a rate decreasing due to their risk aversion), the trading volume is proportional to the indicator of the accuracy of the information announcement. Therefore, according to Kim and Verrecchia's (1991) model, there will be an increase in trading volume as long as information about the firm is reliable, while announcements without credibility will not generate significant market reactions.

Based on Kim and Verrecchia's (1991) theory, Jang and Lin (1993) found empirical evidence of a significant relationship between audit quality and trading volume. The main results showed that stocks offered for the first time, whose companies were audited by Big Eight firms, had higher trading volume on the first day of trading than stocks of companies audited by non-Big Eight firms. Despite this, Jang and Lin (1993) observed that this effect is not persistent over time, as the results indicated that, on subsequent trading days, the trading volume of stocks of companies audited by the Big Eight became smaller than those audited by non-Big Eight firms.

More recent correlated studies corroborate the findings of Jang and Lin (1993). For example, Czerney et al. (2019) detected a higher trading volume in reaction to audit reports with explanatory language, suggesting its informative function to investors. Chen et al. (2014) state, with empirical data, that audited earning announcements are more informative and, as a consequence, temporarily increase the variability of stock returns and trading volume. Wang et al. (2015) found that investors are interested in the engagement audit partner experience, which is also perceived as a component of audit quality.

When institutional investors are dissatisfied with a particular firm in which they hold shares, they may attempt direct intervention with management to influence some changes in the direction they want or stop investing in the company by selling their shares (McCahery et al. 2016). One element that can cause institutional investors to leave firms is the poor quality of information. According to Fan and Fu (2020), institutional investors

may exit when the firm's information environment is unsatisfactory, especially in response to bad news, which leads to an increase in firm crash risk.

Ng (2011) argues that investors pay attention to the quality of stock information when deciding to sell or buy shares of a company, especially in times of unexpected changes in market liquidity. According to Elaoud and Jarboui (2017), the efficiency of investment provided by the quality of accounting information increases when the audit is performed by a specialized auditor, suggesting that auditor specialization has a positive moderating effect on the relationship between the efficiency of investment and the quality of information.

Prior findings suggest that institutional investors are sensitive to information quality. Zhai and Wang (2016) state that institutional investors play a key role in this regard as they react quickly to abnormal financial information by withdrawing their investments from the firm, thus collaborating with the market in identifying inefficient resource applications. In the same way, Kim et al. (2020) found empirical evidence that institutional investors increase their sales of securities of firms with lower accruals quality, which was used as a proxy for firm-specific information risk.

3. Methods

We collected daily stock fund data from the Brazilian Securities and Exchange Commission (CVM) database. The sample period goes from January 2005 to March 2023, resulting in 219 monthly observations for each fund with complete data. All funds that do not have information on the name of the audit firm, fund size (total net assets at the beginning of each month), or daily returns to estimate performance were excluded.

At this point, we have a panel dataset with cross-sectional observations over 219 months. The final sample contains 6362 different investment funds, resulting in a dataset of 148,162 fund/month observations. The main independent variable in this study is the Big Four audit firms. Big Four is a dummy variable that receives 1 for funds audited by Deloitte, EY, KPMG, or PwC (alphabetical order) and 0 for other cases.

Regarding the dependent variables, we used four different measures that are directly affected by accounting information: (i) standard deviation of the fund's monthly returns; (ii) the Sharpe index (Sharpe 1966); (iii) the Sharpe index, considering the adjustment presented by Israelsen (2005) regarding funds with negative risk premium; and (iv) Jensen's Alpha. For each three-month period, the dependent variables were calculated using three-month moving windows and daily data for fund returns. This procedure allows having a database with monthly measurements, for example, a Jensen's Alpha for each fund each month. As a proxy for the risk-free rate, we used the Brazilian Selic interest rate, a fundamental resource used by the Central Bank of Brazil.

We also included three control variables in the quantitative models: Fund Size, measured through the natural logarithm of fund's TNA at the beginning of each month; Fund Age, indicating the age of each fund in years at the beginning of each year; and Fund's Net Inflow, which is the ratio between the average daily net inflow (investments minus redemptions) during the quarter and the fund's total net asset at the beginning of the quarter. Through the winsorizing procedure at 2% (1% in each tail), we eliminated the potential effects of extreme outliers on the scalar variables.

To test the study hypotheses, we used the Fama and MacBeth (1973) regression. Through the Fama and MacBeth (1973) model, we are able to test, each month, the effect of the variable of interest ("Big Four") on the dependent variable (risk-adjusted proxies or fund's risk), also considering the three controls mentioned above (Fund Size; Fund Age; Fund's Net Inflow). Finally, an average of these coefficients over time is reported, which allows their behavior/persistence to be analyzed.

4. Results and Discussion

The initial descriptive statistics (Table 2) of the sample indicate a significant preference for hiring a Big Four audit firm since 97% of the sample observations are audited by Big Four companies (Deloitte, EY, KPMG, and PwC). Previous research also presented a large

percentage of sample firms audited by one of the Big Four (Behn et al. 2008; De Franco et al. 2011; Lee and Lee 2013). For example, 85% of the observations in the Lee and Lee (2013) database are audited by the Big Four firms. These findings may be related to the arguments of Krishnamurthy et al. (2006) on the influence of the reputation of audit firms on the perceived quality of the audit, assuming that investment funds demand high-quality audits due to the complexity of their natural operations. This assumption would explain why the funds in this study predominantly hired Big Four companies.

Table 2. Descriptive statistics of the study variables.

Variables	n	Mean	S.D.	Min.	p25	Median	p75	Max.
Std. Dev. Ret.	148,162	0.0124	0.0040	0.0049	0.0249	0.0098	0.0121	0.0144
Sharpe	148,162	-0.0088	0.1358	-0.2908	0.2835	-0.1030	-0.0177	0.0885
SharpeADJ	148,162	0.0514	0.0778	-0.0001	0.2835	0.0000	0.0000	0.0885
Jensen’s Alpha	148,162	-0.0001	0.0010	-0.0030	0.0021	-0.0006	-0.0001	0.0004
BIG4	148,162	0.9785	0.1451	0.0000	1.0000	1.0000	1.0000	1.0000
Age	148,162	4.2753	4.3696	0.0000	19.0000	1.0000	2.0000	6.0000
Size	148,162	17.4021	1.7901	4.6015	24.3577	16.2095	17.4179	18.6167
Net Inflow	148,162	0.0008	0.0062	-0.0093	0.0326	-0.0010	0.0000	0.0003

Notes: Std. Dev. Ret. = standard deviation of fund’s daily returns of each fund during each quarter; Sharpe = the Sharpe index (Sharpe 1966) of each fund during each quarter; SharpeADJ = the Sharpe index (Sharpe 1966) considering the adjustment presented by Israelsen (2005) of each fund during each quarter; Jensen’s Alpha = the Jensen’s Alpha of each fund during each quarter; BIG4 = a dummy variable which receives 1 for funds audited by Deloitte, EY, KPMG, or PwC, and 0 for the other cases; Age = the age of the fund, in years, at the beginning of each year; Size = the natural logarithm of average of monthly fund’s TNA at the beginning of each quarter; Net Inflow = the ratio between the average daily net inflow (investments minus redemptions) during the quarter and the fund’s total net asset at the beginning of the quarter; all scalar variables were winsorized at 2% (1% in each tail).

Table 2 also indicates that the average age of the funds is 4.27 years and that more than half of the funds presented more redemptions than new applications during the period since the median is negative. The performance of the funds, on average, was negative in both the Shape Ratio and Jensen’s Alpha. Table 3 contains the results related to the Fama and MacBeth regressions, using the first dependent variable considered: the standard deviation of the fund’s daily returns.

Table 3. Results for the Fama and MacBeth Regression (Std. Dev. Ret.). This table reports the results for the Fama and MacBeth (1973) two-step procedure, Newey–West-corrected S.E. (lag length: 1). Dependent variable: Std. Dev. Ret. = standard deviation of fund’s daily returns of each fund during each quarter.

Variables	Coef.	F.M.S.E.	t	sig.
BIG4	-0.0001	0.0001	-1.2600	0.2080
Age	0.0002	0.0000	9.8600	0.0000 ***
Size	-0.0001	0.0000	-8.9600	0.0000 ***
Net Inflow	-0.0103	0.0033	-3.1000	0.0020 ***
Constant	0.0132	0.0003	40.7000	0.0000 ***

n = 148,162
 n° time periods = 219
 avg. r-squared = 7.85%

Notes: Dependent variable: Std. Dev. Ret. = standard deviation of fund’s daily returns of each fund during each quarter; BIG4 = a dummy variable which receives 1 for funds audited by Deloitte, EY, KPMG, or PwC, and 0 for the other cases; Age = indicates the age of the fund, in years, at the beginning of each year; Size = the natural logarithm of average of monthly fund’s TNA at the beginning of each quarter; Net Inflow = the ratio between the average daily net inflow (investments minus redemptions) during the quarter and the fund’s total net asset at the beginning of the quarter; *** indicates the significance level at 1%.

The results of Table 3 indicated that funds audited by Big Four firms, on average, did not present lower volatility in their returns each quarter compared to other funds that are

not audited by a Big Four auditing firm. The coefficient of the variable “Big Four” was not statistically significant, as shown in Table 3. Previous studies show the benefits of Big Four auditing firms, such as mitigation of earnings management practices (Van Tendeloo and Vanstraelen 2008; Almeida and Almeida 2009), high sale proceeds (De Franco et al. 2011), and fewer reporting errors (Geiger and Rama 2006), among others. However, the results of the quantitative tests did not show a significant difference in terms of volatility of returns (Std. Dev. Ret.) for the funds in the sample in relation to the BIG4 variable. Regarding fund characteristics, the results suggest that large funds and funds that received more applications during the period tend to be willing to take on lower levels of risk. On the other hand, the effect of “Age” was negative and statistically significant. This negative effect of age may have two implications: (i) younger funds tend to be willing to assume higher levels of risk, probably in order to achieve better levels of returns and a better position in the market; and (ii) older funds, or funds already established in the market, may choose to maintain a moderate position in terms of their risk level, avoiding exposure to the market.

Panel A of Table 4 contains the results considering the Sharpe Index as the dependent variable. According to the results reported in Table 4, the coefficient of the variable “Big Four” was positive and statistically significant at the 1% level on risk-adjusted performance, measured by the Sharpe Index (see Panel A). Moreover, considering other proxies for risk-adjusted performance (see Panels B and C of Table 4), the results remain equivalent and also indicate a positive effect of the “Big Four” variable on risk-adjusted performance.

Table 4. Results for the Fama and MacBeth Regression. This table reports the results for the Fama and MacBeth (1973) two-step procedure, Newey–West corrected S.E. (lag length: 1). *Panel A:* dependent variable = the Sharpe index (Sharpe 1966) of each fund during each quarter. *Panel B:* dependent variable = the Sharpe index (Sharpe 1966) considering the adjustment presented by Israelsen (2005) of each fund during each quarter. *Panel C:* dependent variable = Jensen’s Alpha = the Jensen’s Alpha of each fund during each quarter.

(A)					
Variables	Coef.	F.M.S.E.	t	sig.	
BIG4	0.0137	0.0036	3.8500	0.0000	***
Age	−0.0007	0.0010	−0.7400	0.4580	
Size	0.0034	0.0005	7.3100	0.0000	***
Net Inflow	0.9786	0.1145	8.5500	0.0000	***
Constant	−0.0503	0.0123	−4.1000	0.0000	***
n =	148,162				
n° time periods =	219				
avg. r-squared =	6.51%				
(B)					
Variables	Coef.	F.M.S.E.	t	sig.	
BIG4	0.0073	0.0018	4.1300	0.0000	***
Age	−0.0010	0.0007	−1.3600	0.1760	
Size	0.0014	0.0003	4.3600	0.0000	***
Net Inflow	0.5469	0.0708	7.7200	0.0000	***
Constant	0.0389	0.0066	5.8500	0.0000	***
n =	148,162				
n° time periods =	219				
avg. r-squared =	5.65%				

Table 4. *Cont.*

(C)					
Variables	Coef.	F.M.S.E.	t	sig.	
BIG4	0.0001	0.0000	2.9200	0.0040	***
Age	0.0000	0.0000	−1.2600	0.2080	
Size	0.0000	0.0000	6.6900	0.0000	***
Net Inflow	0.0096	0.0011	8.8000	0.0000	***
Constant	−0.0007	0.0001	−6.4300	0.0000	***
	n =	148,162			
	n° time periods =	219			
	avg. r-squared =	6.55%			

Notes: BIG4 = a dummy variable which receives 1 for funds audited by Deloitte, EY, KPMG, or PwC, and 0 for the other cases; Age = the age of the fund, in years, at the beginning of each year; Size = the natural logarithm of average of monthly fund’s TNA at the beginning of each quarter; Net Inflow = the ratio between the average daily net inflow (investments minus redemptions) during the quarter and the fund’s total net asset at the beginning of the quarter; *** indicates the significance level at 1%.

Strong audit processes can contribute to corporate governance (Carcello et al. 2002), benefiting the internal management of investment funds, and this statement is in line with the empirical results found in this study. Moreover, when observing the effect of Big Four audits on fund performance (Table 4), other benefits provided by Big Four firms have also been found. This evidence is equivalent among the three proxies for performance: the Sharpe index, the adjusted Sharpe index, and Jensen’s Alpha.

Therefore, the results of this study are in line with the findings of Chou et al. (2014), which observed that firms audited by the Big Four outperform those audited by non-Big Four. Comparing Tables 3 and 4, the effect of the “Big Four” variable on fund performance seems not to be related to a managerial decision to assume higher or lower levels of risk, as funds audited by Big Four firms did not present higher or lower levels of volatility in their returns (according to Table 3). Individual and institutional investors can consider this characteristic of funds (being audited by a Big Four firm) when making decisions regarding the portfolio composition involving quotas of investment funds.

Chou et al. (2014) also observed that mutual funds tend to increase investments in firms audited by a Big Four audit firm. Based on the results of this study, the funds in the sample showed a preference for hiring a Big Four audit firm (see Table 2), and these funds, on average, achieved better risk-adjusted performance. Therefore, the decision to hire a Big Four audit firm may also represent a strategy to convey to potential clients the reliability of investing in a given fund since the allocation of resources in mutual funds naturally represents an activity that involves risk.

Regarding the other characteristics of the funds, large funds presented better performance, as well as those funds that received more applications during each quarter. In contrast to the results in Table 3, the fund age did not have a significant effect on performance; therefore, if, on average, younger funds tend to present higher levels of risk, these funds do not necessarily achieve better performance.

5. Conclusions

The aim of this study was to analyze the effect of being audited by a Big Four audit firm on fund risk and fund performance. The database contains data on the performance of stock funds during the period from January 2005 to March 2023. Since we constructed a measure for fund performance each month, considering daily data for the three-month period (a quarter), Fama and MacBeth (1973) regressions were used to test the study hypotheses.

We found evidence of the benefits of audit quality in the context of entities that use financial instruments to develop their daily activities. Funds audited by the Big Four audit firms presented better performance measurements based on risk-adjusted indexes. However, the level of risk when comparing funds audited and not audited by the Big Four audit firms seems to be equivalent.

The results presented in this paper contribute to the accounting literature by showing the benefits provided by the Big Four audit firms in the context of institutional investors. Specifically, this study empirically indicates that the Big Four audits are associated with better measurements of risk-adjusted performance. These findings have special implications for fund managers in choosing their auditors, as well as for those investors who invest directly in investment funds.

The results obtained in this study also have implications for the literature that considers the positive relationship between audit quality and corporate governance mechanisms. Strong corporate governance practices and internal controls benefit fund managers, and their effects also extend to fund shareholders, as they can achieve better performance indexes.

This study has some limitations. The first limitation is related to sample composition since we only considered funds in the stock fund category. Future research can also analyze the effect of the Big Four dummy variable in the context of other investment fund categories. Another limitation is related to the number of funds that usually hire a Big Four audit firm since 97% of the observations are from funds with this characteristic. Therefore, new research may consider alternative procedures for comparing fund performance based on the variable of being audited by a Big Four firm. For future research, we also suggest an analysis that considers the value of audit fees and its potential relationship with fund risk and fund risk-adjusted returns.

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References

- Almeida, José Elias Feres, and Juan Carlos Goes Almeida. 2009. Auditing and earnings management: An empirical study in publicly-traded companies audited by the big four and other auditing firms. *Revista Contabilidade e Finanças* 20: 62–74. [CrossRef]
- Balsam, Steven, Jagan Krishnan, and Joon S. Yang. 2003. Auditor industry specialization and earnings quality. *Auditing: A Journal of Practice and Theory* 22: 71–97. [CrossRef]
- Behn, Bruce K., Jong-Hag Choi, and Tony Kang. 2008. Audit Quality and Properties of Analyst Earnings Forecasts. *The Accounting Review* 83: 327–49. [CrossRef]
- Berk, Jonathan B., and Richard C. Green. 2004. Mutual Fund Flows and Performance in Rational Markets. *Journal of Political Economy* 112: 1269–95. [CrossRef]
- Bills, Kenneth L., Lauren M. Cunningham, and Linda A. Myers. 2016. Small Audit Firm Membership in Associations, Networks, and Alliances: Implications for Audit Quality and Audit Fees. *The Accounting Review* 91: 767–92. [CrossRef]
- Calabrese, Kristyn. 2023. The effects of time pressure on audit fees. *Advances in Accounting* 63: 100663. [CrossRef]
- Carcello, Joseph V., Dana R. Hermanson, Terry L. Neal, and Richard A. Riley, Jr. 2002. Board Characteristics and Audit Fees. *Contemporary Accounting Research* 19: 365–84.
- Chandar, Nandini, and Robert Bricker. 2002. Incentives, Discretion, and Asset Valuation in Closed-End Mutual Funds. *Journal of Accounting Research* 40: 1037–70. [CrossRef]
- Chen, Charles J. P., Bin Srinidhi, and Xijia Su. 2014. Effect of auditing: Evidence from variability of stock returns and trading volume. *China Journal of Accounting Research* 7: 223–45. [CrossRef]
- Chen, Huimin Amy, Bill B. Francis, Yinjie Victor Shen, and Qiang Wu. 2024. The impact of hedge fund activism on audit pricing. *The British Accounting Review* 56: 101264. [CrossRef]

- Chou, Julia, Nataliya Zaiats, and Bohui Zhang. 2014. Does auditor choice matter to foreign investors? Evidence from foreign mutual funds worldwide. *Journal of Banking & Finance* 46: 1–20.
- Christensen, Brant E., Steven M. Glover, Thomas C. Omer, and Marjorie K. Shelley. 2016. Understanding audit quality: Insights from audit professionals and investors. *Contemporary Accounting Research* 33: 1648–84. [CrossRef]
- Czerney, Keith, Jaime J. Schmidt, and Anne M. Thompson. 2019. Do investors respond to explanatory language included in unqualified audit reports? *Contemporary Accounting Research* 36: 198–229. [CrossRef]
- De Franco, Gus, Ilanit Gaviols, Justin Y. Jin, and Gordon D. Richardson. 2011. Do Private Company Targets that Hire Big 4 Auditors Receive Higher Proceeds? *Contemporary Accounting Research* 28: 215–62. [CrossRef]
- Dunn, Kimberly A., and Brian W. Mayhew. 2004. Audit Firm Industry Specialization and Client Disclosure Quality. *Review of Accounting Studies* 9: 35–58. [CrossRef]
- Elaoud, Assawer, and Anis Jarboui. 2017. Auditor specialization, accounting information quality and investment efficiency. *Research in International Business and Finance* 42: 616–29. [CrossRef]
- Fama, Eugene F., and James D. MacBeth. 1973. Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy* 81: 607–36. [CrossRef]
- Fan, Yunqi, and Hui Fu. 2020. Institutional investors, selling pressure and crash risk: Evidence from China. *Emerging Markets Review* 42: 100670. [CrossRef]
- Felix, Robert, and Amanda L. Wilford. 2023. Auditor's financial stress: An inconspicuous determinant of audit outcomes. *Advances in Accounting. in press*. [CrossRef]
- Francis, Jere R. 2004. What do we know about audit quality? *The British Account Review* 36: 345–68. [CrossRef]
- Geiger, Marshall A., and Dasaratha V. Rama. 2006. Audit Firm Size and Going-Concern Reporting Accuracy. *Accounting Horizons* 20: 1–17. [CrossRef]
- Getmansky, Mila, Andrew W. Lo, and Igor Makarov. 2004. An econometric model of serial correlation and illiquidity in hedge fund returns. *Journal of Financial Economics* 74: 529–609. [CrossRef]
- Goldie, Bradley A., Lei Li, and Adi Masli. 2018. Do Mutual Fund Investors Care about Auditor Quality? *Contemporary Accounting Research* 35: 1505–32. [CrossRef]
- Habbash, Murya. 2010. The Effectiveness of Corporate Governance and External Audit on Constraining Earnings Management Practice in the UK. Ph.D. thesis, Durham University, Durham, UK.
- Hoitash, Rani, Ariel Markelevich, and Charles A. Barragato. 2007. Auditor fees and audit quality. *Managerial Auditing Journal* 22: 761–86. [CrossRef]
- Israelsen, Craig. 2005. A refinement to the Sharpe ratio and information ratio. *Journal of Asset Management* 5: 423–27. [CrossRef]
- Ivkovic, Zoran, and Scott Weisbenner. 2009. Individual investor mutual fund flows. *Journal of Financial Economics* 92: 223–37. [CrossRef]
- Jang, Hwee-Yong Jonathan, and Chan-Jane Lin. 1993. Audit quality and trading volume reaction: A study of initial public offering of stocks. *Journal of Accounting and Public Policy* 12: 263–87. [CrossRef]
- Kim, Kyung Soon, Chune Young Chung, Jin Hwon Lee, and Sangjun Cho. 2020. Accruals quality, information risk, and institutional investors' trading behavior: Evidence from the Korean stock market. *The North American Journal of Economics and Finance* 51: 101081.
- Kim, Oliver, and Robert E. Verrecchia. 1991. Trading volume and price reactions to public announcements. *Journal of Accounting Research* 29: 302–21. [CrossRef]
- Krishnamurthy, Srinivasan, Jian Zhou, and Nan Zhou. 2006. Auditor Reputation, Auditor Independence, and the Stock-Market Impact of Andersen's Indictment on Its Client Firms. *Contemporary Accounting Research* 23: 465–90. [CrossRef]
- Lee, Hsien-Li, and Hua Lee. 2013. Do Big 4 audit firms improve the value relevance of earnings and equity? *Managerial Auditing Journal* 28: 628–46. [CrossRef]
- Leng, Aolin, and Yue Zhang. 2024. The effect of enterprise digital transformation on audit efficiency—Evidence from China. *Technological Forecasting and Social Change* 201: 123215. [CrossRef]
- Lennox, Clive S. 1999. Non-audit fees, disclosure and audit quality. *European Accounting Review* 8: 239–52. [CrossRef]
- Liu, Xiaomei, Bin Li, Shuai Zhang, and Zhenhe Yang. 2024. Does the resignation of an independent director affect audit fees? An empirical study based on Chinese A-share listed companies. *International Review of Financial Analysis* 92: 103075. [CrossRef]
- Malaquias, Rodrigo Fernandes, and Miguel Hernandez Júnior. 2023. Lockup Periods During Lockdown Periods in the Context of Brazilian Funds. *Revista Contabilidade & Finanças* 34: e1563. [CrossRef]
- Mao, Juan, Baolei Qi, and Qian Xu. 2017. Does International Accounting Network Membership Affect Audit Fees and Audit Quality? Evidence from China. *International Journal of Accounting* 52: 262–78. [CrossRef]
- McCahery, Joseph A., Zacharias Sautner, and Laura T. Starks. 2016. Behind the scenes: The corporate governance preferences of institutional investors. *The Journal of Finance* 71: 2905–32. [CrossRef]
- Ng, Jeffrey. 2011. The effect of information quality on liquidity risk. *Journal of Accounting and Economics* 52: 126–43. [CrossRef]
- O'Keefe, Terrence B. O., Raymond D. King, and Kenneth M. Gaver. 1994. Audit fees, industry specialization, and compliance with GAAS reporting standards. *Auditing: A Journal of Practice and Theory* 13: 40–55.
- O'Sullivan, Noel. 2000. The impact of board composition and ownership on audit quality: Evidence from large UK Companies. *The British Accounting Review* 32: 397–414. [CrossRef]

- Shahzad, Khurram, Thierry Pouw, Ghulame Rubbaniy, and Osama El-Temtamy. 2018. Audit quality during the global financial crisis: The investors' perspective. *Research in International Business and Finance* 45: 94–105. [CrossRef]
- Sharpe, William F. 1966. Mutual Fund Performance. *The Journal of Business* 39: 119–38. [CrossRef]
- Sirri, Erik R., and Peter Tufano. 1998. Costly Search and Mutual Fund Flows. *The Journal of Finance* 53: 1589–622. [CrossRef]
- Song, Yunling, Hao Wu, and Yan Ma. 2023. Does ESG performance affect audit pricing? Evidence from China. *International Review of Financial Analysis* 90: 102890. [CrossRef]
- Van Tendeloo, Brenda, and Ann Vanstraelen. 2008. Earnings Management and Audit Quality in Europe: Evidence from the Private Client Segment Market. *European Accounting Review* 17: 447–69. [CrossRef]
- Wang, Xiaoke, Yanyan Wang, Lisheng Yu, Yuping Zhao, and Zhenyu Zhang. 2015. Engagement audit partner experience and audit quality. *China Journal of Accounting Studies* 3: 230–53. [CrossRef]
- Zhai, Jinbu, and Yutao Wang. 2016. Accounting information quality, governance efficiency and capital investment choice. *China Journal of Accounting Research* 9: 251–66. [CrossRef]

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Article

Other Comprehensive Income: Do Nonprofessional Investors Value It as Much as Net Income?

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Abstract: This study examines how investors incorporate unrealized gains or losses reported in Other Comprehensive Income (OCI) into their investment judgments. Since unrealized gains or losses can be presented in either OCI or net income—gains from trading securities are included in net income, while those from available-for-sale securities are reported in OCI (ASC 320 and ASC 851)—it raises the question of whether OCI items are perceived as equally significant as net income items. To explore this, we conducted a 2×2 experiment with 240 individual investors, manipulating the presentation of unrealized gains or losses in either net income or OCI. Our findings reveal that unrealized gains are valued significantly lower when presented in OCI compared to net income, indicating that investors see OCI-reported gains as less relevant. However, for unrealized losses, the incorporation degree remained consistent across both presentations, reflecting a general aversion to unrealized losses regardless of how they are reported.

Keywords: net income; other Comprehensive Income; categorization; unrealized gains or losses; assimilation

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1. Introduction

The collapse of Silicon Valley Bank (SVB) in March 2023, which once held over USD 200 billion in assets, highlights the critical importance of understanding unrealized gains or losses that are not reported in net income. SVB experienced significant unrealized losses on its securities as interest rates increased, causing a sharp decline in its market value (OIG 2024). These unrealized losses were crucial to the bank's financial instability. As the value of these securities plummeted, SVB encountered a liquidity crisis, which led to a bank run and ultimately the bank's collapse. This situation highlights the need for investors to comprehend unrealized items, as it can reveal financial vulnerabilities not apparent in net income alone.

Unrealized gains or losses are often reported as part of Other Comprehensive Income (OCI). Publicly traded companies in the U.S. and Europe are required to report Comprehensive Income (CI) in their financial statements, which combines net income (NI) with Other Comprehensive Income (OCI). Current standards mandate that OCI be presented alongside NI (ASC 220), though the usefulness of OCI remains controversial (Du et al. 2024). Our study seeks to examine the extent to which investors incorporate OCI information, such as unrealized gain/loss, into their investment judgments.

Other Comprehensive Income (OCI) is a crucial component of financial reporting, offering a more comprehensive view of a company's financial health. In 2023, Amazon.com, Inc. reported a net income of USD 30.4 billion. Additionally, the company reported Other Comprehensive Income of USD 1.4 billion, driven mainly by positive foreign currency translation adjustments and gains on available-for-sale debt securities. This culminated in a total Comprehensive Income of USD 31.9 billion for the year. Alternately, in 2023, Apple Inc. reported a net income of USD 97.0 billion. However, the company recorded an OCI loss of USD 343 million, primarily due to unrealized losses from foreign currency

translation and unrealized losses on derivative instruments, partially offset by gains on marketable debt securities. This resulted in a total Comprehensive Income of USD 96.7 billion for the year.

Previous research suggests that OCI items are typically transient, offering limited predictive value for future cash flows or earnings, and therefore have minimal impact on company valuation (Bamber et al. 2010; Barker 2004; Chambers et al. 2007; Linsmeier et al. 1997; Yen et al. 2007). Nevertheless, experimental studies reveal that OCI can influence investors' stock price judgments (Du et al. 2024; Hirst and Hopkins 1998), risk assessments, and evaluations of management performance (Maines and McDaniel 2000), although the extent and nature of this impact remains insufficiently defined. As a result, how individual investors assess and respond to OCI and its components continues to be an area of uncertainty, warranting further investigation.

In a recent study, Du et al. (2024) found that financial analysts incorporate unrealized gains or losses into their valuation judgments, even though these items are of an unrealized nature and reported in Other Comprehensive Income (OCI). Their study focuses solely on unrealized items reported in OCI, investigating whether OCI has informational value. However, it is important to note that unrealized gains or losses can be reported either in OCI or net income. For instance, unrealized gains or losses from trading securities are included in net income, while those from available-for-sale securities are reported in OCI (ASC 320 and ASC 851). This raises the question of whether items reported in OCI have the same impact on valuation as those reported in net income. This question is important because it explores whether investors perceive OCI items of equal significance to those in net income. Additionally, it examines the consistency and comparability of financial information, which are fundamental to accurate financial analysis and decision-making.

Building on prior research in accounting and psychology, particularly on categorization, we propose that for investors to effectively incorporate OCI information—such as unrealized gains or losses into their investment decisions, they must assimilate this information into a familiar category, such as a performance measure like net income (NI). Two key factors may influence this assimilation process: the presentation format of the unrealized item and its direction (gain or loss).

We hypothesize that when unrealized items are presented in the income statement (e.g., changes in trading securities), investors are more likely to fully integrate them into the performance measure category, viewing them as part of the company's profitability. However, when these items are presented in OCI (e.g., changes in available-for-sale securities), the assimilation into the performance measure category is more difficult due to investors' limited familiarity with OCI. Additionally, we hypothesize that the direction of the unrealized item will moderate this effect: the natural tendency toward loss aversion may cause investors to more readily incorporate unrealized losses into their assessments of profitability compared to unrealized gains.

We conducted a 2×2 experiment manipulating the presentation at two levels: NI presentation (unrealized items from trading securities included in net income) and OCI presentation (unrealized items from available-for-sale (AFS) securities included in OCI). Two hundred and forty nonprofessional investors participated in our online study. We focused on investors' perceptions of value relevance, including their price-to-earnings (P/E) multiple judgments, to investigate the judgment process (Jones and Smith 2011; Maines and McDaniel 2000). Our findings reveal that the degree of incorporation of unrealized gains into valuation judgments is significantly lower (indicated by lower P/E multiple judgments) when the gains are presented in OCI compared to when they are presented net income (NI). This suggests that investors perceive gains reported in OCI as less value-relevant than those reported in NI. However, for unrealized losses, the degree of incorporation did not vary between OCI and NI presentations, indicating that investors dislike unrealized losses regardless of where they are reported.

Our study contributes to the existing literature in several key ways. First, it complements archival research on the value relevance of Other Comprehensive Income (OCI)

(Jones and Smith 2011). Since net income (NI) and OCI are often presented together in the same Comprehensive Income (CI) statement, it is difficult to isolate their individual effects on investors' valuation decisions using archival data. By employing an experimental approach, we can directly compare how investors respond to information from both NI and OCI, providing clearer insights into their distinct impacts on valuation judgments.

Next, our study extends previous experimental research on the decision usefulness of OCI (Du et al. 2015; Du et al. 2024) by offering direct evidence of how unrealized gains and losses affect investor behavior when presented in different formats. We find that unrealized losses influence investors' decisions consistently, whether they are reported in OCI or NI. However, the impact of unrealized gains is more pronounced when they are included in NI rather than OCI, highlighting how the reporting location affects investors' valuation judgments.

Our study also contributes to research on the effects of categorization and presentation formats in financial reporting (Hirst and Hopkins 1998; Hopkins 1996). We find that unrealized gains influence valuation judgments differently depending on whether they are classified in net income (NI) or Other Comprehensive Income (OCI). This highlights the significant role that presentation formats play in shaping how investors interpret financial information and make decisions.

2. Literature Review

Both the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) require firms to disclose Other Comprehensive Income (OCI). Firms can report OCI in one continuous statement, the statement of Comprehensive Income, or in two separate but consecutive statements, per ASC 220 and IAS 1. Comprehensive Income (CI) encompasses both net income (NI) and OCI, where OCI captures revenues, expenses, gains, and losses excluded from NI. Items within OCI include unrealized gains and losses on available-for-sale securities, cash flow hedges, asset revaluations, minimum pension liability adjustments, and foreign currency translation adjustments.

Unlike net income, which reflects a company's operational performance, OCI captures changes in the fair value of specific assets and liabilities, often representing unrealized gains or losses driven by external market factors (Bratten et al. 2016; Chisnall 2001). While net income is more directly linked to core business operations, OCI includes fair value adjustments, management estimates, and actuarial assumptions. Despite these distinctions, accounting standards require both NI and OCI to be presented within a performance-based Comprehensive Income (CI) statement, implying that OCI reflects a firm's overall financial performance. However, it remains uncertain whether investors perceive OCI to be as decision-useful as net income, given its link to unrealized and often temporary market changes.

The usefulness of OCI remains debated, as OCI gains and losses often arise from volatile market conditions, which can limit their ability to predict future cash flows and firm value (Bamber et al. 2010; Barker 2004; Chambers et al. 2007; Linsmeier et al. 1997; Yen et al. 2007). Researchers typically evaluate OCI's usefulness in terms of value relevance, persistence (its ability to predict its own future values), and predictive value for forecasting financial outcomes (Ohlson 1999).

Empirical evidence on the usefulness of OCI is mixed. Kanagaretnam et al. (2009) found that Comprehensive Income is more strongly associated with stock returns and future cash flows than net income. However, Dhaliwal et al. (1999) reported conflicting results, with net income showing a stronger association. Jones and Smith (2011) found that while the value relevance of OCI gains and losses is smaller than that of net income, OCI demonstrates stronger predictive value for forecasting future net income and cash flows. Similarly, Bratten et al. (2016) reported that unrealized gains and losses from available-for-sale securities and derivatives are significantly related to future earnings. Although OCI is often viewed as transitory, research shows that OCI gains and losses exhibit negative persistence, meaning they tend to partially reverse over time (Easton and Zhang 2017;

Jones and Smith 2011). This reversal complicates assessments of OCI's long-term predictive value but suggests that OCI can still provide useful information for forecasting future financial performance.

The mixed findings from archival studies suggest that the market struggles to interpret signals from Other Comprehensive Income (OCI), which is unsurprising given the lack of a clear conceptual distinction between net income (NI) and OCI under U.S. GAAP and IFRS. The mixed-attribute model present in current accounting standards leads to inconsistent treatment of similar economic transactions, whereas some changes in the fair value of assets and liabilities are recognized in NI others are reported in OCI. For instance, under GAAP (ASC 320 and ASC 815), unrealized gains and losses on available-for-sale securities and cash flow hedge derivatives are reported in OCI, whereas those on trading securities and fair value hedge instruments are included in NI. Meanwhile, unrealized gains and losses on securities intended to be held to maturity are typically not recognized in either NI or OCI. ASU 2016-01 adds further complexity by making significant changes to the accounting for equity investments that were previously classified as available-for-sale (AFS). While unrealized gains and losses on available-for-sale securities were previously reported in OCI, ASU 2016-01 now requires these gains and losses to be included in net income. This shift can significantly impact reported earnings, making it harder for investors to compare financial performance across periods or between companies. These inconsistencies can obscure the true economic reality of a company's financial situation. As a result, investors may find it challenging to fully understand the implications of OCI items, leading to inconsistent valuation and investment decisions.

Experimental studies often investigate how the presentation of Other Comprehensive Income (OCI) affects the judgments of financial statement users, including financial analysts and individual investors. Research suggests that the format in which OCI is presented can improve transparency, enabling users to better assess firm performance when OCI is included in a performance statement (Hirst and Hopkins 1998). Hirst and Hopkins (1998) found that buy-side financial analysts were more effective at detecting earnings management through the selective sale of available-for-sale (AFS) securities when Comprehensive Income was reported in a performance-based statement, which also improved their evaluations of stock price and financial reporting quality.

Maines and McDaniel (2000) provided experimental evidence that nonprofessional investors often struggle to interpret OCI and that the presentation format significantly affects their valuation judgments. Du et al. (2015) showed that participants assigned greater importance to OCI in a single-statement format compared to a two-statement format, particularly when the entity incurred an economic loss. More recently, Du et al. (2024) found that financial analysts were sensitive to the direction of OCI, with unrealized gains or losses affecting their valuation judgments based on the company's profitability. However, none of these studies directly examine how investors value unrealized gains or losses reported in OCI versus in net income (NI).

3. Hypothesis Development

Accounting research on format effects is grounded in categorization theory, which posits that the way information is categorized influences judgments (Clor-Proell et al. 2016; Hopkins 1996; Maines and McDaniel 2000). This categorization process aids individuals in assimilating new information into familiar categories, thereby reducing cognitive load by organizing concepts into meaningful groups. This organization allows individuals to apply prior knowledge to infer characteristics of new items within those groups (Schwarz and Bless 1992; 2007). Furthermore, prior psychological research highlights the significant role of emotional responses in influencing information processing and assimilation. For instance, Lerner et al. (2004) found that emotions such as anger, fear, and sadness can alter the weight assigned to different pieces of information based on emotional context, impacting how individuals assimilate and categorize new information. Similarly, Isen (2001) demonstrated that positive emotions can enhance creative problem-solving and

broaden cognitive flexibility, facilitating more effective assimilation of new information into existing categories.

In accounting, the categorization of an item significantly influences its perceived importance. For example, Hopkins (1996) found that analysts' stock price judgments for hybrid financial instruments varied based on whether the instrument was classified as debt or equity on the balance sheet. Analysts relied on their existing knowledge of these categories to evaluate the unfamiliar instruments. However, there is scant research on the categorization of unrealized gains and losses. Understanding how these items are classified could illuminate their impact on investors' judgments. If items included in OCI are viewed as equally robust as those in net income (NI), investors may attribute similar value relevance to OCI transactions.

Despite being of an unrealized nature, unrealized gains or losses from marketable securities are classified differently, either in OCI or NI, depending on managers' intentions to hold or sell these assets. Drawing on psychological and accounting research on categorization, we propose that investors process new information by assimilating it into a familiar category, such as a performance measure like net income (NI).

We argue that the lack of a clear conceptual definition of OCI complicates investors' ability to form a coherent mental model of it. When a non-core activity item, such as an unrealized gain or loss from AFS securities, is reported in OCI, investors may find it difficult to interpret this information due to their limited familiarity with OCI. As a result, they are less likely to assimilate these items into performance measures like net income (NI). In contrast, when the same item is presented in the income statement, such as an unrealized gain or loss from trading securities, investors, who are more accustomed to the income statement format, can more readily incorporate it into their evaluation of the company's financial performance.

Prior psychological research underscores the impact of emotional responses on assimilating financial information, demonstrating that emotions significantly shape investor decisions. This emotional framing influences how investors process information: negative emotions heighten sensitivity to unrealized losses, while positive emotions facilitate the integration of unrealized gains into valuations. Loss aversion indicates that losses elicit stronger negative emotions than gains, leading to more intense reactions to potential losses (Kahneman and Tversky 1979; Fochmann et al. 2017). This heightened sensitivity may result in a greater incorporation of unrealized losses, regardless of whether they appear in net income (NI) or Other Comprehensive Income (OCI) (Schwarz and Bless 1992; 2007). In contrast, unrealized gains generally trigger weaker emotional responses, prompting more rational assessments that consider the reporting location of unrealized items and the distinctions between OCI and NI. This asymmetry affects how gains and losses are evaluated and informs the following hypotheses:

H1. *Nonprofessional investors will provide higher P/E multiples for a company when an unrealized gain is included in net income than when it is included in Other Comprehensive Income.*

H2. *Nonprofessional investors will assign the same P/E multiples to a company regardless of whether an unrealized loss is reported in net income or Other Comprehensive Income.*

In addition to value relevance, OCI's decision usefulness is often centered on four other dimensions, persistence (ability to predict future values of itself), predictive value (forecasting relevance), management effectiveness, and investment risk (Maines and McDaniel 2000; Ohlson 1999). Based on prior research, we also evaluate OCI's judgment impact on predictability, persistency, risk, and management effectiveness perceived by nonprofessional investors. We expect that judgments differ across presentation formats, but we do not make any specific prediction.

4. Methods

4.1. Participants

We recruited 240 individual participants from Amazon's Mechanical Turk (MTurk), all based in the U.S. Each participant completed the task in exchange for a payment of USD 0.50. Amazon's Mechanical Turk (AMT) is an internet labor market where "workers" complete "Human Intelligence Tasks" (HITs) for compensation (Farrell et al. 2014). Prior accounting studies have used Mechanical Turk participants to proxy for nonprofessional investors (Rennekamp 2012; Rennekamp et al. 2015). We believe our participants' knowledge level is sufficient for the experimental task (Libby et al. 2002), which has low complexity (Elliott et al. 2007) and only requires the participants to have some limited knowledge of accounting. On average, our participants have about 12 years of working experience and 5 years of investment experience. Sixty eight are female and one hundred twelve are male. One hundred sixteen participants have at least an undergraduate degree, twenty-seven have at least a graduate degree and thirty-seven have at least high school degree.

4.2. Procedure and Task

We ask participants to assume the role of an investor who is interested in investing in a particular company. Before starting the survey, all participants are required to answer three questions. They can continue to the survey page only if they answer all questions correctly. The three questions are as follows: (1) If a company has a total revenue of USD 5000 and a total expense of USD 3000, how much is its net income?; (2) if a company has a total assets of USD 10,000 and liabilities of USD 6000, how much is its equity?; and (3) if a company has a net income of USD 7000 and Other Comprehensive Income of USD 2000, how much is its total Comprehensive Income? This allowed us to screen out participants who did not have the basic accounting knowledge to evaluate financial statements.

Next, participants are presented with some background information about a mid-sized manufacturing company, TRX, and asked to evaluate how the company recognizes unrealized gains or losses related to investment. Specifically they are told that "Due to positive cash flow in recent years, TRX's management has decided to invest extra cash in the financial market by purchasing marketable securities. During 2017 the market value of these investments fluctuate significantly". Then, participants proceed to review the company's Comprehensive Income statement and answer additional questions.

We randomly assigned the participants to the four experimental conditions. By randomly assigning participants to the four experimental conditions, we ensure that each participant has an equal chance of being placed in any group. This method helps to eliminate selection bias and ensures that the groups are comparable at the start of the experiment. Random assignment enhances the internal validity of the study by ensuring that differences in outcomes can be attributed to the experimental conditions rather than pre-existing differences among participants.

4.3. Independent and Dependent Variables

The experiment is structured with a 2×2 between-subject design. The two variables are presentation and direction. We designed an experiment where we manipulate how an unrealized gain or loss (UGL) is presented. Under the mixed-attribute model currently prescribed by GAAP, some changes in fair value estimates of assets and liabilities are included in net income, and other changes are included in OCI. Unrealized gains and losses on AFS securities are included in OCI but unrealized gains and losses on trading securities are included in NI, similar to realized gains or losses (ASC 320 and ASC 851). We omitted the holding intention of the management from the instrument.

The variable of presentation is manipulated at two levels: NI format including UGL from trading securities and OCI format including UGL from available-for-sale (AFS) securities. The variable of direction is manipulated as an unrealized gain or an unrealized loss. We hold operating income constant in all four conditions at USD 88,000. We vary the amount of the unrealized gain or loss and the format by including them either above or

below the line of net income to create four experimental conditions.¹ Appendix A includes a copy of the instrument.

We focus our investigation on investors' perception of value relevance. We also examine additional judgments related to predictability, persistency, management effectiveness, and risk. We measure valuation judgment using the first question "Firms in the same industry as TRX have historically had trailing P/E multiples ranging from 10 to 20 times reported net income. Please select a P/E multiple between 10 and 20 with the knowledge that, all else equal, higher P/E multiples result in higher stock prices" (Drag the slider from 10 to 20). Perceived predictability is measured by the second question: "Please determine the strength of TRX's future financial performance (or overall financial health, including earnings and cash flow in the future) (from 1 being very weak to 11 very strong)". The third question measures perceived persistence of the unrealized gain/loss and states: "Please indicate how long it takes for the unrealized gains/losses related to TRX's investment to be realized as net income (net loss) in the future" (from 1 being in the near future to 11 being in the far future)". The fourth question states "Please rate the effectiveness of TRX's management at managing its operation (from 1 being not effective at all to 11 very effective)". The last question states: "Please rate the risk of investing in TRX's stock (from 1 very low risk to 11 very high risk)". In addition, we obtain demographic information from the participants, such as gender, education level, and working/investment experience.²

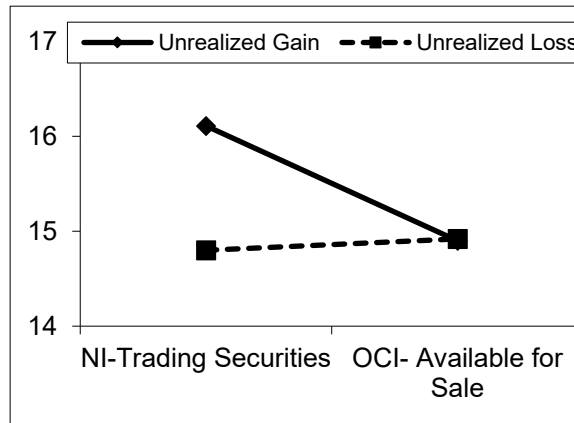
5. Results

In the experiment, we elicited five judgments, perception of value relevance, predictability, persistency, risk judgment, and management effectiveness. The means of these judgments are plotted in Figure 1. To ensure these judgments are unique and do not capture the same underlying construct, we conduct a reliability test. The Cronbach alpha coefficient, which measures the consistency among these five variables is 0.57, suggesting that each measure captures a relatively unique aspect of the investment judgment (Nunnally 1978; Peterson 1994). We therefore analyze the effect of our independent variables on each measure separately. For each variable, we conduct a 2×2 analysis of variance (ANOVA).

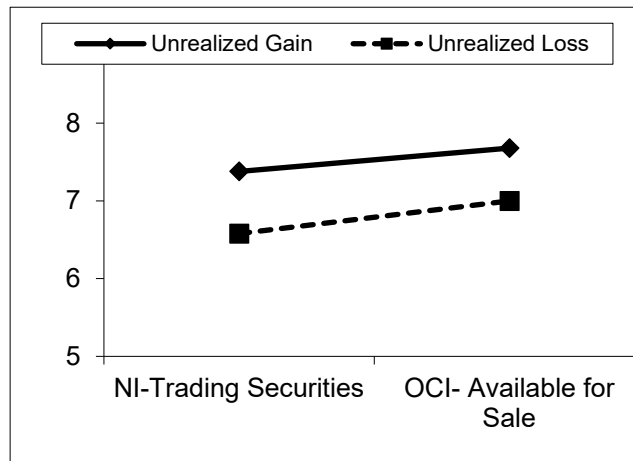
We utilize two methods for our analysis: ANOVA and contrast coding, both of which are commonly used for analyzing experimental results in accounting research. ANOVA (analysis of variance) is a statistical method that compares the means of three or more groups to determine if there are significant differences between them (Montgomery 2019). It is efficient for simultaneously comparing the four groups in our experiment and helps identify where and how strong the differences are. Contrast coding, on the other hand, is a statistical technique used to test specific hypotheses about the differences between group means. When a specific pattern of cell means is predicted, contrast coding allows for direct testing of these predictions by creating contrasts, which are linear combinations of the group means (Buckless and Ravenscroft 1990; Guggenmos et al. 2018).

Panel A is related to the judgment of future performance. Participants are asked to determine the strength of TRX's future financial performance (or overall financial health, including earnings and cash flow in the future) (1 being very weak, 11 being very strong). Panel B is related to the perceived persistence of unrealized gain/loss. Participants are asked to indicate how long it takes for the unrealized gains related to TRX's investment to be realized as net income in the future" (1 being in the near future, 11 being in the far future). Panel C is related to the judgments about management effectiveness. Participants are asked to rate the effectiveness of TRX's management at managing its operation (1 being in effective at all, 11 being very effective). Panel D is related to risk judgments. Participants are asked to rate the risk of investing in TRX's stocks (1 being very low risk, 11 being very high risk).

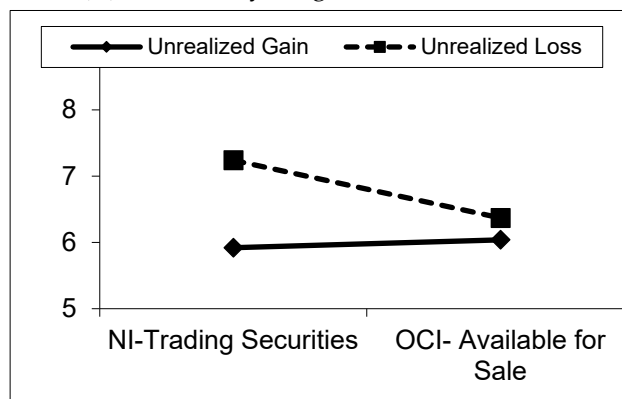
Panel (A): P/E Multiple Judgments



Panel (B): Predictability Judgments

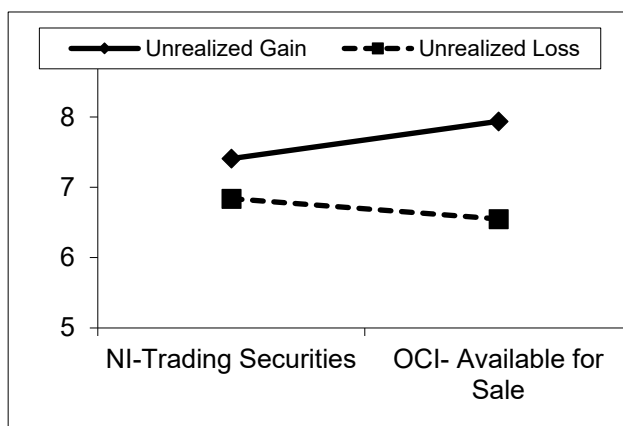


Panel (C): Persistency Judgments



Panel (D): Management Effectiveness.

Figure 1. Cont.



Panel (E): Risk Judgments.

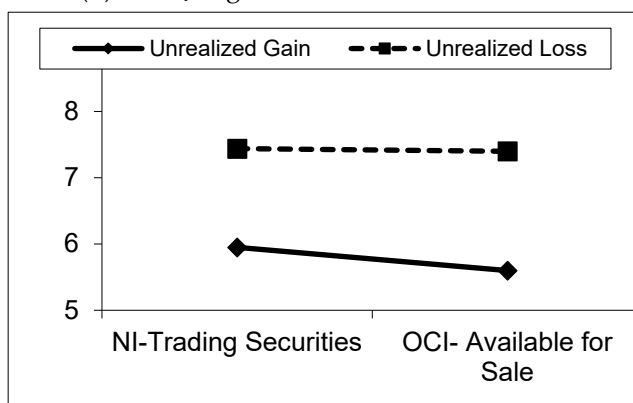


Figure 1. Judgments of decision usefulness.

5.1. Test of Hypotheses

Descriptive statistics for participants’ perceived P/E judgments are provided in Table 1, Panel A. We conducted an analysis of variance (ANOVA). As expected, we find a significant main effect of gain/loss ($F(1,175) = 3.38, p < 0.05$, one-sided). On average, participants provided higher P/E multiples when the company’s investment resulted in an unrealized gain (mean of 15.51) compared to an unrealized loss (14.86). This suggests that participants react to the direction of unrealized items and recognize the differential economic impact between unrealized gains and losses. We did not observe a significant effect of NI vs. OCI presentation, but we observed a marginally significant interaction between independent variables ($F(1,175) = 3.60, p = 0.06$).

This table presents the means (std) for valuation judgment. Participants are asked to select a P/E multiple between 10 and 20 with the knowledge that, all else equal, higher P/E multiples result in higher stock prices by dragging the slider from 10 to 20. They are also told that “Firms in the same industry as TRX have historically had trailing P/E multiples ranging from 10 to 20 times reported net income”.

Our hypotheses, in essence, predict an ordinal interaction between presentation and direction, and a main effect of direction. Because we predict a specific pattern of cell means, contrast coding is the most appropriate and most powerful means of testing our hypotheses (Buckless and Ravenscroft 1990; Guggenmos et al. 2018). Consistent with our predictions, our specific contrast weights are as follows: +3 in the NI/unrealized gain condition (A), −1 in the OCI/unrealized gain condition (B), −1 in the NI/unrealized loss condition (C), and −1 in the OCI/unrealized loss condition (D). With these contrast codes, we not only test for a main effect between the unrealized gain and unrealized loss conditions (which is shown in the conventional analysis of variance) but also a specific type of interaction effect of gain/loss and presentation. The first two weights reflect our expectation that participants would incorporate unrealized gain more easily when it is included in the net

income than Other Comprehensive Income. The next two weights provide evidence that the incorporation of unrealized losses does not differ across presentation forms. The same value we assigned to the second and third weights indicates that investors are indifferent about the direction of OCI items because of a lack of prior knowledge of OCI. We assigned a lower average weight in the OCI than in the NI condition because we expect that investors react to the presentation format and thus integrating OCI is more difficult than NI.

Table 1. P/E multiple judgments.

Panel A: Means (Standard Deviation) for P/E				
	NI-Trading Securities	OCI-Available for Sale	Row Means	
Unrealized Gain	16.11 (1.58) N = 37	14.90 (2.76) N = 50	15.51	
Unrealized Loss	14.80 (2.40) N = 55	14.92 (2.30) N = 38	14.86	
Column Means	15.46	14.91		
Panel B: Analysis of Variance Results				
Source	df	MS	F	p-value
Direction (Unrealized Gain or Loss)	1	18.10	3.38	0.07
Presentation (OCI or NI)	1	12.91	2.41	0.12
Presentation X Direction	1	19.30	3.60	0.06
Error	175	5.01		
Panel C: Residual Between-Cells Variance Test				
Source	df	MS	F	p-value
[+3, -1, -1, -1] Contrast	1	44.56	8.311	0.00
Residual between-cells variance	2	0.56	0.10	0.90
Total between-cells variance	3	15.23	2.84	0.04
Error	176	5.36		
Contrast effect size, r ²	98%			
Panel D: Simple Effects				
		Mean Diff.	t	p-value
Unrealized Gain	NI vs. OCI	1.28	2.45	0.02
Unrealized Loss	NI vs. OCI	-0.12	-0.25	0.81
NI	Unrealized Gain vs. Loss	1.31	2.71	0.01
OCI	Unrealized Gain vs. Loss	-0.02	-0.04	0.97

Table 1, Panel C presents the results of the hypothesized contrast. We find that the contrast is significant ($F(1,176) = 8.31, p\text{-value} = 0.00$), which is consistent with our main and interaction effect predictions. Further, our (r^2) calculation of the effect size indicates that our planned contrast explains 98% of the between-cells variation in our P/E measure, with the residual variation not captured by the planned contrast being insignificant ($F(1,176) = 0.10, p = 0.90$). Taken together, these results indicate that our planned contrast adequately explains the variation in our measure (Guggenmos et al. 2018).

Table 1, Panel D presents the simple effects tests. We find that there is a significant difference between P/E judgments across presentation formats in the unrealized gain condition ($t = 2.45, p = 0.02$). Specifically, the higher P/E judgment in the NI presentation condition suggests that an unrealized gain is easier to incorporate into net income than it is

in the OCI presentation condition, which supports H1. In the unrealized loss condition, the P/E judgments do not differ across the presentation formats ($t = -0.25, p = 0.81$). Consistent with H2, this evidence suggests that participants are not sensitive to the presentation format facing unrealized loss, potentially due to the general tendency of loss aversion.

In summary, our experimental results suggest that investors can differentiate between the impacts of Other Comprehensive Income (OCI) and net income (NI) when the unrealized item is positive, assigning higher valuations when the unrealized gain is included in NI rather than OCI. However, when it comes to unrealized losses, investors do not distinguish between OCI and NI, as their judgments remain consistent across both conditions. Investors generally dislike unrealized losses, assigning lower valuations to these losses regardless of whether they are included in NI or OCI.

5.2. Additional Analysis

In this section, we discuss other aspects of OCI decision usefulness and judgments related to predictability, persistency, management effectiveness, and risk. The descriptive statistics of these judgments are presented in Table 2, and the ANOVA results are presented in Table 3. First, we examine the perceived predictability. Participants are asked to determine the strength of TRX's future financial performance (or overall financial health, including earnings and cash flow in the future) on an eleven-point scale (from 1 being very weak to 11 being very strong). The descriptive statistics are presented in Table 2, Panel A. We find a significant main effect of gain/loss ($F(1,175) = 6.05, p = 0.02$), but the main effect of NI vs. OCI presentation and the interactions between these two factors are not significant (See Table 3, Panel A). As expected, participants predicted higher future performance when the company's investment results in an unrealized gain (mean of 7.53) than when it results in an unrealized loss (6.79). Table 2, Panel B presents the means (std) for perceived persistence. Participants are asked to indicate the length of time it takes for the unrealized gains or losses related to TRX's investment to be realized as net income in the future (from 1 being in the near future to 11 being in the far future) on an eleven-point scale. The ANOVA shows that the main effect of gain/loss is significant ($F(1,175) = 2.56, p = 0.02$) but none of the other effects are significant (see Table 3, Panel B). It appears that participants believe that it takes longer for an unrealized loss compared to an unrealized gain to be realized into real gain and loss. Panel C presents the means (std) for management's effectiveness in managing its operation. The ANOVA shows a significant main effect of gain and loss ($F(1,175) = 10.36, p = 0.00$), as participants deem management more effective when the company has an unrealized gain than a loss. None of the other effects are significant. Panel D presents the means (std) for the risk of investing in TRX's stock (from 1 being very low risk to 11 being very high risk). The ANOVA shows a significant main effect of the direction of the unrealized gain or loss. Therefore, the participants judge the investment risk significantly higher when there is an unrealized loss (mean = 7.42) compared to an unrealized gain (5.72).

Table 2 presents the means (std) for other judgments. Panel A is related to the judgment of future performance. Participants are asked to determine the strength of TRX's future financial performance (or overall financial health, including earnings and cash flow in the future) (1 being very weak, 11 being very strong). Panel B is related to the perceived persistence of an unrealized gain/loss. Participants are asked to indicate how long it takes for the unrealized gain related to TRX's investment to be realized as net income in the future (1 being in the near future, 11 being in the far future). Panel C is related to the judgments about management effectiveness. Participants are asked to rate the effectiveness of TRX's management at managing its operation (1 being not effective at all, 11 being very effective). Panel D is related to the risk judgments. Participants are asked to rate the risk of investing in TRX's stocks (1 being very low risk, 11 being very high risk).

Table 2. Other judgments related to OCI (means (standard deviation)).

Panel A: Judgments about Future Performance (Predictability)			
	NI-Trading Securities	OCI-Available for Sale	Row Means
Unrealized Gain	7.38 (1.63) N = 37	7.68 (1.73) N = 50	7.53
Unrealized Loss	6.58 (2.39) N = 55	7.00 (1.95) N = 38	6.79
Column Means	6.98	7.34	
Panel B: Judgments about Realization of Unrealized Gain/Loss (Persistency)			
Unrealized Gain	5.95 (2.50) N = 37	6.04 (2.27) N = 50	6
Unrealized Loss	7.24 (2.26) N = 55	6.37 (2.24) N = 38	6.81
Column Means	6.6	6.21	
Panel C: Management Effectiveness Judgments			
Unrealized Gain	7.41 (1.79) N = 37	7.94 (1.71) N = 50	7.71
Unrealized Loss	6.84 (2.23) N = 55	6.55 (2.23) N = 38	6.72
Column Means	7.13	7.25	
Panel D: Risk Judgments			
Unrealized Gain	5.95 (2.03) N = 37	5.60 (1.73) N = 50	5.77
Unrealized Loss	7.44 (2.17) N = 55	7.40 (1.88) N = 38	7.42
Column Means	6.7	6.5	

Table 3 presents the ANOVA for other judgments. Panel A is related to the judgment of future performance. Participants are asked to determine the strength of TRX’s future financial performance or overall financial health, including earnings and cash flow in the future (1 being very weak, 11 being very strong). Panel B is related to the perceived persistence of unrealized gain/loss. Participants are asked to indicate how long it takes for the unrealized gains related to TRX’s investment to be realized as net income in the future” (1 being in the near future, 11 being in the far future). Panel C is related to the judgments about management effectiveness. Participants are asked to rate the effectiveness of TRX’s management at managing its operation (1 being not effective at all, 11 being very effective). Panel D is related to the risk judgments. Participants are asked to rate the risk of investing in TRX’s stocks (1 being very low risk, 11 being very high risk).

In addition, we collect data on self-insights in the post-experimental questions about the weights assigned for NI, OCI, and CI when participants evaluate the case (the total must add up to 100%). The averages show that participants assigned a much higher weight for net income (mean = 50%) than Other Comprehensive Income (mean = 24%) and Comprehensive Income (mean = 26%). For net income, a two-way ANOVA shows no other effects except for a main effect of unrealized gain and loss ($F(1,176) = 6.78, p = 0.01$), suggesting that participants assigned more weight to net income when there is an unrealized gain (mean = 54%) compared to a loss (mean = 47%). None of the effects are significant for the weights related to Other Comprehensive Income.

Moreover, we ask two questions related to self-knowledge about OIC and UGA on an 11-point scale. The ratings on self-knowledge on both items are quite low. The mean (std) of knowledge about Other Comprehensive Income is 4.56 (2.69), and the mean of

unrealized gains and losses related to investments is 4.47 (2.62). They do not vary across all four experimental conditions. This supports our conjecture that nonprofessional investors have limited knowledge about OCI.

In summary, the results of the additional analysis suggest that participants have limited knowledge about OCI and do not appear to have a good understanding of OCI in terms of its decision usefulness related to predictability, persistency, management effectiveness, and risk.

Table 3. ANOVA results for other judgments related to OCI.

Panel A: Judgments about Future Performance (Predictability)				
Source	df	MS	F	<i>p</i> -value
Direction (Unrealized Gain or Loss)	1	23.82	6.05	0.02
Presentation (OCI or NI)	1	5.66	1.44	0.23
Presentation X Direction	1	0.15	0.04	0.85
Error	175	3.4		
Panel B: Judgments about Realization of Unrealized Gain/Loss (Persistency)				
Direction (Unrealized Gain or Loss)	1	12.84	2.56	0.02
Presentation (OCI or NI)	1	2.45	0.49	0.27
Presentation X Direction	1	7.14	1.42	0.17
Error	175	5.03		
Panel C: Management Effectiveness Judgments				
Direction (Unrealized Gain or Loss)	1	41.82	10.36	0
Presentation (OCI or NI)	1	0.69	0.17	0.68
Presentation X Direction	1	7.32	1.81	0.18
Error	175	3.46		
Panel D: Risk Judgments				
Direction (Unrealized Gain or Loss)	1	117.92	30.59	0
Presentation (OCI or NI)	1	1.64	0.43	0.52
Presentation X Direction	1	1.01	0.27	0.61
Error	175	3.86		

6. Conclusions

This study examines how investors incorporate unrealized gains or losses reported in Other Comprehensive Income (OCI) into their investment judgments. Since unrealized gains or losses can be presented in either OCI or net income—gains from trading securities are included in net income, while those from available-for-sale securities are reported in OCI (ASC 320 and ASC 851)—it raises the question of whether OCI items are perceived as equally significant as net income items. To explore this, we conducted a 2 × 2 experiment with 240 nonprofessional investors, manipulating the presentation of unrealized items in either net income or OCI. Our findings reveal that unrealized gains are valued significantly lower when presented in OCI compared to net income, indicating that investors see OCI-reported gains as less relevant. However, for unrealized losses, the incorporation degree remained consistent across both presentations, reflecting a general aversion to unrealized losses regardless of how they are reported.

Our study’s results highlight the limited understanding that individual investors have regarding the economic significance of Other Comprehensive Income (OCI). This points to a need for accounting standard setters to enhance guidance on OCI, improve disclosures, and provide better educational resources for individual investors. The findings suggest that clearer and more consistent reporting of OCI is essential. Standard setters may need to

revise existing standards to better communicate OCI's economic importance and require improved disclosures. Additionally, preparers should consider how the presentation format of OCI and net income affects investors' perceptions and find ways to clarify OCI's relevance. Developing educational materials or sessions could also help investors better understand OCI and its significance.

Our study has several limitations. First, we infer that investors do not perceive OCI gains as being as value-relevant as net income (NI) gains because their price-to-earnings (P/E) judgments are lower for the OCI treatment. Second, we focus solely on unrealized holding gains and losses on available-for-sale and trading securities, which limits our ability to generalize findings to other OCI items, such as gains and losses from foreign currency transactions or pension adjustments. Future research should investigate a broader range of OCI items. Third, we maintain a positive operating income, which may affect how OCI is interpreted; the impact of unrealized gains or losses could differ if a company is experiencing operating losses. Fourth, we must consider alternative explanations for our results, such as the realization principle, which suggests that investors assign a higher value to recognized gains, and the conservatism convention, where investors account for losses regardless of realization. Future studies should aim to eliminate these potential explanations. Lastly, we assume that the unrealized gains or losses from trading and available-for-sale securities have the same economic effects without specifying management intentions regarding holding the market securities. Participants did not differentiate between reversal dates in our experiment, suggesting that this assumption is reasonable, but future research should explore these effects in other contexts.

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Appendix A

Please assume the role of an investor. Your task is to evaluate the following company. TRX, Ltd. (the "Company") is a mid-sized specialty manufacturer of tools and is headquartered in the Midwestern U.S. The Company ships first-rate tools to carpenters, contractors, production facilities, and fabricators across North America. Due to positive cash flow in recent years, TRX's management has decided to invest extra cash in the financial market by purchasing marketable securities. During 2017, the market value of these investments fluctuates significantly.

Please assess the impact of unrealized gain (loss) related to TRX's investment in marketable securities.

The financial market has posted strong gains (losses) in 2017. TRX's investments in marketable securities are classified as trading securities (available-for-sale securities) and the valuation has gone up (down) by USD 60,000. In accordance with the General Accepted Accounting Principles (GAAP), investments are adjusted to their current market value at the end of each year. A change in value is recognized as unrealized gain (loss) and included in "Net Income" ("Other Comprehensive Income"). In 2017, the company had USD 60,000 in unrealized gains (loss) from trading securities recognized in "Net Income" ("Other Comprehensive Income").

Condition One: Net Income and Unrealized Gain (NI-GAIN) from Trading Securities

Statement of Comprehensive Income For Year Ended 31 December 2017			
Revenues	USD 550,000		
Cost of Goods Sold	–USD 400,000		
Gross Profit		USD 150,000	
Selling, general and administrative expenses	–USD 50,000		
Income from operations		USD 100,000	
Interest revenue	USD 10,000		
Income before income tax		USD 110,000	
Income tax	–USD 22,000		
Net income		USD 88,000	
Other comprehensive income			
Unrealized gain from available for sale securities	USD 60,000		
Income tax	–USD 12,000		
Other comprehensive income		USD 48,000	
Comprehensive income			USD 136,000
Earnings per share		USD 0.88	
Shares outstanding		100,000	

The income tax rate is 20%.

Condition Two: Other Comprehensive Income and Unrealized Gain (OCI-Gain) from Available-for-Sale Securities

Statement of Comprehensive Income For Year Ended 31 December 2017			
Revenues	USD 550,000		
Cost of Goods Sold	–USD 400,000		
Gross Profit		USD 150,000	
Selling, general and administrative expenses	–USD 50,000		
Income from operations		USD 100,000	
Unrealized gain from trading securities	USD 60,000		
Interest revenue	USD 10,000		
Income before income tax		USD 170,000	
Income tax	–USD 34,000		
Net income		USD 136,000	
Other comprehensive income			
Other comprehensive income		USD 0	
Comprehensive income			USD 136,000
Earnings per share		USD 1.36	
Shares outstanding		100,000	

The income tax rate is 20%.

Condition Three: Net Income with Unrealized Loss (NI-Loss) from Trading Securities

Statement of Comprehensive Income For Year Ended 31 December 2017			
Revenues	USD 550,000		
Cost of Goods Sold	–USD 400,000		
Gross Profit		USD 150,000	
Selling, general and administrative expenses	–USD 50,000		
Income from operations		USD 100,000	
Interest revenue	USD 10,000		
Income before income tax		USD 110,000	
Income tax	–USD 22,000		
Net income		USD 88,000	
Other Comprehensive Income			
Unrealized loss from available for sale securities	–USD 60,000		
Income tax	USD 12,000		
Other Comprehensive Income		–USD 48,000	
Comprehensive income			USD 40,000
Earnings per share		USD 0.88	
Shares outstanding		100,000	

The income tax rate is 20%.

Condition Four: Other Comprehensive Income with Unrealized Loss (OCI-Loss) from Available-for-Sale Securities

Statement of Comprehensive Income For Year Ended 31 December 2017			
Revenues	USD 550,000		
Cost of Goods Sold	–USD 400,000		
Gross Profit		USD 150,000	
Selling, general and administrative expenses	–USD 50,000		
Income from operations		USD 100,000	
Unrealized loss from trading securities	–USD 60,000		
Interest revenue	USD 10,000		
Income before income tax		USD 50,000	
Income tax	–USD 10,000		
Net income		USD 40,000	
Other Comprehensive Income		USD 0	
Other Comprehensive Income			USD 40,000
Comprehensive income			USD 40,000
Earnings per share		USD 0.40	
Shares outstanding		100,000	

The income tax rate is 20%.

Notes

- 1 We hold income from operations at USD 100,000 across all four conditions. In addition, in the unrealized gain (loss) conditions, we hold Comprehensive Income constant at USD 136,000 (USD 40,000) across both presentation conditions. In the OCI condition, the unrealized gain (loss) of USD 60,000 is listed as available for sale and included in the OCI. In the NI condition, the unrealized gain (loss) of USD 60,000 is listed as trading securities and included in the net income. For the unrealized gain, in the NI condition, an unrealized gain from trading securities of USD 60,000 is added to the NI, resulting in an NI after tax of USD 136,000. There is no OCI, and the total CI is equal to USD 136,000. In the OCI condition, an unrealized gain from AVF of USD 60,000 is included in the OCI, and thus, the NI after tax remains USD 88,000. The OCI before tax is USD 60,000, and the CI is USD 136,000. For the unrealized loss, in the NI condition, an unrealized loss from trading securities of USD 60,000 is subtracted from the net income, resulting in an NI after tax of USD 40,000. There is no OCI, and the CI is equal to USD 40,000. In the OCI condition, an unrealized loss from AVF of USD 60,000 is subtracted from the OCI, and thus, the NI remains USD 88,000. The OCI is negative USD 48,000 after tax, and the CI is equal to USD 40,000.
- 2 We include two manipulation check questions. First, we ask participants to select the unrealized gain or loss that describes TRX’s investment in market securities. Second, they must select net income or Other Comprehensive Income to describe the placement (treatment) of the unrealized gain/loss related to TRX’s investment in market securities. Fifty-three participants failed to answer both questions correctly and were excluded from the analysis. In addition, we include an attention check question, “Please select “Yes” if you are a Robot, otherwise select “No”. Seven participants failed the question and were also excluded from the data set.

References

- Bamber, Linda, John Jiang, Kathy R. Petroni, and Isabel Yanyan Wang. 2010. Comprehensive Income: Who’s Afraid of Performance Reporting? *The Accounting Review* 85: 97–126. [CrossRef]
- Barker, Richard. 2004. Reporting financial performance. *Accounting Horizons* 18: 157–72. [CrossRef]
- Bratten, Brian, Monika Causholli, and Urooj Khan. 2016. Usefulness of fair values for predicting banks’ future earnings: Evidence from other comprehensive income and its components. *Review of Accounting Studies* 21: 280–315. [CrossRef]
- Buckless, Frank A., and Sue Pickard Ravenscroft. 1990. Concrast Coding: A Refinement of ANOVA in Behavioral Analysis. *The Accounting Review* 65: 933–45.
- Chambers, Dennis, Thomas J. Linsmeier, Catherine Shakespeare, and Theodore Sougiannis. 2007. An evaluation of SFAS No. 130 comprehensive income disclosures. *Review of Accounting Studies* 12: 557–93. [CrossRef]
- Chisnall, Paul. 2001. Fair value accounting: An industry view. *Balance Sheet* 9: 27–33. [CrossRef]
- Clor-Proell, Shana, Lisa Nccnce, and Brian White. 2016. How Do Experienced Users Evaluate Hybrid Financial Instruments? *Journal of Accounting Research* 54: 1267–96. [CrossRef]
- Dhaliwal, Dan, K. R. Subramanyam, and Robert Trezevant. 1999. Is comprehensive income superior to net income as a measure of firm performance? *Journal of Accounting and Economics* 26: 43–67. [CrossRef]
- Du, Ning, Jeffrey Byrne, Robert Knisley, Dwayne Powell, and James Valentine. 2024. The Role of Other Comprehensive Income in Analyst Valuation: Profitability, Perception, and Performance. *Accounting Research Journal*, in press.
- Du, Ning, Kevin Stevens, and John McEnroe. 2015. The Effects of Comprehensive Income on Investors’ Judgments: An Investigation of One Statement vs. Two-Statement Presentation Formats. *Accounting Research Journal* 28: 284–99. [CrossRef]
- Easton, Peter, and Xiao-Jun Zhang. 2017. Mixing fair-value and historical-cost accounting: Predictable other-comprehensive-income and mispricing of bank stocks. *Review of Accounting Studies* 22: 1732–60. [CrossRef]
- Elliott, W. Brooke, Frank D. Hodge, Jane Jollineau Kennedy, and Maarten Pronk. 2007. Are M.B.A. students a good proxy for nonprofessional investors? *The Accounting Review* 82: 139–68. [CrossRef]

- Farrell, Anne M., Joshua O. Goh, and Brian J. White. 2014. The Effect of Performance-Based Incentive Contracts on System 1 and System 2 Processing in Affective Decision Contexts: fMRI and Behavioral Evidence. *The Accounting Review* 89: 1979–2010. [CrossRef]
- Fochmann, Martin, Johannes Hewig, Dirk Kiesewetter, and Katharina Schüßler. 2017. Affective Reactions Influence Investment Decisions: Evidence from a Laboratory Experiment with Taxation. *Journal of Business Economics* 87: 779–808. [CrossRef]
- Guggenmos, Ryan D., M. David Piercey, and Christopher P. Agoglia. 2018. Custom Contrast Testing: Current Trends and a New Approach. *The Accounting Review* 93: 223–44. [CrossRef]
- Hirst, D. Eric, and Patrick E. Hopkins. 1998. Comprehensive income reporting and analysts' valuation judgments. *Journal of Accounting Research* 36: 47–75. [CrossRef]
- Hopkins, Patrick E. 1996. The effect of financial statement classification of hybrid financial instruments on financial analysts' stock price judgments. *Journal of Accounting Research* 34: 33–50. [CrossRef]
- Isen, Alice M. 2001. An influence of positive affect on decision making in complex situations: Theoretical issues with practical implications. *Journal of Consumer Psychology* 11: 75–85. [CrossRef]
- Jones, Denise A., and Kimberly J. Smith. 2011. Comparing the value relevance, predictive value, and persistence of other comprehensive income and special items. *The Accounting Review* 86: 2047–73. [CrossRef]
- Kahneman, Daniel, and Amos Tversky. 1979. Prospect theory: An analysis of decision under risk *Econometrica*. *Journal of the Econometric Society* 43: 263–91. [CrossRef]
- Kanagaretnam, Kiridaran, Robert Mathieu, and Mohamed Shehata. 2009. Usefulness of comprehensive income reporting in Canada. *Journal of Accounting and Public Policy* 28: 349–65. [CrossRef]
- Lerner, Jennifer S., Deborah A. Small, and George Loewenstein. 2004. Heart strings and purse strings: Carryover effects of emotions on economic decisions. *Psychological Science* 15: 337–41. [CrossRef] [PubMed]
- Libby, Robert, Robert Bloomfield, and Mark W. Nelson. 2002. Experimental research in financial accounting. *Accounting Organizations and Society* 27: 777–812. [CrossRef]
- Linsmeier, Thomas, John Gribble, Ross G. Jennings, Mark H. Lang, Stephen H. Penman, Kathy R. Petroni, D. Shores, John H. Smith, and Terry D. Warfield. 1997. An issues paper on comprehensive income. *Accounting Horizons* 11: 120–26.
- Maines, Lauren A., and Linda S. McDaniel. 2000. Effects of comprehensive-income characteristics on nonprofessional investors' judgments: The role of financial statement presentation format. *The Accounting Review* 75: 179–207. [CrossRef]
- Montgomery, Douglas C. 2019. *Design and Analysis of Experiments*, 10th ed. Hoboken: Wiley.
- Nunnally, Jum C. 1978. *Psychometric Theory*, 2nd ed. New York: McGraw-Hill.
- Ohlson, James A. 1999. On transitory earnings. *Review of Accounting Studies* 4: 145–62. [CrossRef]
- OIG. 2024. OIG: Material Loss Review of Silicon Valley Bank—Board Report 2023-SR-B-013. Available online: <http://OIG.FederalReserve.gov> (accessed on 3 November 2024).
- Peterson, Robert A. 1994. A Meta-Analysis of Cronbach's Coefficient Alpha. *Journal of Consumer Research* 21: 381–91. [CrossRef]
- Rennekamp, Kristina. 2012. Processing fluency and investors' reactions to disclosure readability. *Journal of Accounting Research* 50: 1319–54. [CrossRef]
- Rennekamp, Kristina, Kathy K. Rugar, and Nicholas Seybert. 2015. Impaired judgment: The effects of asset impairment reversibility and cognitive dissonance on future investment. *The Accounting Review* 90: 739–59. [CrossRef]
- Schwarz, Norbert, and Herbert Bless. 1992. Constructing Reality and Its Alternatives: Assimilation and Contrast Effects in Social Judgment. In *The Construction of Social Judgment*. Edited by Leonard L. Martin and Abraham Tesser. Hillsdale: Erlbaum, pp. 217–45.
- Schwarz, Norbert, and Herbert Bless. 2007. Mental construal processes: The inclusion/exclusion model. In *Assimilation and Contrast in Social Psychology*. Edited by Diederik A. Stapel and Jerry Suls. Philadelphia: Psychology Press, pp. 119–42.
- Yen, Alex C., D. Eric Hirst, and Patrick E. Hopkins. 2007. A content analysis of the comprehensive income exposure draft comment letters. *Research in Accounting Regulation* 19: 53–79. [CrossRef]

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Article

Environmental, Social, and Governance (ESG) and Firm Valuation: The Moderating Role of Audit Quality

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Abstract: This paper investigates whether the external audit quality has an impact on the link between ESG performance and firm valuation using a sample of publicly listed Nordic firms. The results from a fixed-effect panel regression show that higher ESG scores lead to higher valuation when a Big Four audit firm is engaged as the external auditor, highlighting the impact of audit quality on the the reliability of the ESG evaluation. The finding highlights the importance of intense external audits in reinforcing investors' confidence in ESG–firm valuation assessment.

Keywords: ESG; firm valuation; audit quality; Nordic countries

JEL Classification: G32; M4

1. Introduction

Several studies (e.g., Fatemi et al., 2015; Vaihekoski & Yahya, 2023) demonstrate a positive relationship between Environmental, Social, and Governance (ESG) performance and firm valuation. The positive relationship highlights the role of firms' ESG performance in enhancing stakeholder trust and long-term growth (Pong & Man, 2024). Firms with strong ESG scores are often associated with enhanced reputations, reduced risks, and improved operational efficiencies, all of which contribute to higher valuations (Verheyden et al., 2016). These benefits come from increased stakeholders' trust and the idea that good ESG practices support long-term financial stability. However, the reliability of ESG scores has recently faced significant scrutiny in the academic literature. ESG ratings have been argued to be inconsistent across providers and influenced by subjective judgments and methodological biases (Berg et al., 2021). ESG scores remain also challenging to interpret due to discrepancies in how metrics are constructed and reported, raising questions about their validity as corporate sustainability indicators despite their increasing use.

The increasing need for robust verification of the ESG activities of firms is mostly due to heavy reliance on self-reported data, which is a key challenge in ESG evaluation. According to Moneva et al. (2006), reporting frameworks like the Global Reporting Initiative (GRI) are designed to standardize sustainability reporting. However, they have been criticized for allowing selective disclosures that align corporate goals with sustainability narratives. This selective reporting frequently undermines genuine accountability. The practice, referred to as 'greenwashing', erodes stakeholder trust and diminishes the credibility of ESG metrics as dependable indicators of corporate sustainability. Further, GRI has been criticized for overlooking broader ecological justice and social equity issues and failing to ensure that reported data accurately reflect substantive sustainability efforts (Dumay et al., 2010). For instance, firms using GRI reports are not necessarily more active in addressing emissions

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reductions or improving social equity, suggesting that reporting alone does not guarantee meaningful action (Moneva et al., 2006). This reliance on self-reported data makes the credibility of ESG disclosures particularly essential, with stakeholders increasingly depending on them to make informed decisions.

Meanwhile, the direct role of audit quality in enhancing confidence in sustainability disclosures is less well documented and continues to be debated despite the widely acknowledged conclusion that high-quality audits reinforce trust in a company's financial reporting (Surya et al., 2021). This issue is fundamental given the skepticism surrounding self-reported ESG metrics. However, the potential role of audit quality lies in its ability to independently verify the accuracy and completeness of ESG disclosures, thereby reducing the risks associated with self-reported metrics. By applying rigorous auditing practices, auditors can bolster the credibility of ESG scores, enhancing their reliability as indicators of a firm's true actions. Previous research has shown that audit quality significantly affects, for example, the accuracy of a company's financial position (see Behn et al., 2008) and improves the reliability of analyst forecasts (see Jeong, 2020). This raises an important question of whether researchers can extend these same principles to ESG metrics to ensure they are not merely compliance driven but reflective of substantive sustainability efforts which could potentially be seen as value increasing. In this context, audit quality presents a promising approach to addressing the inherent shortcomings of ESG disclosures, serving as a bridge between self-reported data and stakeholder trust.

A few studies have examined the impact of audit quality on the ESG–firm performance relationship. For instance, Zahid et al. (2022) explores the moderating effect of audit quality on financial performance measures such as return on assets, revenue, and return on equity. Their findings indicate that high ESG ratings can sometimes adversely affect financial performance, particularly when firms engage Big Four auditors. However, their study is limited to financial performance metrics. It does not consider market-based valuation measures, arguably better in reflecting shareholders' perception of a firm's ability to manage, for example, environmental-related risks. Unlike other financial performance indicators, Tobin's Q used in this study provides a forward-looking perspective, capturing the broader implications of ESG performance on investor sentiment and market valuation (Fatemi et al., 2015).

Similar to Dakhli (2022), our study focuses on the relationship between firm's market valuation and ESG rating. Using Tobin's Q as a measure of valuation, we extend their analysis to the individual ESG pillars (Environmental, Social, and Governance) to assess whether audit quality has a disproportionate impact on specific aspects of firms' sustainability performance. In addition, unlike most earlier studies, we also test an alternative measure of audit quality to show that the effect on the relationship between ESG and firm valuation is robust to the choice of measure.

Furthermore, we extend the analysis by focusing on the Nordic region, where a strong culture of transparency provides an ideal setting for such analysis. Nordic countries can be also said to enjoy robust institutional frameworks with strong regulatory bodies, transparent governance, and high civic trust (Gjølberg, 2013). These features enhance the reliability of corporate disclosures and minimize the likelihood of superficial "box-ticking" ESG practices. Moreover, Nordic firms have historically engaged in proactive social and environmental initiatives, reflecting cultural norms prioritizing collective well-being and corporate accountability (Matten & Moon, 2008). The robust framework in the Nordic area reduces factors such as hidden sustainability practices or unchecked managerial discretion, making it easier to isolate the moderating role of audit quality on ESG–valuation relationships. Thus, focusing on the Nordic context provides a clearer understanding of

whether high audit quality genuinely enhances stakeholder confidence in ESG disclosures or merely ensures compliance with reporting standards.

Our results confirm a positive relationship between ESG rating and firm valuation if the firms have been audited by one of the Big Four auditors. This finding aligns with prior research by Dakhli (2022) but extends their analysis by demonstrating consistent results across all three ESG pillars. Additionally, by focusing on the Nordic region, we show that even in regions with more advanced ESG standards due to strong institutional and cultural settings, the role of audit quality in ensuring stakeholder trust in the reported ESG performance of firms is as important. This approach ensures that the significance of audit quality in the ESG–firm valuation relationship is not only due to stakeholders' mistrust due to institutional laxity or cultural decadence around sustainability requirements. The findings in this study are consistent in using audit fees as an alternative measure of audit quality. Hence, this study affirms that high audit quality reduces the likelihood of greenwashing and selective reporting while enhancing the credibility of ESG disclosures.

Essentially, this study expands existing research by revealing how high-quality auditing can reinforce the link between ESG performance and firm valuation, particularly under the unique institutional and cultural conditions found in the Nordic region. Strong legal frameworks, transparent business norms, and established stakeholder activism in Nordic economies often set a higher bar for corporate responsibility and auditing practices. By highlighting that even in a context recognized for mature sustainability agendas, robust audits remain vital to translating ESG efforts into market value, the study underscores the wide-ranging implications for policymakers, regulators, and investors elsewhere. Specifically, ensuring credible ESG disclosures and high-quality audits fosters accountability and prevents greenwashing. This outcome benefits local stakeholders and global markets seeking reliable sustainability metrics (Kolk & Van Tulder, 2010). Furthermore, this study shows that the effect of audit quality in the ESG–firm valuation link is robust to the choice of the quality measure. This is particularly important given the different opinions on the most appropriate audit quality measures in the literature (Rajgopal et al., 2021). Ultimately, the findings show that audit quality does more than validate financial statements. It can help align ESG efforts with investor confidence, while institutional and cultural traits like those in the Nordic region amplify or hinder this effect. This integrated view of governance, sustainability, and culture thus offer a template for other economies aiming to strengthen the impact of ESG initiatives on firm valuation.

The rest of the article is organized as follows. The theoretical framework, literature review, and hypothesis development are discussed in Section 2. The data and research design is presented in Section 3. Section 4 presents the main empirical results. Section 5 concludes the paper and offers suggestions for further research.

2. Theoretical Framework, Literature Review and Hypothesis Development

The connection between audit quality, institutional settings, and ESG efforts has become increasingly important in today's corporate world. Reliable auditing is crucial for building stakeholders' trust in the authenticity of a company's ESG commitments. Early studies on audit quality generally focused on the precision of financial statements and the auditor's ability to detect material misstatements (Fontaine & Pilote, 2012; Francis, 2011). This emphasis stemmed from classical agency theory, where stakeholders entrust auditors to mitigate information asymmetry between corporate management and external parties (DeAngelo, 1981; Meckling & Jensen, 1976). Yet, in the contemporary business landscape, stakeholders increasingly demand credible assurance on the non-financial facets of the business, particularly on ESG-related practices (Bose, 2020; Ferrer et al., 2020). Firms must

produce verifiable financial reports and disclose reliable ESG data, as stakeholder theory by Freeman (1984) emphasizes accountability to a broad range of stakeholders, not just shareholders. ESG disclosure, rooted in this theory, helps firms meet stakeholder expectations.

As the popularity of ESG has risen, concerns about whether firms report genuine ESG activities have raised questions about the reliability and transparency of their disclosures. In such cases, audit quality, long regarded as the cornerstone of stakeholder confidence, plays a crucial role in addressing these challenges (Surya et al., 2021). If the audits are rigorous—marked by adequate expertise, professional skepticism, and independence—corporate transparency rises, and the risk of financial misreporting becomes smaller (AL-Qatamin & Salleh, 2020; Francis, 2004). As such, earlier studies have documented several proxies to capture audit quality, such as the identity of the auditor (Big Four vs. non-Big Four), audit fees, or detected restatements (DeFond & Zhang, 2014; Francis & Yu, 2009; Hoitash et al., 2007). Higher-resourced auditors are seen to offer more profound investigative capacity, leading to more “true and fair” financial statements (Becker et al., 1998), which in turn increases shareholder, creditor, and regulator trust (Francis, 2011). This trust is crucial in securing cost-effective capital market access and a positive reputation (Surya et al., 2021).

Recent research has also found evidence that high-quality audits also influence the credibility of ESG disclosures (Dakhli, 2022). As firms adopt complex operational strategies—for instance, restructuring supply chains to reduce carbon emissions—stakeholders increasingly demand assurance that reported non-financial data accurately reflect actual practices (Pizzi et al., 2024). In addition, international frameworks such as the International Financial Reporting Standard (IFRS) S1 and S2 sustainability disclosure standards, or more advanced regulations like the European Union’s (EU) Corporate Sustainability Reporting Directive (CSRD), compel companies and their auditors to scrutinize environmental and social metrics (Bose, 2020). Against this backdrop, the auditor’s role has expanded from a purely financial gatekeeping function to validating whether carbon targets, workforce welfare, or ethical supply-chain measures stand up to scrutiny (Ferrer et al., 2020). In effect, rigorous audits mitigate the risk of “greenwashing”, where firms might exaggerate or fabricate ESG accomplishments to attract socially responsible investments or to appease stakeholder activism (Delmas & Burbano, 2011).

In the same way, the institutional environment—comprising legal structures, cultural norms, and regulatory enforcement—significantly modulates the interplay between audit quality and ESG disclosures (Aguilera et al., 2007; North, 1990). In contexts featuring a strong rule of law, coherent stakeholder activism, and effective enforcement, high audit quality aligns powerfully with ESG reporting, reinforcing corporate trust. For example, the EU’s updated sustainability directives require extensive disclosures, prompting deeper collaboration between companies and auditors to guarantee accuracy in metrics such as emissions, workplace inclusivity, or community impact (Kinderman, 2020). By contrast, emerging or transitioning markets may exhibit weaker institutions, resulting in more superficial ESG adoption or audits, often creating a trust deficit among investors and regulators (Arora & Dharwadkar, 2011; Dam & Scholtens, 2012). In such settings, insufficient enforcement may allow unverified claims of carbon neutrality or social responsibility to go unscrutinized, leaving stakeholders exposed to undisclosed risks (Delmas & Burbano, 2011).

Importantly, consistent auditing standards, when rigorously applied, can strengthen institutional frameworks over time (Chang et al., 2008). This is particularly relevant in ESG domains, where reporting norms remain unevenly distributed across geographies and industries (Ferrer et al., 2020). The availability of robust external assurance fosters a culture of compliance and transparency, as firms that voluntarily subject themselves to high-caliber audits signal a proactive stance on risk management (Pincus et al., 1989; Pizzi et al., 2024). Additionally, stakeholders grow more confident when companies recognize and address

potential financial, environmental, or reputational vulnerabilities (AL-Qatamin & Salleh, 2020). A thorough audit bridges the gap between a company's stated ESG commitments and their practical implementation, particularly in contexts with strong institutional oversight. This highlights the importance of audit quality for ESG initiatives, which are inherently less standardized and more challenging to measure consistently than financial metrics (Bose, 2020). Overall, an auditor's scrutiny of internal controls, including how sustainability data are collected, aggregated, and reported, boosts reliability and reduces the threat of inadvertent errors and deliberate manipulations (Trotman & Duncan, 2018). Hence, audits promote stakeholder trust by confirming that management has instituted robust governance mechanisms to identify and mitigate corporate risks (Chang et al., 2008).

Furthermore, as ESG reporting standards have evolved, as illustrated by IFRS S1 and S2 in 2023 or the EU's CSRD entering into force, the symbiosis between audit quality and sustainability disclosures has become increasingly central (Bose, 2020). The alignment with recognized frameworks demands thorough verification practices, implying that an auditor's contribution extends into non-financial realms. Regulatory standards and auditors' credible verification can yield significant positive outcomes for firms. For instance, credible ESG data can secure a more substantial market valuation, as some socially responsible investors reward transparent sustainability practices (Ferrer et al., 2020; Friede et al., 2015). Thus, quality audits reinforce stakeholders' confidence in a company's overall reporting and operations, both financial and non-financial (Surya et al., 2021). Shareholders, for example, depend on audits to confirm accurate representations of financial health—a perspective strongly supported by evidence of higher earnings management in firms with lower audit quality (Becker et al., 1998). The same dynamic applies to sustainability and risk controls, where a comprehensive audit signals a well-managed organization capable of meeting regulatory responsibilities and mitigating unanticipated financial or reputational setbacks (AL-Qatamin & Salleh, 2020; Pincus et al., 1989). In the end, robust ESG disclosure and high audit quality eventually strengthen organizational legitimacy, especially in mature institutional contexts. Where strong legal oversight or stakeholder activism is lacking, even thorough ESG reporting can go under-validated if audits remain superficial or compromised by low independence (Arora & Dharwadkar, 2011; Dam & Scholtens, 2012).

In summary, the theoretical framework suggests that enhanced audit quality strengthens stakeholder trust in financial and ESG disclosures, with institutional conditions acting as a catalyst or a barrier to such a combination. Properly functioning institutions reinforce accountability, while weaker ones allow rhetorical claims to overshadow substantive action. As companies continue integrating sustainability into strategic goals—prompted by evolving standards like IFRS S1/S2 and the EU CSRD—verifiable ESG commitments grow in significance for external stakeholders (Bose, 2020). By evaluating both financial and ESG data rigorously, high-quality audits instill confidence in the company's capacity for sustainable growth, thus cementing trust among shareholders, employees, customers, and regulators alike. Consequently, one can anticipate that improved audit quality contributes positively to the ESG–firm valuation relationship, as reliability in sustainability disclosures improves the firm's reputation and market standing. Hence, we propose the following testable hypothesis:

Hypothesis 1. *The audit quality has a positive and significant effect on the ESG–firm valuation relationship.*

3. Research Design

3.1. Data

To analyze the role of audit quality in the ESG relationship with firm valuation, we use the auditor data of publicly listed firms on the Nordic (Denmark, Finland, Iceland, Norway, and Sweden) stock exchange from 2010 to 2022. All publicly listed companies on Nordic exchanges for which we have data on the auditor, financial performance, and ESG scores at least for one year are included in the sample. Auditor data are from the Center for Corporate Governance (CCG)—Copenhagen Business School. According to the Center, the data are from various data sources and methods, harmonized, and quality checked. The detailed data description, including sources and collection method, is available on request from the Center. The data from the Center cover the years 2010 to 2019, and they are augmented with data from 2020 to 2022 from the Orbis database. ESG scores, financial data, and the Global Industry Classification Standard (GICS) for the firms are taken from the LSEG Workspace (Eikon). Our final sample consists of about 2757 firm-year unbalanced observations for 319 firms (42 firms are from Denmark, 55 from Finland, 5 from Iceland, 60 from Norway, and 157 from Sweden).

3.2. Variables and Model Specification

The dependent variable in this study is Tobin's Q, commonly used as a forward-looking valuation measure, approximated by the ratio of a firm's market capitalization value to the book value of its assets (Chung & Pruitt, 1994; Lawrence et al., 2011). In the estimation, we use the natural logarithm of the value. There are two main independent variables. The first one is the overall ESG score. It aggregates a firm's performance across environmental, social, and governance components (Friede et al., 2015). The overall ESG score is replaced in different models with the environmental score (E), the social score (S), and the governance score (G) to explore how specific aspects of ESG are related to firm valuation (Gompers et al., 2003; Hassel et al., 2005; Lins et al., 2017).¹ The second main independent variable is *Big_4*, a binary indicator that gets value one if a firm is audited by one of the Big Four auditors—Klynveld Peat Marwick Goerdeler (KPMG), PricewaterhouseCoopers International Limited (PwC), Ernst & Young (EY), or Deloitte. This variable is widely accepted as a proxy for audit quality (Che et al., 2020; Khurana & Raman, 2004).

To test our hypothesis, we run the following unbalanced panel regression model:

$$\text{Ln_Tobin's } Q_{it} = \beta_0 + \beta_1 \text{ESG}_{it} + \beta_2 \text{Big_4}_{it} \times \text{ESG}_{it} + \text{Controls} + \text{firm}_i + \text{year}_t + \epsilon_{it}, \quad (1)$$

where *Ln_Tobin's Q_{it}* is the natural logarithm of the ratio of the market value of the company assets to the replacement cost at the end of the year. In practice, we proxy replacement cost by adding equity book value to the liabilities book value. The ESG score variable *ESG_{it}* is used in the baseline model, whereas its pillar scores (*E*, *S*, and *G*) are used in alternative models. *Big_4_{it}* is an audit quality indicator variable that is one if firm *i* has one of the four big audit firms as the auditor in year *t* and zero otherwise. *Big_4_{it} × ESG_{it}* is the interaction term between the ESG score and audit quality indicator variable. To study the robustness of the findings, we also use audit fees, calculated as the ratio of audit fees to total fees (total fees include non-audit fees paid to auditors) as an alternative measure of audit quality similar to Rajgopal et al. (2021). *Controls* stands for the control variables as defined earlier. Finally, *firm_i* and *year_t* are firm and year fixed-effect controls in our model.

To ensure reliable results, several key control variables are included in the analysis. The first group of variables control for the nature of the client–auditor relationship. First, *Auditor_Tenure*, measured as the natural log of the number of years since the auditor's ap-

pointment, is utilized to account for the accumulated client-specific knowledge an auditor develops over time (Carey & Simnett, 2006; Garcia-Blandon et al., 2020). Second, *Auditor_Change* is an indicator variable that equals one if the firm switched auditors in a given year. This variable is used to reflect disruptions in auditor continuity due to, for example, mandatory rotation, the potential signaling of dissatisfaction with prior audit quality, or conflicts over audit findings (Hackenbrack & Hogan, 2005). Third, *Change_to_Big_4*, which is a binary indicator that equals one if a firm switched from a non-Big Four auditor to one of the Big Four. It is used to account for a firm's desire to strengthen perceived audit rigor (Lawrence et al., 2011).

Other control variables include *Firm_Size*, measured as the natural logarithm of total assets, reflecting both resource availability for sustainability and external monitoring intensity (Clarkson et al., 2008). *ROA*, defined as earnings before interest and taxes over total assets similar to Demerjian et al. (2012), is used to measure profitability. It is used to control for baseline operating performance that might influence both ESG investment and firm valuation. *Leverage*, measured as the debt-to-equity ratio, is expected to capture a firm's capital structure choices and associated risk (Jiang et al., 2019). *Book_to_Market* variable is used to distinguish growth from value firms (Fama & French, 1992). *Board_Gender_Diversity* is to account for governance characteristics linked to broader stakeholder perspectives and decision-making dynamics (Terjesen et al., 2009). It is measured as the ratio of female to male board members. *Board_Size* is measured as the natural logarithm of the total number of members in the board. It is used to account for variations in board capacity and complexity (Raheja, 2005). A list of the variables with definition and support from the literature is presented Appendix A.

4. Empirical Results and Discussion

4.1. Descriptive Statistics

Table 1 provides the descriptive statistics for the variables used in this study.² The average logarithm of Tobin's Q is 0.55 (corresponds to a Tobin's Q of 1.733), which aligns with the expectation of relatively highly valued, growth-oriented firms in the Nordic stock exchange. The average ESG score is 50.53 with a standard deviation of 18.69, showing wide dispersion in the ESG performance. Financial metrics suggest moderate health and potential for sustainable investments during the sample period, with an average return on assets at 2%, leverage at 21%, and a book-to-market ratio of 0.6. The board characteristics reveal 25% gender diversity (i.e., the average proportion of women to men on the company board) and a large board size of 2.6 (corresponding to about 14 members on average).

The Pearson correlation matrix in Table 2 indicates a negative correlation between firm valuation and ESG scores, possibly reflecting the notion that ESG initiatives impose short-term costs or divert resources from more immediate profit-generating activities as documented in earlier studies (see Brammer & Millington, 2008; Lee & Faff, 2009). In this case, market participants might regard sustainability investments as liabilities, particularly if metrics are hard to verify. The inconsistent reporting standards and occasional "green-washing" concerns can exacerbate skepticism, undermining the perceived value of higher ESG scores (Delmas & Burbano, 2011; Krüger, 2015). Overall, this negative correlation does not necessarily imply that strong ESG performance undermines firm value; rather, it reflects how firm characteristics and market expectations about growth, risk, and returns can shape the observed relationship between ESG activities and valuation measures.

Table 1. Descriptive statistics.

	N	Mean	St. Dev.	Min	Median	Max
Ln(Tobin’s Q)	2318	0.55	0.78	−2.45	0.29	5.54
ESG	2757	50.53	18.69	1.22	50.57	92.25
E	2755	46.67	26.97	0.00	46.44	98.43
S	2755	52.62	21.18	0.58	54.09	96.39
G	2757	51.16	22.43	1.24	52.91	98.56
ROA	2304	0.02	0.15	−3.26	0.03	0.78
Firm_Size	2341	21.41	2.15	14.84	21.46	27.24
Leverage	2302	2.14	17.62	−7.25	0.75	570.51
Book_to_Market	2320	0.60	25.00	−794.10	0.51	1077.57
Board_Size	2757	2.62	0.54	0.69	2.48	4.70
Board_Gender_Diversity	2757	0.25	0.18	0.00	0.25	0.64
Big_4	2757	0.22	0.42	0.00	0.00	1.00
Auditor_Tenure	2757	2.94	2.16	0.00	2.00	13.00
Change_to_Big_4	2648	0.02	0.13	0.00	0.00	1.00
Auditor_Change	2648	0.08	0.28	0.00	0.00	1.00
Audit_Fees	2191	13.10	1.43	8.85	12.97	19.25

Ln(Tobin’s Q) is a measure of firm valuation calculated as the ratio of the market value of the company’s assets to the replacement cost of those assets. ESG is the overall score (i.e., the weighted average of the environmental, social, and governance pillars), and E, S, and G are the environmental, social, and governance individual pillar scores. ROA, i.e., the return on asset calculated as the earnings before interest and taxes over the total assets of the firm; Firm_Size, i.e., the natural log of total assets; leverage, i.e., the debt–equity ratio of the firm; Book_to_Market, i.e., the ratio of the firm’s book value (total assets minus total liabilities) to its market value (market capitalization); Board_Size, i.e., the natural log of number of board members of the firm; Board_Gender_Diversity, i.e., the proportion of females to males on the board of a firm in a year; Big_4, i.e., an indicator variable that is one if the firm is audited by any of the Big Four audit firms and zero otherwise; Auditor_Tenure, i.e., the number of years (annual) the auditor has been with the firm; Change_to_Big_4, i.e., an indicator variable that is one if the auditor has changed to a Big_4 audit firm from the previous year and zero otherwise; Auditor_change, i.e., an indicator variable that is one if the auditor has changed from the previous year and zero otherwise; Audit_Fees, i.e., the ratio of audit fees to total fees paid to auditor in a year.

4.2. Univariate Analysis

Our initial analysis examines whether or not having a Big Four auditing firm has an impact on the variables of interest. We conduct standard difference in means tests for continuous variables in this study. The results reported in Table 3 show a lower average Tobin’s Q for Big Four-audited firms.³ Big Four auditors typically attract more mature, asset-intensive firms with fewer high-growth opportunities. These characteristics often translate into lower market-to-book valuations and thus a lower Tobin’s Q. In contrast, non-Big Four-audited firms often include smaller, younger, or more growth-oriented companies that can exhibit higher market valuations relative to their assets. Therefore, even with a stronger audit quality, Big Four clients’ profiles inherently predispose them to lower Tobin’s Q (see Francis, 2004 and Garcia-Blandon & Argiles-Bosch, 2018). In addition, research shows that Big Four auditors constrain aggressive financial reporting more effectively (see Becker et al., 1998; DeFond & Zhang, 2014). This heightened scrutiny can lead to more conservative accounting outcomes, which may dampen inflated valuations and result in lower market-based multiples. As a result, while the Big Four’s audits enhance credibility and reduce information risk, they can also limit the “optimistic” signals that some companies might otherwise present to the market under less rigorous audit standards.

Table 2. Pearson correlation matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1) Ln(Tobin's Q)																			
(2) ESG	-0.173 ***																		
(3) E	-0.228 **	0.816																	
(4) S	-0.154	0.888 ***	0.714 *																
(5) G	-0.079	0.703 *	0.334	0.403 *															
(6) ROA	-0.006 ***	0.205 **	0.195 *	0.217 **	0.067 ***														
(7) Firm_Size	-0.488 **	0.484 ***	0.540 ***	0.468	0.203	0.201 ***													
(8) Leverage	-0.061	0.027 ***	0.028	0.038 **	0.008	-0.034 ***	0.047 ***												
(9) Book to Market	-0.030	0.035 ***	0.025 **	0.037 *	0.019 ***	0.050 **	0.041	0.015 *											
(10) Board_Size	0.026 **	0.336 ***	0.305	0.336 **	0.148 ***	0.147 *	0.238	-0.062	0.012 ***										
(11) Board_Gender_Diversity	0.142 ***	0.097 **	0.021	0.078 **	0.105 ***	0.040	-0.137 ***	-0.003 *	-0.026	0.174 ***									
(12) Big_4	-0.154 *	0.044 ***	0.067 ***	0.092	-0.049 **	0.034 ***	0.273 ***	0.040	0.014 **	0.027	-0.170 *								
(13) Auditor_Tenure	-0.003	0.081 ***	0.108 ***	0.087 **	0.003 *	0.067	0.089 ***	-0.030 *	0.009	0.070 ***	-0.030 **	-0.014							
(14) Change_to_Big_4	-0.048 ***	0.011 ***	0.020	0.015	-0.006 ***	0.003 ***	0.099	0.005 ***	0.004	0.035	-0.032 **	0.244 ***	0.042						
(15) Auditor_Change	0.041 ***	0.036 ***	0.017 **	0.025 ***	0.047 ***	0.031	0.013	-0.011 ***	0.004	0.064 **	0.057	-0.015 ***	0.022 *	0.432					
(16) Audit_Fees	-0.129 ***	0.347	0.271 **	0.356 **	0.243	0.141	0.338 *	-0.023 *	0.008	0.239 **	0.067	0.113	0.204 ***	0.062	0.032 ***				
(17) ESG × Big_4	0.127 ***	0.168 ***	0.175 **	0.198	0.039 ***	0.050	0.289 *	0.042	0.011	0.060 ***	-0.159 **	0.947	0.006	0.230	-0.015				
(18) E × Big_4	0.131 **	0.190	0.288 *	0.214	-0.008 **	0.042 ***	0.299	0.035	0.010	0.068 ***	0.148 **	0.862 **	0.011	0.212	-0.012 ***	0.940			
(19) S × Big_4	0.116 **	0.157	0.166 **	0.224 ***	-0.007 **	0.056	0.275 *	0.044	0.012	0.061	-0.150 ***	0.939 **	0.005	0.222 ***	-0.018 *	0.984			
(20) G × Big_4	0.132	0.144 **	0.092	0.129 ***	0.137	0.035 *	0.274 *	0.044 **	0.008	0.036	-0.160 **	0.905 *	0.002 ***	0.225	-0.012 *	0.942 **	0.815 ***	0.890	

This table shows the correlation between variables in our sample. Variables are defined earlier under the variables subsection. Note that the ESG scores for each firm for year *t* are publicly announced the next year. Significance levels are denoted by *** (1%), ** (5%) and * (10%).

Table 3. Audit quality two-sample *t*-test.

	Firm Characteristics By Audit Quality		
	Big-4	Non-Big-4	Diff in Means
	(1)	(2)	(1)–(2)
N.of Obs.	882	1360	
Ln(Tobin’s Q)	0.588	1.230	−0.642 *** (9.56)
ESG	52.4	44.00	8.40 *** (6.99)
E	47.40	36.20	11.20 *** (6.93)
S	54.40	43.30	11.10 *** (8.34)
G	53.40	49.00	4.40 *** (3.25)
Firm_Size	21.20	20.00	1.20 *** (9.94)
Leverage	1.61	1.01	0.60 (1.41)
ROA	0.036	0.031	0.005 (0.06)
Book_to_Market	0.17	1.32	−1.15 (1.33)
Board_Gender_Diversity	0.282	0.248	−0.034 *** (3.36)
Board_Size	2.60	2.67	−0.07 * (1.72)
Audit_Fees	13.20	12.80	0.40 *** (4.36)

This table shows the two-sample *t*-test comparing firm sustainability and financial performance variables based on audit quality measured by the type of audit firm, i.e., Big-4 and non-Big-4. Variables are defined earlier under the variables subsection. The third column shows the difference in means with *t*-statistics in parentheses calculated with firm-level clustered standard errors. *** (*) denotes significance at the 1% (10%) level (two-sided test).

The results also show that firms audited by Big Four auditors have higher overall ESG ratings as well as environmental, social, and governance pillar scores. These findings align with earlier studies (see DeAngelo, 1981; DeFond & Zhang, 2014) suggesting that Big Four auditors might reinforce or align with broader commitments to sustainability, consistent with evidence that rigorous auditing fosters more credible disclosures. In addition, the results show that Big Four audited firms are larger which is in line with the earlier literature suggesting that Big Four-audited firms typically operate at a larger scale, which can help accommodate higher audit fees and maintain more extensive reporting procedures (Khurana & Raman, 2004). Although leverage and profitability remain relatively similar across the two groups, the Big Four-audited companies exhibit greater board gender diversity. This result aligns with the conclusion of Terjesen et al. (2009) that there is potentially a link between rigorous auditing, progressive governance practices, and stakeholder-oriented board composition.

Overall, these findings indicate that ESG and its pillar scores could be influenced by audit quality, thereby potentially influencing firm value. Finding a negative relation between audit quality and firm valuation highlights the need for a more detailed investigation where we control for the possible cross effects that may influence the relationship.

4.3. Audit Quality and the ESG–Firm Valuation Relationship

Our main analysis examines if and how the audit quality influences the relationship between ESG scores and firm valuation if we control for other possible factors using Equation (1).⁴ We use an unbalanced panel estimation approach. The Hausman test for fixed vs. random effects models indicates that fixed-effect estimation is appropriate for the model as the null hypothesis of random effects is rejected with *p*-values less than 5%. The results from the fixed-effect estimations are presented in Table 4.

Table 4. Audit quality, ESG, and firm valuation.

	Ln(Tobin's Q)			
	(1)	(2)	(3)	(4)
ESG	0.035 (0.381)			
E		−0.062 (1.077)		
S			0.050 (0.555)	
G				−0.053 (0.878)
ESG × Big_4	0.238 *** (3.681)			
E × Big_4		0.230 *** (4.129)		
S × Big_4			0.211 *** (3.449)	
G × Big_4				0.209 *** (3.367)
Firm_Size	−0.199 *** (22.335)	−0.194 *** (22.054)	−0.199 *** (21.521)	−0.196 *** (23.320)
Leverage	−0.001 *** (4.201)	−0.001 *** (4.014)	−0.001 *** (4.325)	−0.001 *** (4.022)
ROA	0.380 (1.394)	0.413 (1.475)	0.392 (1.410)	0.387 (1.420)
Book_to_Market	−0.0002 (0.214)	−0.0002 (0.211)	−0.0002 (0.227)	−0.0002 (0.202)
Auditor_Tenure	0.035 *** (3.001)	0.035 *** (3.111)	0.034 *** (2.916)	0.034 *** (2.935)
Auditor_Change	0.082 * (1.694)	0.082 * (1.687)	0.083 * (1.721)	0.083 * (1.720)
Change_to_Big_4	−0.114 (1.262)	−0.112 (1.214)	−0.111 (1.230)	−0.103 (1.148)
Board_Gender_Diversity	0.121 (1.468)	0.129 (1.602)	0.119 (1.435)	0.128 (1.554)
Board_Size	0.177 *** (4.159)	0.183 *** (4.327)	0.173 *** (4.074)	0.182 *** (4.317)
Firm and Year FE	Yes	Yes	Yes	Yes
Observations	2244	2243	2243	2244
Adjusted R ²	0.249	0.248	0.248	0.248

This table reports the results from the panel regression of Equation (1). Variables are as defined earlier under the variables subsection. The last rows include the firm and year, fixed effects, the number of observations in the model, and adjusted R². T-statistics with firm-level clustered standard errors are reported in parentheses. *** (*) denotes significance at the 1% (10%) level (two-sided test). ESG and pillar scores are scaled_down by 100 (%) for reporting.

The results show a mixed relationship between ESG (and its components) and market valuation (Tobin's Q). ESG (pillar) scores are found to have a significant positive relationship on firm valuation only if the firm is audited by the Big Four auditors.⁵ Now, given a strong positive relationship with firm valuation across all models, one can draw the conclusion that high ESG performance when coupled with superior audit quality (as signaled by a Big Four auditor) produces a positive effect on valuation for firms.⁶ Economically, this means that firms audited by a Big Four can expect a substantial and significant boost in their Tobin's Q from improvements in ESG performance, underscoring the importance of audit quality for translating ESG investments into higher market valuations. This finding follows the expectation that audit quality can positively increase investor confidence in a firm's ESG activities, thereby having a positive effect on firm valuation. These results align with the prior literature, such as Chatterji et al. (2009), which emphasized the importance of third-party validation in enhancing the perceived reliability of ESG-related practices.

The robustness of our findings is confirmed, as the moderating role of audit quality remains consistent across individual ESG pillars (environmental, social, and governance dimensions) and alternative model specifications, even when certain control variables are excluded (results are available upon request). We also consider the effect distribution to understand how the audit quality influences the ESG impact on the value of the firms in our sample, as performed in earlier studies on firm valuation (see Nguyen et al., 2018). The quantile regression results (available in Supplementary Material) indicate that the interaction between ESG and Big_4 auditors has a progressively stronger positive effect on firm valuation ($\ln(\text{Tobin's Q})$) across the 25th, 50th, and 75th quantiles, with coefficients increasing from 0.034 to 0.151.⁷ This suggests that high-quality audits amplify the valuation benefits of ESG performance more significantly for growth firms at higher quantiles of the Tobin's Q variable.

Most control variables, as expected, conform to the standard theoretical predictions. Larger firms tend to report a lower Tobin's Q, consistent with the notion that mature companies face modest growth prospects even when they display higher absolute resource capacity. By contrast, leverage emerges as only weakly negative, indicating that high financial obligations do not dramatically impair market valuations under normal circumstances. This is in line with the conclusion of Fama and French (2002). Profitability (ROA) is positively linked with Tobin's Q, illustrating how robust earnings bolster investor perceptions of long-term viability. Auditor_Tenure and Auditor_Change show small but significant signs, implying that transitions in the auditor relationship or deeper auditor familiarity can modestly influence how stakeholders interpret corporate disclosures. Meanwhile, board gender diversity and board size, governance attributes frequently discussed in corporate governance scholarship (see Gompers et al., 2003; Terjesen et al., 2009), align with the principle that more diversified and sufficiently large boards support more effective oversight, thus reflecting higher valuations. For each model, we conduct the variance inflation factor (VIF) test (results in Supplementary Material) of multicollinearity, which shows factor values lower than five for all the models. This means our results are not biased due to issues of multicollinearity (Hair et al., 2012).

4.4. Additional Consideration and Robustness Test

The validity of any finding requires scrutiny; as such, a test of robustness can either validate or invalidate the study's conclusion. Hence, we consider some alternative approaches to ascertain the strength of our findings.

First, we use an instrumental variable analysis to control for the potential endogeneity. We use ESG score averages (and corresponding individual pillar score averages) for eleven different industry sectors as instruments, as we expect them to influence valuation only

through their impact on individual ESG scores. As such, sector averages can be expected to be important in determining firm-level ESG practices, as they represent sector-wide benchmarks, reflecting the collective behavior of firms within a specific sector. As noted in Matten and Moon (2008), industry (or sector) norms are critical in guiding firm-specific strategies, particularly in areas like corporate social responsibility (CSR), where external legitimacy and adherence to sectoral standards are key. This external pressure makes sector average values highly correlated with individual firm scores, ensuring instrument relevance. Studies such as those by Flammer (2015) demonstrate that industry-wide ESG benchmarks significantly influence firm-level ESG strategies, further validating using these averages as instruments. Finally, Eccles et al. (2014) highlight that while sector ESG norms shape a firm’s ESG practices, these norms are not directly tied to a firm’s financial performance, as they operate at a broader, non-firm-specific level. The results are provided in Table 5.

Table 5. Instrumental variable analysis.

	Ln(Tobin’s Q)			
	(1)	(2)	(3)	(4)
<i>ESG × Big_4</i>	0.280 *** (2.971)			
<i>E × Big_4</i>		0.252 *** (2.806)		
<i>S × Big_4</i>			0.251 *** (3.010)	
<i>G × Big_4</i>				0.216 * (1.745)
Firm_Size	−0.158 *** (8.437)	−0.164 *** (8.350)	−0.154 *** (8.579)	−0.156 *** (7.643)
Leverage	−0.0001 (0.779)	−0.0001 (0.486)	−0.0001 (1.028)	−0.0001 (0.462)
ROA	2.799 *** (5.050)	2.797 *** (4.985)	2.769 *** (4.990)	2.865 *** (5.072)
Book_to_Market	−0.058 *** (5.967)	−0.056 *** (6.024)	−0.063 *** (6.690)	−0.053 *** (4.304)
Auditor_Tenure	0.022 * (1.756)	0.022 * (1.796)	0.020 (1.628)	0.024 ** (1.964)
Auditor_Change	0.058 (0.467)	0.042 (0.341)	0.058 (0.472)	0.030 (0.239)
Change_to_Big_4	−0.032 (0.235)	−0.007 (0.053)	−0.032 (0.236)	−0.0002 (0.001)
Board_Gender_Diversity	0.059 (0.478)	0.059 (0.468)	0.044 (0.366)	0.037 (0.292)
Board_Size	0.348 *** (5.554)	0.352 *** (5.506)	0.341 *** (5.525)	0.352 *** (5.427)
Constant	2.737 *** (7.698)	2.874 *** (7.724)	2.674 *** (7.646)	2.697 *** (7.374)
Firm and Year FE	Yes	Yes	Yes	Yes
Observations	2165	2164	2164	2165
Adjusted R ²	0.340	0.372	0.357	0.337

This table reports the two-stage least-square instrumental variable estimation results using annual sector average ESG (and E, S, G) scores as instruments. Ln(Tobin’s Q) is a measure of the firm valuation calculated as the ratio of the market value of the company’s assets to the replacement cost of those assets. ESG is the overall sustainability score, and E, S, and G are the individual environmental, social, and governance scores. Big_4 is an indicator variable with a value of one if the firm is audited by any of the Big Four auditing firms and zero otherwise. The control variables are as defined earlier. The last rows include the number of observations in the model and adjusted R². T-statistics with firm-level clustered standard errors are reported in parentheses. *** (**, *) denotes significance at the 1% (5%, 10%) level (two-sided test). ESG and pillar scores are scaled_down by 100 (%) for reporting.

Overall, the results corroborate our earlier main findings to a large extent.⁸ The positive interaction terms, although only marginally significant (at the 10% level) for the governance score, ranging from approximately 0.22 to 0.28, suggest that combining higher ESG scores

(or their components) with a Big Four audit firm significantly enhances the firm’s valuation. The control variables also show similar patterns to our baseline result, further reiterating the consistency of our findings.

Our second test considers the fact that some studies (e.g., Lawrence et al., 2011) indicate that the observed differences in audit quality between Big Four and non-Big Four firms can often be attributed to client selection effects rather than auditor practices themselves, suggesting that the “Big Four” status alone may not fully capture the intrinsic audit rigor. Further, other studies (see Francis, 2004) have claimed that even within Big Four auditors, individual office size and partner-specific traits can vary substantially, meaning that the audit outcome may hinge more on local office expertise than on the broader brand label. Hence, we use an alternative measure of audit quality—audit fees—to test Equation (1). Audit fees are calculated similarly to earlier studies (e.g., Rajgopal et al., 2021) as the ratio of audit fees to total fees (total fees include non-audit fees paid to auditors). The results are presented in Table 6.

Table 6. Alternative audit quality measure and ESG–firm valuation relationship.

	Ln(Tobin’s Q)			
	(1)	(2)	(3)	(4)
ESG	−0.814 *** (2.647)			
E		−0.835 *** (3.584)		
S			−0.979 *** (3.512)	
G				0.299 (1.088)
ESG × Audit_Fees	0.039 ** (2.050)			
E × Audit_Fees		0.046 *** (2.810)		
S × Audit_Fees			0.045 *** (2.759)	
G × Audit_Fees				0.021 (1.157)
Firm_Size	−0.185 *** (16.141)	−0.180 *** (16.049)	−0.181 *** (15.168)	−0.195 *** (18.086)
Leverage	−0.002 ** (2.300)	−0.001 ** (2.350)	−0.001 ** (2.213)	−0.002 ** (2.519)
ROA	0.188 (0.770)	0.298 (1.110)	0.249 (0.956)	0.160 (0.643)
Book_to_Market	−0.00004 (0.039)	−0.0001 (0.064)	−0.00004 (0.032)	−0.0002 (0.215)
Auditor_Tenure	0.038 * (1.712)	0.041 * (1.886)	0.036 * (1.666)	0.035 (1.580)
Auditor_Change	−0.086 (0.596)	−0.088 (0.624)	−0.097 (0.687)	−0.081 (0.551)
Board_Gender_Diversity	0.250 ** (2.413)	0.230 ** (2.295)	0.248 ** (2.417)	0.212 ** (2.065)
Board_Size	0.072 (1.552)	0.057 (1.271)	0.081 * (1.720)	0.057 (1.283)
Firm and Year FE	Yes	Yes	Yes	Yes
Observations	1820	1817	1817	1820
Adjusted R ²	0.198	0.199	0.199	0.195

This table reports the analysis results with Big_4 replaced with Audit_Fees as the audit quality measure. Audit_Fees is the ratio of audit fees to total fees (total fees include non-audit fees paid to auditors). The other variables are defined earlier under the variables subsection. The last rows include the firm and year fixed effects, the number of observations in the model, and adjusted R². T-statistics with firm-level clustered standard errors are reported in parentheses. *** (**, *) denotes significance at the 1% (5%, 10%) level (two-sided test). ESG and pillar scores are scaled_down by 100 (%) for reporting.

Contrary to Table 4, the results now show a significant and negative coefficient for the ESG and its pillar scores (except for the Governance pillar score). This results indicate an inverse relationship between the scores and firm valuation which could be explained by the fact that the number of observations has dropped by almost 20 percent from Table 4. In any case, as the interaction term is also significant (except for Governance), one needs to take into account its impact on the slope coefficient as well. In any case (except the Governance pillar score), we can draw the conclusion that the slope is significantly less negative, shown by the direct impact, as auditing fees are always non-negative. In fact, if the auditing fees are high enough, the slope becomes positive, suggesting that firms with high-quality auditing (i.e., firms incurring higher audit costs and presumably undergoing more rigorous oversight) can reassure investors of the authenticity of their ESG commitments.⁹ Nevertheless, one should be cautious with drawing too big conclusions from the results. Auditing fees may reflect also issues other than the quality of the process. At minimum, one can say that higher auditing fees influence the relationship between ESG and valuation, and in that sense, the results are in line with our earlier results.

Finally, we test a simple model, where *Big_4* is kept as the only main explanatory variable in Equation (1) to study whether the audit quality alone drives the value-enhancing effect. The results (available on request) show this is not the case (the coefficient on *Big_4* is 0.074 with *t*-value 0.785).

5. Conclusions, Limitations, and Future Research

This paper has studied whether audit quality has an impact on the relationship between ESG score and firm valuation. Our analysis shows that the relationship is influenced by high-quality audits. In practice, firms with high ESG scores and audited by the Big Four exhibit higher market valuations which is arguably due to enhanced credibility and investor confidence. For firms that are not audited by the Big Four, there is no significant relationship between ESG scores and firm valuation. The result aligns with the belief that the ESG–firm valuation relationship benefits from high-quality external validation.

Overall, our study emphasizes the critical role of audit quality, especially the presence of Big Four auditors, in strengthening the ESG–valuation link. The results show the importance of comprehensive audit procedures in indirectly supporting the reliability of ESG disclosures. High-quality audits mitigate information asymmetry and enhance transparency by ensuring accurate and reliable reporting, which is essential for investors assessing a firm’s sustainability practices. It supports the idea that combining strong ESG practices with reliable audit processes enhances a firm’s value.

Overall, the results regarding the role of the Big Four auditors is mostly consistent across different robustness tests. However, we do find partly contradictory results when we use audit fees as a measure of audit quality. The results support the idea that there is a direct impact from ESG scores to the valuation and the impact is negative. Further study is need on this issue. In addition, one limitation of our study is its focus on Nordic countries, a region known for high transparency and ESG standards, which may limit the generalization of the results to other geographic areas with different regulatory environments and cultural attitudes toward ESG practices even though it provides an invaluable benchmark. Future studies could extend the sample to firms in other regions to confirm whether the observed effects hold globally. Additionally, exploring potential temporal regulatory changes and their impact on the ESG–audit quality–valuation relationship could offer a deeper understanding of how evolving policies influence the importance of audit quality in ESG reporting. Investigating other dimensions of audit quality, such as auditor expertise in sustainability issues or the role of non-Big Four auditors, may further enrich the literature on the interplay between audit

practices and the valuation relevance of ESG information. Alternative ESG measures could also provide a valuable test for analyzing if the result of this study still holds.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/jrfm18030148/s1>, Table S1: VIF Comparison Across Models for Big 4 as Audit Quality Measure. Table S2: VIF Comparison Across Models for Audit Fees as Audit Quality Measure. Table S3: Audit quality, ESG and firm valuation without control variables. Table S4: A quadratic estimation: Audit quality, ESG, and firm valuation. Table S5: Quantile Regression Results for Distributional Effects. Table S6: First-stage Results of Instrumental Variable Regression.

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Appendix A

Table A1. Variables definition and support from the literature.

<i>Dependent variable</i> Ln(Tobin's Q)	A measure of firm valuation calculated as the ratio of the market value of the company's assets to the replacement cost of those assets, the replacement cost has been proxied by equity book value plus the liabilities book value.	See Lawrence et al. (2011)
<i>Independent variables</i>		
ESG	The overall environmental, social, and governance score.	See Friede et al. (2015)
E	The environmental pillar score of a firm's ESG.	See Hassel et al. (2005)
S	The social pillar score of a firm's ESG.	See Lins et al. (2017)
G	The governance pillar score of a firm's ESG.	See Gompers et al. (2003)
<i>Moderating variable</i> Big_4	Audit quality indicator variable that equals one if a firm is audited by the four largest auditing firms (KPMG, PricewaterhouseCoopers (PwC), Ernst & Young (EY), or Deloitte) during the year in question and zero otherwise.	See Che et al. (2020)
Audit_fees	is the ratio of audit fees to total fees (total fees include non-audit fees paid to auditors) as an alternative measure of audit quality	See Rajgopal et al. (2021)
<i>Control variables</i>		
Auditor_Tenure	The natural logarithm of the years since the auditor has been appointed in a firm.	See Garcia-Blandon et al. (2020)
Auditor_Change	Indicator variable that equals one if the auditor has changed from the last year and zero otherwise.	See Hackenbrack and Hogan (2005)
Change_to_Big_4	Indicator variable that equals one if the auditor has changed from non-Big Four to Big Four from the previous year and zero otherwise.	See Lawrence et al. (2011)
Firm_Size	The natural logarithm of total assets of the firm.	See Clarkson et al. (2008)
ROA	The earnings before interest and taxes over the total assets of the firm is the measure of profitability.	See Demerjian et al. (2012)
Leverage	The debt-to-equity ratio of the firm.	See Jiang et al. (2019)
Book_to_Market	The natural logarithm debt-to-equity ratio.	See Fama and French (1992)
Board_Gender_Diversity	The proportion of females to males on the firm's board in a year.	See Terjesen et al. (2009)
Board_Size	The natural logarithm of the number of board members of the firm in a year.	See Raheja (2005)

Notes

- ¹ Used ESG and component scores vary between 0 and 100, with higher scores indicating a better performance for the firm.
- ² Note that the number of observations here differs across variables. Regression estimations use those observations for which all variables are available for a firm in a particular year. It is a standard case in unbalanced panel regressions.
- ³ Note that reference to ‘firms audited by Big-4’ refers to only those firms and years when a Big-4 company has audited them.
- ⁴ We also estimate the model without the control variables, and the results, available in Supplementary Material , are similar to those reported here.
- ⁵ As the coefficient for the direct effect (β_1) is not statistically significant, one can consider its value to be zero, and thus, the net impact (slope) from ESG to value equals to β_2 .
- ⁶ We also re-estimate the models (results are in the Supplementary Material) using squared terms for ESG (and its pillars) to see if the relationship with the firm value is non-linear. The result is similar to linear models, suggesting that our main results are not just due to the limitations of a linear model.
- ⁷ The result available on request shows similar trends across the E, S, and G analysis.
- ⁸ Detailed analysis of the results shows that the Hansen J-test for overidentifying restrictions shows p -values greater than 0.10, confirming that the instruments are not correlated with the error term (exogeneity condition). Furthermore, the F-statistic from the first-stage regressions is above the commonly accepted threshold of 10, indicating the instruments are strongly correlated with the endogenous variables (relevance condition). The results are in the Supplementary Material.
- ⁹ For example, taking both the direct and indirect impacts into account, for example, the ESG score slope coefficient becomes $-0.814 + 0.039 \times \text{Audit_Fees}$ given the estimates in column (2). If audit fees are larger than 20.90 (the average in Table 1 was 13.10), the coefficient becomes positive, and the ESG rating has a positive impact on the firm valuation.

References

- Aguilera, R. V., Rupp, D. E., Williams, C. A., & Ganapathi, J. (2007). Putting the S back in corporate social responsibility: A multilevel theory of social change in organizations. *Academy of Management Review*, 32(3), 836–863. [CrossRef]
- AL-Qatamin, K. I., & Salleh, Z. (2020). Audit quality: A literature overview and research synthesis. *IOSR Journal of Business and Management (IOSR-JBM)*, 22(2), 56–66.
- Arora, P., & Dharwadkar, R. (2011). Corporate governance and corporate social responsibility (CSR): The moderating roles of attainment discrepancy and organizational slack. *Strategic Management Journal*, 32(3), 182–198. [CrossRef]
- Becker, C. L., DeFond, M. L., Jiambalvo, J., & Subramanyam, K. (1998). The effect of audit quality on earnings management. *Contemporary Accounting Research*, 15(1), 1–24. [CrossRef]
- Behn, B. K., Choi, J.-H., & Kang, T. (2008). Audit quality and properties of analyst earnings forecasts. *The Accounting Review*, 83(2), 327–349. [CrossRef]
- Berg, F., Fabisik, K., & Sautner, Z. (2021). Is history repeating itself? The (un)predictable past of ESG ratings. *European Corporate Governance Institute–Finance Working Paper 708/2020*. [CrossRef]
- Bose, S. (2020). Evolution of ESG reporting frameworks. In *Values at work: Sustainable investing and ESG reporting* (pp. 13–33). Springer.
- Brammer, S., & Millington, A. (2008). Does it pay to be different? an analysis of the relationship between corporate social and financial performance. *Strategic Management Journal*, 29(12), 1325–1343. [CrossRef]
- Carey, P., & Simnett, R. (2006). Audit partner tenure and audit quality. *The Accounting Review*, 81(3), 653–676. [CrossRef]
- Chang, X., Gygas, A. F., Oon, E., & Zhang, H. F. (2008). Audit quality, auditor compensation and initial public offering underpricing. *Accounting & Finance*, 48(3), 391–416.
- Chatterji, A. K., Levine, D. I., & Toffel, M. W. (2009). How well do social ratings actually measure corporate social responsibility? *Journal of Economics & Management Strategy*, 18(1), 125–169.
- Che, L., Hope, O.-K., & Langli, J. C. (2020). How Big-4 firms improve audit quality. *Management Science*, 66(10), 4552–4572. [CrossRef]
- Chung, K. H., & Pruitt, S. W. (1994). A simple approximation of Tobin’s Q. *Financial Management*, 23, 70–74. [CrossRef]
- Clarkson, P. M., Overell, M. B., & Chapple, L. (2008). Environmental reporting and its relation to corporate environmental performance. *Abacus*, 44(4), 538–568. [CrossRef]
- Dakhli, A. (2022). The impact of corporate social responsibility on firm financial performance: Does audit quality matter? *Journal of Applied Accounting Research*, 23(5), 950–976. [CrossRef]
- Dam, L., & Scholtens, B. (2012). Does ownership type matter for corporate social responsibility? *International Review of Applied Economics*, 26(6), 791–807. [CrossRef]
- DeAngelo, L. E. (1981). Auditor independence, ‘low balling’, and disclosure regulation. *Journal of Accounting and Economics*, 3(2), 113–127. [CrossRef]
- DeFond, M., & Zhang, J. (2014). A review of archival auditing research. *Journal of Accounting and Economics*, 58(2–3), 275–326. [CrossRef]
- Delmas, M. A., & Burbano, V. C. (2011). The drivers of greenwashing. *California Management Review*, 54(1), 64–87. [CrossRef]

- Demerjian, P., Lev, B., & McVay, S. (2012). Quantifying managerial ability: A new measure and validity tests. *Management Science*, 58(7), 1229–1248. [CrossRef]
- Dumay, J., Guthrie, J., & Farneti, F. (2010). GRI sustainability reporting guidelines for public and third sector organizations: A critical review. *Public Management Review*, 12(4), 531–548. [CrossRef]
- Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, 60(11), 2835–2857. [CrossRef]
- Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *The Journal of Finance*, 47(2), 427–465.
- Fama, E. F., & French, K. R. (2002). Testing trade-off and pecking order predictions about dividends and debt. *Review of Financial Studies*, 15, 1–33. [CrossRef]
- Fatemi, A., Fooladi, I., & Tehrani, H. (2015). Valuation effects of corporate social responsibility. *Journal of Banking & Finance*, 59, 182–192.
- Ferrer, E., López-Arceiz, F. J., & del Rio, C. (2020). Sustainability disclosure and financial analysts' accuracy: The European case. *Business Strategy and the Environment*, 29(8), 2939–2952. [CrossRef]
- Flammer, C. (2015). Does corporate social responsibility lead to superior financial performance? a regression discontinuity approach. *Management Science*, 61(11), 2549–2568. [CrossRef]
- Fontaine, R., & Pilote, C. (2012). Clients' preferred relationship approach with their financial statement auditor. *Current Issues in Auditing*, 6(1), P1–P6. [CrossRef]
- Francis, J. R. (2004). What do we know about audit quality? *The British Accounting Review*, 36(4), 345–368. [CrossRef]
- Francis, J. R. (2011). A framework for understanding and researching audit quality. *Auditing: A Journal of Practice & Theory*, 30(2), 125–152.
- Francis, J. R., & Yu, M. D. (2009). Big 4 office size and audit quality. *The Accounting Review*, 84(5), 1521–1552. [CrossRef]
- Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Cambridge University Press.
- Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5(4), 210–233.
- García-Blandón, J., & Argiles-Bosch, J. M. (2018). Audit partner industry specialization and audit quality: Evidence from Spain. *International Journal of Auditing*, 22(1), 98–108. [CrossRef]
- García-Blandón, J., Argilés-Bosch, J. M., & Ravenda, D. (2020). Audit firm tenure and audit quality: A cross-European study. *Journal of International Financial Management & Accounting*, 31(1), 35–64.
- Gjølberg, M. (2013). Nordic companies—global pioneers in CSR. In *CSR and beyond: A Nordic perspective*. Cappelen Damm.
- Gompers, P., Ishii, J., & Metrick, A. (2003). Corporate governance and equity prices. *The Quarterly Journal of Economics*, 118(1), 107–156. [CrossRef]
- Hackenbrack, K. E., & Hogan, C. E. (2005). Client retention and engagement-level pricing. *Auditing: A Journal of Practice & Theory*, 24(1), 7–20.
- Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, 40, 414–433. [CrossRef]
- Hassel, L., Nilsson, H., & Nyquist, S. (2005). The value relevance of environmental performance. *European Accounting Review*, 14(1), 41–61. [CrossRef]
- Hoitash, R., Markelevich, A., & Barragato, C. A. (2007). Auditor fees and audit quality. *Managerial Auditing Journal*, 22(8), 761–786. [CrossRef]
- Jeong, K. (2020). The effect of audit quality on analyst following. *Cogent Business & Management*, 7(1), 1798068.
- Jiang, J., Wang, I. Y., & Wang, K. P. (2019). Big N auditors and audit quality: New evidence from quasi-experiments. *The Accounting Review*, 94(1), 205–227. [CrossRef]
- Khurana, I. K., & Raman, K. (2004). Litigation risk and the financial reporting credibility of Big 4 versus non-Big 4 audits: Evidence from Anglo-American countries. *The Accounting Review*, 79(2), 473–495. [CrossRef]
- Kinderman, D. (2020). The challenges of upward regulatory harmonization: The case of sustainability reporting in the European Union. *Regulation & Governance*, 14(4), 674–697.
- Kolk, A., & Van Tulder, R. (2010). International business, corporate social responsibility and sustainable development. *International Business Review*, 19(2), 119–125. [CrossRef]
- Krüger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics*, 115(2), 304–329. [CrossRef]
- Lawrence, A., Minutti-Meza, M., & Zhang, P. (2011). Can Big 4 versus non-Big 4 differences in audit-quality proxies be attributed to client characteristics? *The Accounting Review*, 86(1), 259–286. [CrossRef]
- Lee, D. D., & Faff, R. W. (2009). Corporate sustainability performance and idiosyncratic risk: A global perspective. *Financial Review*, 44(2), 213–237. [CrossRef]
- Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *The Journal of Finance*, 72(4), 1785–1824. [CrossRef]

- Matten, D., & Moon, J. (2008). "Implicit" and "explicit" CSR: A conceptual framework for a comparative understanding of corporate social responsibility. *Academy of Management Review*, 33(2), 404–424. [CrossRef]
- Meckling, W. H., & Jensen, M. C. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360.
- Moneva, J. M., Archel, P., & Correa, C. (2006). GRI and the camouflaging of corporate unsustainability. *Accounting Forum*, 30(2), 121–137. [CrossRef]
- Nguyen, P., Rahman, N., & Zhao, R. (2018). CEO characteristics and firm valuation: A quantile regression analysis. *Journal of Management & Governance*, 22, 133–151.
- North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press.
- Pincus, K., Rusbarsky, M., & Wong, J. (1989). Voluntary formation of corporate audit committees among NASDAQ firms. *Journal of Accounting and Public Policy*, 8(4), 239–265. [CrossRef]
- Pizzi, S., Venturelli, A., & Caputo, F. (2024). Restoring trust in sustainability reporting: The enabling role of the external assurance. *Current Opinion in Environmental Sustainability*, 68, 101437. [CrossRef]
- Pong, H. K., & Man, F. L. C. (2024). The influence of environmental, social, and governance (ESG) perception on investor trust and brand relationship quality: A study among retail investors in Hong Kong. *Journal of Risk and Financial Management*, 17(10), 455. [CrossRef]
- Raheja, C. G. (2005). Determinants of board size and composition: A theory of corporate boards. *Journal of Financial and Quantitative Analysis*, 40(2), 283–306. [CrossRef]
- Rajgopal, S., Srinivasan, S., & Zheng, X. (2021). Measuring audit quality. *Review of Accounting Studies*, 26(2), 559–619. [CrossRef]
- Surya, D., Pratiwi, E., Wijaya, G., Permadi, H., & Suryani, I. (2021). Audit quality and its influence on stakeholder trust: A qualitative analysis. *Golden Ratio of Auditing Research*, 1(1), 34–44. [CrossRef]
- Terjesen, S., Sealy, R., & Singh, V. (2009). Women directors on corporate boards: A review and research agenda. *Corporate Governance: An International Review*, 17(3), 320–337. [CrossRef]
- Trotman, A. J., & Duncan, K. R. (2018). Internal audit quality: Insights from audit committee members, senior management, and internal auditors. *Auditing: A Journal of Practice & Theory*, 37(4), 235–259.
- Vaihekoski, M., & Yahya, H. (2023). ESG and firm performance: Evidence from the nordic countries. *Nordic Journal of Business*, 72(3), 164–189.
- Verheyden, T., Eccles, R. G., & Feiner, A. (2016). ESG for all? The impact of ESG screening on return, risk, and diversification. *Journal of Applied Corporate Finance*, 28(2), 47–55. [CrossRef]
- Zahid, R. A., Khan, M. K., Anwar, W., & Maqsood, U. S. (2022). The role of audit quality in the ESG-corporate financial performance nexus: Empirical evidence from Western European companies. *Borsa Istanbul Review*, 22, S200–S212. [CrossRef]

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