Universitat Autònoma de Barcelona

Determinants of financial reporting quality: Three essays exploring the role of managers, directors, and ownership structure

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Abstract

This thesis consists of three essays organized into three chapters. The three essays are related in that each analyzes the effect of a unique firm characteristic on financial reporting quality (FRQ). In the first essay, we consider how the gender of the CFO and the gender diversity of the board of directors affect the likelihood of restatements that occur when financial statements contain material errors. We demonstrate evidence that FRQ is improved via reduced restatement likelihood when the CFO is a woman and when more women serve on the board of directors. We also find that women on the board of directors are more effective at reducing restatement likelihood when the CFO is a woman. And we find that while female CFOs reduce restatement likelihood generally, they have no measurable effect when the board of directors is all male. We discuss the theoretical drivers of these findings. In the second essay, we expand our analysis of executive characteristics, considering how CEO age affects FRQ at a time of increasing CEO age in the United States. We find that financial statement irregularities are more prevalent when CEOs are older. This holds when pre-SOX observations are included, when retirement-aged CEO observations are excluded, when performance-based CEO compensation is controlled for, and when an instrumental variable approach is used. We find less robust evidence that abnormal decreases in discretionary expenses are more prevalent when CEOs are older as well. We also find some evidence that abnormal production costs are more prevalent when CEOs are younger. We find that clawback provisions may eliminate any effect of CEO age on FRQ. We posit that these results are driven by career concerns that evolve as CEOs age. In the third essay, we move to ownership structure. We take a comprehensive approach, considering how institutional investor ownership affects the prevalence of earnings surprises and earnings management. We find evidence that institutional investor ownership has a positive effect on earnings surprise likelihood overall, but that the relation is dynamic and heavily context-dependent with evidence of nonlinearity as well. We find evidence that IO affects accruals-based earnings management positively and real activities earnings management negatively overall. And, we find that the passage of the Sarbanes–Oxley Act plays an important role in the IO-earnings management relation.

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Chapter 1

Introduction

> Creative accounting is an absolute curse to a civilization. You can argue that one of the great inventions of man was double-entry bookkeeping, where we could keep our economic affairs under better control. . . . Now, I think a democracy is ordinarily set up so it takes a big scandal to cause much reform. And there may be some favorable fallout from Enron because that was certainly the most disgusting example of a business culture gone wrong that any of us has seen in a long, long time. . . . I think we'll always get Enron-type behavior, but it may be moderated some in the next few years. (Charlie Munger, Berkshire Hathaway annual meeting, 2002)

Financial reporting is foundational to the global economic system. Capital markets are driven by how much firms report as their earnings, their assets, their liabilities, and so on. Capital markets and their participants depend on the assumption that financial statements faithfully reflect each firm's true standing. However, the managers tasked with preparing financial statements face a profound conflict of interest. They must disclose an accurate representation of their firm's performance while their compensation, career prospects, and continued employment depend on reported earnings continually being slightly above and not slightly below the consensus analyst forecast.

Enron was one of the world's largest publicly traded firms in the year 2000 with a market valuation of about $70 billion. Of course, this valuation was based on fraudulent financial reporting and by the end of 2001, the firm was virtually worthless, its managers and independent auditor facing criminal investigations. The Enron scandal spelled ruin for thousands, many of whom were innocent of any wrongdoing. Charlie Munger was right, stating that some good could come of the scandal if it were a significant enough catalyst to spur better regulation of Enron-type behavior. Soon after his statement, the Sarbanes–Oxley Act (SOX) was passed in the United States, drastically overhauling

financial reporting regulations. He was right about another thing too, an Enron-sized scandal is unlikely in the modern regulatory environment, but there will always be Enron-like behavior.

1.1 Overview

The purpose of this thesis is to bring further clarity to our understanding of the determinants of financial reporting quality (FRQ), building on the work of previous researchers. Specifically, we focus on the effects of managerial characteristics, board of directors (BOD) characteristics, and ownership structure. According to the International Accounting Standards Board, the two fundamental characteristics of FRQ are "relevance and faithful representation". A more specific description is given by Biddle et al. (2009) who define FRQ as "the precision with which financial reporting conveys information about the firm's operations, in particular its expected cash flows, that inform equity investors" (p. 113). At times throughout the essays, we will refer to earnings quality, especially when discussing earnings management. We do not use FRQ and earnings quality interchangeably, even though they are similar concepts. Earnings quality refers specifically to the accuracy of reported earnings. It is similar to FRQ because when financial reports are inaccurate, it is typically the earnings that have been manipulated. However, FRQ may also refer to how well the written portions of financial statements relevantly and faithfully represent the firm's standing.

The disclosure of high-quality financial reports is an important duty of publicly traded firms. Multiple entities take part in ensuring the accuracy of financial reports. Generally, these are the internal preparers, the independent auditor, the audit committee, and the shareholders (ICAEW, 2019). For this reason, it is the characteristics of these entities that are most often considered when researchers study the determinants of FRQ. The responsibility of preparing financial reports falls to the firm's managers (SEC, 2002). The individual manager chiefly responsible for this task is the CFO (IFAC, 2013). As the chief executive, responsible for managing every aspect of firm operations, the CEO plays an important role as well. In the United States, since the passage of SOX, both the CEO

and the CFO have been required to personally certify that financial reports fairly present the operations and financial condition of the company (Marden et al., 2003), ensuring the involvement of both the CEO and the CFO. The firm's independent auditor examines the financial reports and develops a written report detailing an opinion of whether the financial reports adhere materially to accounting standards (SEC, 2002). The BOD and the audit committee are responsible for many tasks related to financial reporting oversight. They review the financial reports and oversee the firm's financial reporting process and internal controls. In the United States, the audit committee is a subset of the BOD comprised entirely of independent directors. The audit committee is also in charge of the selection, compensation, and oversight of the independent auditor (Bujno et al., 2018). Finally, shareholders play an important role in the financial reporting process as well. Shareholders appoint directors to serve on the board and vote on the ratification of the appointed independent auditor (ICAEW, 2019). The involvement of several oversight entities and controls is by design, this reduces the likelihood of financial malfeasance and promotes the perception of trustworthy financial reporting.

FRQ is difficult to measure, this is likely why so many approaches to its measurement exist (Gaynor et al., 2016). Dechow et al. (2010) provide an in-depth analysis of the various proxies for earnings quality which measure properties such as "persistence, accruals, smoothness, timeliness, loss avoidance, investor responsiveness, and external indicators." They divide earnings quality proxies into three categories: properties of earnings, investor responsiveness to earnings, and external indicators of earnings misstatements. We use several FRQ proxies throughout the essays, each chosen because of their fit with the specific circumstances.

Numerous factors contribute to the quality of a firm's financial statements. The most obvious and easiest to measure are financial characteristics like the firm's size, performance, debt ratio, market valuation, and financial distress. Then there are characteristics of monitoring bodies like independent auditors and institutional investors that may work to prevent or encourage earnings management. Finally, characteristics of management and the BOD, tasked with monitoring managers, are important as well. Upper eche-

lons theory posits that the background characteristics of top executives affect the actions they take, thereby influencing firm outcomes (Hambrick & Mason, 1984). Corroborating this theory, we demonstrate evidence that FRQ is an important firm outcome influenced significantly by the characteristics of top executives and BOD members.

The essays that follow use samples of listed U.S. firms that are generally medium to large in size. For this reason, our findings are not completely applicable to all situations, but they give a starting point for future studies to consider whether results differ in contexts such as emerging markets, varying regulatory environments, or for small-cap firms. That being said, there are several advantages of studying U.S. firms that drove our decision to focus on them. The United States contains a vast number of medium to large firms, it has robust financial reporting regulations and corporate governance standards, and firm data going back decades is easily accessible and reliably accurate.

1.2 Essays

The three essays that comprise this thesis take diverse approaches. The overarching goal of the thesis is to contribute to the understanding of the firm-level characteristics that determine FRQ. The three essays use unique variables for FRQ proxies, which serve as the dependent variables. This was done intentionally for two reasons. First, it allows for a more nuanced overall analysis which includes the consideration of various measures. And second, the best way to address each research question differs between the essays. In the first essay, we measure FRQ with the occurrence of restatements. Being a dichotomous variable, this approach allows us to construct a matched-pair sample and analyze the interaction effects of another dichotomous variable to create four easily distinguishable categories. In the second and third essays, we move to very large datasets and away from the use of matched pairs. In the second essay, we proxy FRQ with the financial statement divergence score, which measures financial statement irregularities. For robustness, we include measures of earnings management as well. For the third essay, we needed a measure that captures both accruals-based and real activities earnings management. For this reason, we proxy FRQ in the third essay with earnings surprises which, we argue,

captures evidence of both.

Because each essay models the determinants of FRQ, it would make sense that each essay generally have the same control variables. However, just as the FRQ proxies vary between the essays, the control variables differ somewhat as well due to the requirements and possibilities inherent in each. There is also a greater difference between the control variables used in the first essay and those used in the second and third because different data sources were used after the first essay. In the first essay, we include test variables related to executive gender and board of directors gender diversity, and we control for three board-level variables and eight firm-level variables. In the second essay, we test the effects of CEO age and include other CEO and CFO controls to alleviate concerns that CEO age could be endogenous to those characteristics. We then include six firm-level controls which are the exact six used in the third essay and which have considerable overlap with the firm-level controls of the first essay. In the third essay, the six firm-level control variables from the second essay are used. One of those six, and its squared term, are used as the test variables for the third essay.

1.2.1 Financial reporting quality and the effects of CFO gender and board gender diversity

In the first essay, we consider how restatement likelihood is affected by chief financial officer (CFO) gender and BOD gender diversity. We use the occurrence of restatements as an indicator of poor FRQ, they are routinely used as such in prior studies (e.g., Abbott et al., 2012; Agrawal & Chadha, 2005; Zhang, 2019). Restatements occur when previously reported financial statements are found to contain material errors that must be disclosed to the public in a unique filing, corrected, and reissued. Restatements result in damaged firm reputation (Chakravarthy et al., 2014), a loss of shareholder value (Palmrose et al., 2004), and are generally the result of significant earnings management (Ettredge et al., 2010).

Restatements are generally uncommon. Therefore, a traditional sample would be heavily unbalanced with only a fraction having filed restatements. For this reason, and

as a means of abating endogeneity concerns, we use a matched pair sample. We first identify all firms from the Russell 3000 index that filed restatements during the period 2010-2017. We then match the restatement firms to similar non-restatement firms. We then analyze how the gender of the CFO and chief executive officer (CEO) and the gender composition of the BOD differ between restatement and non-restatement firms. FRQ is known to be improved by women serving on the BOD (Abbott et al., 2012; Srinidhi et al., 2011; Wahid, 2019). Some studies show that female CFOs improve FRQ as well (Barua et al., 2010; Gupta et al., 2020; Peni & Vähämaa, 2010). We provide a novel contribution to the literature by considering the interaction of these effects which produces interesting results and to our knowledge has not been done before.

We find that restatement likelihood is reduced when the CFO is a woman and when more women serve on the BOD, indicating that these factors have a positive effect on FRQ. The interaction of these effects reveals evidence that women on the BOD are more effective at reducing restatement likelihood when the CFO is also a woman and that while female CFOs reduce restatement likelihood generally, they have no effect on restatement likelihood when the BOD is all male. We posit that the situation of a female CFO and all-male BOD is similar to that of a lone woman on an otherwise all-male BOD. This is important because in both cases only one woman is present, and the CFO's job involves working directly with the BOD during the financial reporting process. Konrad et al. (2008) interviewed women who served on the BODs of Fortune 1000 companies about their experiences. They described the situation of serving on otherwise all-male BODs as the invisibility phase in which they were "ignored, dismissed, not taken seriously, or otherwise excluded." We posit that this explains why female CFOs reduce restatement likelihood generally, but not when working with all-male BODs.

These findings are important as increased attention is being paid to gender diversity in management and on the BOD. Historically, women have been absent from executive teams and boardrooms but that is beginning to change. Our study adds to the body of literature demonstrating that the inclusion of a lone woman in management is insufficient in improving firm outcomes by including diverse perspectives and reducing groupthink.

It also serves as a guide to policymakers considering the implementation of gender quotas which are becoming increasingly common around the world.

1.2.2 CEO age, financial statement irregularities, and earnings management

In the second essay, we focus on a different managerial characteristic: CEO age. There is a well-documented link between CEO characteristics and financial reporting outcomes (see, Habib & Hossain, 2013). Continuing with the theme of upper echelons theory, we consider how CEO age affects FRQ, a topic that has received relatively little attention. This essay is further motivated by the fact that CEO age has been rising dramatically in the United States where, from 2005 to 2021, the average age of newly hired CEOs rose from 45.9 to 53.9. In this essay, we move away from restatements and towards more technical approaches to measuring FRQ. We begin by considering how the financial statement divergence (FSD) score is affected by CEO age. The FSD score is a relatively new measure of financial statement manipulation developed by Amiram et al. (2015) that is used to detect irregularities by applying Benford's law (Benford, 1938) to the leading digits of financial statement line items. Because the FSD score is relatively new, we expand the analysis using well-established measures of earnings management for robustness.

Using a panel dataset of 18,492 firm-year observations from the period 2003-2019, we find evidence that financial statement irregularities (measured with the FSD score) are more prevalent when CEOs are older. We use several sensitivity tests to rule out alternative explanations to our findings and to demonstrate evidence of a causal link. The CEO age-FSD score relation holds when pre-SOX observations are included, when retirement-aged CEO observations are excluded, when performance-based CEO compensation is controlled for, and when an instrumental variable approach, based on the consumer price index from the CEO's birth year, is used. Turning to earnings management, we find evidence that abnormal decreases in discretionary expenses are more prevalent when CEOs are older as well. This result is not as robust, as it does not hold when pre-SOX observations are included nor when the instrumental variable is used. We also find some evidence that abnormal production costs are more prevalent when CEOs are

younger. We find no evidence of a relation between CEO age and accruals-based earnings management. We consider the effect of clawback provisions as well. We find no evidence of a relation between CEO age and FRQ when clawback provisions are in place. This shows that clawback provisions may eliminate any effect of CEO age on FRQ, evidence supporting their effectiveness.

Given that our results indicate a general negative CEO age-FRQ relation, we posit that they are driven by career concerns that evolve as CEOs age. Earnings management is likely more costly for younger CEOs because a financial reporting scandal would be more damaging to their reputation and future employment prospects, given their shorter track records and longer career horizons.

1.2.3 Institutional ownership, earnings management, and earnings surprises

In the third essay, we move to the role of ownership structure, considering how FRQ is affected by institutional investor ownership (IO). The influence of institutional investors has risen dramatically over the past decades, largely because investors are attracted to the low-cost diversification they offer (Bebchuk et al., 2017). Institutional investors own about 80% of the market value of U.S. firms according to a 2017 report.[1] This means that institutional investors account for the vast majority of votes cast at the annual meetings of virtually all major U.S. firms leading them to influence corporate governance and managerial decision-making substantially.

We take a comprehensive approach to analyzing the effect of IO on earnings management using multiple earnings management proxies, testing for nonlinearity, and considering changes in the post-SOX period. We use a panel dataset of 59,503 firm-year observations from the period 1981-2019. We use between-within regression models to analyze differences between the between-firm and within-firm effects due to the characteristics of the data.

We use earnings surprises as a measure that captures evidence of both accruals-based and real activities earnings management. We find evidence that IO affects earnings sur-

[1]See https://www.pionline.com/article/20170425/INTERACTIVE/170429926/80-of-equity-market-cap-held-by-institutions.

prises and abnormal discretionary accruals positively overall, with evidence that the relations are concave when tested for nonlinearity. Alternatively, we find that IO affects real activities earnings management measures negatively overall, with evidence that the relations are convex when tested for nonlinearity. Overall, we find that the IO-earnings management relation is dynamic and heavily context-dependent, with earnings management type and the passage of SOX playing important roles. Most interestingly, we find that the effect of IO is dependent on earnings management type, effecting accruals-based earnings management positively and real activities earnings management negatively. This is likely due to real activities earnings management having an adverse effect on long-term firm value (Graham et al., 2005).

Chapter 2

Financial reporting quality and the effects of CFO gender and board gender diversity

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Abstract

The purpose of this study is to examine the effects of CFO gender, board gender diversity, and the interaction of both factors on financial reporting quality proxied by restatements. Restatements indicate inaccurate financial reporting. We use fixed effects, conditional logistic regression models to compare firms with and without restatements matched by size, industry, and year. Our results show evidence that restatements are less likely when the CFO is a woman and when a higher proportion of women serve on the board of directors. Considering the interaction effects, we find evidence that women on the board of directors are more effective at reducing restatement likelihood when the CFO is also a woman. And that while female CFOs reduce restatement likelihood generally, they have no statistically significant effect on restatement likelihood when the board of directors is all male. This study is the first that we know of to consider how financial reporting quality is affected by the interaction effects of CFO gender and board gender diversity. The findings corroborate upper echelons theory and extend the understanding of the effects of managerial gender diversity at a time when firms face growing pressure to increase gender diversity at the highest levels. The unique sample, methodology, and findings provide new insights into the impact of gender on financial reporting quality which has important policy implications.

This essay is based on Davis & Garcia-Cestona (2021). We are thankful for the feedback from the participants of the Workshop on Corporate Governance and Investment 2018 (UIB), the DEMO Workshop 2018 (UAB), and the DEMO Workshop 2019 (UPNA).

2.1 Introduction

We investigate how financial reporting quality (FRQ) is affected by CFO gender, board of directors (BOD) gender diversity, and the interaction of both factors. We draw from upper echelons theory which posits that firm outcomes are influenced by the characteristics of individuals in top management (Hambrick & Mason, 1984). This topic is particularly important because gender quota laws and pressure from institutional investors (Gormley et al., 2021) are driving increased gender diversity in the upper echelons of U.S. firms.[2] We build on the work of prior authors who find that FRQ is improved when the CFO is a woman (Barua et al., 2010; Gupta et al., 2020; Peni & Vähämaa, 2010) and when a higher proportion of women serve on the BOD (Abbott et al., 2012; Srinidhi et al., 2011; Wahid, 2019). We begin by confirming these findings using the occurrence or absence of restatements as a proxy for FRQ. We then consider how FRQ is affected by the interaction of CFO gender and BOD gender diversity. Specifically, we consider how the effect of CFO gender on FRQ differs between firms with and without all-male BODs. And how the effect of one or more women on the BOD is influenced by CFO gender. To our knowledge, the interaction of the effects of CFO gender and BOD gender diversity has not been considered previously, leaving a gap in the literature. We find evidence that restatements are less likely when the CFO is a woman and when a higher proportion of women serve on the BOD. We consider the interaction of these effects, finding evidence that women on the BOD are more effective at reducing restatement likelihood when the CFO is also a woman. The interaction effects also show evidence that while female CFOs reduce restatement likelihood generally, they have no statistically significant effect on restatement likelihood when the BOD is all male. These findings reveal that the effects of CFO gender are moderated by BOD gender diversity and vice versa. Thus, contributing to a more nuanced understanding of the relations between CFO gender, BOD gender diversity, and FRQ.

Financial reports shape the investment decisions of market participants who depend

[2]From 2008 to 2019, the proportion of women appointed to new directorships of Russell 3000 firms rose from 11% to 45% and the proportion of total Russell 3000 board seats held by women rose from 9% to 19% (Papadopoulos, 2019).

on their accuracy. For this reason, high-quality financial reports improve investment efficiency by reducing adverse selection and moral hazard (Biddle et al., 2009; Bzeouich et al., 2019). While FRQ has been defined similarly by various researchers, the academic literature provides no generally accepted FRQ definition (Gaynor et al., 2016). The International Accounting Standards Board's Conceptual Framework for Financial Reporting defines the two fundamental characteristics of FRQ as "relevance and faithful representation". In more specific terms, Biddle et al. (2009) define FRQ as "the precision with which financial reporting conveys information about the firm's operations, in particular its expected cash flows, that inform equity investors" (p. 113).

Several measures are used as FRQ proxies (Gaynor et al., 2016). These proxies generally focus on the accuracy and informative value of reported earnings. For example, Dechow et al. (2010) provide an in-depth analysis of the various proxies for earnings quality which measure properties such as "persistence, accruals, smoothness, timeliness, loss avoidance, investor responsiveness, and external indicators such as restatements and SEC enforcement releases." Dechow et al. (2010) divide earnings quality proxies into three categories: properties of earnings, investor responsiveness to earnings, and external indicators of earnings misstatements. In the present study, we adopt an FRQ proxy from the third category. As with prior studies, we use the occurrence (absence) of restatements as a proxy for low (high) financial reporting quality (e.g., Abbott et al., 2012; Agrawal & Chadha, 2005; Zhang, 2019). Restatements occur when previously reported financial statements are found to contain material errors that must be disclosed to the public in a unique filing, corrected, and reissued. Restatements result in damaged firm reputation (Chakravarthy et al., 2014), a loss of shareholder value (Palmrose et al., 2004), and are generally the result of significant earnings management (Ettredge et al., 2010).

The remainder of this essay proceeds as follows. We review the background and relevant literature. We develop the hypotheses. We explain the research design. And finally, we discuss the results and conclude.

2.2 Background

2.2.1 Gender diversity of the board of directors and management

The effect of gender diversity on firm outcomes has become a topic of growing interest in recent years. Firms with more gender-diverse BODs are found to be more philanthropic (Williams, 2003), more likely to pay dividends (Ye et al., 2019), and have better environmental performance (Lopatta et al., 2020) and better corporate investment efficiency (Bzeouich et al., 2019). There is also considerable evidence that firms with more gender-diverse BODs have better corporate social responsibility performance (Bear et al., 2010; Cabeza-García et al., 2018; Galbreath, 2018; Ibrahim & Hanefah, 2016). Regarding financial reporting, firms with more gender-diverse BODs are found to have better FRQ (Abbott et al., 2012; Srinidhi et al., 2011; Wahid, 2019) and fewer internal control weaknesses (Y. Chen et al., 2016). Regarding the gender of management, female CEOs and CFOs are associated with more conservative accounting (Francis et al., 2015)Ho et al. (2015) (Francis et al., 2015; Ho et al., 2015) and female CFOs are associated with more conservative earnings management (Peni & Vähämaa, 2010), better accruals quality (Barua et al., 2010), and fewer financial reporting irregularities (Gupta et al., 2020).

Next, we consider studies on the relation between BOD gender diversity and firm performance. Several studies find that BOD gender diversity improves firm performance (Campbell & Mínguez-Vera, 2008; Conyon & He, 2017; Erhardt et al., 2003; Jabari & Rusnah, 2020; Post & Byron, 2015). Others find no relation (Carter et al., 2010; Randøy et al., 2006) or that BOD gender diversity affects firm performance negatively (Adams & Ferreira, 2009). Adams & Ferreira (2009) find that firms with gender-diverse BODs have better governance, better monitoring of the CEO, and more alignment of incentives, but that performance is decreased when gender diversity is mandated for otherwise well-governed firms.

2.2.2 Determinants of financial reporting quality

Gaynor et al. (2016) divide the primary determinants of FRQ into three categories based on the judgment and decision-making framework developed by Bonner (2008): preparer

characteristics, task characteristics, and environmental characteristics. Preparer characteristics refer to the characteristics of individual managers who are directly responsible for preparing financial reports. Characteristics of management such as gender, the focus of this study, play an important role in shaping FRQ. Task characteristics are factors that affect the process of financial report preparation such as the level of complexity or subjectivity involved in the task. Finally, environmental characteristics are the exogenous conditions present when financial reports are prepared such as characteristics of the independent auditor or country-specific accounting regulations.

FRQ is positively associated with BOD independence (Beasley, 1996; Idris et al., 2018; Jaggi et al., 2009), BOD size (Geraldes Alves, 2011), and the frequency of BOD meetings (Xie et al., 2003). Firm size plays an important role in determining FRQ as well. Gu et al. (2005) find that firm size is negatively related to discretionary accruals and Aman et al. (2006) find that larger firms are more likely to engage in income-decreasing earnings management. Financial performance and earnings growth also affect FRQ (Lee et al., 2006). Several studies posit that increased leverage encourages managers to engage in income-increasing earnings management as a means to avoid debt covenant violation costs (Beatty & Weber, 2003; Dichev & Skinner, 2002; Lazzem & Jilani, 2018). However, others find a direct positive relation between leverage and FRQ (Jelinek, 2007; Zamri et al., 2013). The need for external financing is found to affect FRQ negatively as financing needs may motivate managers to inflate reported earnings to reduce financing costs (Dechow et al., 1996; Richardson et al., 2002).

Independent auditors play an important monitoring role in shaping FRQ as well. Blankley et al. (2012) find that abnormally large audit fees increase FRQ. Similarly, prior studies find that audit quality decreases when audit fees are abnormally low (Asthana & Boone, 2012) and when the auditor is pressured to reduce audit fees by their clients (Ettredge et al., 2014). Auditor size is another important factor as larger auditors are associated with increased audit quality (DeAngelo, 1981; Jiang et al., 2019).

FRQ is also affected by ownership structure because firm owners act as monitors (Al-Fayoumi et al., 2010; Kazemian & Sanusi, 2015). FRQ is associated negatively with

controlling shareholders (Bao & Lewellyn, 2017; Kim & Yi, 2006) and positively with institutional investor ownership (Hadani et al., 2011; Koh, 2003; Sakaki et al., 2017).

2.3 Hypothesis development

We begin by considering the gender-risk preference relation and the effect of executive gender on financial reporting outcomes. An analysis of 150 studies on this relation finds that women are less inclined to risk-taking than men (Byrnes et al., 1999). Women are also found to be more risk-averse when making financial decisions (Eckel & Grossman, 2002; Sapienza et al., 2009; Schubert et al., 1999). CFOs are directly involved in the financial reporting process and CFO characteristics are known to influence financial reporting outcomes (Habib & Hossain, 2013). Since the passage of the Sarbanes–Oxley Act of 2002, CEOs and CFOs in the United States have been required to review and personally confirm the accuracy of financial reports. The Sarbanes–Oxley Act mandates the involvement of the CEO and CFO in the reporting process making them personally liable for financial reporting errors. Francis et al. (2015) find that accounting conservatism increases after a female CFO is hired to replace a male one. Prior studies also find that female CFOs are associated with reduced earnings management (Barua et al., 2010; Peni & Vähämaa, 2010) and fewer financial statement irregularities (Gupta et al., 2020). Given these findings and the evidence that women are more risk-averse and more inclined to accounting conservatism, we hypothesize the following:

H1: Female CFOs improve FRQ by reducing restatement likelihood.

Next, we turn to the BOD. Prior studies find that FRQ is improved when a higher proportion of women serve on the BOD (Abbott et al., 2012; Srinidhi et al., 2011; Wahid, 2019). Abbott et al. (2012) attribute the negative association between BOD gender diversity and restatement likelihood to reduced groupthink. Groupthink occurs in groups of individuals lacking diverse characteristics or backgrounds. Groupthink results in pressure for consensus, a lack of dissent or alternatives, and a deterioration of judgment and independent thought. Abbott et al. (2012) posit that BOD gender diversity improves FRQ

because reduced groupthink heightens the board's oversight ability. This is supported by psychology literature which routinely demonstrates that homogeneous working groups function differently than more diverse ones (Cox et al., 1991; Pelled et al., 1999; van Knippenberg & Schippers, 2007). Given the evidence that female BOD members improve FRQ and because the inclusion of women on otherwise all-male BODs reduces groupthink, we hypothesize the following:

H2: Increased BOD gender diversity improves FRQ by reducing restatement likelihood.

Finally, we consider whether the positive effect that female CFOs have on FRQ is moderated by BOD gender diversity. Specifically, we consider whether female CFOs are less effective at improving FRQ when no women serve on the BOD. In a similar vein of research, Schopohl et al. (2021) find that female CFOs reduce firm leverage but that the relation is moderated by BOD gender diversity. The CFO's job involves working directly with the BOD. CFOs are expected to communicate finances and financial reporting issues to the BOD in order to aid the BOD in decision-making (Agrawal et al., 2013; IFAC, 2013). We posit that, when working with all-male BODs, female CFOs are treated in a similar manner to female BOD members on otherwise all-male BODs. In both cases, they are the lone woman in the group. Konrad et al. (2008) interviewed women who served on the BODs of Fortune 1000 companies about their experiences. They described the situation of women serving on otherwise all-male BODs as the invisibility phase in which the lone woman is "ignored, dismissed, not taken seriously, or otherwise excluded." If the situation of female CFOs working with all-male BODs is similar, as we expect, then the positive effect that female CFOs have on FRQ may be hampered when no women serve on the BOD. Thus, we hypothesize the following:

H3: Female CFOs are more effective at reducing restatement likelihood when one or more women serve on the BOD.

2.4 Research design

2.4.1 Sample

We believe it is appropriate to use U.S. firms for this study. No BOD gender quotas were in effect in the United States during the period we examine. This ensures that the director appointments we observe are the result of firm choice rather than legal obligation. Our sample is comprised of 273 restatement firms and 273 non-restatement firms, selected through the following process. We begin with the 4,697 firms included in the Russell 3000 index for at least one year from 2010-2017 that have available data in the U.S. SEC database (EDGAR). We choose to collect data beginning from the year 2010 because we need enough years to include sufficient restatement firms, but we also need to avoid excessive observations because much of the data is collected manually and we seek to complete data collection in a timely manner. The data range ends in 2017 because it is the last year of available data. Of these, we identify 273 firms that filed a restatement and have an appropriate match. While the restatements were filed from 2010-2017, the data included in our sample are captured from the year before the first restatement period such that the range of analyzed data spans from 2005-2016.

As with prior literature on similar topics, we form a control group using matched pairs (Abbott et al., 2012; Agrawal & Chadha, 2005; Beasley, 1996). The non-restatement matches are selected from the same initial set of 4,697 firms. Each restatement firm is matched to a non-restatement firm from the same year and industry and as close as possible in size. We use market capitalization as the measure of firm size. The firms are matched by industry using the Standard Industrial Classification (SIC) codes. For each restatement firm, the match meeting all described criteria with the smallest difference in market capitalization and with a 4-digit SIC code match is chosen. When no such 4-digit match exists, a 3-digit match is used. When no 3-digit match exists, a 2-digit match is used.[3] 68.1% of the matches in our sample are 4-digit SIC code matches, the highest degree match possible, 9.9% are 3-digit matches, and 22.0% are 2-digit matches. As with Abbott et al. (2012), the maximum difference in market capitalization between each restatement

[3]For example, if a firm's 4-digit SIC code is 3571, its 3-digit and 2-digit codes are 357 and 35 respectively.

firm and its match is 30%. The difference in average market capitalization between the restatement and non-restatement firms is small and not statistically significant. This holds when measuring firm size by total assets as well, demonstrating that the matches are well fitted by size.

2.4.2 Data

The two public data sources used are Thompson Reuters Datastream and EDGAR. All financial variables are collected from Datastream. We use EDGAR to determine which firms restated their financial reports. Since 2004, U.S. firms have been required to publicly disclose restatements in a Form 8-K as item 4.02. To accurately determine which firms have restatements from the large initial sample, we develop and use a web scraping program capable of identifying all 8-k filings with restatement disclosures. To ensure that the firm data reflect the management and financial circumstances responsible for the restatement, the variables are collected from the year prior to the first year of restated financials for restatement firms and the same year as their match for non-restatement firms. This is consistent with prior literature on the topic (Abbott et al., 2012).

Definitive proxy statements (form DEF 14A) are filed by publicly traded U.S. firms before each annual meeting to disclose information and solicit shareholder votes. We use the proxy statements from the EDGAR database to determine gender and characteristics of the BOD, the independent auditor, and the ownership structure. We determine the gender of executives and BOD members based on gender-specific words in their bios (i.e., Mr., Ms., he, she, his, her).

2.4.3 Empirical modeling

We examine how FRQ, proxied by restatements, is affected by CFO gender and BOD gender diversity. For the regression analysis, we use fixed effects, conditional logistic regression models with robust standard errors. Conditional logistic regression is appropriate due to the dichotomous nature of the dependent variable which indicates the presence or absence of a restatement. First, we model the effects of CFO gender together with three

measures of BOD gender diversity. Then, we model CFO gender with a measure of BOD gender diversity and the interaction of both variables. Thus, we estimate the following two models:

$$\begin{aligned} Restate_{i,t} = {} & \alpha_0 + \alpha_1 CFO\ gender_{i,t-1} + \alpha_2 BOD\ GD_{i,t-1} + \alpha_3 CEO\ gender_{i,t-1} \\ & + \alpha_4 Ind_{i,t-1} + \alpha_5 BOD\ size_{i,t-1} + \alpha_6 BOD\ meet_{i,t-1} + \alpha_7 Firm\ size_{i,t-1} \\ & + \alpha_8 ROA_{i,t-1} + \alpha_9 Growth_{i,t-1} + \alpha_{10} Leverage_{i,t-1} + \alpha_{11} Fin_{i,t-1} \\ & + \alpha_{12} Big\ auditor_{i,t-1} + \alpha_{13} Fees_{i,t-1} + \alpha_{14} Control_{i,t-1} + \epsilon \end{aligned} \tag{1}$$

$$\begin{aligned} Restate_{i,t} = {} & \beta_0 + \beta_1 CFO\ gender_{i,t-1} + \beta_2 BOD\ GD_{i,t-1} \\ & + \beta_3 (BOD\ dum_{i,t-1} * CFO\ gender_{i,t-1}) + \beta_4 CEO\ gender_{i,t-1} \\ & + \beta_5 Ind_{i,t-1} + \beta_6 BOD\ size_{i,t-1} + \beta_7 BOD\ meet_{i,t-1} + \beta_8 Firm\ size_{i,t-1} \\ & + \beta_9 ROA_{i,t-1} + \beta_{10} Growth_{i,t-1} + \beta_{11} Leverage_{i,t-1} + \beta_{12} Fin_{i,t-1} \\ & + \beta_{13} Big\ auditor_{i,t-1} + \beta_{14} Fees_{i,t-1} + \beta_{15} Control_{i,t-1} + \epsilon \end{aligned} \tag{2}$$

Table 2.1 provides a description of the variables. The dependent variable *Restate* is a dummy variable indicating whether a restatement was filed. We use the occurrence (absence) of restatements as a proxy for low (high) financial reporting quality (Abbott et al., 2012; Agrawal & Chadha, 2005; Zhang, 2019). We believe that this approach is appropriate given that restatements only occur when previously reported financial statements are found to contain material errors. Therefore, restatements indicate serious inadequacies of the firm's financial reporting quality and internal controls. We also choose restatements as the financial reporting quality proxy because of advantages related to the empirical approach of using a dichotomous dependent variable. In particular, this allows us to analyze matched pairs of restatement and non-restatement firms. Furthermore, because two of our test variables are also dichotomous (CFO gender and the presence of women on the BOD), we are able to consider differences between four clearly distinguished cate-

Table 2.1: Description of variables

Restate	Dummy variable equal to one if a restatement is filed and zero otherwise
CFO gender	Dummy variable equal to one if the CFO is a woman and zero otherwise
BOD dum	Dummy variable equal to one if one or more BOD members are women and zero otherwise
BOD %	Percentage of BOD members who are women
BOD blau	$1 - [BOD\ \%^2 + (1 - BOD\ \%)^2]$
CEO gender	Dummy variable equal to one if the CEO is a woman and zero otherwise
Ind	Percentage of BOD members who are independent
BOD size	Log of the number of BOD members
BOD meet	Log of the number of BOD meetings
Firm size	Log of total assets
ROA	Total income divided by total assets
Growth	Percentage change in total income from the prior year
Leverage	Total liabilities divided by total assets truncated at one for firms with negative stockholders' equity
Fin	Dummy variable equal to one if operating cash flow, minus average capital expenditures from the prior three years, divided by current assets is less than -0.5 and zero otherwise
Big auditor	Dummy variable equal to one if the independent auditor is one of the big four and zero otherwise
Fees	Fees paid to the independent auditor for audit services divided by total assets
Control	Dummy variable equal to one if more than 50% of the voting power is held by one individual, group, or firm

gories.[4] This is especially important for analyzing the interaction effects and it would not be possible with a continuous dependent variable.

All independent variables are lagged by one year ($t-1$) to reflect the conditions that led to the restatement (absence of restatement) for restatement (non-restatement) firms. The independent variables are as follows. *CFO gender* is a dummy variable indicating whether the CFO is a woman. *BOD GD* is BOD gender diversity measured with one of three variables: *BOD dum*, *BOD %*, *BOD blau*. We use three measurements of BOD gender diversity for robustness. *BOD dum* is a dummy variable indicating whether one or more women serve on the BOD. *BOD %* is the proportion of women serving on the

[4]These categories are explained in detail in Section 2.5.2

BOD. And *BOD blau* is a measure of BOD gender diversity using Blau's Index.[5]

All regression models include the following 12 control variables. *CEO gender* is a dummy variable indicating whether the CEO is a woman. Female CEOs are associated with greater accounting conservatism (Ho et al., 2015). *Ind* is the proportion of BOD members who are independent. BOD independence is positively associated with FRQ (Beasley, 1996; Idris et al., 2018; Jaggi et al., 2009). *BOD size* is the log of the number of BOD members. BOD size is positively associated with FRQ (Geraldes Alves, 2011). *BOD meet* is the log of the number of BOD meetings. The frequency of BOD meetings is positively associated with FRQ (Xie et al., 2003). *Firm size* is the log of total assets which we include as a proxy for firm size. Firm size is known to affect FRQ (Aman et al., 2006; Gu et al., 2005). Although firm size is controlled for primarily via the fixed effects nature of the matched pair sample, we include it as a control variable to further abate endogeneity concerns. *ROA* is return on assets which we include as a proxy for firm performance. Firm performance is known to affect FRQ (Lee et al., 2006). *Growth* is income growth which is known to affect FRQ (Lee et al., 2006). *Leverage* is the leverage ratio which we calculate following the methodology of DeFond & Jiambalvo (1991). There is a well-documented link between leverage and FRQ (Beatty & Weber, 2003; Dichev & Skinner, 2002; Jelinek, 2007; Lazzem & Jilani, 2018; Zamri et al., 2013). *Fin* is a dummy variable indicating whether an immediate financing need exists which we calculate following the methodology of Dechow et al. (1996). The need for financing is known to affect FRQ (Dechow et al., 1996; Richardson et al., 2002). *Big auditor* is a dummy variable indicating whether the independent auditor is one of the big four. Auditor size is positively associated with audit quality (DeAngelo, 1981; Jiang et al., 2019). *Fees* is the amount charged by the independent auditor for audit services divided by total assets. The amount charged by the independent auditor is known to affect audit quality (Asthana & Boone, 2012; Blankley et al., 2012; Ettredge et al., 2014). Finally, *Control* is a dummy variable indicating whether majority voting power is held by one individual, group, or firm. Controlling ownership is

[5]Blau's index is a measurement of diversity within groups that quantifies the likelihood that two randomly selected group members are from the same category (from the same gender in this context). Blau's index is commonly used by researchers to measure gender diversity in groups (e.g., Bear et al., 2010; Campbell & Mínguez-Vera, 2008).

Table 2.2: Correlation matrix

	1	2	3	4	5	6	7	8
1. *Restate*	1.00							
2. *CFO gender*	**-0.10**	1.00						
3. *BOD dum*	**-0.10**	**0.09**	1.00					
4. *BOD %*	**-0.09**	**0.13**	**0.83**	1.00				
5. *BOD blau*	**-0.09**	**0.12**	**0.90**	**0.98**	1.00			
6. *CEO gender*	0.01	0.00	**0.21**	**0.32**	**0.30**	1.00		
7. *Ind*	-0.03	0.04	**0.19**	**0.15**	**0.16**	0.00	1.00	
8. *BOD size*	-0.07	0.03	**0.38**	**0.23**	**0.26**	0.03	**0.27**	1.00
9. *BOD meet*	**0.08**	0.04	0.08	**0.09**	**0.09**	0.03	**0.11**	**0.11**
10. *Firm size*	0.01	0.01	**0.27**	**0.23**	**0.25**	0.04	**0.22**	**0.48**
11. *ROA*	-0.04	0.03	0.03	-0.02	-0.01	0.02	**0.11**	**0.16**
12. *Growth*	-0.02	-0.02	0.00	0.05	0.04	-0.01	0.04	-0.06
13. *Leverage*	**0.10**	0.04	**0.17**	**0.14**	**0.15**	0.04	0.03	**0.26**
14. *Fin*	0.06	0.03	-0.06	-0.05	-0.05	-0.01	-0.08	**-0.14**
15. *Big auditor*	-0.06	0.03	**0.14**	**0.15**	**0.15**	-0.02	**0.21**	**0.23**
16. *Fees*	-0.04	-0.02	-0.01	-0.02	-0.02	-0.02	0.00	-0.03
17. Control	0.05	0.05	-0.05	-0.02	-0.03	0.05	**-0.48**	-0.06

	9	10	11	12	13	14	15	16
9. *BOD meet*	1.00							
10. *Firm size*	**0.11**	1.00						
11. *ROA*	0.01	**0.40**	1.00					
12. *Growth*	**-0.17**	-0.02	0.00	1.00				
13. *Leverage*	**0.24**	**0.39**	**-0.14**	-0.01	1.00			
14. *Fin*	0.02	**-0.23**	**-0.35**	0.00	0.08	1.00		
15. *Big auditor*	0.06	**0.32**	**0.10**	0.02	0.00	-0.05	1.00	
16. *Fees*	0.04	**-0.32**	**-0.50**	0.00	0.08	**0.20**	-0.01	1.00
17. Control	-0.05	0.01	-0.05	-0.01	**0.09**	-0.03	-0.08	-0.02

Bold correlation coefficients are significant at the 5% level.

negatively associated with FRQ (Bao & Lewellyn, 2017; Kim & Yi, 2006).

We test for the presence of multicollinearity within the independent variables by examining their variance inflation factors. The highest, lowest, and mean variance inflation factors are 2.21, 1.03, and 1.36 respectively. These values are far below levels that would cause concern demonstrating the absence of multicollinearity issues (Chatterjee & Hadi, 2012). Table 2.2 gives a breakdown of the correlation between variables. We find that none of the independent variables are highly correlated except for the measures of BOD gender diversity which are modeled separately.

2.4.4 Endogeneity

Studies of the effects of female executives and female BOD members on any firm outcome have the potential to suffer from endogeneity issues. Male and female executives are not randomly assigned to firms (J. Huang & Kisgen, 2013). Firms may discriminate by gender when hiring executives and the executive's gender may cause them to self-select into certain types of firms. In the case of the present study, if either of these factors correlates with restatement likelihood, endogeneity is an issue. Brady et al. (2011) find that female executives are more likely to be present in certain industries and at larger firms and firms with greater sales growth. Because a firm's industry, size, and growth are likely predictors of restatement likelihood, endogeneity concerns are present. However, our empirical modeling is designed specifically to address this. The fixed effects, conditional logistic regression models only consider the variation within the pairs of matched firms (one with and one without a restatement) that are in the same industry and close in size. Therefore, our results are not influenced by endogenous factors related to industry or size, reducing the potential for endogeneity concerns. The matched firms are also from the same year which is important because the changing regulatory environment affects restatement likelihood as well. Because female executives are also more prevalent at firms with greater sales growth, we include sales growth as a control variable. We find that neither CFO gender nor BOD gender diversity is significantly correlated with sales growth as seen in Table 2.2. Despite our efforts to reduce the influence of endogeneity, it is still possible that our results are biased by endogenous factors. It is especially important to recognize this limitation since the topic is more prone to endogeneity given that firms are likely to consider characteristics like gender when hiring executives, and executive gender is therefore not randomly assigned.

Table 2.3: Descriptive statistics – full sample

	N	Mean	Standard deviation	Q1	Q3
CFO gender	546	0.08	0.28	0.00	0.00
BOD dum	546	0.51	0.50	0.00	1.00
BOD %	546	0.08	0.10	0.00	0.14
BOD blau	546	0.13	0.15	0.00	0.24
CEO gender	546	0.04	0.20	0.00	0.00
Ind	546	0.75	0.13	0.67	0.86
BOD size	546	2.19	0.24	2.08	2.30
BOD meet	546	2.17	0.42	1.79	2.48
Firm size	546	13.41	1.93	12.26	14.61
ROA	546	-0.10	0.99	0.00	0.09
Growth	546	0.97	16.61	-0.38	0.41
Leverage	546	0.54	0.28	0.31	0.80
Fin	546	0.14	0.35	0.00	0.00
Big auditor	546	0.69	0.46	0.00	1.00
Fees	546	0.53	3.75	0.05	0.31
Control	546	0.07	0.26	0.00	0.00

2.5 Empirical results

2.5.1 Descriptive statistics and univariate analysis

Table 2.3 provides the descriptive statistics of the full sample and Table 2.4 provides the means of each variable for the restatement and non-restatement samples. The last column of Table 2.4 gives the p-values of the t-tests comparing the differences in means between the restatement and non-restatement samples. Table 2.5 details the differences between the restatement and non-restatement samples with respect to CFO gender, BOD gender diversity, and the interaction of both. Table 2.4 shows that the percentage of restatement firms with female CFOs is significantly lower than that of non-restatement firms ($p < 0.05$). Indeed, as seen in Table 2.5, twice as many non-restatement firms have female CFOs. Likewise, all three BOD gender diversity measures show that restatement firms have less BOD gender diversity than non-restatement firms ($p < 0.05$). This serves as preliminary support for hypotheses *H1* and *H2*.

Table 2.4: Descriptive statistics and mean comparison – restatement and non-restatement subsamples

	Restatement		Non-restatement		
	N	Mean	N	Mean	*P*-value
CFO gender	273	0.05	273	0.11	0.020
BOD dum	273	0.46	273	0.56	0.017
BOD %	273	0.07	273	0.09	0.047
BOD blau	273	0.12	273	0.15	0.035
CEO gender	273	0.04	273	0.04	0.832
Ind	273	0.75	273	0.76	0.453
BOD size	273	2.17	273	2.21	0.117
BOD meet	273	2.20	273	2.13	0.042
Firm size	273	13.42	273	13.39	0.891
ROA	273	-0.14	273	-0.06	0.342
Growth	273	0.68	273	1.27	0.676
Leverage	273	0.57	273	0.52	0.016
Fin	273	0.16	273	0.12	0.143
Big auditor	273	0.67	273	0.72	0.164
Fees	273	0.39	273	0.68	0.353
Control	273	0.08	273	0.06	0.246

The final column reports the p-values of a t-test comparison of the differences in means between the restatement and non-restatement subsamples.

Table 2.5: Breakdown of gender composition differences

	Restatement		Non-restatement	
Firms with:	N	%	N	%
A female CFO	15	5.5%	30	11.0%
0 female BOD members	148	54.2%	120	44.0%
1 female BOD member	88	32.2%	104	38.1%
2 female BOD members	27	9.9%	33	12.1%
3 female BOD members	8	2.9%	10	3.7%
4 female BOD members	2	0.7%	5	1.8%
5 female BOD members	0	0.0%	1	0.4%
A female CFO and 1 or more female BOD members	6	2.2%	24	8.8%

Percentages reflect the proportion out of the 273 restatement or 273 non-restatement firms.

2.5.2 Regression results

Table 2.6 shows the regression results of Models 1-3, modeled after equation (1), and Model 4, modeled after equation (2). Models 1-3 include the effects of CFO gender and three measures of BOD gender diversity. Models 1-3 show evidence that female CFOs reduce restatement likelihood ($p < 0.05$) and that restatement likelihood is reduced by all three measures of BOD gender diversity ($p < 0.05$). Together with the univariate analysis, these findings serve as strong evidence of the validity of hypotheses *H1* and *H2*. These results hold when testing the effects of CFO gender separately from the BOD gender diversity variables (not reported for brevity).

Model 4 is estimated including the interaction term detailed in equation (2). This allows us to consider the effects of CFO gender and BOD gender diversity in four situations (Brambor et al., 2006):

1. The effect of a female CFO when one or more women serve on the BOD, represented by the coefficients $\beta_1 + \beta_3$.

2. The effect of a female CFO when no women serve on the BOD, represented by the coefficient β_1.

3. The effect of one or more women on the BOD when the CFO is a woman, represented by coefficients $\beta_2 + \beta_3$.[6]

4. And the effect of one or more women on the BOD when the CFO is a man, represented by the coefficient β_2.

Thus, we find evidence that while female CFOs reduce restatement likelihood generally (as seen in Models 1-3), CFO gender has no statistically significant effect on restatement likelihood for firms with all-male BODs. This is demonstrated by the low t-value associated with the variable CFO gender in Model 4. This serves as strong evidence of the validity of *H3*. Additionally, Model 4 shows that the effect on restatement likelihood of

[6]Situations 1 and 3 detail identical scenarios, but the distinct coefficient combinations represent the effects of distinct factors within the scenario (the effect of CFO gender [1] versus the effect of female BOD representation [3]).

Table 2.6: Restatements and gender characteristics – conditional logistic regression

	Model 1	Model 2	Model 3	Model 4
	Restate	Restate	Restate	Restate
CFO gender	-0.697**	-0.677**	-0.682**	0.401
	(-2.16)	(-2.08)	(-2.11)	(0.70)
BOD dum	-0.513**			-0.396*
	(-2.43)			(-1.81)
BOD %		-2.464**		
		(-2.24)		
BOD blau			-1.754**	
			(-2.41)	
*BOD dum * CFO gender*				-1.773**
				(-2.35)
CEO gender	0.266	0.474	0.444	0.187
	(0.52)	(0.87)	(0.83)	(0.33)
Ind	0.694	0.676	0.708	0.663
	(0.82)	(0.79)	(0.83)	(0.75)
BOD size	-0.618	-0.931	-0.872	-0.423
	(-0.63)	(-0.99)	(-0.92)	(-0.43)
BOD meet	1.048*	1.089**	1.075**	1.104**
	(1.98)	(2.09)	(2.06)	(2.08)
Firm size	-0.361	-0.331	-0.340	-0.364
	(-1.07)	(-0.99)	(-1.01)	(-1.09)
ROA	-0.212	-0.216	-0.214	-0.188
	(-1.14)	(-1.23)	(-1.21)	(-1.12)
Growth	-0.001	-0.001	-0.001	-0.001
	(-0.18)	(-0.13)	(-0.13)	(-0.15)
Leverage	1.430***	1.380***	1.408***	1.529***
	(2.71)	(2.60)	(2.67)	(2.93)
Fin	0.381	0.379	0.386	0.403
	(1.12)	(1.13)	(1.14)	(1.23)
Big auditor	-0.401	-0.388	-0.388	-0.409
	(-1.61)	(-1.57)	(-1.57)	(-1.63)
Fees	-0.167**	-0.170**	-0.168**	-0.164**
	(-2.07)	(-2.07)	(-2.08)	(-2.24)
Control	0.361	0.419	0.411	0.379
	(0.88)	(1.01)	(1.00)	(0.89)
N	546	546	546	546
Pseudo R-sq	0.098	0.096	0.098	0.113

Models 1-3 are modeled after equation (1) and Model 4 is modeled after equation (2). Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 2.1 for a description of each variable.

BODs with one or more women when the CFO is a woman is $\beta_2 + \beta_3$ = -2.169. And that the effect on restatement likelihood of one or more women on the BOD when the CFO is a man is β_2 = -0.396. This suggests that BODs with one or more women are significantly more effective at reducing restatement likelihood when the CFO is a woman than when the CFO is a man.

2.5.3 Analysis

The results of the empirical analysis suggest that FRQ is improved via reduced restatement likelihood when the CFO is a woman and when a higher proportion of women serve on the BOD. This corroborates prior studies which find that FRQ is improved by female CFOs (Barua et al., 2010; Gupta et al., 2020; Peni & Vähämaa, 2010) and female BOD members (Abbott et al., 2012; Srinidhi et al., 2011; Wahid, 2019). However, no study that we know of has considered how FRQ is affected by the interaction of CFO gender and BOD gender diversity. This additional analysis shows an intriguing new perspective. We find evidence that the positive effect that female CFOs have on FRQ is not present in firms with all-male BODs. This is especially interesting because it suggests that the positive effect that female CFOs are found to have on FRQ in the present study and others (Barua et al., 2010; Gupta et al., 2020; Peni & Vähämaa, 2010) is not present when the BOD is all male. To explain this, we posit that the situation of female CFOs working with all-male BODs is similar to that of women serving on otherwise all-male BODs. In such situations, the lone woman is found to be "ignored, dismissed, not taken seriously, or otherwise excluded" (Konrad et al., 2008). The finding that BODs with one or more female members are more effective at improving FRQ when the CFO is a woman is interesting as well. This highlights the importance of CFO gender as a determinant of financial reporting outcomes. It also demonstrates that perhaps female CFOs contribute to the "critical mass" of female representation on the BOD and in management required to influence firm outcomes (Konrad et al., 2008; Torchia et al., 2011).

We control for CEO gender because of the importance of the CEO in shaping financial reporting outcomes. Given the demonstrated importance of CFO gender, we find it

surprising that no link is found between restatement likelihood and CEO gender as well. However, there is precedent for this in prior literature. Peni & Vähämaa (2010) find that female CFOs improve FRQ while CEO gender has no significant effect. It is also possible that our sample does not include sufficient firms with female CEOs (23) for adequate analysis.

2.6 Conclusion

Firms face growing pressure to improve gender diversity at the managerial and board level. If current trends persist, the upper echelons of firms will become increasingly gender diverse. The goal of this study is to improve our understanding of how firm outcomes are affected by gender diversity. We use a matched pair sample of listed U.S. firms. We find that restatements are less likely when the CFO is a woman and when a higher proportion of women serve on the BOD. We find that women on the BOD are more effective at reducing restatement likelihood when the CFO is also a woman. And we find that while female CFOs reduce restatement likelihood generally, they have no statistically significant effect on restatement likelihood when the BOD is all male.

Our findings have important implications. By decreasing restatement likelihood, female CFOs and female BOD members increase shareholder value by increasing the information value of financial reports and reducing restatement risk. To improve FRQ, we suggest that firms lacking gender diversity consider adopting policies that encourage the appointment of female CFOs and female BOD members. They may also consider the synergetic effects of having both a female CFO and gender-diverse BOD. Our findings are significant for policymakers considering the implementation of BOD gender diversity quotas and for stock market participants, who can expect the financial reports from firms with female CFOs and gender-diverse BODs to be more reliable.

Our study reveals promising new directions for future research. A similar study to ours focusing on audit committee gender diversity could generate interesting results. Also, future studies with samples including more firms with female CEOs could reconsider how FRQ is affected by CEO gender. Additionally, in our sample, only 4.8% of firms have

more than two female BOD members. For this reason, we could not adequately test whether the positive effect that additional female BOD members have on FRQ diminishes as they reach or surpass representational parity with their male counterparts. Such an examination of non-linear effects could be a promising topic for future studies which will become more practical as BOD gender diversity increases. Finally, this study along with that of Schopohl et al. (2021) provide a framework for research on the interacting effects of executive gender and BOD gender diversity. Future research could expand on this by examining how similar interactions affect FRQ and other firm outcomes. For example, it would be interesting to consider how CEO performance is affected by the interacting effects of CEO gender and BOD gender diversity.

Chapter 3

CEO age, financial statement irregularities, and earnings management

Chapter 3

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Abstract

Motivated by the rapid increase in the average age of U.S. CEOs in recent years, we study how CEO age affects financial reporting quality using a large sample of listed U.S. firms. We find evidence that financial statement irregularities, measured by applying Benford's law to financial statements, are more prevalent when CEOs are older. We find evidence of a complex relation between CEO age and real activities earnings management and we find no evidence that CEO age affects accruals-based earnings management. We also test the role of clawback provisions, finding no evidence that CEO age affects financial statement irregularities or earnings management when they are in place.

We are thankful for the feedback from the participants of the DEMO Workshop 2020 (UAB) and the DEMO Workshop 2021 (UAB).

3.1 Introduction

It is imperative that financial statements accurately represent the true financial standing of listed firms. Financial statements influence the decisions made by capital market participants and accurate financial statements improve investment efficiency by reducing moral hazard and adverse selection (Biddle et al., 2009; Dou et al., 2019). According to upper echelons theory, the background characteristics of top executives affect the actions they take, thereby influencing firm outcomes (Hambrick & Mason, 1984). In the present study, we consider how financial reporting quality (FRQ) is affected by CEO age using a large panel dataset of listed U.S. firms. We use financial statement irregularities, accruals-based earnings management, and real activities earnings management as proxies for FRQ.

We find evidence that financial statement irregularities are more prevalent when CEOs are older. We provide robust supplementary evidence of this finding, using several approaches to rule out endogeneity and show evidence of causality including an instrumental variable approach. We also find less robust evidence of a positive relation between CEO age and earnings management via cuts to discretionary expenses. And, we find some evidence of a negative relation between CEO age and earnings management via excessive price discounts and overproduction. We find no evidence of a relation between CEO age and accruals-based earnings management. We focus our analysis on the period following the passage of the Sarbanes–Oxley Act (SOX), making it relevant for the modern regulatory environment. This is important because the passage of SOX fundamentally reformed securities regulations in the United States to protect investors and crack down on fraudulent financial reporting. We demonstrate that our findings are not driven solely by retirement-age CEOs by removing them from a supplementary analysis. This helps disentangle the effects of CEO age from the horizon problem which occurs as CEOs approach retirement, and it shows evidence that the CEO age-FRQ relation is continuous. Additionally, we consider the effect of clawback provisions. We find no evidence that FRQ is affected by CEO age when clawback provisions are in place, serving as evidence that clawback provisions eliminate any effect of CEO age on FRQ.

Our study contributes to the literature by demonstrating the impact of CEO age on

FRQ outcomes. Our findings have important implications for capital market participants evaluating the reliability of reported financial statements, boards of directors making CEO hiring decisions or considering CEO age limitations, and auditors evaluating the audit risk of firms. Each of these interested parties should include CEO age as part of their decision-making. Additionally, our findings are relevant to policy-makers considering making clawback provisions mandatory for listed firms.

The importance of CEO characteristics to financial reporting outcomes is well established (see Habib & Hossain, 2013). The passage of SOX further cemented the CEO's role in the financial reporting process, requiring them to certify the truthfulness and accuracy of financial statements before disclosure. We choose to focus on CEO age for two reasons. First, because CEO age is an important factor known to be a strong determinant of firm outcomes (Andreou et al., 2017; Burney et al., 2021; Cline & Yore, 2016; Croci et al., 2017; Serfling, 2014; Yim, 2013), while the effect of CEO age on FRQ has been largely unaddressed. And second, because on average, CEO age in the United States has been shifting dramatically, making it an interesting moment to study how firms may be affected. The 2021 Volatility Report from Crist Kolder Associates affirms that the average age of newly hired Fortune 500 and S&P 500 CEOs has increased considerably, from 45.9 in 2005 to 53.9 in 2021. The striking rise in average CEO age at time of hire is represented graphically in Figure 3.1. One factor contributing to increasing average CEO age is that many U.S. firms are removing mandatory CEO retirement ages from their bylaws (McGregor, 2018). This trend illustrates the need for studies that contribute to a clearer understanding of the effects of CEO age on firm outcomes in a climate of older CEOs.

We measure financial statement irregularities using the financial statement divergence (FSD) score developed by Amiram et al. (2015). The FSD score is calculated as the divergence of the distribution of financial statement line item leading digits from the expected distribution theorized by Benford's law (Benford, 1938). We measure accruals-based earnings management using the performance-matched Jones model (Kothari et al., 2005). And we measure real activities earnings management with abnormal production costs

Figure 3.1: Change in average CEO age at time of hire from 2005 to 2021

Source: The 2020 Volatility Report from Crist Kolder Associates

and abnormal decreases in discretionary expenses (Roychowdhury, 2006; Zang, 2012). We use three measures of earnings management for robustness and because managers are known to choose between earnings management methods such that any single measure is unrepresentative of the full picture (Zang, 2012).

The remainder of this essay proceeds as follows. We review the background and develop the hypotheses. We explain the research design. And finally, we present the results, discuss, and conclude.

3.2 Background and hypothesis development

3.2.1 The ethics and legality of earnings management

Davis-Friday & Frecka (2002) describe earnings management as "the intentional intervention of management to change the reported earnings number (by making operating decisions or by changing accounting procedures) from what it would otherwise have been in the absence of such intervention" (p. 58). Earnings management is widely understood to be unethical, especially following the high-profile accounting scandals of the early 2000s and the passage of SOX (Grasso et al., 2009). The extent to which earnings management is unethical depends on the context of its use, which should be approached considering the purpose of accounting and financial reporting. Drawing from agency theory, accounting serves two purposes towards aligning the interests of shareholders and managers: informativeness and stewardship (Ronen & Yaari, 2008, p. 6). The informativeness of accounting, disclosed in financial reports, advises owners and potential investors on the predicted future cash flows and risks associated with the firm's continued operations. From the stewardship perspective, financial reports provide the information demanded by shareholders to align interests and constrain management. Therefore, it is possible for managers to manage earnings to achieve more informativeness and stewardship by reflecting a better picture of the firm's true standing based on the first-hand information only possessed by managers. This type of earnings management, which is ethical, is described as *white* by Ronen & Yaari (2008) who divide earnings management by ethicality into three categories: *white*, *grey*, and *black* (p. 25). *Black* earnings management is inherently

unethical, it involves situations in which financial report manipulation is conducted with the intention of misrepresenting information and reducing transparency (Ronen & Yaari, 2008). *Grey* earnings management represents the edge of ethical conduct between the two extremes (Ronen & Yaari, 2008). When referring to earnings management going forward, we refer to unethical practices. We use earnings management measures developed in previous studies and rely on the expertise of previous researchers to assume that we are detecting unethical earnings management practices.

Considering legality, the threshold at which earnings management becomes criminal is higher than the threshold for unethicality (Davis-Friday & Frecka, 2002). In the U.S. context, the legality threshold begins after the generally accepted accounting practices have been seriously violated. However, this threshold is not explicit, as it depends on the interpretation of the SEC. The consequences that managers risk facing from earnings management depend on the extent to which it is engaged in. Generally, when earnings management is excessive, managers risk receiving an unfavorable auditor opinion, shareholder litigation, and enforcement actions from the SEC.

3.2.2 CEO age and firm outcomes

CEO characteristics are studied extensively because the CEO, serving as the chief decision-maker, determines firm outcomes more than any other manager. The seminal work by Hambrick & Mason (1984) notes the striking relation between CEO age and organizational characteristics. Younger CEOs appear to have a greater proclivity for innovation. They are found to invest more in research and development (Barker & Mueller, 2002; Serfling, 2014) and conduct more acquisitions (Yim, 2013). A suggested explanation for this is that younger CEOs have greater mental and physical stamina (Child, 1974) and are better suited to understanding new ideas and making behavioral changes (Hambrick & Mason, 1984). CEO age affects firm outcomes in other ways as well. Younger CEOs are more engaged in corporate social responsibility (Oh et al., 2016) and firms run by younger CEOs are less operationally diverse, more leveraged (Serfling, 2014), and more likely to experience a stock price crash (Andreou et al., 2017). Firms run by younger CEOs are

also found to be more likely to file restatements and more likely to meet or barely beat analyst forecasts, indicative of earnings management (H. W. Huang et al., 2012).

3.2.3 CEO career concerns

It is well documented that CEO age is a strong determinant of CEO career concerns (Croci et al., 2017; Gibbons & Murphy, 1992; Holmström, 1999; X. Li et al., 2017; Serfling, 2014). Younger CEOs have stronger incentives to demonstrate their managerial ability to the labor market since they have shorter track records and longer career horizons. Serfling (2014) provides evidence of this, finding that younger CEOs adopt riskier strategies to demonstrate their ability early on. Alternatively, studies of the age of fund managers and analysts find that younger individuals adopt more risk-averse strategies because poor performance is more detrimental to their careers (Chevalier & Ellison, 1999; Croci et al., 2017; Hong et al., 2000). A CEO's career horizon is measured by the number of years until they retire, making it a direct function of their age (Cho & Kim, 2017; McClelland et al., 2012), such that older CEOs have shorter career horizons and vice versa.

According to agency theory, CEOs are self-interested, working in the interest of their principals (stakeholders) only when it benefits them to do so (Jensen & Meckling, 1976). Because of this, CEOs are directly incentivized to work in the firm's interest through performance-based compensation (Jensen & Murphy, 1990). Direct incentives are supplemented by more abstract motives such as the CEO's interest in maintaining their reputation and future employment prospects (Kang, 2016). Some of these incentives persist throughout a CEO's career because of their interest in legacy preservation (Braga-Alves et al., 2020; Matta & Beamish, 2008). However, the behavioral changes in CEOs approaching retirement are studied extensively because certain CEO incentives depend on the CEO having a long career horizon. CEOs nearing retirement are found to be less innovative (Cho & Kim, 2017), less committed to corporate social responsibility (Kang, 2016), less likely to conduct international acquisitions (Matta & Beamish, 2008), and more likely to adopt risk-averse strategies which adversely affect the firm's future performance (McClelland et al., 2012). The compensation committees of firms with near-retirement CEOs

are even found to adjust CEO compensation to mitigate the possibility of opportunistic research and development spending cuts (S. Cheng, 2004). Turning to earnings management, near-retirement CEOs are found to engage in more income-increasing earnings management when their pension is performance-based (Kalyta, 2009) and earnings management is found to increase during the final year before the replacement of retirement-aged CEOs (Davidson et al., 2007). Altogether, this evidence suggests that CEOs become more opportunistic as their career horizon shortens.

3.2.4 Age and risk-taking

CEO gender (Faccio et al., 2016) and CEO religiosity (Hilary & Hui, 2009) are found to affect firm-level risk-taking. This serves as evidence that CEO characteristics that affect the risk preferences of CEOs as individuals, affect risk-related firm outcomes as well. Building on these findings, Hilary et al. (2017) show that non-married CEOs are associated with higher levels of earnings management. They cite differing risk preferences between single and married CEOs as a potential explanation, highlighting the riskiness of earnings management and the importance of CEO characteristics. Therefore, a general relation between the age of an individual and their risk preferences could explain a link between CEO age and FRQ. However, the literature on this topic lacks a strong consensus. Vroom & Pahl (1971) administer tests to managers and find that risk-taking and the value placed on risk decrease as individuals age. They theorize that this occurs because of cultural experiences or because the number of people who financially depend on a person increases as they age. Using a survey designed to measure risk preferences, Hallahan et al. (2003) find that the relation between age and risk tolerance is non-linear but negative overall. These findings are confirmed by others as well (McInish, 1982; Morin & Suarez, 1983; Pålsson, 1996). However, Wang & Hanna (1997) challenge the notion that risk tolerance decreases with age. By defining risk tolerance as the ratio of risky assets to total wealth, they find that it increases with age. Several others find a positive relation between age and risk tolerance as well (Bakshi & Chen, 1994; Bellante & Green, 2004; Bellante & Saba, 1986; Grable, 2000; Riley & Chow, 1992).

Given that earnings management is understood to be an unethical business practice (Grasso et al., 2009), we review literature on the relation between age and business ethics. Most studies conclude that older individuals behave more ethically in business settings. Ruegger & King (1992) survey business students and find that older respondents have a stronger perception of ethical conduct. Another survey of business students shows that older students are less likely to make unethical decisions involving insider trading (Terpstra et al., 1993). A survey of business professionals reveals that ethical belief standards increase with age (Peterson et al., 2001) and a survey of managers of large non-profits reveals that older individuals perceive certain questionable practices as more unethical than their younger counterparts (Deshpande, 1997). Alternatively, one survey of MBA students finds that age does not affect the likelihood of tolerating questionable business practices (Kohut & Corriher, 1994) and a survey of Chinese state-owned firm employees finds that younger individuals behave more ethically (Fu, 2014).

While the consensus points towards a positive relation between age and ethical behavior, there is an important caveat to address. To our knowledge, no study on the age-business ethics relation uses a sample of individuals in the upper echelons of management, and most use samples of individuals much younger than the average CEO. Therefore, it may be dubious to assume that the changing ethical beliefs found in young adults extend into late adulthood. Furthermore, to our knowledge, no such study surveys CEOs. This is important because CEOs are found to be considerably different than average adults, being more stable, composed, competitive, ambitious, outgoing, and oriented to formal learning (Winsborough & Sambath, 2013). CEOs are even found to differ from other senior managers, being less neurotic and more extraverted, agreeable, and conscientious (Palaiou & Furnham, 2014). This highlights further issues with using the standing age-business ethics research to explain CEO behavior.

In summary, these two perspectives (CEO career concerns and changing ethical behavior with age) provide conflicting views regarding the likely effect of CEO age on FRQ. Therefore, we develop alternative hypotheses and consider the direction of the relation revealed in the empirical analysis. Thus, we hypothesize the following:

H1a: There is a negative relation between CEO age and financial reporting quality.

H1b: There is a positive relation between CEO age and financial reporting quality.

3.3 Research design

3.3.1 Data and sample

We form the sample of listed U.S. firms from four databases. Data on financial statements, firm characteristics, and auditor characteristics are collected from the Fundamentals Annual section of the CRSP/Compustat Merged database (Compustat). Data on CEO characteristics, CFO characteristics, and CEO compensation are collected from the Annual Compensation section of the Compustat Executive Compensation database (Execucomp). The Execucomp data are matched to the Compustat data using the ticker symbols. Data on institutional ownership are collected from the Stock Ownership Summary section of the Thompson Reuters Institutional (13f) Holdings database. The Thompson Reuters data are matched using the CUSIP numbers, the ticker symbols, and then the company names; they are matched using those variables in that order, only using the subsequent variables to find matches if none were procured by the prior. Data on the presence of clawback provisions are collected from annually filed definitive proxy statements (form DEF 14A) accessed from the U.S. SEC database (EDGAR). Clawback provision data are matched using the CIK numbers. All data were collected during January 2022.

Our sample spans from 2003 (the first post-SOX year) to 2019 (the final year of data availability). We exclude pre-SOX observations from the main analysis because they do not represent the modern regulatory environment and because the vast majority of observations are post-SOX. Still, for robustness, we include an additional analysis of a sample beginning in 1992 (the first year of Execucomp data availability). Our sample is formed using all observations with data availability from the four sources. Thus, our sample comprises 18,492 firm-year observations representing 1,981 individual firms. The analysis including pre-SOX observations includes 22,809 firm-year observations representing 2,327 individual firms.

3.3.2 Dependent variables

We use four FRQ proxies which serve as the dependent variables of the study. We begin with the FSD score, a measure of FRQ that represents the extent of financial statement irregularities. For robustness, we accompany this analysis with one measure of accruals-based earnings management and two measures of real activities earnings management. The following sections describe the dependent variables in greater detail.

Financial statement irregularities

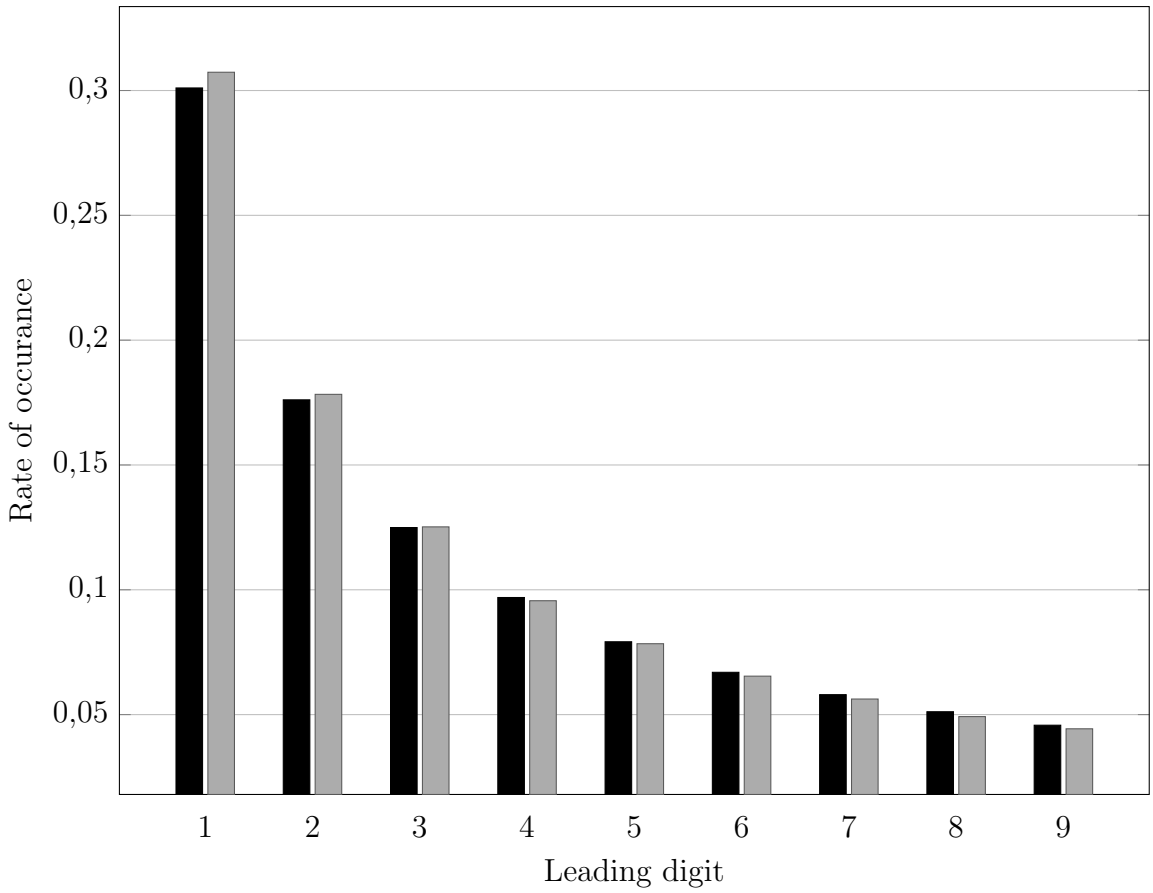
We measure financial statement irregularities using the FSD score developed by Amiram et al. (2015). The FSD score is a robust measure calculated by applying Benford's law to the year-end financial statement line items. Benford's law was developed following the peculiar discovery that the leading digits[7] of sufficiently large number sets from real-life settings are not evenly distributed (Benford, 1938). Within a randomly generated number set, the numbers 1-9 occur as the leading digit with uniform frequency, each about 11.1% of the time. However, in number sets generated from real-life settings, the numbers 1-9 occur as the leading digit following the function $F_x = log[(1/x) + 1]$, where F_x is the frequency of numbers with the leading digit x. Accordingly, in real-life settings about 30.1% of numbers will have the leading digit 1, about 17.6% will have the leading digit 2, about 12.5% will have the leading digit 3, and so on, continually decreasing in frequency. Since its discovery, Benford's law has been used for numerous applications and its remarkable accuracy has been routinely confirmed.

Because financial statements are the result of real-life situations, the leading digits of financial statement line items should adhere to Benford's distribution. The degree of divergence from Benford's distribution can be interpreted as the degree of financial statement manipulation which we use as a proxy for financial statement irregularities. In our sample, we find that on average the distribution of leading digits from financial statement line items closely follows Benford's distribution. This is shown in Figure 3.2.

Amiram et al. (2015) test the FSD score extensively to validate its effectiveness. They

[7]The leading digit of a number is the first non-zero digit, from one to nine, in the leftmost position. For example, the leading digits of the numbers -1710, 0.201, and 610 are 1, 2, and 6, respectively.

Figure 3.2: Comparison of the theoretical and observed distribution of leading digits



■ The theoretical distribution of leading digits (1-9) in number sets from real-life settings according to Benford's law

▒ The average distribution of leading digits (1-9) observed in our sample of 18,492 firms-years comprising 1,981 individual firms

compare the FSD score to established FRQ proxies, finding significant positive relations between them. They find that firms with barely positive incomes have higher FSD scores than those with barely negative incomes. This follows the discovery by Burgstahler & Dichev (1997), that barely profitable firms are more likely to have managed their earnings to avoid reporting a loss. They compare misstated financial statements that require restatements to the corrected versions finding that, for the same firm year, the corrections result in significantly lower FSD scores. And, along with further tests, they show that higher FSD scores correspond with less persistent earnings and that lagged FSD scores predict material misstatements.

In recent literature, the FSD score has been used to study how FRQ varies over a firm's life cycle (Krishnan et al., 2021), to measure the effect of auditor size on audit quality (Jiang et al., 2019), and to study the effect of CFO gender on FRQ (Gupta et al., 2020).

As with Amiram et al. (2015), we calculate the FSD score as the average of the absolute differences between the theoretical Benford distribution and the observed distribution of the leading digits of the financial statement line items[8] as shown in equation (1).

$$FSD\ score = \frac{\sum_{n=1}^{9} |P_n - log[(1/n) + 1]|}{9} \tag{1}$$

where P_n is the proportion of financial statement line items with the leading digit n.

Thus, a higher FSD score signifies greater divergence from the theoretical Benford distribution indicating greater financial statement irregularities and poorer FRQ. Following prior literature, any firm-year observation with less than 100 total financial statement line items is dropped because a sufficiently large number set is needed to identify authentic abnormalities (Amiram et al., 2015).

[8]The line items are captured from the Compustat database as all available items under the categories: Balance Sheet Items, Income Statement Items, and Cash Flow Items.

Accruals-based earnings management

Earnings management is generally divided into two types: *accounting*-based and *operating*-based, depending on the method engaged in by management (Cohen et al., 2008; Roychowdhury, 2006). We analyze the effect of CEO age on both types.

In accounting, accruals occur when revenues or expenses are realized before the cash related to the transaction has been exchanged. While accruals are commonplace, they can be manipulated by bad actors to temporarily inflate reported earnings. Ronen & Yaari (2008) define discretionary accruals as "accruals that arise from transactions made or accounting treatments chosen in order to manage earnings" (p. 372). Jones (1991) developed a method of measuring discretionary accruals, now known as the Jones model, to test whether firms managed earnings to benefit from import relief. Kothari et al. (2005) found that the reliability of discretionary accruals measures is improved by controlling for performance. Thus, we use a performance-matched measure of the Jones model including a constant term.[9]

Discretionary accruals are calculated as the difference between total accruals[10] and non-discretionary accruals. We calculate discretionary accruals as the residual (error term) from equation (2) which is regressed cross-sectionally for each group of firm-year observations from the same year and same two-digit SIC code.

$$\frac{TA_t}{A_{t-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \alpha_2 \left(\frac{\Delta S_t}{A_{t-1}}\right) + \alpha_3 \left(\frac{PPE_t}{A_{t-1}}\right) + \alpha_4 \left(ROA_t\right) + \epsilon \tag{2}$$

where TA_t is total accruals in year t, A_{t-1} is total assets in year $t-1$ using Compustat item (AT), ΔS_t is change in sales from year $t-1$ to year t using Compustat item (REVT), PPE_t is net property, plant, and equipment in year t using Compustat item (PPEGT), and ROA_t is total income divided by total assets using Compustat items (NI) and (AT).

[9] We find that variations of this approach (i.e. the modified Jones model, non-performance-matched, no constant) do not seriously affect our results.

[10] As with prior studies, we calculate total accruals (TA) using the following formula with the corresponding Compustat database items in parentheses: the change in current assets Δ(ACO) minus the change in current liabilities Δ(LCT) plus the change in debt in current liabilities Δ(DLC) minus the change in cash and cash equivalents (CHECH) minus depreciation and amortization expenses (DP) (Dechow et al., 1995).

As with prior studies, when calculating discretionary accruals, we drop all firm-year observations from year-industry groups with less than 15 observations (Zang, 2012).

Real activities earnings management

Real activities earnings management measures consider real economic activities taken by managers to manage earnings (Cohen & Zarowin, 2010; Graham et al., 2005; Zang, 2012). Graham et al. (2005) survey executives and find that the vast majority are willing to take economic actions that smooth reported earnings at the expense of long-term firm value. Zang (2012) stresses that it is important for researchers to consider both accruals-based and real activities earnings management. She finds that managers tradeoff between the two methods based on their relative costs such that neither method alone represents the whole picture.

Roychowdhury (2006) develops three measures of real activities earnings management: abnormal operating cash flow, abnormal production costs, and abnormal decreases in discretionary expenses. Many researchers have moved to using only the measures of abnormal production costs and abnormal decreases in discretionary expenses (Farooqi et al., 2014; Harris et al., 2019; Sakaki et al., 2017; Zang, 2012) because, as noted by Roychowdhury (2006), the direction of the net effect of earnings management on operating cash flow is ambiguous. This makes it difficult to interpret the meaning of a relation in a given direction. Therefore, we adopt abnormal production costs and abnormal decreases in discretionary expenses as our two proxies for real activities earnings management. Still, we provide the regression results of abnormal operating cash flow in Appendix A1 for robustness. The results do not show evidence of a relation with CEO age.

Managers may enact excessive price discounts and overproduction to temporarily inflate reported earnings (Roychowdhury, 2006). This can be observed as abnormally high production costs relative to sales. Therefore, abnormal production costs are calculated as the residual from equation (3) which is regressed cross-sectionally for each group of firm-year observations from the same year and same two-digit SIC code.

$$\frac{Prod_t}{A_{t-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \alpha_2 \left(\frac{S_t}{A_{t-1}}\right) + \alpha_3 \left(\frac{\Delta S_t}{A_{t-1}}\right) + \alpha_4 \left(\frac{\Delta S_{t-1}}{A_{t-1}}\right) + \epsilon \tag{3}$$

where $Prod_t$ is cost of goods sold in year t plus change in inventory in year t using Compustat items (COGS) and (INVT).

Managers may also inflate earnings temporarily by reducing discretionary expenditures. This can be observed as abnormally low discretionary expenditures relative to sales (Roychowdhury, 2006). As with prior studies, we multiply the level of abnormal discretionary expenditures by -1 to capture abnormal decreases in discretionary expenses (Farooqi et al., 2014; Harris et al., 2019; Sakaki et al., 2017). Therefore, abnormal decreases in discretionary expenses are calculated as -1 multiplied by the residual from equation (4) which is regressed cross-sectionally for each group of firm-year observations from the same year and same two-digit SIC code.

$$\frac{DisX_t}{A_{t-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \alpha_2 \left(\frac{S_{t-1}}{A_{t-1}}\right) + \epsilon \tag{4}$$

where $DisX_t$ is research and development expenses plus advertising expenses plus selling, general, and administrative expenses in year t using Compustat items (XRD), (XAD), and (XSGA).[11]

As with prior studies, when estimating the real activities earnings management models, we drop all firm-year observations from year-industry groups with less than 15 observations (Roychowdhury, 2006; Zang, 2012).

3.3.3 Independent variables

The variable of interest is *CEO age*, measured as the natural log of the CEO's age using Execucomp item (AGE).[12] For observations missing this variable, we first attempt to capture it using item (AGE) from the same individual and different year, matched by

[11] As with prior studies, as long as selling, general, and administrative expenses are available, research and development expenses and advertising expenses are set to zero if they are unavailable (Roychowdhury, 2006).

[12] From the Execucomp data, we determine who the CEO and CFO are using Execucomp items (CEOANN) and (CFOANN). If these indicate no CEO or CFO, we determine the CEO and CFO by the presence of the phrases "ceo" or "chief exec" and "cfo" or "chief financ" present in the executive's title from Execucomp item (TITLEANN), regardless of the capitalization of the phrases.

(EXECID), adjusting for the difference in years. If CEO age remains unavailable, we attempt to capture it using the CEO's present age, Execucomp item (PAGE), adjusting for the difference in years.

Because CEO age and CEO tenure are related, we control for *CEO tenure* measured as the natural log of the number of years since the CEO was first labeled a CEO in Execucomp (including if they were first labeled a CEO at a different firm). Despite CEO age and tenure being related, prior literature confirms that they capture distinct incentives and affect CEO behavior differently (W. T. Chen et al., 2019). Because female CEOs are associated with greater accounting conservatism (Ho et al., 2015), we control for *CEO gender* using Execucomp item (GENDER), coded 1 if the CEO is a woman and zero otherwise. We control for certain CFO characteristics because CFOs play a critical role in the financial reporting process as well. Because CFO age may be related to CEO age, we control for *CFO age* calculated as the natural log of the CFO's age. We do not find a concerning level of correlation between CEO and CFO age as the correlation coefficient for the variables is 0.17. We calculate CFO age following the previously described process for CEO age, but applied to the CFO. We control for CFO gender because female CFOs are associated with more conservative financial reporting (Francis et al., 2015) and better FRQ (Barua et al., 2010; Davis & Garcia-Cestona, 2021; Gupta et al., 2020; Peni & Vähämaa, 2010). We capture *CFO gender* using Execucomp item (GENDER), coded 1 if the CFO is a woman and zero otherwise.

Additionally, we include six controls for firm characteristics. Larger firms are subject to increased monitoring and face greater consequences for financial misconduct (Deli & Gillan, 2000). We measure *Firm size* as the natural log of total assets using Compustat item (AT). We control for firm performance proxied by return on assets (*ROA*) calculated as total income divided by total assets using Compustat items (NI) and (AT). We include the *Market to book* ratio as a measure of market valuation calculated as the firm's market value divided by its book value using Compustat items (PRCC_F) and (BKVLPS). Firms with greater levels of debt face increased monitoring from creditors (Jelinek, 2007; Zamri et al., 2013). We control for *Leverage* calculated as total liabilities divided by

Table 3.1: Description of variables

FSD score	Average of the absolute differences between the theoretical Benford distribution and the observed distribution of the leading digits of the financial statement line items
Ab. disc. acc.	Abnormal discretionary accruals
Ab. prod. cost	Abnormal production costs
Ab. disc. exp.	Abnormal decreases in discretionary expenses
CEO age	Natural log of the CEO's age
CEO tenure	Natural log of the CEO's tenure
CEO gender	Dummy variable equal to one if the CEO is a woman and zero otherwise
CFO age	Natural log of the CFO's age
CFO gender	Dummy variable equal to one if the CFO is a woman and zero otherwise
Firm size	Natural log of total assets
ROA	Total income divided by total assets
Market to book	The firm's market value divided by its book value
Leverage	Total liabilities divided by total assets
Inst. ownership	Number of shares held by institutional investors divided by the number of shares outstanding
Big auditor	Dummy variable equal to one of the auditor is one of the big four and zero otherwise

total assets using Compustat items (LT) and (AT). Institutional investors serve an important monitoring role and institutional investor ownership is associated with increased FRQ (Ramalingegowda et al., 2021; Velury & Jenkins, 2006). We control for the level of institutional ownership (*Inst. ownership*) calculated as the number of shares held by institutional investors divided by the number of shares outstanding using Thomson Reuters item (instown_perc). Finally, research shows that larger auditors provide better quality audits (Becker et al., 1998; DeAngelo, 1981; Lennox, 1999). The variable *Big auditor* indicates whether the firm's auditor is one of the big four using Compustat item (AU).

Table 3.1 provides a description of the variables and Table 3.2 shows the descriptive statistics. We test for multicollinearity within the independent variables by examining their variance inflation factors (VIFs). The mean, highest, and lowest VIF of the independent variables are 1.11, 1.31, and 1.00, respectively, indicating no multicollinearity concerns. Table 3.3 gives a breakdown of the correlation between all variables. We find that none of the independent variables are highly correlated.

Table 3.2: Descriptive statistics

	N	Mean	Standard deviation	Q1	Q3
FSD score	18,492	0.03	0.01	0.02	0.03
Ab. disc. acc.	18,492	0.00	0.18	-0.04	0.03
Ab. prod. cost	18,492	-0.03	0.20	-0.12	0.07
Ab. disc. exp.	18,492	-0.01	0.28	-0.13	0.07
CEO age	18,492	4.02	0.13	3.93	4.11
CEO tenure	18,492	1.61	0.82	1.10	2.20
CEO gender	18,492	0.04	0.19	0.00	0.00
CFO age	18,492	3.92	0.13	3.83	4.03
CFO gender	18,492	0.10	0.30	0.00	0.00
Firm size	18,492	7.47	1.64	6.32	8.50
ROA	18,492	0.04	0.13	0.02	0.09
Market to book	18,492	4.01	55.10	1.37	3.60
Leverage	18,492	0.52	0.27	0.35	0.65
Inst. ownership	18,492	0.77	0.21	0.69	0.92
Big auditor	18,492	0.89	0.31	1.00	1.00

3.3.4 Empirical modeling

Using a panel sample of listed U.S. firms from 2003 to 2019, we test how CEO age affects financial statement irregularities and earnings management controlling for characteristics known to affect FRQ. Thus, we estimate the following regression model:

$$\begin{aligned} FRQ_t = {} & \beta_0 + \beta_1 CEO\ age_t + \beta_2 CEO\ tenure_t + \beta_3 CEO\ gender_t \\ & + \beta_4 CFO\ age_t + \beta_5 CFO\ gender_t + \beta_6 Firm\ size_t + \beta_7 ROA_t \\ & + \beta_8 Market\ to\ book_t + \beta_9 Leverage_t + \beta_{10} Inst.\ ownership_t \\ & + \beta_{11} Big\ auditor_t + Year\ dummies_t + \epsilon \end{aligned} \tag{5}$$

where FRQ_t is a general term for the four FRQ proxies in time t.

We use firm fixed effects regression models because significant Hausman tests for each of the four dependent variables reveal that the observed and unobserved variables are correlated, violating an assumption required for random effects regression (Allison, 2009, p. 23). We include year dummies in each model to control for time-variant factors. We do not include industry dummies because firm fixed effects regression only analyzes the within-firm variation and a firm's industry is invariant. All results are based on robust

Table 3.3: Correlation matrix

	1	2	3	4	5	6	7
1. *FSD score*	1.00						
2. *Ab. disc. acc.*	**0.01**	1.00					
3. *Ab. prod. cost*	**-0.06**	**0.03**	1.00				
4. *Ab. disc. exp.*	**0.08**	**0.09**	**-0.53**	1.00			
5. *CEO age*	**-0.02**	**0.01**	**0.05**	**-0.09**	1.00		
6. *CEO tenure*	**-0.03**	0.00	**0.01**	**-0.03**	**0.38**	1.00	
7. *CEO gender*	**0.03**	0.00	**-0.01**	**0.02**	**-0.03**	**-0.04**	1.00
8. *CFO age*	**-0.02**	**0.02**	**0.03**	**-0.02**	**0.17**	**0.11**	0.00
9. *CFO gender*	**-0.02**	**-0.01**	**-0.01**	**-0.01**	**0.03**	**-0.01**	**0.02**
10. *Firm size*	**-0.23**	0.00	**0.11**	**-0.19**	**0.09**	**0.12**	**-0.01**
11. *ROA*	**-0.05**	**-0.04**	**-0.17**	**-0.08**	**0.04**	**0.06**	**0.01**
12. *Market to book*	0.00	**-0.01**	**-0.03**	**0.02**	0.00	0.00	0.00
13. *Leverage*	**-0.12**	**0.01**	**0.11**	**-0.02**	**0.02**	**-0.01**	**0.01**
14. *Inst. ownership*	**-0.06**	**0.01**	0.00	**-0.06**	**-0.03**	**0.04**	**-0.01**
15. *Big auditor*	**-0.11**	0.00	**0.06**	**-0.05**	**-0.03**	**0.01**	**0.01**

	8	9	10	11	12	13	14
8. *CFO age*	1.00						
9. *CFO gender*	**-0.04**	1.00					
10. *Firm size*	**0.12**	**0.02**	1.00				
11. *ROA*	**0.03**	**0.04**	**0.17**	1.00			
12. *Market to book*	**0.02**	**0.01**	0.00	**0.02**	1.00		
13. *Leverage*	**0.01**	**-0.01**	**0.30**	**-0.15**	**0.05**	1.00	
14. *Inst. ownership*	**-0.02**	0.00	**0.12**	**0.16**	0.00	**-0.04**	1.00
15. *Big auditor*	0.00	**0.02**	**0.34**	**0.08**	**0.01**	**0.15**	**0.17**

Bold correlation coefficients are significant at the 5% level.

standard errors.

Because executives are not randomly assigned to firms, it is especially important to address potentially endogenous factors in order to show evidence of causality. Time-invariant endogeneity is controlled for through the use of firm fixed effects regression which only analyzes the within-firm variation. We take additional steps to further abate endogeneity concerns detailed in Section 3.4.1.

3.4 Empirical results

Table 3.4 shows the results of Models 1-4 which model the effect of CEO age on four measures of FRQ. We begin with the FSD score in Model 1, a measure of financial statement irregularities. The model shows a significant positive relation between CEO age and the FSD score ($p < 0.01$). Because a higher FSD score indicates greater financial statement manipulation, this relation shows evidence that CEO age affects FRQ negatively, serving as initial evidence supporting hypothesis *H1a*. Model 1 also shows that the FSD score is higher when the CFO is older ($p < 0.01$), when firms are smaller ($p < 0.01$), when firms are less leveraged ($p < 0.01$), and when less stock is held by institutional investors ($p < 0.05$).

We proceed, analyzing the measures of earnings management, beginning with the accruals-based approach. Model 2 does not show evidence of a relation between CEO age and abnormal discretionary accruals. The lack of explanatory power in Model 2 may be explained by less accruals-based earnings management generally, as a result of analyzing the post-SOX period. Research shows that accruals-based earnings management was constrained disproportionately due to increased scrutiny following the passage of SOX (Zang, 2012).

Turning to real activities earnings management, we use abnormal production costs and abnormal decreases in discretionary expenses as dependent variables in Models 3 and 4, respectively. Model 3 shows no evidence of a relation between CEO age and abnormal production costs. There is evidence that abnormal production costs are greater when CEO tenure is greater ($p < 0.05$), when the CEO is a woman ($p < 0.05$), when firms are

Table 3.4: Financial reporting quality and CEO age – firm fixed effects

	Model 1	Model 2	Model 3	Model 4
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
CEO age	0.002***	-0.002	-0.007	0.048**
	(2.80)	(-0.09)	(-0.54)	(2.24)
CEO tenure	0.000	-0.002	0.003**	0.000
	(-1.62)	(-0.94)	(2.04)	(-0.02)
CEO gender	0.000	-0.005	0.018**	-0.001
	(-0.28)	(-0.70)	(2.39)	(-0.09)
CFO age	0.002***	0.018	0.015*	-0.034**
	(2.78)	(1.07)	(1.72)	(-2.14)
CFO gender	0.000	-0.007	0.003	-0.007
	(-0.48)	(-1.53)	(0.84)	(-1.19)
Firm size	-0.001***	-0.006	0.038***	0.059***
	(-8.14)	(-1.04)	(12.85)	(11.36)
ROA	0.001	-0.050	-0.253***	-0.039
	(1.26)	(-1.40)	(-18.25)	(-1.30)
Market to book	0.000	0.000	0.000	0.000
	(-0.67)	(-0.91)	(-0.13)	(0.18)
Leverage	-0.002***	-0.005	-0.005	-0.074***
	(-3.57)	(-0.28)	(-0.63)	(-4.21)
Inst. ownership	-0.001**	0.014	0.009	0.015
	(-2.00)	(1.25)	(1.36)	(1.14)
Big auditor	0.000	0.036**	0.000	-0.019
	(0.01)	(2.22)	(0.01)	(-1.30)
Constant	0.021***	-0.066	-0.329***	-0.397***
	(5.50)	(-0.70)	(-4.92)	(-3.44)
Year dummies	Yes	Yes	Yes	Yes
N	18,492	18,492	18,492	18,492
Adj. R-squared	0.188	0.028	0.770	0.590

Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.

larger ($p < 0.01$), and when they perform worse ($p < 0.01$).

Model 4 shows evidence of a positive relation between CEO age and abnormal decreases in discretionary expenses ($p < 0.05$), supporting hypothesis *H1a*. The model also shows that abnormal decreases in discretionary expenses are greater when the CFO is younger ($p < 0.05$), when firms are larger ($p < 0.01$), and when firms are less leveraged ($p < 0.01$).

3.4.1 Sensitivity tests

The initial analysis shows evidence of a negative relation between CEO age and FRQ. Next, we address endogeneity further and attempt to establish evidence of a causal link using several sensitivity tests.

Pre-Sarbanes–Oxley Act

We believe it is appropriate to focus on the post-SOX period because SOX's sweeping reforms to financial reporting regulations in the United States make the analysis of pre-SOX data less applicable to contemporary issues. Still, we conduct an analysis of all available years to see how our results differ with the inclusion of pre-SOX observations. Table 3.5 reports the results of Models 5-8 which are identical to Models 1-4 but with the inclusion of pre-SOX firm-year observations. Thus, Models 5-8 include data from the period 1992-2019.

Model 5 shows that the positive relation between CEO age and the FSD score holds when pre-SOX observations are included ($p < 0.01$). Model 5 also shows evidence of a positive relation between CEO tenure and the FSD score that is not revealed in Model 1 ($p < 0.05$). While Model 4 from Table 3.4 shows evidence of a positive relation between CEO age and abnormal decreases in discretionary expenses, the coefficient remains positive but statistically insignificant when pre-SOX observations are included (Model 6).

CEO career horizon

It is well established in the literature that CEO proximity to retirement affects an array of firm outcomes (S. Cheng, 2004; Cho & Kim, 2017; Heyden et al., 2017; Kang, 2016; Matta

Table 3.5: Financial reporting quality and CEO age, including pre-SOX observations – firm fixed effects

	Model 5	Model 6	Model 7	Model 8
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
CEO age	0.002***	-0.004	-0.007	0.095
	(2.92)	(-0.26)	(-0.65)	(1.31)
CEO tenure	0.000**	0.001	0.002	0.020
	(-2.32)	(0.38)	(1.22)	(1.62)
CEO gender	0.000	0.012	0.003	-0.054
	(0.27)	(0.61)	(0.24)	(-1.05)
CFO age	0.001**	0.010	0.004	-0.103*
	(2.10)	(0.61)	(0.53)	(-1.68)
CFO gender	0.000	-0.008	0.005	-0.006
	(-1.43)	(-1.44)	(1.31)	(-0.39)
Firm size	-0.001***	-0.018*	0.041***	0.062***
	(-9.57)	(-1.75)	(7.50)	(4.04)
ROA	0.001*	-0.027	-0.211***	-0.088**
	(1.67)	(-0.62)	(-10.88)	(-2.16)
Market to book	0.000	0.000	0.000	0.000
	(-1.20)	(0.04)	(0.29)	(0.14)
Leverage	-0.002***	-0.010	0.015	-0.062
	(-4.98)	(-0.57)	(1.44)	(-0.85)
Inst. ownership	-0.001***	0.009	0.011	0.056
	(-2.86)	(0.68)	(1.45)	(1.18)
Big auditor	0.000	0.027	0.003	-0.027
	(0.17)	(1.64)	(0.41)	(-1.19)
Constant	0.023***	0.031	-0.302***	-0.311
	(5.59)	(0.25)	(-4.11)	(-0.86)
Year dummies	Yes	Yes	Yes	Yes
N	22,809	22,809	22,809	22,809
Adj. R-squared	0.181	0.047	0.716	0.097

Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.

& Beamish, 2008; McClelland et al., 2012), including earnings management (Davidson et al., 2007; Kalyta, 2009). This is an important issue to consider as it relates directly to age. In order to establish that our results are due to CEO age, we must rule out proximity to retirement as a potential confounding factor. Doing so is also important to show evidence that the effect of CEO age on FRQ is continuous over the CEO age spectrum, and not driven exclusively by observations with older CEOs. We begin with an analysis excluding CEOs that are directly pre-retirement age and older. Thus, Table 3.6 shows Models 9-12 which are identical to Models 1-4, except that observations with CEOs aged 60 and over are excluded (Cho & Kim, 2017).

Models 9 and 12 show evidence that CEO age continues to have a significant positive relation with the FSD score ($p < 0.01$) and abnormal decreases in discretionary expenses ($p < 0.10$) when post-retirement and directly pre-retirement-aged CEOs are excluded. This indicates that our results from Table 3.4 are not driven exclusively by the distinct behavior of CEOs nearing retirement.

CEO compensation

Next, we consider aspects of CEO compensation and attempt to rule out the possibility that our results are explained by endogenous compensation-related factors, rather than CEO age. This is especially important considering that the structure of a CEO's compensation is likely related to their age, thereby increasing the possibility of endogeneity. We begin by considering the proportion of CEO compensation that is performance-based, as this metric is found to increase the prevalence of earnings management (Bergstresser & Philippon, 2006; Q. Cheng & Warfield, 2005; Harris et al., 2019; L. Li & Kuo, 2017). Thus, Table 3.7 shows Models 13-16 which are identical to Models 1-4, but with dummy variables reflecting ten levels of performance-based CEO compensation. This allows us to analyze the effect of CEO age within groups with very little variation in the level of performance-based CEO compensation. Following Harris et al. (2019), we measure the level of performance-based CEO compensation as the value of restricted stocks and stock

Table 3.6: Financial reporting quality and CEO age, excluding observations with CEOs aged 60 and over – firm fixed effects

	Model 9	Model 10	Model 11	Model 12
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
CEO age	0.003***	0.011	0.019	0.078*
	(2.64)	(0.43)	(0.78)	(1.92)
CEO tenure	0.000	0.000	0.003*	0.001
	(-1.16)	(0.06)	(1.80)	(0.36)
CEO gender	0.000	-0.005	0.025**	0.011
	(0.03)	(-0.57)	(2.30)	(0.73)
CFO age	0.001*	0.032*	0.009	-0.019
	(1.94)	(1.78)	(0.85)	(-0.93)
CFO gender	0.000	-0.010*	0.002	-0.014*
	(-0.46)	(-1.65)	(0.40)	(-1.73)
Firm size	-0.001***	-0.007	0.037***	0.057***
	(-7.08)	(-1.17)	(10.38)	(8.59)
ROA	0.000	-0.039	-0.244***	-0.035
	(0.64)	(-1.23)	(-14.23)	(-0.95)
Market to book	0.000	0.000	0.000	0.000
	(-0.34)	(-0.27)	(0.59)	(-1.02)
Leverage	-0.001*	0.007	-0.001	-0.057***
	(-1.85)	(0.32)	(-0.13)	(-2.80)
Inst. ownership	-0.001**	0.015	0.016*	0.036**
	(-2.27)	(0.99)	(1.86)	(2.17)
Big auditor	0.000	0.055**	0.001	-0.029
	(-0.80)	(2.15)	(0.06)	(-1.43)
Constant	0.018***	-0.195	-0.415***	-0.581***
	(3.13)	(-1.59)	(-3.78)	(-3.12)
Year dummies	Yes	Yes	Yes	Yes
N	12,885	12,885	12,885	12,885
Adj. R-squared	0.187	0.060	0.777	0.605

Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.

options divided by total compensation.[13]

Table 3.7 shows evidence that our initial findings are not the result of performance-based CEO compensation. This is because CEO age continues to have a significant positive relation with the FSD score ($p < 0.01$) and abnormal decreases in discretionary expenses ($p < 0.05$) in Models 13 and 16, respectively.

In order to observe differences in the role of CEO age when performance-based CEO compensation is at high and low levels, we repeat the analysis after dividing the sample into two groups based on the level of performance-based CEO compensation. Thus, Table 3.8 shows Models 17-20 in Panel A and Models 21-24 in Panel B that include the 9,246 firm-year observations with the highest and lowest levels of performance-based compensation, respectively. This additional analysis is important for testing whether the effect of CEO age on FRQ is dependent on the level of performance-based compensation.

Comparing Models 17 and 21, the effect of CEO age on financial statement irregularities does not differ significantly between the analysis of high and low levels of performance-based CEO compensation ($p < 0.10$). Turning to abnormal decreases in discretionary expenses, no statistically significant relation is revealed in Model 20 of Panel A. However, Model 24 of Panel B shows evidence of a positive relation between CEO age and abnormal decreases in discretionary expenses, as revealed in previous models, when performance-based CEO compensation is low ($p < 0.05$). This indicates that the findings related to abnormal decreases in discretionary expenses may be driven by observations with low levels of performance-based CEO compensation.

Clawback provisions

We continue with the consideration of compensation characteristics, turning to the presence of clawback provisions. Clawback provisions are typically adopted by firms to enable shareholders to recover executive compensation related to earnings that are subsequently

[13]Restricted stock value is captured using Execucomp items (RSTKGRNT) for 2003-2005 observations and (STOCK_AWARDS_FV) for 2006-2019 observations. Stock options value is captured using Execucomp items (OPTION_AWARDS_BLK_VALUE) for 2003-2005 observations and (OPTION_AWARDS_FV) for 2006-2019 observations. Total compensation is captured using Execucomp item (TDC1).

Table 3.7: Financial reporting quality and CEO age with dummies for CEO performance-based compensation deciles – firm fixed effects

	Model 13	Model 14	Model 15	Model 16
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
CEO age	0.002***	-0.004	-0.006	0.048**
	(2.69)	(-0.24)	(-0.44)	(2.26)
CEO tenure	0.000	-0.002	0.003**	0.000
	(-1.58)	(-0.86)	(2.04)	(-0.01)
CEO gender	0.000	-0.004	0.018**	-0.001
	(-0.26)	(-0.61)	(2.37)	(-0.09)
CFO age	0.002***	0.019	0.015*	-0.035**
	(2.82)	(1.11)	(1.68)	(-2.15)
CFO gender	0.000	-0.007	0.003	-0.007
	(-0.49)	(-1.54)	(0.87)	(-1.19)
Firm size	-0.001***	-0.006	0.037***	0.058***
	(-8.10)	(-1.02)	(12.81)	(11.37)
ROA	0.001	-0.049	-0.253***	-0.039
	(1.29)	(-1.37)	(-18.21)	(-1.30)
Market to book	0.000	0.000	0.000	0.000
	(-0.72)	(-0.94)	(-0.13)	(0.18)
Leverage	-0.002***	-0.006	-0.005	-0.074***
	(-3.65)	(-0.34)	(-0.54)	(-4.18)
Inst. ownership	-0.001*	0.016	0.009	0.015
	(-1.90)	(1.38)	(1.25)	(1.11)
Big auditor	0.000	0.036**	0.000	-0.019
	(0.03)	(2.23)	(0.00)	(-1.30)
Constant	0.022***	-0.055	-0.334***	-0.399***
	(5.59)	(-0.58)	(-4.98)	(-3.45)
Year dummies	Yes	Yes	Yes	Yes
CEO comp. dummies	Yes	Yes	Yes	Yes
N	18,492	18,492	18,492	18,492
Adj. R-squared	0.188	0.028	0.770	0.590

Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.

Table 3.8: Financial reporting quality and CEO age – firm fixed effects

Panel A. Observations with above-median levels of performance-based CEO compensation

	Model 17	Model 18	Model 19	Model 20
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
CEO age	0.002*	0.014	-0.019	0.030
	(1.95)	(0.65)	(-1.12)	(0.93)
CEO tenure	-0.000**	-0.003	0.002	-0.006*
	(-2.16)	(-0.97)	(1.08)	(-1.66)
CEO gender	-0.000	-0.003	0.024**	0.005
	(-0.29)	(-0.33)	(2.13)	(0.30)
CFO age	0.002**	0.017	0.011	0.047**
	(2.49)	(0.81)	(0.95)	(1.96)
CFO gender	0.000	-0.009	-0.004	0.020*
	(0.77)	(-1.16)	(-0.72)	(1.90)
Firm size	-0.001***	-0.009	0.037***	-0.060***
	(-4.26)	(-1.30)	(9.91)	(-7.21)
ROA	0.001	-0.013	-0.289***	0.092***
	(1.26)	(-0.52)	(-15.77)	(2.76)
Market to book	-0.000	-0.000	0.000	-0.000
	(-0.61)	(-0.54)	(0.04)	(-0.13)
Leverage	-0.001	-0.025	-0.026**	0.082***
	(-1.02)	(-0.91)	(-1.98)	(3.28)
Inst. ownership	-0.000	0.020	0.030***	-0.042*
	(-0.43)	(1.06)	(3.02)	(-1.92)
Big auditor	-0.000	0.012	0.001	0.012
	(-0.29)	(0.63)	(0.05)	(0.49)
Constant	0.016**	-0.063	-0.286***	0.084
	(2.45)	(-0.54)	(-3.29)	(0.49)
Year dummies	Yes	Yes	Yes	Yes
N	9,246	9,246	9,246	9,246
Adj. R-squared	0.175	-0.027	0.796	0.539

Panel B. Observations with below-median levels of performance-based CEO compensation

	Model 21	Model 22	Model 23	Model 24
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
CEO age	0.002*	-0.006	-0.006	0.082**
	(1.66)	(-0.20)	(-0.27)	(2.35)
CEO tenure	-0.000	-0.001	0.003	-0.002
	(-0.10)	(-0.42)	(1.26)	(-0.52)
CEO gender	0.001	-0.013	0.009	0.011
	(0.99)	(-1.30)	(0.74)	(0.66)
CFO age	0.001	0.008	0.019	-0.032
	(0.80)	(0.26)	(1.32)	(-1.42)
CFO gender	-0.001	-0.008	0.008	0.003
	(-1.39)	(-1.21)	(1.42)	(0.28)
Firm size	-0.002***	-0.004	0.035***	0.053***
	(-7.20)	(-0.32)	(7.09)	(6.71)
ROA	0.001	-0.084	-0.205***	0.010
	(1.01)	(-1.09)	(-9.37)	(0.18)
Market to book	-0.000	0.000	-0.000	-0.000
	(-0.14)	(0.19)	(-0.03)	(-1.45)
Leverage	-0.002***	0.006	0.016	-0.075***
	(-2.86)	(0.23)	(1.15)	(-2.86)
Inst. ownership	-0.002***	0.013	-0.014	0.007
	(-2.89)	(0.72)	(-1.28)	(0.33)
Big auditor	0.001	0.042*	0.007	-0.004
	(0.94)	(1.74)	(0.77)	(-0.23)
Constant	0.029***	-0.042	-0.312***	-0.498***
	(5.00)	(-0.28)	(-2.83)	(-2.70)
Year dummies	Yes	Yes	Yes	Yes
N	9,246	9,246	9,246	9,246
Adj. R-squared	0.189	0.040	0.765	0.645

Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.

restated due to material errors. U.S. firms began adopting clawback provisions following the passage of SOX in 2002 as a means to protect shareholders and discourage executives from engaging in financial misconduct. U.S. policymakers have long considered making clawback provisions mandatory, but such requirements have not been enacted to date.

Clawback provisions are found to reduce restatement likelihood, increase perceived FRQ, and reduce audit risk (Chan et al., 2012). Because clawback provisions likely reduce financial reporting malfeasance, we seek to rule out the possibility that our results are driven by a relation between clawback provisions and CEO age. To do this, we determine which firm-year observations in our sample have clawback provisions and then estimate separate regression models including observations with and without them.

We determine whether an observation has a clawback provision following the methodology of Remesal (2019). For this purpose, we developed a web data-gathering program. The program opens the annually filed form DEF 14A of each firm and checks whether any of a list of keywords and phrases [14], indicative of a clawback provision, are present. Additionally, when a given firm is discovered to have implemented a clawback provision in a given year, all subsequent observations of that firm are coded as having clawback provisions as well (Remesal, 2019). Thus, Table 3.9 shows Models 25-28 in Panel A and Models 29-32 in Panel B. These models are identical to models 1-4 except that they divide observations by the presence of clawback provisions. Of the 18,492 firm-year observations, 7,714 are found to have clawback provisions and 9,637 are found not to.[15] It is important that we consider how the presence of clawback provisions affects both accruals-based and real activities earnings management because their implementation is found to drive managers to switch from the prior to the latter (Chan et al., 2015; Levine & Smith, 2018).

Panel A reveals that CEO age continues to have a significant positive relation with the

[14]We use the following list developed by Remesal (2019) to discover clawback provisions: "claw back","clawback","clawed back","compensation recovery","recapture award","recapture compensation","recapture incentive","recapture of award","recapture of compensation","recapture of incentive","recoup awards","recoup compensation","recoup incentive","recoupment of award","recoupment of compensation","recoupment of incentive","recover award","recover compensation","recover incentive","recovery of awards","recovery of compensation","recovery of incentive","reduction of award","reduction of incentive","reductions of award","reductions of incentive".

[15]The remaining 1,141 observations could not be checked for clawback provisions, either because the Compustat CIK did not match with EDGAR records or because no DEF 14As, or more than one DEF 14A, was filed for the particular firm-year.

Table 3.9: Financial reporting quality and CEO age – firm fixed effects

Panel A. Observations without clawback provisions

	Model 25	Model 26	Model 27	Model 28
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
CEO age	0.003**	-0.008	-0.037*	0.069*
	(2.35)	(-0.31)	(-1.84)	(1.84)
CEO tenure	0.000	-0.004	0.003	-0.002
	(-0.92)	(-1.37)	(1.10)	(-0.36)
CEO gender	-0.001*	-0.006	0.015	-0.014
	(-1.75)	(-0.56)	(1.25)	(-0.58)
CFO age	0.001	0.006	-0.017	-0.058**
	(1.15)	(0.25)	(-1.15)	(-2.28)
CFO gender	0.000	-0.017*	-0.007	0.006
	(0.12)	(-1.79)	(-0.94)	(0.45)
Firm size	-0.002***	0.006	0.049***	0.050***
	(-5.76)	(0.94)	(9.40)	(6.46)
ROA	0.000	-0.010	-0.234***	-0.067
	(0.61)	(-0.43)	(-12.88)	(-1.60)
Market to book	0.000	0.000***	0.000	0.000
	(-1.53)	(-3.40)	(-0.70)	(1.38)
Leverage	-0.002***	-0.002	-0.003	-0.122***
	(-2.78)	(-0.09)	(-0.20)	(-3.83)
Inst. ownership	-0.001*	0.010	-0.016	-0.011
	(-1.74)	(0.54)	(-1.14)	(-0.48)
Big auditor	0.000	0.020	-0.006	-0.048**
	(-0.31)	(1.16)	(-0.47)	(-2.32)
Constant	0.023***	-0.057	-0.134	-0.262
	(3.71)	(-0.40)	(-1.23)	(-1.29)
Year dummies	Yes	Yes	Yes	Yes
N	9,637	9,637	9,637	9,637
Adj. R-squared	0.216	-0.024	0.796	0.656

Panel B. Observations with clawback provisions

	Model 29	Model 30	Model 31	Model 32
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
CEO age	0.000	0.026	-0.007	-0.014
	(-0.04)	(1.06)	(-0.40)	(-0.39)
CEO tenure	0.000	0.000	0.001	0.004
	(-0.70)	(-0.12)	(0.56)	(0.95)
CEO gender	-0.001	-0.013	0.014*	-0.005
	(-0.87)	(-1.17)	(1.67)	(-0.37)
CFO age	0.001	0.030	0.003	-0.030
	(0.93)	(0.97)	(0.25)	(-1.15)
CFO gender	0.000	-0.016**	0.002	-0.018**
	(0.00)	(-2.14)	(0.37)	(-2.26)
Firm size	0.000	0.011	0.028***	0.047***
	(-1.25)	(1.61)	(6.38)	(4.27)
ROA	0.002	-0.050	-0.218***	-0.008
	(1.55)	(-1.58)	(-9.83)	(-0.24)
Market to book	0.000	0.000	0.000**	0.000
	(-0.19)	(-0.47)	(-2.10)	(-0.35)
Leverage	0.000	-0.049	0.010	-0.025
	(-0.54)	(-1.49)	(0.68)	(-1.11)
Inst. ownership	0.000	0.040**	-0.001	-0.015
	(0.37)	(2.31)	(-0.07)	(-0.98)
Big auditor	0.001	0.018	0.020*	0.071***
	(0.99)	(1.50)	(1.69)	(2.76)
Constant	0.024***	-0.358**	-0.195*	-0.303
	(3.30)	(-2.04)	(-1.88)	(-1.49)
Year dummies	Yes	Yes	Yes	Yes
N	7,714	7,714	7,714	7,714
Adj. R-squared	0.191	0.381	0.840	0.588

Pre-SOX observations are excluded because none have compensation clawback provisions. Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.

FSD score ($p < 0.05$) and abnormal decreases in discretionary accruals ($p < 0.10$) when clawback provisions are not present. Panel A also reveals evidence of a negative relation between CEO age and abnormal production costs ($p < 0.10$), a relation that was not present in any prior model. This indicates evidence of a complex CEO age-FRQ relation.

Panel B shows evidence that none of the dependent variables have a significant relation with CEO age when clawback provisions are enacted. We posit that this is the result of clawback provisions effectively discouraging managers from engaging in financial report manipulation and earnings management across the CEO age spectrum, so that any effect from CEO age is lost.

Instrumental variable

Because firm fixed effects models leave the possibility of time-variant omitted variables, we address endogeneity concerns further with an instrumental variable approach. As with prior studies, we take a two-stage approach, first using the CPI[16] of the year of the CEO's birth (*CPI at birth*) as an instrument to predict CEO age (Burney et al., 2021; Cline & Yore, 2016; Croci et al., 2017; Serfling, 2014). We draw on the work by Serfling (2014) to explain the economic theory behind using the CPI to predict CEO age. An appropriate instrument in this context must be unrelated to FRQ but strongly correlated with CEO age. The CPI of the year of the CEO's birth is the best instrument, to our knowledge, that satisfies both requirements. We can find no evidence and we can think of no way in which the CPI of the year of the CEO's birth could be related to current period FRQ. And, the CPI of the year of the CEO's birth is related negatively with CEO age because older CEOs are born in earlier years when the CPI was lower, since the CPI is found to consistently increase over time due to inflation. In our sample, the variables *CEO age* and *CPI at birth* have a correlation coefficient of -0.77 which is significant at the 1% level. Thus, in the first stage, we regress *CEO age* on the instrumental variable *CPI at birth* and the 10 control variables from the previous models, using firm fixed effects. The partial F-statistic of *CPI at birth* is 2,427.8, indicating no concern that the first-stage model

[16]We collect the annual average CPI data from: https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1913-.

suffers from a weak instrument (Larcker & Rusticus, 2010). The results of the first-stage regression are provided in Appendix A2.

We then use the first-stage model to predict CEO age, forming the variable *Predicted CEO age* which is presumably free of remaining endogenous influences. Thus, Table 3.10 shows the second-stage results, Models 33-36, which are identical to Models 1-4, but with the variable *CEO age* replaced with *Predicted CEO age*.

Model 33 of Table 3.10 shows evidence that our findings of a positive relation between CEO age and financial statement irregularities are not the result of endogenous influences as *Predicted CEO age* is found to effect the FSD score positively ($p < 0.01$). The coefficient on *Predicted CEO age* in Model 36 is not statistically significant. Thus, we have less evidence to rule out endogeneity related to the positive relation we find between CEO age and abnormal decreases in discretionary expenses. Interestingly, Model 35 shows evidence of a negative relation between *Predicted CEO age* and abnormal production costs ($p < 0.05$). This corresponds with the results of Model 19, providing additional evidence that CEO age effects abnormal production costs negatively.

3.5 Discussion

We find strong evidence that financial statement irregularities (proxied by the FSD score) are more prevalent when CEOs are older. This relation holds when pre-SOX observations are included, when retirement-aged CEO observations are excluded, when performance-based CEO compensation is controlled for, and when an instrumental variable approach is used. We find evidence that abnormal decreases in discretionary expenses are more prevalent when CEOs are older as well. This result is not as robust, as it does not hold when pre-SOX observations are included nor when the instrumental variable is used. We also find some evidence that abnormal production costs are more prevalent when CEOs are younger, demonstrating the complexity of the CEO age-FRQ relation. However, this relation is not observed in the main model and is only present when observations with clawback provisions are excluded and when the instrumental variable is used. The variation between the relations of CEO age to the earnings management proxies is not

Table 3.10: Financial reporting quality and predicted CEO age – firm fixed effects

	Model 33	Model 34	Model 35	Model 36
	FSD score	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
Predicted CEO age	0.004***	0.001	-0.047**	0.034
	(3.16)	(0.03)	(-2.07)	(0.84)
CEO tenure	0.000**	-0.002	0.006***	0.001
	(-2.34)	(-0.81)	(2.90)	(0.21)
CEO gender	0.000	-0.005	0.019**	-0.002
	(-0.38)	(-0.71)	(2.43)	(-0.16)
CFO age	0.001**	0.018	0.019**	-0.036**
	(2.32)	(1.02)	(2.15)	(-2.25)
CFO gender	0.000	-0.007	0.003	-0.008
	(-0.60)	(-1.52)	(0.96)	(-1.24)
Firm size	-0.001***	-0.006	0.040***	0.057***
	(-8.69)	(-1.13)	(13.05)	(10.50)
ROA	0.001	-0.050	-0.253***	-0.039
	(1.31)	(-1.39)	(-18.42)	(-1.29)
Market to book	0.000	0.000	0.000	0.000
	(-0.73)	(-0.91)	(-0.10)	(0.17)
Leverage	-0.002***	-0.005	-0.003	-0.076***
	(-3.97)	(-0.29)	(-0.28)	(-4.23)
Inst. ownership	-0.001*	0.015	0.008	0.015
	(-1.85)	(1.26)	(1.20)	(1.16)
Big auditor	0.000	0.036**	-0.001	-0.018
	(0.23)	(2.24)	(-0.16)	(-1.25)
Constant	0.018***	-0.075	-0.199**	-0.326**
	(3.80)	(-0.67)	(-2.24)	(-2.07)
Year dummies	Yes	Yes	Yes	Yes
N	18,492	18,492	18,492	18,492
Adj. R-squared	0.188	0.028	0.771	0.590

The results of the first-stage regression are provided in Appendix A2. Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.

surprising considering that CEOs are found to tradeoff between earnings management methods given their relative costs (Zang, 2012).

Given that our results indicate a general negative CEO age-FRQ relation, we posit that they are driven by career concerns that evolve as CEOs age. Earnings management is likely more costly for younger CEOs because a financial reporting scandal would be more damaging to their reputation and future employment prospects, given their shorter track records and longer career horizons.

Interestingly, our results differ considerably from those of H. W. Huang et al. (2012), who find that CEO age affects the likelihood of earnings surprises and restatements negatively. However, this is explained in part by the distinct contexts between our study and theirs. Despite this contradicting evidence, we are confident in the importance of our results and the contribution to the field provided by them, especially because of the robustness of our approach and the extent of our sensitivity tests.

We find no evidence that CEO age affects any of our FRQ proxies when clawback provisions are adopted. This indicates that clawback provisions may be effective at mitigating the effects of CEO age on FRQ, a relevant finding for policymakers contemplating the implementation of mandatory clawback provisions. The possibility of requiring clawback provisions has long been considered but never implemented in the United States. In 2010, the requirement was part of the Dodd–Frank Act (section 954) that was never enacted[17] and in 2015 it was proposed by the U.S. Securities and Exchange Commission (SEC).[18] However, we note two important limitations of our findings related to clawback provisions. First, the smaller sample sizes inherent in Panels A and B of Table 3.9 (compared to the previous tables) result in less within-firm variation of CEO age which could contribute to the explanation of the lost statistical significance of the CEO age variable in Panel B. Second, the firm-year observations with clawback provisions represent more recent data generally, as clawback provisions have been adopted over time. This factor introduces bias to the clawback provision results.

We find interesting results related to CFO age. Several models show evidence that

[17]See https://www.sec.gov/spotlight/dodd-frank-section.shtml#954.
[18]See https://www.sec.gov/news/pressrelease/2015-136.html.

CFO age is related positively with the FSD score but negatively with abnormal decreases in discretionary expenses. This may indicate that for CFOs, their approach to earnings management changes with age. Thus, forming a complex CFO age-FRQ relation.

The FSD score is a relatively new measure of FRQ, developed in 2015, which has been used with increasing frequency in recent years (see Gupta et al., 2020; Jiang et al., 2019; Krishnan et al., 2021). We find it to be a promising measure and suggest its use in future empirical research. A crucial assumption of the FSD score is that the line items of accurate financial statements adhere to Benford's law. This is imperative in order to suggest that financial statements with line items that deviate from Benford's distribution are irregular. We find that, on average, financial statement line items adhere closely to Benford's law, as can be seen in Figure 3.2. Additionally, we find that several control variables are significant determinants of the FSD score in the anticipated directions. As expected, we find that larger firms, more leveraged firms, and firms with greater institutional investor ownership have lower FSD scores.

We encourage researchers to build on our findings by considering the role played by the board of directors and the dynamics of the relationship between the board and the CEO. This topic could also be enriched further by studies considering other dynamics related to CEO age, especially given the rapidly evolving nature of average CEO age in the United States. Additionally, a limitation of this study is that we do not include controls for other CEO characteristics such as CEO education or CEO ownership because we do not have the data. Future studies could consider how the CEO age-FRQ relation is affected by other CEO characteristics for a more complete understanding.

3.5.1 Concluding remarks

There is an enduring need to improve FRQ and discover organizational factors that affect financial reporting processes. Recent literature has focused primarily on the effect of managerial gender on FRQ, leaving the effect of managerial age largely unaddressed. We attempt to fill this gap, considering how several FRQ proxies are affected by CEO age. We find evidence that financial statement irregularities, measured using the FSD

score, are more prevalent when CEOs are older. We test the sensitivity of this relation extensively and present evidence of a causal link from an instrumental variable approach. Considering earnings management measures, we find evidence that CEO age increases abnormal decreases in discretionary expenses, and some evidence that it decreases abnormal production costs. We also find that no FRQ proxy is affected by CEO age when clawback provisions are adopted, demonstrating evidence that clawback provisions effectively eliminate the effect of CEO age on FRQ. We present these results at an interesting time, given that average CEO age in the United States has risen sharply in recent years, driving the need for a better understanding of the impact of CEO age on firm outcomes. Our study contributes to the literature and derives important implications for stakeholders and policymakers, particularly boards of directors considering CEO age limits and policymakers considering making clawback provisions mandatory.

Chapter 4

Institutional ownership and earnings management:

A reexamination of nonlinearity

Chapter 4

Institutional ownership, earnings management, and earnings surprises

Abstract

As the influence held by institutional investors over managerial decision-making grows, so does the importance of understanding the effect of institutional investor ownership (IO) on firm outcomes. We take a comprehensive approach to studying the effect of IO on earnings management proxied with earnings surprises and traditional accruals-based and real activities measures. We test for nonlinear relations and analyze changes resulting from the passage of the Sarbanes–Oxley Act. Our findings support a positive IO-earnings management relation overall, but show that the relation is dynamic and heavily context-dependent with evidence of nonlinearity as well. We also find evidence that IO affects accruals-based earnings management positively and real activities earnings management negatively.

4.1 Introduction

The managers of listed firms are responsible for reporting financial statements that accurately represent the firm's true financial standing. Capital market participants depend on financial statement accuracy to make sound investment decisions. Indeed, financial statement accuracy is found to improve investment efficiency by reducing moral hazard and adverse selection for market participants (Biddle et al., 2009; Dou et al., 2019). Despite the importance of financial statement accuracy, managers may be incentivized to engage in earnings management, the act of manipulating reported earnings by using accounting maneuvers or operating decisions. Researchers have long studied the mechanisms and determinants of earnings management, and the role of institutional investor ownership (IO) is at the forefront of this topic (Kałdoński et al., 2020; Lemma et al., 2018; Sakaki et al., 2017).

The influence of institutional investors has risen dramatically over past decades, largely because investors are attracted to the low-cost diversification they offer (Bebchuk et al., 2017). Institutional investors own about 80% of the market value of U.S. firms according to a 2017 report.[19] This means that institutional investors account for the vast majority of votes cast at the annual meetings of virtually all major U.S. firms leading them to influence corporate governance and managerial decision-making substantially. IO has long been known to affect earnings management (Bushee, 1998), but evidence also suggests that the relation is not homogeneous across earnings management types (Lemma et al., 2018; Roychowdhury, 2006; Zang, 2012). We take a comprehensive approach to improve the understanding of this topic by analyzing a panel dataset of listed U.S. firms. We consider how IO affects accruals-based and real activities earnings management differently and how it affects earnings surprises which we use as a proxy for capturing all earnings management approaches. Going further, we consider whether these relations are nonlinear and analyze how they have evolved in the post-Sarbanes–Oxley Act (SOX) period.

We find a positive relation between IO and the likelihood of earnings surprises, evidence that managers are encouraged by IO to manage earnings overall. Considering

[19] See https://www.pionline.com/article/20170425/INTERACTIVE/170429926/80-of-equity-market-cap-held-by-institutions.

the direct measures of accruals-based and real activities earnings management, we find evidence that abnormal discretionary accruals are also affected positively by IO. Alternatively, we find evidence that IO has a negative effect on abnormal production costs and abnormal decreases in discretionary expenses. This corroborates prior findings that institutional investors are likely to disproportionately discourage managers from engaging in real activities earnings management (Zang, 2012; Roychowdhury, 2006) which has an adverse effect on long-term firm value (Graham et al., 2005). We also find evidence of nonlinearity. Our findings show evidence that IO's relation with earnings surprises and abnormal discretionary accruals is concave and IO's relation with abnormal production costs and abnormal decreases in discretionary expenses is convex. Finally, we find that these relations are altered in the post-SOX period.

Our findings contribute to the literature by providing a comprehensive analysis of the relation between IO and earnings management in the U.S. context where institutional investors hold significant influence over managerial behavior.

The remainder of this essay proceeds as follows. We review the background and relevant literature. We develop the hypothesis. We explain the research design. And finally, we discuss the results and conclude.

4.2 Background and hypothesis development

As institutional investors grow in prominence their ability to influence firm outcomes continues to garner attention and scrutiny. IO is known to affect firm outcomes such as innovation (Aghion et al., 2013; Rong et al., 2017) and performance (Cornett et al., 2007; Elyasiani & Jia, 2010) while playing an important role in financial reporting outcomes as well (Ramalingegowda & Yu, 2012). From the perspective of agency theory, institutional investors are believed to serve as monitors of management. This is asserted in the seminal works by Shleifer & Vishny (1986, 1997) who argue that the large stakes held by institutional investors allow them to analyze information and monitor managers to an extent that is unfeasible for smaller stakeholders. Institutional investors holding large stakes are also more likely to engage with firms as monitors because the option to exit from a large

position is more costly (Maug, 1998).

Because of the importance of institutional investors, their influence on earnings management is a topic of ongoing debate. A question at the heart of this topic is whether institutional investors act as stakeholders interested in short-term profitability that drive managers to manipulate earnings to avoid reporting disappointing earnings, or as monitors stewarding good corporate governance practices (Roychowdhury, 2006, p. 343). Chung et al. (2002) and Rajgopal et al. (1999) consider this question and find a negative relation between IO and absolute discretionary accruals, thus supporting the role of institutional investors as monitors. Charitou et al. (2007) focus on financially distressed firms, finding that IO reduces the tendency of managers to use discretionary accruals to manage earnings downward prior to bankruptcy.

Relatively few studies on this topic consider the possibility of a nonlinear IO-earnings management relation. Velury & Jenkins (2006) find that while earnings quality is improved generally by IO, it decreases when IO is concentrated, suggesting the possibility of nonlinearity. Koh (2003) considers nonlinearity directly, measuring its presence in the IO-discretionary accruals relation. Using a sample of Australian firms, Koh (2003) finds that IO increases earnings management when IO levels are low, but that it has the opposite effect at high levels. Koh (2003) posits that a nonlinear relation between IO and accruals-based earnings management exists because of the following. At low levels, IO represents ownership by transient institutional investors interested in near-term earnings. Such investors are likely to exit positions that miss earnings forecasts, pressuring managers to engage in earnings management to avoid sell-offs. Alternatively, at high levels, IO represents greater ownership by institutional investors holding large positions that are likely to reduce earnings management by engaging with firms as monitors, being less concerned with near-term earnings. Hsu & Koh (2005) provide additional evidence of a nonlinear relation between IO and accruals-based earnings management. They find that long-term-oriented institutional investors are likely to engage with portfolio firms as monitors while transient institutional investors 'vote with their feet', choosing to exit from positions.

To our knowledge, a nonlinear IO-earnings management relation has not been studied in the U.S. context, nor considering both accruals-based and real activities earnings management. We address this, first using earnings surprises, described in detail below, which we believe capture evidence of earnings management, regardless of type. Thus, given the findings of Koh (2003), we hypothesize the following:

H1: The effect of IO on earnings surprises is nonlinear, being concave in form.

Earnings management research has evolved from generally considering accruals-based measures alone to including measures of real activities earnings management as well (Roychowdhury, 2006). Bushee (1998) considers whether IO drives earnings management finding that managers are less likely to cut research and development expenses to meet earnings goals when IO is higher. This serves as early evidence that the effect of IO on disparate earnings management measures may not be homogeneous. Institutional investors that maintain stable equity holdings are found to reduce the use of real activities earnings management (Kałdoński et al., 2020; Sakaki et al., 2017). Alternatively, an international study finds that IO affects accruals-based earnings management negatively and has no effect on real activities earnings management (Lemma et al., 2018).

There is an important distinction between accruals-based and real activities earnings management that likely influences the actions taken by institutional investors. While manipulating discretionary accruals has no effect on overall cash flows, the same cannot be said for real actions taken to manage earnings which can have a negative overall effect (Roychowdhury, 2006; Zang, 2012). In a survey of executives, Graham et al. (2005) find that most executives are willing to take actions that smooth reported earnings, even at the expense of long-term firm value, and that they prefer such approaches over accruals-based methods. Zang (2012) posits that institutional investors, being more informed than other investors, are likely to understand the long-term consequences of real activities earnings management, leading them to monitor such practices more than accruals-based alternatives. Given this evidence, we hypothesize the following:

H2: IO affects accruals-based earnings management positively and real activities earnings management negatively.

4.3 Research design

4.3.1 Data and sample

We form the sample of listed U.S. firms from three databases. Data on firm characteristics and auditor characteristics are collected from the Fundamentals Annual section of the CRSP/Compustat Merged database (Compustat). Data on institutional ownership are collected from the Stock Ownership Summary section of the Thompson Reuters Institutional (13f) Holdings database. The Thompson Reuters data are matched using the CUSIP numbers, the ticker symbols, and then the company names; they are matched using those variables in that order, only using the subsequent variables to find matches if none were procured by the prior. Data on analyst forecasted earnings and actual reported earnings are collected from the Summary Statistics section of the IBES database. The IBES data are matched using the IBES CRSP Link database which is used to match the Compustat PERMNO identifier with the IBES ticker. All data were collected during January 2022.

Our sample spans from 1981 (the first year of Thompson Reuters data availability) to 2019 (the final year of data availability). Our sample is formed using all observations with data availability from the sources mentioned above to calculate all variables used. Thus, our sample comprises 59,503 firm-year observations representing 8,340 individual firms.

4.3.2 Dependent variables

We use four earnings management measures which serve as the dependent variables of the study. We begin with earnings surprises, a measure that captures ex-post evidence that earnings were managed. We then expand the analysis, using three measures of earnings management. The following sections describe the dependent variables in greater detail.

Earnings surprises

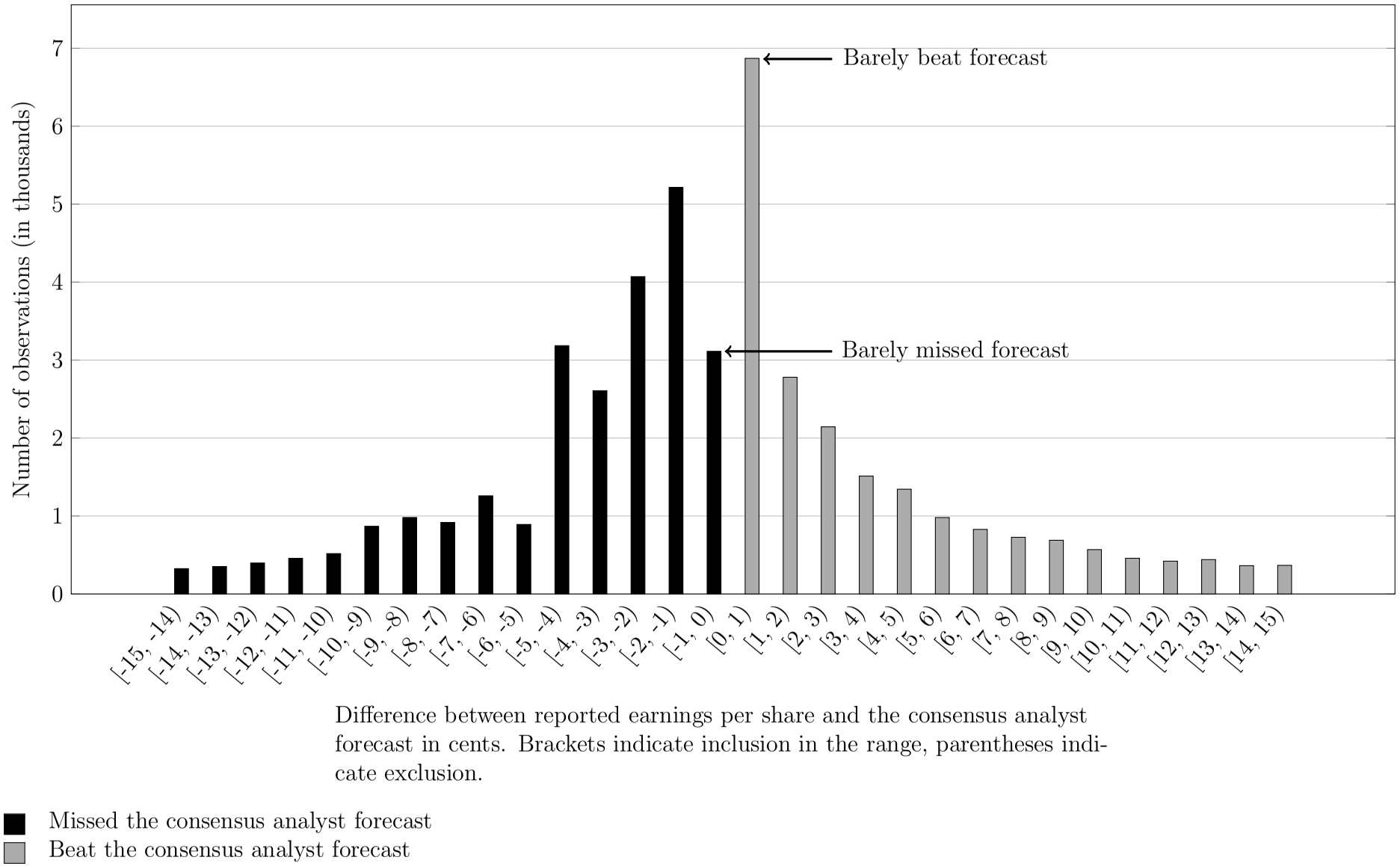
Ex-post measures of earnings management consider evidence that earnings management occurred regardless of the type engaged in by managers. We use one such measure, earn-

ings surprises, as the dependent variable of this study. A measure that captures both accruals-based and real activities earnings management is important for several reasons. Managers are found to choose between earnings management approaches depending on the relative cost of each (Zang, 2012). The level of IO likely affects the type of earnings management engaged in by managers as institutional investors are found to pressure firms to constrain real activities earnings management more than accruals-based earnings management (Roychowdhury, 2006; Zang, 2012). Additionally, the passage of SOX in 2002 is found to have corresponded with a decrease in accruals-based earnings management pressuring managers to engage in more real activities earnings management as an alternative (Cohen et al., 2008). For these reasons, we begin our analysis using earnings surprises, a measure that captures evidence of both accruals-based and real activities earnings management. An earnings surprise occurs when reported earnings exactly meet or barely beat the consensus analyst forecast (Ashbaugh et al., 2003; Bhojraj et al., 2009; Frankel et al., 2002). When earnings are reported, market participants respond strongly to whether the reported earnings beat or miss forecasts (Bartov et al., 2002; Skinner & Sloan, 2002). Firms that meet or beat forecasts are found to enjoy higher returns than firms with similar earnings relative to forecasts that miss analyst projections (Bartov et al., 2002). There are also consequences for managers when analyst forecasts are missed. CEOs and CFOs are found to face bonus cuts, equity grant cuts, and forced turnover when analyst forecasts are barely missed (Edmonds et al., 2013; Mergenthaler et al., 2012). For these reasons, exactly meeting or barely beating analyst forecasts serves as evidence of earnings management. We can see evidence of this in our own sample. If we assume that no earnings management exists in our sample, we would expect the differences between reported earnings and forecasted earnings to be normally distributed and centered around zero, with about the same number of observations barely missing and barely beating forecasted earnings. However, this is not the case. In our sample of 60,721 firm-year observations, slightly less than half (49.3%) met or beat the analyst forecast. However, as shown in Figure 4.1, while 6,994 observations exactly met or barely beat the consensus forecast, only 3,178 barely missed it. Additionally, while the right side of Figure 4.1 shows a rela-

tively uniform decrease in frequency, the left side appears erratic and non-uniform, likely because of manipulation occurring to avoid disappointing earnings reports. This shows evidence of the effectiveness of earnings surprises as an earnings management proxy.

Figure 4.1: Difference in the number of observations that barely beat and barely missed the consensus analyst forecast.

Of the 59,503 firm-year observations from our sample with reported earnings per share within 15 cents of the consensus analyst forecast, 6,870 beat the forecast by 1 cent or less while only 3,112 missed it by 1 cent or less.



Accruals-based earnings management

Earnings management is generally divided into two types: *accounting*-based and *operating*-based, depending on the method engaged in by management (Cohen et al., 2008; Roychowdhury, 2006). We analyze the effect of IO on both types.

In accounting, accruals occur when revenues or expenses are realized before the cash related to the transaction has been exchanged. While accruals are commonplace, they can be manipulated by bad actors to temporarily inflate reported earnings. Ronen & Yaari (2008) define discretionary accruals as "accruals that arise from transactions made or accounting treatments chosen in order to manage earnings" (p. 372). Jones (1991) developed a method of measuring discretionary accruals, now known as the Jones model, to test whether firms managed earnings to benefit from import relief. Kothari et al. (2005) found that the reliability of discretionary accruals measures is improved by controlling for performance. Thus, we use a performance-matched measure of the Jones model including a constant term.[20]

Discretionary accruals are calculated as the difference between total accruals[21] and non-discretionary accruals. We calculate discretionary accruals as the residual (error term) from equation (2) which is regressed cross-sectionally for each group of firm-year observations from the same year and same two-digit SIC code.

$$\frac{TA_t}{A_{t-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \alpha_2 \left(\frac{\Delta S_t}{A_{t-1}}\right) + \alpha_3 \left(\frac{PPE_t}{A_{t-1}}\right) + \alpha_4 \left(ROA_t\right) + \epsilon \tag{1}$$

where TA_t is total accruals in year t, A_{t-1} is total assets in year $t-1$ using Compustat item (AT), ΔS_t is change in sales from year $t-1$ to year t using Compustat item (REVT), PPE_t is net property, plant, and equipment in year t using Compustat item (PPEGT), and ROA_t is total income divided by total assets using Compustat items (NI) and (AT).

[20] We find that variations of this approach (i.e. the modified Jones model, non-performance-matched, no constant) do not seriously affect our results.

[21] As with prior studies, we calculate total accruals (TA) using the following formula with the corresponding Compustat database items in parentheses: the change in current assets Δ(ACO) minus the change in current liabilities Δ(LCT) plus the change in debt in current liabilities Δ(DLC) minus the change in cash and cash equivalents (CHECH) minus depreciation and amortization expenses (DP) (Dechow et al., 1995).

As with prior studies, when calculating discretionary accruals, we drop all firm-year observations from year-industry groups with less than 15 observations (Zang, 2012).

Real activities earnings management

Real activities earnings management measures consider real economic activities taken by managers to manage earnings (Cohen & Zarowin, 2010; Graham et al., 2005; Zang, 2012). Graham et al. (2005) survey executives and find that the vast majority are willing to take economic actions that smooth reported earnings at the expense of long-term firm value. Zang (2012) stresses that it is important for researchers to consider both accruals-based and real activities earnings management. She finds that managers tradeoff between the two methods based on their relative costs such that neither method alone represents the whole picture.

Roychowdhury (2006) develops three measures of real activities earnings management: abnormal operating cash flow, abnormal production costs, and abnormal decreases in discretionary expenses. Many researchers have moved to using only the measures of abnormal production costs and abnormal decreases in discretionary expenses (Farooqi et al., 2014; Harris et al., 2019; Sakaki et al., 2017; Zang, 2012) because, as noted by Roychowdhury (2006), the direction of the net effect of earnings management on operating cash flow is ambiguous. This makes it difficult to interpret the meaning of a relation in a given direction. Therefore, we adopt abnormal production costs and abnormal decreases in discretionary expenses as our two proxies for real activities earnings management. Still, we provide the regression results of abnormal operating cash flow in Appendix A1 for robustness. The results do not show evidence of a relation with CEO age.

Managers may enact excessive price discounts and overproduction to temporarily inflate reported earnings (Roychowdhury, 2006). This can be observed as abnormally high production costs relative to sales. Therefore, abnormal production costs are calculated as the residual from equation (3) which is regressed cross-sectionally for each group of firm-year observations from the same year and same two-digit SIC code.

$$\frac{Prod_t}{A_{t-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \alpha_2 \left(\frac{S_t}{A_{t-1}}\right) + \alpha_3 \left(\frac{\Delta S_t}{A_{t-1}}\right) + \alpha_4 \left(\frac{\Delta S_{t-1}}{A_{t-1}}\right) + \epsilon \tag{2}$$

where $Prod_t$ is cost of goods sold in year t plus change in inventory in year t using Compustat items (COGS) and (INVT).

Managers may also inflate earnings temporarily by reducing discretionary expenditures. This can be observed as abnormally low discretionary expenditures relative to sales (Roychowdhury, 2006). As with prior studies, we multiply the level of abnormal discretionary expenditures by -1 to capture abnormal decreases in discretionary expenses (Farooqi et al., 2014; Harris et al., 2019; Sakaki et al., 2017). Therefore, abnormal decreases in discretionary expenses are calculated as -1 multiplied by the residual from equation (4) which is regressed cross-sectionally for each group of firm-year observations from the same year and same two-digit SIC code.

$$\frac{DisX_t}{A_{t-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{t-1}}\right) + \alpha_2 \left(\frac{S_{t-1}}{A_{t-1}}\right) + \epsilon \tag{3}$$

where $DisX_t$ is research and development expenses plus advertising expenses plus selling, general, and administrative expenses in year t using Compustat items (XRD), (XAD), and (XSGA).[22]

As with prior studies, when estimating the real activities earnings management models, we drop all firm-year observations from year-industry groups with less than 15 observations (Roychowdhury, 2006; Zang, 2012).

4.3.3 Independent variables

The variable of interest is the level of firm ownership held by institutional investors (IO). IO is calculated as the number of shares held by institutional investors divided by the number of shares outstanding using Thomson Reuters item (instown_perc). Thomson Reuters classifies entities as institutional investors if they file Form 13F, a form required by the U.S. Securities and Exchange Commission for all investment managers with $100

[22] As with prior studies, as long as selling, general, and administrative expenses are available, research and development expenses and advertising expenses are set to zero if they are unavailable (Roychowdhury, 2006).

million or more in assets under management. We capture evidence of nonlinear IO effects using the squared term of *IO* (IO^2).

We include five controls for firm characteristics. Larger firms are subject to increased monitoring and face greater consequences for financial misconduct (Deli & Gillan, 2000). We measure *Firm size* as the natural log of total assets using Compustat item (AT). We control for firm performance proxied by return on assets (*ROA*) calculated as total income divided by total assets using Compustat items (NI) and (AT). We include the *Market to book* ratio as a measure of market valuation calculated as the firm's market value divided by its book value using Compustat items (PRCC_F) and (BKVLPS). Firms with greater levels of debt face increased monitoring from creditors (Jelinek, 2007; Zamri et al., 2013). We control for *Leverage* calculated as total liabilities divided by total assets using Compustat items (LT) and (AT). Finally, research shows that larger auditors provide better quality audits (Becker et al., 1998; DeAngelo, 1981; Lennox, 1999). The variable *Big auditor* indicates whether the firm's auditor is one of the big four using Compustat item (AU).

Table 4.1 provides a description of the variables and Table 4.2 shows the descriptive statistics. We test for multicollinearity within the independent variables by examining their variance inflation factors (VIFs). The mean, highest, and lowest VIF of the independent variables are 1.18, 1.49, and 1.00, respectively, indicating no multicollinearity concerns. Table 4.3 gives a breakdown of the correlation between all variables. We find that none of the independent variables are highly correlated except for *IO* and IO^2 which are correlated by design. We find that *Firm size* is moderately correlated with the following independent variables: *IO* (0.44), IO^2 (0.43), *ROA* (0.22), *Leverage* (0.29), and *Big auditor* (0.22).

Table 4.1: Description of variables

Earnings surprise	Dummy variable equal to one if reported earnings per share minus the median analyst forecast is between zero and one inclusive, and zero otherwise
Ab. disc. acc.	Abnormal discretionary accruals
Ab. prod. cost	Abnormal production costs
Ab. disc. exp.	Abnormal decreases in discretionary expenses
IO	Number of shares held by institutional investors divided by the number of shares outstanding
IO^2	*IO* squared
Firm size	Natural log of total assets
ROA	Total income divided by total assets
Market to book	The firm's market value divided by its book value
Leverage	Total liabilities divided by total assets
Big auditor	Dummy variable equal to one if the auditor is one of the big four and zero otherwise

Table 4.2: Descriptive statistics

	N	Mean	Standard deviation	Q1	Q3
Earnings surprise	59,503	0.15	0.35	0.00	0.00
Ab. disc. acc.	59,503	0.00	0.47	-0.06	0.05
Ab. prod. cost	59,503	-0.04	0.25	-0.15	0.08
Ab. disc. exp.	59,503	-0.05	0.87	-0.13	0.14
IO	59,503	0.49	0.29	0.24	0.73
IO^2	59,503	0.32	0.30	0.06	0.54
Firm size	59,503	6.03	1.92	4.62	7.31
ROA	59,503	-0.01	0.31	-0.02	0.08
Market to book	59,503	4.08	396.38	1.09	2.96
Leverage	59,503	0.48	0.26	0.29	0.62
Big auditor	59,503	0.89	0.32	1.00	1.00

4.3.4 Empirical modeling

Using a sample of listed U.S. firms from the period 1981-2019, we study how earnings management is affected by IO and test for the presence of a nonlinear relation. First, we develop a regression model which tests for a linear relation between IO and earnings management, shown in equation (4).

Table 4.3: Correlation matrix

	1	2	3	4	5
1. *Earnings surprise*	1.00				
2. *Ab. disc. acc.*	0.00	1.00			
3. *Ab. prod. cost*	**-0.04**	**-0.02**	1.00		
4. *Ab. disc. exp.*	0.00	**0.01**	**0.11**	1.00	
5. *IO*	**0.03**	**0.01**	**0.00**	**0.01**	1.00
6. IO^2	**0.02**	**0.01**	0.00	**0.02**	**0.97**
7. *Firm size*	**-0.01**	**0.01**	**0.11**	**0.06**	**0.44**
8. *ROA*	**0.06**	**-0.01**	**-0.05**	**0.05**	**0.16**
9. *Market to book*	0.00	0.00	0.00	0.00	**0.00**
10. *Leverage*	**-0.06**	**-0.03**	**0.14**	**0.01**	**0.03**
11. *Big auditor*	0.00	**0.00**	**0.00**	**-0.01**	**0.11**

	6	7	8	9	10
6. IO^2	1.00				
7. *Firm size*	**0.43**	1.00			
8. *ROA*	**0.14**	**0.22**	1.00		
9. *Market to book*	0.00	**0.00**	**-0.01**	1.00	
10. *Leverage*	**0.05**	**0.29**	**-0.14**	**0.01**	1.00
11. *Big auditor*	**0.09**	**0.22**	**0.08**	0.00	**0.07**

Bold correlation coefficients are significant at the 5% level.

$$EM_t = \beta_0 + \beta_1 IO_t + \beta_2 Firm\ size_t + \beta_3 ROA_t + \beta_4 Market\ to\ book_t \quad (4)$$
$$+ \beta_5 Leverage_t + \beta_6 Big\ auditor_t + Year\ dummies$$
$$+ Industry\ dummies + Size\ dummies + \epsilon$$

Where EM_t is a general term for the four earnings management proxies in time t.

Then, we include the squared term IO^2 to consider a quadratic IO-earnings management relation, shown in equation (5).

$$EM_t = \gamma_0 + \gamma_1 IO_t + \gamma_2 IO_t^2 + \gamma_3 Firm\ size_t + \gamma_4 ROA_t + \gamma_5 Market\ to\ book_t \quad (5)$$
$$+ \gamma_6 Leverage_t + \gamma_7 Big\ auditor_t + Year\ dummies$$
$$+ Industry\ dummies + Size\ dummies + \epsilon$$

The same five control variables are used in each model. We include year dummies and industry dummies to control for time-variant and industry-variant factors. Because of the correlation between *Firm size* and other regressors, noted above, we include size dummies so that the regressions include negligible firm size variation to abate multicollinearity concerns. The size dummies are based on decile groups of the variable *Firm size*.

We use the Hausman test to determine whether the observed and unobserved variables are uncorrelated (to indicate the absence of endogenous regressors), an assumption necessary for regressing the between-firm effects (also known as random effects) (Allison, 2009). The test is significant for all dependent variables except for *Abnormal discretionary accruals*[23]. This indicates that within-firm effects regression (also known as fixed effects) should be used for our analysis, besides with respect to *Abnormal discretionary accruals*. However, there are significant disadvantages to within-firm regression related to the characteristics of this study. First, because *Earnings surprise*, the main dependent variable, is dichotomous, firms without variation of this variable (with no earnings surprises or with only earnings surprises) are dropped from the within-firm analysis. This results in 5,004

[23]The significance levels of the Hausman tests for endogenous regressors for the four dependent variables are as follows: *Earnings surprise* (0.000), *Abnormal discretionary accruals* (0.320), *Abnormal production costs* (0.000), *Abnormal decreases in discretionary expenses* (0.000).

firms, or 18,565 firm-year observations, being dropped. This reduces the efficiency of the within-firm analysis considerably and may introduce bias because firms with the lowest and highest perceived propensity for earnings management (with no earnings surprises or only earnings surprises) are not considered. Second, at the firm level, IO is unlikely to have high variation within the limited number of firm-year observations available for each firm. Indeed, while the standard deviation of the variable *IO* for the whole population is 0.29, the average of the standard deviations of *IO* for all firm groups is far lower at 0.14. This results in within-firm regression models being less efficient in modeling the effects of *IO* because only the within-firm effects are analyzed.

Despite the limitations of fixed effects regression, the Hausman test results must be seriously considered. For these reasons, we use between-within regression models (also known as hybrid regression) (Allison, 2009; Sjölander et al., 2013). By using a between-within regression approach, the effects of the regressors are decomposed into between-firm and within-firm components. This allows us to analyze the between-firm effects, with the advantage of greater efficiency, and the within-firm effects simultaneously. If a given variable has a significant between- and within-firm effect in the same direction, then substantial evidence of the effect is shown. However, if the between-firm effect is significant and the within-firm effect is not, then the limitations of the evidence must be considered given correlation between the observed and unobserved variables indicated by significant Hausman tests for all dependent variables, except *Abnormal discretionary accruals*.

We begin by regressing equations (4) and (5) over the full period, 1981-2019. We then regress them over the post-SOX (modern regulatory) period, 2003-2019, to examine the resulting changes. Because the dependent variable *Earnings surprise* is dichotomous, we use logistic regression in Models 1, 5, 9, and 13. Because the remaining dependent variables are continuous, we use linear regression in all other models.

4.4 Empirical results

Table 4.4 shows the results of Models 1-4 which estimate IO's effect on four measures of earnings management. We begin with earnings surprises in Model 1, an indicator of firms that exactly meet or barely beat the consensus analyst forecast. The model shows a significant positive relation between IO and earnings surprises from both the between-firm effects and the within-firm effects ($p < 0.01$). Because earnings surprises are indicators of earnings management, this shows evidence that institutional investors pressure managers to avoid disappointing earnings reports, increasing the likelihood that they manage earnings. Model 1 also shows that earnings surprises are more likely when firms perform better ($p < 0.01$), when firms are less leveraged ($p < 0.01$), and when the firm's independent auditor is not one of the big four ($p < 0.01$). The within-firm effects section of Model 1 also shows that earnings surprises are more likely for smaller firms ($p < 0.01$).

Considering accruals-based earnings management in Model 2, the between-firm effects show evidence of a positive relation between IO and abnormal discretionary accruals($p < 0.01$). This is not supported by the within-firm effects. Model 2 also shows that abnormal discretionary accruals are greater when firms are less leveraged ($p < 0.01$ and $p < 0.05$ for the between-firm and within-firm effects, respectively).

Turning to Models 3 and 4, we find evidence of a negative relation between IO and real activities earnings management. Model 3 indicates a negative relation between IO and abnormal production costs from both the between-firm effects and the within-firm effects ($p < 0.01$). Model 3 also shows that abnormal production costs are greater when firms are larger ($p < 0.01$) and when firms perform worse ($p < 0.01$). The between-firm effects section of Model 3 also shows that abnormal production costs are greater when firms are more leveraged ($p < 0.01$) and when the firm's independent auditor is not one of the big four ($p < 0.01$). Together, the results of Table 4.4 shows significant evidence supporting hypothesis *H2*.

The between-firm effects of Model 4 shows evidence of a negative relation between IO and abnormal decreases in discretionary expenses ($p < 0.01$) that is not supported

Table 4.4: Earnings management and institutional investor ownership – between-within panel regression

	Model 1	Model 2	Model 3	Model 4
	Earnings surprise	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
Between-firm effects				
IO	0.640***	0.042***	-0.108***	-0.145***
	(7.60)	(2.86)	(-8.88)	(-3.40)
Firm size	0.007	0.013	0.022***	0.014
	(0.16)	(1.40)	(5.13)	(0.84)
ROA	0.895***	-0.028	-0.037***	0.134**
	(8.58)	(-1.50)	(-3.36)	(2.00)
Market to book	-0.000	0.000***	0.000	-0.000***
	(-0.68)	(13.22)	(0.84)	(-4.69)
Leverage	-0.718***	-0.079***	0.094***	-0.082
	(-7.88)	(-3.51)	(6.67)	(-1.61)
Big auditor	-0.273***	0.022	-0.032***	-0.091**
	(-4.34)	(1.25)	(-3.27)	(-2.26)
Within-firm effects				
IO	0.255***	0.012	-0.022***	-0.013
	(2.62)	(0.68)	(-2.72)	(-0.51)
Firm size	-0.248***	0.011	0.036***	0.045**
	(-5.56)	(0.81)	(6.94)	(2.20)
ROA	1.042***	-0.020	-0.134***	-0.035
	(9.74)	(-0.57)	(-9.99)	(-1.23)
Market to book	-0.000	-0.000***	-0.000***	0.000***
	(-0.38)	(-26.69)	(-3.06)	(7.18)
Leverage	-0.423***	-0.056**	0.014	-0.051
	(-4.23)	(-2.34)	(1.62)	(-1.46)
Big auditor	-0.185**	-0.021	-0.008	-0.009
	(-2.56)	(-0.63)	(-1.16)	(-0.23)
Constant	-2.113***	-0.086***	-0.050	0.066
	(-2.97)	(-2.91)	(-0.88)	(0.63)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Size dummies	Yes	Yes	Yes	Yes
N	59,503	59,503	59,503	59,503

Reported results include the coefficients and t-values in parentheses. The results of Models 2, 3, and 4 are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 4.1 for a description of each variable. Industry dummies are based on the two-digit SIC codes. Size dummies are based on decile groups of the variable *Firm size*.

by the within-firm effects. The between-firm effects section of Model 4 also shows that abnormal decreases in discretionary expenses are greater when firms perform better ($p < 0.05$) and when the firm's independent auditor is not one of the big four ($p < 0.05$). And the within-firm effects show the same when firms are larger ($p < 0.05$).

Next, we test for evidence of nonlinearity. Table 4.5 shows Models 5-8 which are identical to Models 1-4 but with the inclusion of the variable IO^2 to model a quadratic IO-earnings management relation. Model 5 shows evidence that IO affects earnings surprise likelihood positively ($p < 0.01$) and IO squared affects earnings surprise likelihood negatively ($p < 0.01$ and $p < 0.05$ for the between-firm and within-firm effects, respectively). This indicates that the IO-earnings management relation is nonlinear, being concave in form. Thus, Model 5 shows significant evidence supporting hypothesis *H1*. Evidence of a nonlinear relation with IO is also discovered for abnormal discretionary accruals, revealed in the between-firm effects section of Model 6, given the positive effect of IO ($p < 0.01$) and the negative effect of IO squared ($p < 0.05$).

Turning to Models 7 and 8, we find evidence that IO has a nonlinear effect on real activities earnings management, but that the relation is convex in form. The within-effects section of Model 7 shows evidence that IO affects abnormal production costs in a convex way, given the negative effect of IO ($p < 0.01$) and the positive effect of IO squared ($p < 0.05$). However, this is not supported by the between-firm effects analysis which only shows evidence of a negative linear relation since IO squared is not found to have a significant effect. Model 8 shows evidence that the relation between IO and abnormal decreases in discretionary expenses is convex, given the negative effect of IO ($p < 0.01$) and the positive effect of IO squared ($p < 0.05$) from both the between-firm and within-firm effects.

Post-Sarbanes–Oxley Act

Because of the substantial reforms to financial reporting regulations in the United States brought about by the passage of SOX, we test how our results differ when analyzing the post-SOX observations alone. Tables 4.6 and 4.7 are identical to Tables 4.4 and 4.5,

Table 4.5: Earnings management and institutional investor ownership – between-within panel regression

	Model 5	Model 6	Model 7	Model 8
	Earnings surprise	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
Between-firm effects				
IO	2.448***	0.168***	-0.154***	-0.423**
	(8.34)	(2.82)	(-3.67)	(-2.57)
IO^2	-1.897***	-0.137**	0.051	0.306**
	(-6.46)	(-2.22)	(1.18)	(2.04)
Firm size	-0.015	0.013	0.023***	0.016
	(-0.37)	(1.34)	(5.21)	(0.97)
ROA	0.903***	-0.029	-0.037***	0.134**
	(8.64)	(-1.52)	(-3.37)	(1.99)
Market to book	-0.000	0.000***	0.000	-0.000***
	(-0.63)	(12.81)	(0.82)	(-4.60)
Leverage	-0.678***	-0.077***	0.093***	-0.087*
	(-7.45)	(-3.44)	(6.64)	(-1.72)
Big auditor	-0.273***	0.020	-0.032***	-0.091**
	(-4.33)	(1.13)	(-3.24)	(-2.27)
Within-firm effects				
IO	0.835***	-0.015	-0.066***	-0.245**
	(2.93)	(-0.24)	(-2.77)	(-2.14)
IO^2	-0.583**	0.025	0.043**	0.227**
	(-2.27)	(0.51)	(2.07)	(2.32)
Firm size	-0.284***	0.010	0.037***	0.048**
	(-6.32)	(0.71)	(7.01)	(2.33)
ROA	1.047***	-0.020	-0.134***	-0.035
	(9.79)	(-0.56)	(-10.00)	(-1.22)
Market to book	-0.000	-0.000***	-0.000***	0.000***
	(-0.34)	(-27.62)	(-3.23)	(7.24)
Leverage	-0.425***	-0.057**	0.014	-0.054
	(-4.25)	(-2.36)	(1.54)	(-1.52)
Big auditor	-0.173**	-0.021	-0.009	-0.012
	(-2.40)	(-0.65)	(-1.27)	(-0.34)
Constant	-2.390***	-0.108***	-0.046	0.094
	(-3.34)	(-3.29)	(-0.80)	(0.83)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Size dummies	Yes	Yes	Yes	Yes
N	59,503	59,503	59,503	59,503

Reported results include the coefficients and t-values in parentheses. The results of Models 6, 7, and 8 are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 4.1 for a description of each variable. Industry dummies are based on the two-digit SIC codes. Size dummies are based on decile groups of the variable *Firm size*.

respectively, but with pre-SOX observations excluded.

The first observable difference in the post-SOX models is that the evidence of a negative linear effect and a concave nonlinear effect between IO and earnings surprises is only present in the between-firm effects sections of Models 9 and 13. It is possible that this is due to endogenous regressors related to the between-firm effects analysis, evident from the significant Hausman test. However, we believe it is likely that the between-firm and within-firm effects differ in Models 9 and 13 (with respect to the variables IO and IO^2) because of the loss of efficiency of the within-firm effects analysis coupled with less earnings management overall as a result of SOX. Indeed, reducing earnings manipulation was the fundamental purpose of SOX. This is also supported by the reduced coefficients related to IO and IO^2 in the between-firm effects post-SOX analysis, likely indicating that IO is a weaker explainer of earnings management post-SOX because there is less earnings management present. Similarly, the positive linear effect of IO on abnormal discretionary accruals from Model 2 ($p < 0.01$) is lost post-SOX (Model 10). However, evidence of a concave relation between IO and abnormal discretionary accruals remains in the between-firms effects section of Model 14. In the post-SOX period, there is only evidence of a negative linear relation between IO and abnormal production costs ($p < 0.01$), despite some evidence of a convex relation being present in the full sample. Finally, evidence of a negative linear relation and a convex nonlinear relation between IO and abnormal decreases in discretionary expenses are present in the between-firm effects section of Table 4.6 ($p < 0.05$) and the within-firm effects section of Table 4.7 ($p < 0.10$ and $p < 0.05$ for the IO and IO^2, respectively).

4.5 Discussion

Overall, we show that IO is a significant determinant of earnings management outcomes. We use earnings surprises as the main dependent variable of the study. We believe that earnings surprises capture both accruals-based and real activities earnings management as they indicate ex-post evidence that earnings management has occurred. First, we find evidence of a positive linear relation between IO and earnings surprises in both the

Table 4.6: Earnings management and institutional investor ownership, post-SOX – between-within panel regression

	Model 9	Model 10	Model 11	Model 12
	Earnings surprise	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
Between-firm effects				
IO	0.506***	0.004	-0.060***	-0.110**
	(4.48)	(0.21)	(-4.27)	(-2.29)
Firm size	-0.048	0.011	0.034***	0.025
	(-0.75)	(0.67)	(6.17)	(1.09)
ROA	0.510***	-0.034	-0.026***	0.116
	(3.62)	(-1.43)	(-4.56)	(1.39)
Market to book	-0.001	0.001	-0.001**	-0.004**
	(-0.28)	(1.31)	(-2.12)	(-2.08)
Leverage	-0.236**	-0.039*	0.053***	-0.082
	(-2.05)	(-1.66)	(3.55)	(-1.31)
Big auditor	-0.175**	0.054**	-0.080***	-0.171***
	(-2.14)	(2.44)	(-6.75)	(-3.26)
Within-firm effects				
IO	0.117	0.033	0.002	0.030
	(0.75)	(1.17)	(0.26)	(1.29)
Firm size	-0.179**	0.004	0.044***	0.025
	(-2.28)	(0.16)	(6.56)	(0.99)
ROA	0.558***	-0.109	-0.150***	0.010
	(3.43)	(-1.30)	(-7.01)	(0.17)
Market to book	0.001	-0.000	-0.000	0.000
	(1.01)	(-1.47)	(-0.12)	(0.98)
Leverage	-0.540***	-0.068**	-0.012	0.041
	(-3.35)	(-1.99)	(-1.07)	(1.26)
Big auditor	-0.289***	-0.068	-0.012	0.038
	(-2.58)	(-0.97)	(-1.51)	(1.07)
Constant	-0.893***	-0.140**	-0.169***	-0.061
	(-2.64)	(-2.37)	(-6.37)	(-0.51)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Size dummies	Yes	Yes	Yes	Yes
N	26,183	26,183	26,183	26,183

Reported results include the coefficients and t-values in parentheses. The results of Models 10, 11, and 12 are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 4.1 for a description of each variable. Industry dummies are based on the two-digit SIC codes. Size dummies are based on decile groups of the variable *Firm size*.

Table 4.7: Earnings management and institutional investor ownership, post-SOX – between-within panel regression

	Model 13	Model 14	Model 15	Model 16
	Earnings surprise	Abnormal discretionary accruals	Abnormal production costs	Abnormal decreases in discretionary expenses
Between-firm effects				
IO	1.711***	0.276***	-0.022	-0.563*
	(3.90)	(2.63)	(-0.37)	(-1.67)
IO^2	-1.144***	-0.267***	-0.037	0.451
	(-2.85)	(-2.78)	(-0.67)	(1.50)
Firm size	-0.063	0.008	0.034***	0.026
	(-0.97)	(0.49)	(6.16)	(1.15)
ROA	0.489***	-0.035	-0.026***	0.118
	(3.46)	(-1.45)	(-4.51)	(1.39)
Market to book	-0.000	0.001	-0.001**	-0.004**
	(-0.21)	(1.34)	(-2.11)	(-2.13)
Leverage	-0.229**	-0.036	0.054***	-0.087
	(-1.99)	(-1.58)	(3.59)	(-1.39)
Big auditor	-0.181**	0.052**	-0.080***	-0.166***
	(-2.21)	(2.37)	(-6.72)	(-3.25)
Within-firm effects				
IO	-0.289	0.122	0.002	-0.175*
	(-0.58)	(1.12)	(0.08)	(-1.94)
IO^2	0.359	-0.081	-0.000	0.187***
	(0.85)	(-1.02)	(-0.01)	(2.61)
Firm size	-0.204***	-0.000	0.044***	0.029
	(-2.58)	(0.00)	(6.52)	(1.13)
ROA	0.563***	-0.108	-0.150***	0.011
	(3.46)	(-1.29)	(-7.00)	(0.18)
Market to book	0.001	-0.000	-0.000	0.000
	(1.01)	(-1.47)	(-0.12)	(0.99)
Leverage	-0.552***	-0.068**	-0.012	0.041
	(-3.42)	(-2.00)	(-1.08)	(1.26)
Big auditor	-0.291***	-0.067	-0.012	0.036
	(-2.59)	(-0.97)	(-1.51)	(1.03)
Constant	-1.062***	-0.179***	-0.175***	0.015
	(-3.09)	(-2.96)	(-5.94)	(0.10)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Size dummies	Yes	Yes	Yes	Yes
N	26,183	26,183	26,183	26,183

Reported results include the coefficients and t-values in parentheses. The results of Models 14, 15, and 16 are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 4.1 for a description of each variable. Industry dummies are based on the two-digit SIC codes. Size dummies are based on decile groups of the variable *Firm size*.

between-firm and within-firm effects. This indicates that managers face greater pressure to manage earnings to avoid disappointing earnings reports as IO increases. However, we find evidence, from the between-firm and within-firm effects, that this relation is nonlinear, being concave in form. This indicates that at low levels of IO, increasing IO results in greater earnings management. And, once a turning point is reached, further increases in IO result in decreasing earnings management. This evidence corroborates the study by Koh (2003) who finds a concave relation between IO and abnormal discretionary accruals for Australian firms. Koh (2003) argues that IO has a concave effect on earnings management because of the type of institutional investors that hold a firm's stock, which changes as the level of IO increases. We agree that this likely drives the nonlinear effect of IO on earnings surprises that we find. There is less evidence of a linear or quadratic IO-earnings surprise relation in the post-SOX period given that no relation is observed for IO or IO squared in the within-firm effects sections of Models 9 and 13. As noted previously, the between-firm effects analysis of Models 9 and 13 must be considered with caution because of the significant Hausman test related to earnings surprises.

We expand on these findings by considering three measures of earnings management. Beginning with an accruals-based approach, the between-firm effects reveal evidence of a positive linear relation between IO and abnormal discretionary accruals. This result does not hold for the within-firm effects. However, because of the insignificant Hausman test related to abnormal discretionary accruals, this is likely because of lost modeling efficiency (from the within-firm effects) and not because of endogenous regressors (from the between-firm effects). We test for nonlinearity and find evidence that the relation between IO and abnormal discretionary accruals is concave in form. As with the linear relation, this does not hold for within-firm effects. These findings are similar to those related to earnings surprises above, indicating similarities between the determinants of both measures. In the post-SOX period, we find no evidence of a linear relation between IO and abnormal discretionary accruals. We do find evidence that the concave relation between IO and abnormal discretionary accruals persists in the post-SOX period from the between-firm effects section of Model 14.

Turning to real activities earnings management, we find evidence that IO affects abnormal production costs negatively from both the between-firm and within-firm effects. We find the same for abnormal decreases in discretionary expenses, but only from the between-firm effects. We find evidence that both of these relations are convex from the within-firm effects of Models 7 and 8. In the post-SOX period, we only find evidence of a negative linear relation between IO and the real activities earnings management measures from the between-firm effects. We find no evidence that the IO-abnormal production costs relation is nonlinear post-SOX. And finally, we do find evidence of a convex IO-abnormal decreases in discretionary expenses relation post-SOX from the within-firm effects section of Model 16.

Overall, our findings suggest that the relation between IO and earnings management is dynamic and heavily context-dependent, with earnings management type and the passage of SOX playing important roles. We find evidence of nonlinearity related to earnings surprises, supporting hypothesis *H1*, but that less evidence of nonlinearity exists post-SOX. We also find strong evidence that IO affects accruals-based earnings management positively overall and real activities earnings management negatively overall, supporting hypothesis *H2*. This is an interesting finding and, as discussed by Roychowdhury (2006) and Zang (2012), is likely due to institutional investors not wanting portfolio firms to miss analyst forecasts (thereby encouraging earnings management), but also not wanting managers to engage in real activities earnings management which affects long-term firm value adversely (Graham et al., 2005).

We acknowledge an important limitation of our study. We measure IO as the level of stock ownership held by institutional investors thereby treating all institutional investors as homogeneous entities. This practice is common in earnings management literature (Bushee, 1998; Charitou et al., 2007; Chung et al., 2002; Lemma et al., 2018; Velury & Jenkins, 2006). However, there is significant evidence that earnings management outcomes related to IO are affected by institutional investors being of certain types (Hsu & Koh, 2005; Koh, 2007) and by IO stability (Kałdoński et al., 2020; Sakaki et al., 2017), which we do not account for. We choose our approach, despite the acknowledged limitation, to

analyze the linear and nonlinear aspects of the IO-earnings management relation from a broad perspective and to improve the understanding of the overall picture. We encourage future authors to build on our findings and approach similar research questions considering the behavior of distinct types of institutional investors.

4.5.1 Concluding remarks

There is an enduring need to improve earnings quality and study organizational factors that affect financial reporting processes. As institutional investors grow in prominence, holding increasingly large stakes in listed firms, their importance as a fundamental part of corporate governance grows. We find evidence that IO is a strong determinant of earnings management outcomes but that the direction and nature of the effect depends on several factors.

Our study reveals interesting avenues for future research. Building on our findings, future studies could consider differences in the levels of financial statement irregularities or earnings management between firms that barely beat or barely miss analyst forecasts. A nonlinear IO-earnings management relation has been revealed to exist in the United States by our study and in Australia by Koh (2003). Future studies could consider whether nonlinearity persists in other contexts, especially in emerging markets where the role of institutional investors differs. Perhaps most critically, future studies could examine how earnings management is affected by different types of institutional investors. We define institutional investors broadly, however, they are not homogeneous and consideration of how earnings management is affected by institutional investor type could yield interesting results. Finally, although we focus on IO exclusively, future studies could examine the role of large non-institutional investors in determining financial reporting outcomes.

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Appendices

Table A1: Abnormal operating cash flow and CEO age – firm fixed effects

	Abnormal operating cash flow
CEO age	0.011
	(0.93)
CEO tenure	-0.003*
	(-1.91)
CEO gender	-0.012*
	(-1.84)
CFO age	-0.021**
	(-2.14)
CFO gender	0.001
	(0.27)
Firm size	0.010***
	(2.90)
ROA	0.236***
	(12.88)
Market to book	0.000
	(0.25)
Leverage	-0.055***
	(-3.50)
Inst. ownership	0.005
	(0.61)
Big auditor	-0.013
	(-1.42)
Constant	0.045
	(0.63)
Year dummies	Yes
N	18,492
Adj. R-squared	0.406

Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.

Table A2: First-stage regression using the consumer price index of the year of the CEO's birth as an instrumental variable to predict CEO age – firm fixed effects

	CEO age
CPI at birth	-0.014***
	(-49.27)
CEO tenure	0.035***
	(40.10)
CEO gender	0.012***
	(3.19)
CFO age	0.074***
	(14.88)
CFO gender	0.009***
	(4.44)
Firm size	0.047***
	(36.43)
ROA	-0.001
	(-0.13)
Market to book	0.000
	(1.61)
Leverage	0.059***
	(16.14)
Inst. ownership	-0.014***
	(-4.37)
Big auditor	-0.028***
	(-8.11)
Constant	3.692***
	(186.94)
N	18,492
Adj. R-squared	0.859

Reported results include the coefficients and t-values in parentheses. All results are based on robust standard errors. *, **, and *** denote significance levels of 10%, 5%, and 1%, respectively. See Table 3.1 for a description of each variable.