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ORIGINAL RESEARCH

Female CFOs and managerial opportunism

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Abstract
We employ the Self-Selection Theory and provide new evidence into earnings management practices by female Chief Financial Officers (CFOs). Using 8,288 firm-year observations from 1997 to 2018, we find that female CFOs are positively associated with real earnings management (REM). To gain insights into documented female CFOs' opportunism, we predict and find empirical evidence in line with the expectations that female CFOs facing pressure from age and lack of diversity are positively associated with REM. Likewise, the association between REM and female CFOs dissipates among firms with no pressures from wage, age, or lack of diversity. We further examine the moderating effect of institutional investors and female CFOs' managerial abilities on the association between REM and female CFOs. Our results suggest that the positive association between REM and female CFOs is observable only among firms with high institutional investors, signaling external pressure on female CFOs to manipulate earnings. Collectively, we refer to the pressure factors on female CFOs as the Glass Rock because they are invisible yet drive female CFOs to behave opportunistically. As expected, the positive association between REM and female CFOs is noticeable only among firms with high female CFOs' managerial abilities. Our results are robust to multiple specifications such as using a two-stage regression model (instrumental variable), a propensity score matching sample, a robust standard regression clustered by firm, and a subsample of firms that switched from male-to-female CFOs versus male-to-male CFOs.

Keywords Chief financial officers · Gender · Real earnings management · Institutional investors · Managerial ability · Workplace pressure

JEL Classification C50 · J70 · L50 · M10 · M41 · M40

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"Behavior in organizations is, when all is said and done, adaptive."

-Rosabeth Moss Kanter (1993, *251)*

1 Introduction

Earnings management is affecting nearly all stakeholders of the U.S. firm, increasing the demand for high-quality financial reporting.[1] Prior research examines the association between gender diversity and earnings management (Clikeman et al. 2001; Krishnan and Parsons 2008; Peni and Vähämaa 2010; Zalata et al. 2018a, 2018b; Harris et al. 2019). Prior research also examines the role of CFOs versus that of the Chief Executive Officers (CEOs) in affecting the quality of financial reporting (e.g., Geiger and North 2006; Chava, and Purnanandam 2010; Jiang et al. 2010; Feng et al. 2011), with more emphasis on the gender of CFOs (Vähämaa 2014; Francis et al. 2015; Kim 2017; Davis and Garcia-Cestona 2021) as the primary influencer of the quality of financial reporting.

This study examines the relationship between female CFOs and REM. Prior research on the association between female CFOs and financial reporting quality provides mixed results (Nasution and Jonnergård 2017). For example, some studies document that female CFOs are associated with less discretionary accruals (Hao et al. 2022; Peni and Vähämaa 2010), decreased level of corporate overinvestment (Liu, Neely, and Karim 2022), less tax aggressiveness (Francis et al.. 2014), and higher accrual quality (Barua et al. 2010) than their male counterparts. On the contrary, others did not find an association between the gender of CFOs and discretionary accruals (Ge et al. 2011), the firm's tax avoidance (Dyreng et al. 2010), investment decisions (Cicchiello et al. 2022; Eichholtz and Yonder 2022), or the quality of earnings forecast (Francoeur et al. 2022). Interestingly, Liu, Li, Tong, and Zhang (2022) use data from Chinese listed companies and find that female CFOs avoid tax more aggressively than male CFOs, but this association is weak among firms in better legal environments and with older CFOs. Discretionary accruals and REM are substitute tools to manipulate earnings (Cohen and Zarowin 2010; Zang 2012). Unlike REM, manipulating earnings using accruals is illegal, subjects the firm to SEC penalties, and increases litigation risk (Cohen and Zarowin 2010).

REM artificially inflates earnings by altering business operating decisions and artificially increasing earnings by (1) sharply reducing discretionary expenses such as R&D, advertising, and SG&A expenses, creating abnormal negative discretionary expenses; (2) increasing production costs by increasing the number of units produced so that the cost per unit goes down, and consequently, so does the cost of goods sold, while the overall holding and productions costs go up, creating abnormal positive production costs; and/or (3) decreasing cash flow from operations through excessive discounts and more lenient credit terms to increase the current period's sales, creating abnormal negative cash flow from operations (Gunny 2005; Roychowdhury 2006; Taylor and Xu 2010).

[1] In September 2020, the Securities and Exchange Commission (SEC) launched the Earnings Per Share (EPS) initiative, which relies heavily on risk-based data analytics, to scrutinize public companies that manipulate earnings. SEC (2020) SEC Charges Companies, Former Executives as Part of Risk-Based Initiative. Press Release 2020–226. Available at: https://www.sec.gov/news/press-release/2020-226.

Since males are more likely to be risk-takers (Jianakoplos and Bernasek 1998; Courtenay 2000),[2] it is not surprising that some prior research documents earnings management using accruals by male CFOs. Manipulating earnings using REM is, however, different for many reasons. First, REM is opaque and may not subject the firm to litigation (Huang et al. 2020). Second, REM is indistinguishable from optimal business processes (Cohen and Zarowin 2010). Third, REM artificially inflates earnings by altering business operating decisions and artificially increasing earnings (Gunny 2005; Roychowdhury 2006; Taylor and Xu 2010). Furthermore, female CFOs are continuously facing added pressure to break the glass ceiling. Even after they break the first glass ceiling and climb the upper managerial echelon, some female business leaders are subject to paternalistic micromanagement, a situation where males place females in leadership roles, but tell the females exactly what they are to do.[3] Hurley and Choudhary (2020) argue that female CFOs are leading smaller and financially poorer firms relative to firms with male CFOs, creating pressure on females to avoid reaching the glass cliff.

Female CFOs are also underrepresented among top executives. Anecdotal evidence suggests that only 64 (13%) female CFOs are in the Fortune 500, while only 27 (5%) Fortune 500 companies are led by female CEOs.[4] While this percentage represents a breakthrough compared to the zero female executive representation in top 1000 jobs in 1980, anecdotal evidence suggests that women's advancement on the executive level is still non-linear.[5] We utilize the Self Selection Theory (SST), which predicts that females show traits against their gender stereotype and adopt the same traits as males in the workplace (Deaux and Major 1987). We then argue that female CFOs not only behave like their male counterparts but at the height of pressure, female CFOs manage REM more than their male counterparts do. We predict and find empirical evidence supporting that female CFOs are especially prone to social desirability response bias (Bagley et al. 2012) because REM is not illegal, improves the firm's financial performance, and does not subject the firm to audit scrutiny. Further, we explain REM practices by female CFOs by examining the moderating effect of managerial ability, external governance mechanisms (e.g., institutional holdings), and workplace pressures (e.g., pressure from age, tenure, wage, and diversity) on female CFOs' REM behavior. Collectively, we refer to these pressure factors as the Glass Rock because they are invisible yet drive female CFOs to behave opportunistically.

Using a sample of firms between 1997 and 2018, the study finds that female CFOs are positively associated with REM and that female CFOs facing pressure from age and lack of diversity are positively associated with REM. Likewise, the association between REM and female CFOs dissipates among firms with no pressure from wage, age, and lack of diversity.

[2] The documented risk-taking attitudes among men are not only related to ethical decisions, but also to health-related beliefs, which negatively affect their health and longevity (Courtenay 2000). This argument is in line with the social constructionist perspective. On the contrary, women are more likely to adopt healthy lifestyle patterns than men are.

[3] Bryant, A. (2014). Executive women, finding (and owning) their voice. The New York Times. Available at: http://www.nytimes.com/interactive/2014/11/16/business/corner-office-women-executives-owning-their- voice.html?smid=fb-nytimes&smtyp=cur&bicmp=AD&bicmlukp=WT.mc_id&bicmst=1,409,232,722,000&bicmet=1,419,773,522,000.

[4] Mohan, P. (2019). Women CFOs may be in style but what about the rest of the C-suite? Fact Company. Available at: https://www.fastcompany.com/90305252/women-cfos-may-be-in-style-but-what-about-the-rest-of-the-c-suite

[5] Estrada, S. (2022) Women are increasingly being hired for CFO roles this year, says an executive search firm president. Available at: https://fortune.com/2022/08/22/women-are-increasingly-being-hired-for-cfo-roles-this-year-says-an-executive-search-firm-president/

Interestingly, the study finds mild evidence that female CFOs with longer tenures are associated with REM, which makes sense given that manipulating REM requires knowledge of the industry and business. This study also shows that the percentage of institutional investors' holdings and managerial ability moderate the relationship between female CFOs and REM. The positive association between REM and female CFOs is observable only among firms with high institutional investors, signaling external pressure on female CFOs to manipulate earnings. Additionally, the positive association between REM and female CFOs is noticeable only among firms with high rates of female CFOs' managerial abilities. This result can be interpreted as female CFOs possibly needing managerial knowledge about the industry in order to influence REM. It also corroborates the evidence that female CFOs with longer tenures are associated with more REM than female CFOs with pressure from tenure. The glass cliff phenomenon (Hurley and Choudhary 2020) suggests that female CFOs may choose to join firms with precarious financial reporting (e.g., high levels of REM). Therefore, to rule out endogeneity as an alternative explanation to our results, we employ multiple model specifications such as using two-stage regression model (instrumental variable), a propensity score matching sample, regressions after controlling for the firm-, year-, industry- and industry-year-fixed effects, and a subsample of firms that switched from male-to-female CFOs versus male-to-male CFOs. The results in the additional analysis section still show consistent REM by female CFOs, providing credence to our main results.

This study contributes to prior literature on diversity, organizational behavior, and earnings management in several ways. First, it suggests that individual behaviors in organizations are more complex than they appear. Early childhood and heredity may not be valid structural determinants of organizational behavior. Power, opportunity, and social composition within an organization can be better predictors of individuals' behaviors (Kanter 1993). Second, to the authors' knowledge, this study provides the first empirical evidence on earnings management behavior through REM by female CFOs among U.S. firms. This study complements the findings of prior research (e.g., Hao et al. 2022; Barua et al. 2010; and Peni and Vähämaa 2010), and further suggests that while male CFOs manipulate discretionary accruals, female CFOs are more likely to manipulate REM.[6] These results do not mean female CFOs are less moral than male CFOs but rather suggest that female CFOs opportunistically seek strategies, which are indistinguishable from optimal business operations, to boost earnings and improve the firm's operating performance. Third, this study extends the literature on the determinants of earnings management in relation to gender (Liu et al. 2015). While Liu et al. (2015) find that departing (new) male CFO is associated with upward (downward) aggressive earnings management than female CFOs in China, our study uses a large sample from the U.S. market, spanning nearly two decades, and documents evidence of REM by female CFOs when they face pressure from age, diversity, and institutional investors.

Fourth, in addition to the methodological issues associated with discretionary accruals (McNichols 2002; Kothari et al. 2005), not all discretionary accruals are opportunistic behaviors that expropriate shareholders' wealth and/or reduce firm value (Adut et al. 2013).[7] This study attempts to capture female CFOs' opportunistic behavior using REM

[6] Additional analyses (untabulated) of our study reveal a negative significant association between female CFOs and discretionary accruals.

[7] For example, Adut et al. (2013) provide empirical evidence that predictive earnings management using managerial discretion to enhance realized cash flow reduces the firm's informational risk.

as an alternative to accrual earnings management and the moderating effect of managerial ability, and institutional holdings. Fifth, this study utilizes archival data and several robustness tests to extend prior research on executives' intrinsic gender differences with respect to earnings management and governance mechanisms. Additionally, while several studies document the relationship between executive compensation and earnings management (e.g., Bergstresser and Philippon 2006; Jiang et al. 2010; Laux and Laux 2009), these earlier studies predominantly used historically male-dominated leadership positions simply because only recently have women in executive positions increased to provide a sizable testable sample. For example, no woman held a position in the top 1000 jobs in 1980, compared to 27% of the Fortune 100 in 2021. This study uses a recent sample of firms that spans over two decades.

Sixth, prior research documents mixed evidence on executives' gender in relation to earnings quality. Barua et al. (2010) find evidence that accrual quality is higher for female CFOs than male CFOs, but female CEOs do not exhibit the same pattern of behavior. Ye et al. (2010) find no statistical differences between the gender of executives and earnings quality in China. None of these studies provides a direct test on REM, as a substitute for accruals, by female CFOs. This study then fills this gap in the prior literature and attempts to resolve the documented mixed evidence. Further, the study underscores the importance of understanding that female CFOs use REM instead of efficiently utilizing the available resources and/or using informal corporate alliances, possibly because of the various pressures female CFOs are exposed to, including those from institutional investors. Finally, our study is of importance to policymakers, regulators, standard-setters, activists, and executives because it highlights the need to remove barriers and lessen pressure factors on female CFOs to avoid the unintended consequences of REM on the U.S. firm.

This study is composed of six sections. Section two covers the literature review and hypothesis development. Section three introduces data and methodology. Section four discusses the empirical results. Section five concludes, and section six presents the discussion and direction for future research.

2 Literature review and hypothesis development

2.1 Gender and earnings management practices

The traditional meaning of gender centers on differences, while gender equality is viewed as an exception to the 'norms' (Hare-Mustin and Marecek 1988). For example, females are viewed as compassionate while males are viewed as fair and powerful. Research in this area is classified into three main streams. First, gender differences exist. Second, gender differences dissipate as males and females adapt to standardized work cultures. Third, gender differences do not exist as evidenced by mixed evidence in prior literature. Proponents of gender differences, the first stream of research, argue that gender differences exist and are justified by various physiological theories such as the Gender Socialization Theory (GST), Psychoanalytic Theory, Social Learning Theory, and Cognitive Developmental Theory (Deaux and Major 1987). The GST, for example, is based on Freud's work and argues that gender differences begin in childhood where males place much more weight on money, advancement, power, and tangible measures of personal performance,

while females place more value on helping and caring for people (Clikeman et al. 2001). Studies, such as Betz et al. (1989), Dawson (1995), Ameen et al. (1996), and Weeks et al. (1999) use the GST and provide evidence on gender differences. In line with the notion of GST, prior research finds that females are less skeptical, less tolerant, and less likely to participate in unethical academic activities (Ameen et al. 1996), less likely to manipulate earnings (Shawver et al. 2006), more ethical and help improve the firm's ethical climate (Dawson 1995), show higher ethical judgment in the workforce (Weeks et al. 1999), and take fewer risks than their male counterparts regardless of contextual factors such as costs, ambiguity, familiarity, and framing of risk preferences (Powell and Ansic 1997).

Using a sample of firms between 1994 and 2015, Liu et al. (2022a, b) provide empirical evidence that female CFOs are associated with lower overinvestment decisions, and hence protect the long-term interests of investors. Using situations involving fraud as an extreme form of earnings management, Wahyuningtyas, and Aisyaturrahmi (2021) find that female CFOs are negatively associated with fraud, particularly among state-owned firms where political concerns are more observable. Using cross-listed firms in the US, Maulidi et al. (2022) document a significant negative association between female CFOs and the occurrences of fraud. Kim (2017) argues that female CFOs are prudent and provide quality financial reporting. More specifically, Kim (2017) finds that when female CFOs join the firm, analyst earnings forecasts become less dispersed and provide less erroneous earnings forecasts. Employing the Upper Echelons Theory, Francis et al. (2015) find that female CFOs are associated with more accounting conservatism than male CFOs, but this evidence only exists among firms with higher litigation risk, default risk, systematic risk, or management turnover risk. Vähämaa (2014) uses 3-year sample of Standard & Poor's (S&P) 1500 firms between 2004 and 2006 and finds firms that switch from male to female CFOs are associated with income-decreasing discretionary accruals that persist until the following year.

Opponents of the GST, the second stream of research, suggest distal causes of gender behavior such as heredity and early socialization. Therefore, sociological theories such as the Social Role Theory, the SST and the Expectation States Theory suggest that gender differences are eliminated when women and men play social roles. That is, because these social roles are standardized and diminish gender differences, as both males and females adapt to work climates. Stated differently, the SST predicts that females show traits against their gender stereotype and adopt the same traits as males in the workplace. In line with this thought, Deaux and Major (1987) reject the GST and suggest that contextual factors (e.g., the convergence of the expectations of others, self-negotiation, work environment, and individual goals) affect the way males or females behave. Relatedly, Betz et al. (1989) contend that males and females show different interests and ethical attitudes in their jobs, but these differences disappear as they both adjust to their jobs and respond similarly to unethical situations. Dwyer et al. (2002) find that females are more risk-averse than males in making mutual fund investment decisions, but these gender differences are reduced by 50% when they control for knowledge of financial markets and investment. Related, Bagley et al. (2012) argue that women are more prone to social desirability response bias such that when controlling for social desirability bias, the gender effect in ethical decision-making weakens. This implies that the differences in behavior between males and females predicted by the GST diminish and are context specific. Prior research uses the SST and the social psychology approach and shows no gender differences regarding ethical behavior

(e.g., Hegarty and Sims 1978; 1979; Walker 1984; Dubrinsky and Levy 1985; McNichols and Zimmer 1985; Geiger and O'Connell 1998; Owhoso 2002).

Owhoso (2002) suggests that although female auditors are more sensitive in recognizing ethical versus unethical events than their male counterparts, neither female nor male auditors are sensitive to the presence or absence of positive ethical signals when evaluating a client's fraud risk. Similarly, Radtke (2000) finds no gender differences in relation to ethically sensitive decisions. Smith and Oakley (1997) find that female students are more honest, but male and female students show no behavioral differences when issues violate the law or are related to organizational internal policies and regulations. Related, Stanga and Turpen (1991) do not find evidence to support gender differences in ethical dilemmas requiring judgments. While Zhou et al. (2018) document a negative association between CFOs pay and the incidence of fraud among firms under delisting pressure in China, they did not find an association between female CFOs and the occurrences of corporate fraud as an extreme form of low-quality financial reporting. Using the structural approach that suggests gender similarity and data from Sweden, Nasution and Jonnergård (2017) did not find an association between female CFOs and earnings quality. Using a UK sample of firms, Arun et al. (2015) did not find an association between female CFOs and discretionary accruals.

Further, using the GST, Cicchiello et al. (2022) did not find a statistically significant difference between male and female CFOs in allocating financial resources toward sustainable business investments strategies (e.g., greener bonds versus conventional bonds). Related, Eichholtz and Yonder (2022) did not find empirical evidence that the gender of CFOs is associated with suboptimal investment strategies (e.g., asset prices). While Francoeur et al. (2022) find that female CEOs are associated with higher quality earnings forecasts (e.g., accuracy and frequency) than their male counterparts, this association does not exist for female CFOs. In a study by Hyun et al. (2022) on the association between female executive leadership and Corporate Social Responsibility (CSR), Female CFOs are again not associated with the change in CSR index, strengths, or concerns.

The third stream of research shows mixed results regarding responses of females and males to unethical situations (e.g., Kidwell et al. 1987; Borkowski and Ugras 1992; Galbraith and Stephenson 1993; Ford and Richardson 1994). Overall, these studies indicate gender similarities in some situations. Further, prior studies in business and accounting investigate the association between gender and earnings management and provide mixed results (e.g., Clikeman et al. 2001; Krishnan and Parsons 2008; Peni and Vähämaa 2010; Barua et al. 2010; Zalata et al. 2018a, 2018b; Harris et al. 2019; Davis and Garcia-Cestona 2021). Clikeman et al. (2001) find no differences in students' perceptions of earnings management between males and females and between the U.S. and five Asian countries. Similarly, Lakhal et al. (2015) and Ye et al. (2010) find no association between female CEOs/CFOs and earnings management. Krishnan and Parsons (2008) find that firms with more gender diversity are more profitable and have higher stock returns after initial public offerings than those with less gender diversity.

Na, and Hong (2017) find that male CEOs use discretionary accruals and REM to report small positive earnings or small earnings increases, but female CEOs do not. Peni, and Vähämaa (2010) and Barua et al. (2010) show that female CFOs are associated with less earnings management, but female CEOs are not. Similarly, using French data, Gull et al. (2018) find that female CEOs and CFOs are strongly inclined to reduce earnings

management, with the effect of female CFOs being more pronounced in reducing earnings management after considering gender diversity on the audit committee. Using Chinese data, Liu et al. (2016) show that female CFOs are associated with less real activities earnings management and accrual earnings management. Zalata et al. (2018a) find that both male and female CEOs use classification shifting to manage earnings in the pre-Sarbanes–Oxley Act "SOX" period (e.g., female CEOs do not engage in classification shifting between core expenses and special charges on the income statement post-SOX). Gupta et al. (2020) show that female CFOs are associated with a lowered probability of misreporting as computed using Benford's Law. Davis, and Garcia-Cestona (2021) find that female CFOs are associated with less restatement likelihood, but this association disappears when the board of directors are all males.

Kanter (1993, pg. 250) argues that *"[p]ositions carry a particular structure of rewards….[t]he structures of rewards, in turn, channel behavior, setting people on a course which ties them further into their roles, makes them even more a product of their situations."* Based on the demanding positions held by females at the highest level of the managerial echelons, this study predicts that female CFOs are more likely to manipulate REM for several reasons. First, Chava, and Purnanandam (2010) find that CEOs are more concerned about capital structure and cash flow policies but delegate other specialized finance decisions (e.g., debt maturity and accrual management) to CFOs, who have better control and influence over these decisions. Related, Geiger, and North (2006) find that CFOs have significantly more control over accounting numbers than do CEOs. Jiang et al. (2010) argue that CFOs have more incremental influence over earnings management than CEOs do and that the magnitude of earnings management is more sensitive to CFOs' equity incentives than those of CEOs. Grossman et al. (2022) provide empirical evidence that CFOs curb CEOs' dominance in deals involving overpriced acquisition premiums. Additionally, Feng et al. (2011) document that the SEC charges, on average, 60% of CFOs with earnings management.

Collectively, this evidence suggests that CFOs have more interest and access to earnings numbers than CEOs do. Second, unlike earnings management through accruals, this study argues that REM is of specific interest to female CFOs because it directly affects short-term cash flows and liquidity without subjecting the firm to litigation (Gunny 2005; Taylor and Xu 2010). This is likely so because females are risk-averse and are less likely to violate laws and regulations (Ittonen et al. 2013). However, they are more likely to behave as their male counterparts through REM when considering contextual factors such as work environment, expectations, and individual goals (Kanter 1993). Third, Deaux and Major (1987) argue that gender-related behavior is influenced by the expectations of perceivers and proximal causes. For example, executives use earnings management to enhance their reputation with various stakeholders, including customers, suppliers, and creditors (Bowen et al. 1995). Because REM does not subject firms to regulatory oversight and is difficult to distinguish from optimal business operations, female CFOs engage in earnings manipulation via REM. Based on the above discussion, the study predicts the following hypothesis:

H1 Ceteris Paribus, there is a positive association between female CFOs and REM.

2.2 Gender and workplace pressure

2.2.1 Lack of diversity

Predictably, females have difficulties in advancing their careers and face greater levels of inequality. The glass ceiling[8] phenomenon and the pipeline problem[9] have been cited in prior research as key barriers to female success in climbing the corporate ladder (Hull and Umansky 1997). Therefore, female CFOs are perceived as not "tough or aggressive" enough or as lacking the same power given to male CFOs in the workplace, to form both formal and informal alliances and/or mobilize resources. Several studies have examined the effect of gender diversity of CEOs and CFOs on earnings management and a few studies also examine the effect of diversity of top management team (diversity of the executives in the C-Suite) on the firm performance (Krishan and Park 2005; Shrader et al. 1997; Welbourne et al. 2007; Jurkus et al. 2011). These studies show that females on the top management team improve internal governance and use resources effectively to improve firm performance in the short and long term and send a positive signal to shareholders (Shrader et al. 1997; Krishan and Park 2005; Welbourne et al. 2007). Additionally, Jurkus et al. (2011) show that females in the top management team bring greater scrutiny to the firm and thus reduce agency costs in terms of improving free cash flow in low-growth firms. However, Jurkus et al. (2011) find that the effect of female diversity in the top management team is only pronounced when the external governance mechanism is weak. More recently, using Chinese firms, Baolet et al. (2018) show that the diversity of the management team affects the earnings management behavior of CEOs and CFOs.

In this study, we argue that a lack of diversity places pressure on female CFOs to behave opportunistically to meet the expectations and prove wrong the males in the less diverse environment. Since REM is not perceived differently than optimal business operations, it creates an "opportunity" for female CFOs to improve the firm's operating performance, while not subjecting the firm to litigation or violating laws per se. Additionally, this work environment creates "pressures" on female CFOs to take advantage of the "opportunity" to manipulate REM. We, therefore, argue that female CFOs engage in REM when they face pressure due to a lack of diversity.

2.2.2 Wage (compensation)—pay pressure

Anecdotal evidence suggests that female executives in the Standard & Poor's 500 are paid 18% less than their male counterparts.[10] Using Australian government data, Duong, and

[8] The glass ceiling is a phenomenon known in the literature to describe a vertical job separation for females (Hull and Umansky 1997). It has been variously explained by (1) the Person-Centered Theory, which states that women lack the necessary interpersonal skills to succeed in leadership positions; (2) the Structural-Centered Theory, which contends that in the work environment, 'the practices in organizational power and control structure' favor male supremacy over females; and (3) the Bias-Centered Theory, which claims that bias is the key factor behind the glass ceiling phenomenon. This bias is inherent in sex-characteristic stereotypes and sex-role stereotypes.

[9] For example, Hull and Umansky (1997) argue that women have not been working long enough in the profession in order to reach out to the top management team, which is referred to as a pipeline problem.

[10] Hymowitz and Daurat (2013). Best-paid women in S&P 500 settle for less remuneration. August 13, 2013. Bloomberg. Available on: (https://www.bloomberg.com/news/articles/2013-08-13/best-paid-women-in-s-p-500-settle-for-less-with-18-gender-gap).

Evans (2016) argue that women are likely to be paid less because of "poor recognition of qualifications, absence of appropriate classification structures, absence of previous and detailed assessment of their work and working in industries that are male-dominated." Using U.K. executive data, Kulich et al. (2011) indicate that bonuses paid to male executives are larger than those that are paid to female executives and that bonuses paid to male CEOs are more closely tied to performance while female CEOs are neither rewarded nor punished for performance.

Prior studies examine the relationship between an executive's gender and risk-taking demonstrating that female executives report more conservatively than male executives (e.g., Jiang et al. 2010). However, Khan and Vietito (2013) show that corporate boards provide the same executive compensation to females as an incentive to take risks. While prior studies use several theories to support risk aversion and ethical conduct by female executives (Zalata et al. 2018a), an executive compensation package may encourage risk-taking behavior to support that a female executive is deserving of the compensation package (Rajgopal, and Shevlin 2002; Zhang et al. 2008; Khan and Vietito 2013). Indeed, Bergstresser, and Philippon (2006), Cheng, and Warfield (2005), and O'Connor et al. (2006) find that CEOs' equity incentives are associated with more accrual earnings management, increased likelihood of beating analyst's forecasts and increased likelihood of misreporting. This implies that if female CFOs are considered conservative and risk-averse, it is expected that female CFOs would be more susceptible to "giving in" to REM because it is less likely to be detected or litigated. More recently, Harris et al. (2019) examine the effect of executive compensation structure and the role of executive gender on earnings management. They examine the earnings management behavior of female CEOs contingent on their equity incentives. They show that female CEOs manage earnings to a lesser degree than their male counterparts at lower levels of equity-based compensation and that female and male CEOs exhibit similar earnings management behavior at higher levels of equity-based compensation.

In addition, prior studies on female executives' pay gap show that the pay gap increases as females climb the corporate ladder (Duong and Evans 2016). For example, evidence shows that male executives are compensated at a higher rate than female executives and that this pay gap is smaller when there are females on the board or on the compensation committee. Additionally, evidence suggests that this pay gap persists across different time periods in the U.S. (Bertrand and Hallock 2001; Munoz-Bullon 2010; Shin 2012; Gayle et al. 2012).

Other studies on CEO pay gaps show that female CEOs are paid less than their male counterparts in the U.S. and China respectively (Jordan et al. 2007; Lam et al. 2013). Bugeja et al. (2012) and Geiler and Renneboog (2015) show that male and female CEOs are paid equally while other female executives including those in the CFO position are paid less than their male counterparts are. Gayle et al. (2012) also show that non-CEO female executives' pay gap is driven by a salary gap. Using Australian data, Duong, and Evans (2016) show that female CFOs are paid less than male CFOs. Based on the above studies, we argue that female CFOs face obstacles to climbing the corporate ladder and that once they are there; they are unlikely to receive the reward they earned for performance, so they would be more likely to resort to REM to demonstrate performance.

2.2.3 Age pressure

Prior studies examine the effect of executive age on managerial decisions. Older individuals are seen as more experienced, risk-averse, conservative, and ethical (Hermann and Datta 2006; Sundaram and Yermack 2007). Huang et al. (2012) show that the age of CEOs is positively related to financial reporting quality, but the age of CFOs is not. Baolet et al. (2018) find older male and female CFOs and CEOs are associated with less earning management because older executives are more concerned about their financial security at retirement and that older executives have established career security and social and professional circles such that risky or unethical action is detrimental, and thus is avoided. However, research also documents that even given the obstacles that females face in their careers (Powell 1999), females who reach the CEO position are younger by two years than their male counterparts and this is explained by working hard and deserving to be in this position (Withisuphakorn and Jiraporn 2017). Interestingly, Demers and Wang (2010) show that older CEOs manage earnings upward to maximize their retirements while Serwinek (1992) shows that older people are generally more conservative in their ethical orientation as age increases. As such, we argue that younger female CFOs who reach the CFO position as a result of working hard are more likely to engage in REM.

2.2.4 Tenure pressure

Tenure measures the length of time an executive spent at the firm and is used as a proxy for the executive's power (Duong and Evans 2016). It is expected that powerful CFOs will have a greater ability to engage in REM (Srinidhi et al. 2011; Duong, and Evans 2016). Additionally, Powell (1999) indicates that the obstacles females encounter can become more prominent as they progress further in their careers, implying that as tenure increases, it becomes harder for female CFOs to progress farther. Therefore, we argue that pressure from tenure could moderate the association between female CFOs and REM. Based on previous discussions; we predict that females will be more likely to manipulate REM when they are exposed to any of the four pressure factors.

H2 Ceteris Paribus, female CFOs facing pressure are positively associated with REM.

2.3 Managerial ability

The resource-based theory dictates that the managerial ability to effectively use firm resources is itself a valuable resource with the potential to generate a competitive advantage (Holcomb et al. 2009). In effect, managers accumulate knowledge through education and experience and these managers' individual characteristics influence their decisions (Ge et al. 2011; Bamber et al. 2010; Gull et al. 2018). Prior studies provide evidence that high-able managers are more effective at implementing financing and investing strategies than low able managers (Bertrand and Schoar 2003; Demerjian et al. 2013). Demerjian et al. (2013) argue that high-able CFOs make superior estimates and judgments, and these are reflected in higher-quality earnings. In particular, Demerjian et al. (2013) show that high-able managers report fewer subsequent restatements, fewer errors in estimates of bad debt expense, and higher quality accrual estimates. Demerjian et al. (2013) find that high-able

managers are associated with more income smoothing than low-able managers to the benefit of all stakeholders. Related, Aier et al. (2005) document that CFOs with more accounting expertise have fewer restatements. Francis et al. (2008) show that CEO reputation, as measured by the number of media citations, is negatively associated with earnings quality as measured by accruals quality. Francis et al.'s (2008) results suggest that reputed CEOs improve their personal career and make decisions that may lower earnings quality. Choi et al. (2015) show that CEOs with superior operating ability improve operational decisions such as revenue-increasing, cost-reducing, and capital and labor investing strategies. Bamber et al. (2010) show that managers with accounting and finance backgrounds are associated with conservative earnings releases. Ge et al. (2011) also suggest that CFO-specific factors are a significant determinant of accounting choices. More recently, using Taiwanese data, Li et al. (2016) show that top management teams with core business expertise are negatively associated with real activities earnings management while top management teams with public accounting certification are positively associated with real activities earnings management. Their results hold using accrual earnings management and other robustness specifications.

In this study, we argue that able female CFOs have knowledge and experience that could be used to moderate the relationship between female CFOs and REM, but the direction of this association is unclear for many reasons. First, manipulating REM requires managerial expertise in the firm and industry. Second, female CFOs face pressures even after breaking the glass ceiling. It is expected that female CFOs would be more inclined to use REM as a tool to improve the firm's performance in the presence of a high level of managerial ability or knowledge about the industry and firm. In fact, managerial ability gives leverage to female CFOs to utilize channels that enhance the firm's earnings without violating the law. We, therefore, argue that able female CFOs can be associated with REM because manipulating REM demands knowledge about the industry. Hypothesis 3 is stated in the alternative form:

H3 Ceteris Paribus, managerial ability moderates the association between female CFOs and *REM*.

2.4 Gender and institutional investors holdings

This study also examines the effect of institutional investors on the association between female CFOs and REM. Pound (1988) presents three hypotheses on the relationship between institutional ownership and earnings management. First, the efficient monitoring hypothesis, which postulates that institutional investors have more expertise and knowledge (e.g., tools to effectively monitor) and therefore can monitor management at a lower cost than other investors. This is consistent with the vast research on the negative relationship between institutional ownership and earnings management (e.g., Rajgopal et al. 1999; Chung et al. 2002; Bhojraj and Sengupta 2003). For example, Rajgopal et al. (1999) show that institutional owners are associated with decreased earnings manipulation. Chung et al. (2002) examine the effect of institutional investors on earnings management using discretionary accruals. Their results show that when managers have incentives to increase (decrease) reported earnings, they do so by using income-increasing (income-decreasing) discretionary accruals. However, Chung et al. (2002) find that when institutional holdings are large, managers are deterred from using discretionary accruals to manage earnings.

Thus, they conclude that institutional investors contribute to improvement in corporate governance. The second hypothesis is the strategic alliance hypothesis, which postulates that the interest of institutional ownership is strategically aligned with that of the management at the expense of the other investors, and thus a positive relationship is expected between institutional holdings and earnings management. Third, the conflict-of-interest hypothesis postulates that conflicts arise between institutional investors and other investors, leading them to take management positions that possibly could lead to earnings management.

While the role of governance is integral to the agency theory (Jensen and Meckling 1976), the cognitive evaluation theory proposed by Boal and Cummings (1981) suggests that imposing external governance can be detrimental and provide the incentive to behave in a manner unintended by governance. Philips and Lord (1981) indicate that one's behavior is motivated by one's need to feel self-determined in their decisions. Thus, imposing external monitoring mechanisms "crowd out" one's motivation to behave in compliance (Deci and Ryan 2000). To this effect, Shi et al. (2017) find that external governance mechanisms increase the probability of fraudulent financial reporting.

In this study, we argue that managers use REM because it is less costly than accrual earnings management and is unlikely to be detected due to reduced scrutiny (Zalatta et al. 2018a). Moreover, we argue that in the presence of external pressure such as institutional investors, female CFOs are associated with more or less REM. We, therefore, propose hypothesis 4 as shown below:

H4 Ceteris Paribus, Institutional Investors Moderate the Association between Female CFOs and REM.

3 Research method

3.1 Sample selection

The process of sample selection began with 3,594 (179,083) firms (firm-year observations) from the ExecuComp database from 1996 to 2018.[11] We obtained the initial sample of female only CFOs by manually flagging a female as a CFO if her title was Treasurer, Chief Accounting Officer, Controller, Chief Finance Officer, Chief Administrative and Finance Officer, Corporate Controller, Principal Financial Officer, or Principal Accounting Officer.[12] We exclude 1,103 firms (152,640 firm-year observations) with missing CFO data, and 24 firms (948 firm-year observations) with interim or retiring CEOs/CFOs following Balsam et al. (2012).[13] We also excluded 1,322 firms (17,207) (firm-year observations) from the financial services and utilities industries and/or those missing any control

[11] The ExecuComp database covers S&P 1000 firms. Data is available starting from the year 1992. However, data pertaining to CFOs appears incomplete from 1992 to 1996. The study starts the sample by 1996 to allow us to calculate new CFOs/CEOs but the final sample starts from 1996 to 2018. The study was stopped in 2018 because managerial ability data is unavailable post 2018.

[12] The study focuses on the behavior of female CFOs, only one observation per firm-year is kept, provided that this observation had complete information about the characteristics of CFOs as well as CEOs that was necessary for the analysis, including age, tenure, and compensation data.

[13] Prior research provides empirical evidence that executives who are about to terminate their tenure reduce R&D expenditures to meet earnings benchmarks (Baber, Fairfield, and Haggard 1991; Bushee 1998). Therefore, these executives are deleted from the sample to avoid confounding the results.

or moderating variables from Compustat, I/B/E/S, Managerial Ability data, and Institutional Investor data.[14] The final sample is composed of 1,145 firms (8,288 firm-year observations), of which 911 are female CFOs and 7,377 are male CEOs. The sample selection process is presented in Table 1.

3.2 Real Earnings management (REM)

To measure REM, we first estimate the three *individual* measures of REM: (1) the abnormal level of cash flow from operations (ACFO); (2) the abnormal level of production costs (APROD); and (3) the abnormal level of discretionary expenses (ADISC), as in Roychowdhury (2006). The abnormal levels of individual REM measures (ACFO, APROD, and ADISC) are the residuals from regression models (1), (2) and (5), respectively, as explained below. In the statistical analysis, the study uses three *aggregate* measures of REM, namely REM1, REM2 and REM3 for the main tests and the individual measures of REM, namely, ACFO, APROD and ADISC in additional analyses. Following Cohen and Zarowin (2010), we calculate REM1 and REM2, and we develop REM3 as an additional REM measure. According to Cohen and Zarowin (2010), REM1 is the sum of (ADISC*− 1) and APROD, and REM2 is the sum of (ACFO*− 1) and (ADISC*−1). Roychowdhury (2006) and Cohen and Zarowin (2010) argue that combining the three individual measures of REM into one measure is not reliable because APROD and ACFO share similar characteristics. To create a conclusive measure of REM from the three individual measures and avoid the overlap between APROD and ACFO, we calculated REM3 by taking the sum of "the average of APROD and (ACFO*−1)" and (ADISC*−1). The higher the absolute value of any of the three REM aggregate measures (REM1, REM2, or REM3), the more likely there is an evidence of REM.

We follow the below steps to calculate REM measures. The normal level of discretionary expenses is estimated, as in Roychowdhury's (2006), by first calculating the actual discretionary expenses, which are the sum of Research and Development expenses, General Selling and Administrative Expenses.[15] The discretionary expenses scaled by lagged total assets are then regressed on the reciprocal lagged total assets and prior period lagged sales to estimate the normal level of discretionary expenses as shown in Eq. 1.

$$\mathrm{DE}_{\mathrm{it}}/\mathrm{A}_{\mathrm{it}-1} = \alpha_0 + \alpha_1\left(1/\mathrm{A}_{\mathrm{it}-1}\right) + \beta_1\left(\mathrm{S}_{\mathrm{it}-1}/\mathrm{A}_{\mathrm{it}-1}\right) + \varepsilon_{\mathrm{it}} \quad (1)$$

where $\mathrm{DE}_{\mathrm{it}}$ is the discretionary expense, $\mathrm{A}_{\mathrm{it}-1}$ is the lagged total assets at the end of period $_{\mathrm{it}-1}$, and $\mathrm{S}_{\mathrm{it}-1}$ is the prior period sales. The residual from Eq. 1 is the abnormal discretionary expenses (ADISC). Negative ADISC is an indication of REM manipulation. To calculate ACFO, the normal level of cash flow from operations is estimated by using the cash flow from operations scaled by lagged total assets as the dependent variable and the reciprocal of lagged total assets, current sales, and change in sales as the independent variables, as shown in Eq. (2).

[14] Regulated industries are firms with SIC codes between 4900 and 4999; financial services firms are firms with SIC codes between 6000 and 6999.

[15] The missing values for Advertising and R&D expenses are replaced with zeros if General Selling and Administrative Expenses have values greater than zero in the Compustat database, following Cohen and Zarowin (2010).

Table 1 Sample selection

		Unique obs	# Obs
Panel A: sample selection			
ExecuComp data with CFOs data (1995–2018)		3,594	179,083
(−) Firms with missing CFOs data		(1,103)	(152,640)
		2,491	26,443
(−) Firms with interim/retiring CFOs		(24)	(948)
		2,467	25,495
(−) Firms with missing control or moderating variables		(1,322)	(17,207)
= Final Sample		**1,145**	**8,288**
Industry	SIC codes	# Obs	% Obs
Panel B: sample distribution by industry type			
Mineral	10,14	445	5.4%
Construction	15–17	36	0.4%
Manufacturing	20,22,24–30,32–39	4,848	58.5%
Transportation, communication, and utilities	40,42,45,47–49	312	3.8%
Wholesale trade	50,51	400	4.8%
Retail trade	52–59	893	10.8%
Service industries	70,73,78,79,80,82,89	1,337	16.1%
Others	99	17	0.2%
		8,288	**100%**

This table describes the sample selection criteria, distribution by industry and frequency by year. The final sample of 8,288 firm-year observations is composed of 1,145 firms (8,288 firm-year observations) drawn from non-financial services and unregulated or utilities industries. The final sample represents a merged sample from I/B/E/S, ISS (RiskMetrics), Execucomp, Compustat, BoardEx, and Demerjian et al. (2013) managerial ability score. Panel A contains the description of the sample selection process. Panel B provides details about the industry categorization in the final sample

$$\mathrm{CFO}_{it}/\,\mathrm{A}_{t-1} = \alpha_0 + \alpha_1 1/\mathrm{A}_{it-1} + \beta_1 \mathrm{S}_{it}/\mathrm{A}_{it-1} + \beta_2 \Delta S_t/\mathrm{A}_{it-1} + \varepsilon_{it} \tag{2}$$

where CFO_{it} is the cash flow from operations, A_{it-1} is the lagged total assets at the end of period $_{it-1}$, S_{it} is the sales during the current period, and $\Delta\,\mathrm{St}_{it}$ is the change in sales calculated as $(\mathrm{s}_{it-}\mathrm{s}_{it-1})$. The residual value from Eq. 2 is the ACFO. Negative ACFO is an indication of REM manipulation.

To calculate APROD, the actual production costs are estimated, which is the sum of the cost of goods sold (Eq. 3), the change in inventory (Eq. 4), and the normal level of production costs are then estimated using Eq. 5. The difference between the actual and estimated production costs is the APROD. The components of production costs are estimated in Eqs. 3 and 4, as follows:

$$\mathrm{COGS}_{it}/\,\mathrm{A}_{it-1} = \alpha_0 + \alpha_1\left(1/\mathrm{A}_{it-1}\right) + \beta\left(\mathrm{S}_{it}/\mathrm{A}_{it-1}\right) + \varepsilon_{it} \tag{3}$$

where COGS_{it} is the cost of goods sold, A_{it-1} is the lagged total assets, S_{it} is the current period's sales. The change in inventory is then estimated, as in Eq. 4:

$$\Delta INVT_{it}/\ A_{it-1} = \alpha_0 + \alpha_1 1/A_{it-1} + \beta_1\ \Delta S_{it}/A_{it-1} + \beta_2 S_{it-1}/A_{it-1} + \varepsilon_{it} \quad (4)$$

where $\Delta INVT_{it}$ is the change in inventory measured as ($INVT_{it} - INVT_{it-1}$), A_{it-1} is the lagged total assets at the end of period $_{it-1}$, ΔSt_{it} is the change in sales calculated as ($s_{it} - s_{it-1}$), and ΔSt_{it-1} is change in prior period's sales calculated as follows ($s_{it-1} - s_{it-2}$). Equations 3 and 4 are then combined to estimate the normal level of the production costs as shown in Eq. 5:

$$PC_{it}/A_{t-1} = \alpha_0 + \alpha_1 1/A_{it-1} + \beta_1 S_{it}/A_{it-1} + \beta_2 \Delta S_{it}/A_{it-1} + \beta_3 \Delta S_{it-1} + \varepsilon_{it} \quad (5)$$

where PC_{it} is the production cost, A_{it-1} is the lagged total assets at the end of period $_{it-1}$, S_{it} is the current period's sales, ΔSt_{it} is the change in sales calculated as ($s_{it} - s_{it-1}$), andΔSt_{it-1} is the change in prior period's sales. The residual from Eq. 5 is APROD. Positive APROD is an indication of REM.

3.3 Empirical models

To test the study's hypotheses, the natural logs of the aggregate REM measures (REM1, REM2 and REM3) are used as the dependent variables and gender of CFOs (CFO_FEM) as the independent variable of interest, in addition to a set of control variables. Equation 6 is shown below to represent the model we used to test H1:

$$REM_{it} = \beta_0 + \beta_1 CFO\_FEM_{it} + \delta_j Control\ Variables_j + \varepsilon_{it} \quad (6)$$

where REM is the natural logarithm of REM *aggregate* measures "$REM1_{it}$, $REM2_{it}$, and $REM3_{it}$". CFO_FEM_{it} is an indicator variable that equals one for female CFOs, and zero otherwise. Also included is a list of control variables[16] as suggested by prior literature (e.g., Alkebsee et al. 2022; Barua et al. 2010; Peni and Vähämaa 2010; Cohen and Zarowin 2010; Brown and Caylor 2005) such as the characteristics of the CFOs and CEOs (e.g., age, new, tenure, performance-based compensation, salary, bonus), firm-specific characteristics (e.g., auditor, litigious industries,[17] firm complexity, growth, busy-year, cash flow, ROA, financial health), information asymmetry (e.g., number of analysts following), and earnings management incentives (e.g., avoid reporting losses, meeting earnings benchmarks, and just meet/beat analysts' forecasts). Additionally, we control for CEOs' gender and characteristics as additional control variables to rule out the possibility that the results were influenced by CEOs' REM rather than by CFOs'. Following, Barua et al. (2010) and Peni and Vähämaa (2010), we control for various firm-specific characteristics such as: Big4, firm growth as measured by MTB, ROA, firms with busy year-end, litigious industries, firm complexity as measured by the presence of foreign transactions and extraordinary items, and cash flow. Cohen and Zarowin (2010) argue that there is substantial evidence that REM is likely linked to meeting certain earnings benchmarks. Therefore, we control for three incentives for REM: INC_LOSS, INC_BENCH and INC_BEAT[18] following Degeorge et al. (1999), Brown and Caylor (2005), and Graham et al. (2005). We also

[16] All continuous variables are winsorized at the top and bottom 1% of their respective distributions.

[17] High risk-litigation industries are firms with SIC codes between 2836-2833; 8734-8731; 7379-7371; 3577-3570; and 3600-3674, following Cohen and Zarowin (2010).

[18] Variables' definitions are in Appendix A.

control for the industry and year-fixed effects. Appendix A includes the list and definitions of all variables.

To test H2, which examines the effect of pressures from corporate culture on the association between female CFOs and REM, we first calculate an index of the sum of the four pressures examined in this study (e.g., pressure from less diverse executives, wage, age, and tenure). We then divided the sample into firms with no pressures and firms with any form of pressure as measured by the index that ranged from 1 to 4. We then run regression models using Eq. 6 after splitting the sample into no pressure or pressure samples.

To test H3 that managerial ability of female CFOs is moderating the association between female CFOs and REM, we ran the model in Eq. 6 after splitting the sample into high versus low managerial ability. The study uses the median managerial ability as a cut-off. Firms with managerial ability above the median were classified as high managerial ability and firms with managerial ability below the sample median were classified as firms with low managerial ability.

To test H4 that institutional investors moderate the association between female CFOs and REM, we ran the model in Eq. 6 after splitting the sample into high versus low institutional investors sample of firms based on the sample median.

4 Empirical results

Descriptive statistics for the overall sample are reported in Panel A of Table 2. The mean of REM1, REM2 and REM3 are 1.588, 1.584, and 1.588, respectively. The mean CFO age is almost 51 with a 6.209 standard deviation. About 14.9% of the sample are firms with new CFOs. About 89.6% of the sample audited by Big 4, 19.20% reported extraordinary items, and 22.5% were in litigious industries. The descriptive statistics suggest that 35.5%, 50%, 45.6%, and 47.3% of the firms are experiencing pressures from diversity, wages, age, and tenure respectively. The average pressure index, which ranges from 0 to 4, is 1.782. On average, the sample firms are profitable (ROA's mean of 0.07) with a low risk of bankruptcy (Z score mean of − 1.862) and market-to-book ratio of 3.412. The average managerial ability score is 0.532 with a standard deviation of 0.449 and institutional holding's mean is 79.4% with a standard deviation of 21.1%.

Panel B of Table 2 presents the means and medians of some key variables among female versus male CFOs subsamples of firms and the statistical differences, if any, among these samples. As shown, the preliminary statistics suggest that all REM variables, means and medians, are higher for female CFOs sample than male CFOs sample but the differences are not statistically significant except for the APROD variable. Additionally, female CFOs are significantly younger, and paid less performance-based compensation than male CFOs. Female CFOs also are affiliated with firms that are different from male CFOs' firms. For example, on average, firms with female CFOs are audited more by Big4, more subjected to litigation, engage more in foreign transactions, but have fewer complex operations, exhibit better growth as measured by MTB, are less followed by analysts, display higher managerial ability, and subject female CFOs to more workplace pressures than firms with male CFOs.

Using a 0.8 cutoff, the Pearson correlation matrix shown in Table 3 suggest the absence of multicollinearity among the independent variable of interest, earnings management, and CFOs' characteristics. It shows positive, although non-significant, correlations among aggregate measures of REM and female CFOs. Aggregate REM measures are highly correlated, but they are

Table 2 Descriptive statistics

	Full sample $n=8,288$			
	Mean	Std dev	Min	Max
Panel (A) descriptive statistics for the full sample				
REM1	1.588	0.185	−0.693	2.052
REM2	1.584	0.124	0.496	1.971
REM3	1.588	0.140	0.193	1.996
ACFO	1.591	0.041	1.389	1.928
ADISC	1.603	0.126	0.149	1.971
APROD	1.598	0.049	1.368	1.796
ABSDA	1.629	0.019	1.609	1.763
CFO_AGE	51.229	6.209	37.000	66.000
CFO_NEW	0.149	0.356	0.000	1.000
CFO_PCOM	0.721	0.993	0.000	5.948
CFO_TEN	4.570	3.219	1.000	15.000
CFO_SALARY	5.995	0.436	4.447	6.908
CFO_BONUS	1.056	2.081	0.000	6.957
BIG4	0.896	0.305	0.000	1.000
LIT	0.225	0.417	0.000	1.000
FOR	0.778	0.416	0.000	1.000
EXTRA	0.192	0.394	0.000	1.000
MTB	3.412	3.812	−5.279	25.693
BUSY	0.638	0.481	0.000	1.000
CFFO	5.455	1.712	1.726	9.846
ROA	0.070	0.080	− 0.204	0.327
Z	− 1.862	1.332	− 4.587	1.842
REC	12.676	8.715	1.000	39.000
ABLE	0.532	0.499	0.000	1.000
INST_INVST	0.794	0.211	0.001	1.188
PRE_DIV	0.354	0.478	0.000	1.000
PRE_WAGE	0.500	0.500	0.000	1.000
PRE_AGE	0.456	0.498	0.000	1.000
PRE_TEN	0.473	0.499	0.000	1.000
PRESSURE	1.782	1.121	0.000	4.000

	Female CFOs $n=911$		Male CFOs $n=7,377$		Differences	
	Mean	Median	Mean	Median	Mean	Median
Panel (B) Descriptive statistics for female versus male CFOs samples						
REM1	1.597	1.601	1.586	1.599	0.010	0.002
REM2	1.590	1.598	1.584	1.597	0.007	0.001
REM3	1.595	1.599	1.587	1.598	0.008	0.001
ACFO	1.591	1.595	1.591	1.595	0.000	0.001
ADISC	1.609	1.611	1.602	1.610	0.006	0.001
APROD	1.600	1.597	1.597	1.597	0.003*	0.000
ABSDA	1.629	1.622	1.629	1.623	0.001	− 0.001
CFO_AGE	50.290	50.000	51.345	51.000	− 1.055***	− 1.000***

Table 2 (continued)

	Female CFOs $n=911$		Male CFOs $n=7,377$		Differences	
	Mean	Median	Mean	Median	Mean	Median
CFO_NEW	0.144	0.000	0.149	0.000	− 0.006	0.000
CFO_PCOM	0.714	0.400	0.722	0.463	− 0.008	− 0.063**
CFO_TEN	4.485	4.000	4.581	4.000	− 0.096	0.000
CFO_SALARY	6.013	6.021	5.993	6.004	0.021	0.017
CFO_BONUS	1.138	0.000	1.046	0.000	0.092	0.000
BIG4	0.923	1.000	0.893	1.000	0.030***	0.000***
LIT	0.258	0.000	0.220	0.000	0.038**	0.000**
FOR	0.808	1.000	0.774	1.000	0.034**	0.000**
EXTRA	0.164	0.000	0.196	0.000	− 0.032**	0.000**
MTB	3.196	2.430	3.439	2.449	− 0.242*	− 0.019
BUSY	0.603	1.000	0.642	1.000	− 0.039**	0.000**
CFFO	5.459	5.280	5.454	5.294	0.005	− 0.014
ROA	0.075	0.073	0.070	0.066	0.005*	0.007***
Z	− 1.940	− 1.951	− 1.852	− 1.839	− 0.089*	− 0.111**
REC	12.406	10.000	12.709	11.000	− 0.303	− 1.000
ABLE	0.582	1.000	0.526	1.000	0.056***	0.000***
INST_INVST	0.789	0.835	0.795	0.839	− 0.005	− 0.004
PRE_DIV	0.856	1.000	0.291	0.000	0.565***	1.000***
PRE_WAGE	0.479	0.000	0.503	1.000	− 0.024	− 1.000
PRE_AGE	0.517	1.000	0.448	0.000	0.069***	1.000***
PRE_TEN	0.470	0.000	0.473	0.000	− 0.003	0.000
PRESSURE	2.322	2.000	1.716	2.000	0.606***	0.000***

This table displays the descriptive statistics of the final sample of 8,288 firm− year observations in panel A and female versus male CFOs samples in panel B. Definitions of variables are in Appendix A

used interchangeably in separate models to avoid multicollinearity. The Pearson correlation matrix shows positive and significant correlations at the 1% between CFO_FEM and managerial ability, pressure from diversity, pressure from age, and pressure index. Interestingly, REM measures are negatively correlated at 1% with the number of analyst recommendations, suggesting an oversight from financial analysts on firms that use REM as a form of manipulation.

Table 4 summarizes the results on the association between female CFOs and REM.[19] The results suggest that female CFOs (CFO_FEM) exhibit evidence of REM. As shown in Models 1, 2 and 3, there are significant positive associations at a 5% significance level between CFO_FEM and REM1, REM2, & REM3 (β_1 in Model (1)=0.011, β_1 in Model

[19] Although we control for the industry- and year-fixed effects in all models, we further control for the firm- and year-fixed effects, and industry-year fixed effect in additional statistical analyses and the results are almost identical to our main results. For example, for the models that include the industry-year fixed effect as a control variable, we find significant positive associations at 5% level between CFO_FEM and REM1, REM2, & REM3 (β_1 in Model (1)=0.011, β_1 in Model 2=0.008, and β_1 in Model 3=0.010, one-tailed test).

Table 3 Pearson correlation matrix ($n = 8{,}288$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
CFO_FEM	1	0.017	0.017	0.017	0.000	0.016	0.019[c]	0.009	−0.011	0.035[a]	−0.008	0.370[a]	−0.015	0.043[a]	−0.002	0.169[a]
REM1		1	0.862[a]	0.968[a]	−0.313[a]	0.947[a]	0.510[a]	−0.060[a]	−0.053[a]	−0.126[a]	−0.033[a]	0.012	−0.035[a]	−0.018	0.013	−0.013
REM2			1	0.948[a]	0.006	0.909[a]	0.345[a]	−0.163[a]	−0.050[a]	−0.114[a]	−0.036[a]	0.009	−0.037[a]	−0.001	0.024[b]	−0.003
REM3				1	−0.157[a]	0.954[a]	0.50[a]	−0.101[a]	−0.058[a]	−0.131[a]	−0.036[a]	0.012	−0.040[a]	−0.011	0.017	−0.010
ACFO					1	−0.348[a]	0.146[a]	−0.318[a]	−0.045[a]	−0.100[a]	−0.005	−0.012	−0.017	0.009	0.009	−0.005
ADISC						1	0.292[a]	−0.048[a]	−0.033[a]	−0.081[a]	−0.034[a]	0.014	−0.031[a]	−0.003	0.017	−0.002
APROD							1	−0.080[a]	−0.119[a]	−0.231[a]	−0.025[b]	0.013	−0.041[a]	−0.022[b]	−0.013	−0.028[a]
ABSDA								1	0.050[a]	0.117[a]	0.007	−0.017	0.073[a]	0.006	0.004	0.030[a]
REC									1	0.231[a]	0.074[a]	0.000	−0.401[a]	−0.013	−0.029[a]	−0.198[a]
ABLE										1	0.007	0.025[b]	−0.097[a]	0.015	0.037 [a]	−0.009
INST_INVST											1	0.011	−0.002	−0.017	−0.049[a]	−0.025[b]
PRE_DIV												1	−0.039[a]	0.021[c]	0.014	0.425[a]
PRE_WAGE													1	0.166[a]	0.154[a]	0.572[a]
PRE_AGE														1	0.247[a]	0.637[a]
PRE_TEN															1	0.630[a]
PRESSURE																1

This table presents the Pearson correlations among some selected variables. Variables listed in the table are described in Appendix A

[a, b, c] represents significance level 10%, 5% and 1% respectively

Table 4 The association between female CFOs and real earnings management

Parameter		Model (1) dv = REM1		Model (2) dv = REM2		Model (3) dv = REM3	
		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Intercept	?	1.559	38.2***	1.605	61.86***	1.579	52.72***
CFO_FEM	+	0.011	1.92**	0.008	2.10**	0.009	1.99**
CFO_AGE	−	0.001	1.45	0.000	0.38	0.000	0.99
CFO_NEW	±	−0.002	−0.4	0.001	0.29	−0.001	−0.30
CFO_PCOM	+	−0.007	−2.07**	−0.004	−1.86*	−0.005	−2.12**
CFO_TEN	±	−0.001	−1.2	0.000	−0.15	0.000	−0.79
CFO_SALARY	+	−0.005	−0.76	−0.003	−0.72	−0.003	−0.49
CFO_BONUS	+	0.002	1.14	0.001	1.13	0.001	0.95
CEO_FEM	±	0.007	0.88	0.010	1.88*	0.008	1.29
CEO_AGE	±	0.001	2.02**	0.000	0.44	0.000	1.50
CEO_NEW	±	0.011	1.29	0.009	1.77*	0.009	1.40
CEO_PCOM	+	0.001	0.97	0.000	0.24	0.001	0.64
CEO_TEN	±	0.001	1.18	0.001	1.49	0.001	1.43
CEO_SALARY	+	−0.001	−0.25	0.001	0.45	0.000	0.05
CEO_BONUS	+	−0.005	−2.94**	−0.003	−3.12***	−0.003	−2.88***
BIG4	−	−0.002	−0.29	−0.004	−0.81	−0.004	−0.71
LIT	+	−0.033	−5.07**	−0.012	−3.11***	−0.021	−4.40***
FOR	+	−0.003	−0.73	−0.002	−0.78	−0.003	−0.79
EXTRA	+	0.006	1.20	0.009	2.76***	0.008	2.16**
MTB	−	−0.002	−2.82**	−0.002	−4.31***	−0.002	−3.63***
BUSY	+	−0.003	−0.76	0.000	0.15	−0.001	−0.45
CFFO	−	0.015	6.24**	0.007	4.57***	0.010	5.75***
ROA	−	−0.111	−2.61**	−0.042	−1.51	−0.072	−2.27**
Z	+	0.006	2.34**	0.006	4.33***	0.007	3.76***
REC	−	−0.003	−8.42***	−0.001	−6.25***	−0.002	−8.28***
ABSDA	−	−0.031	−0.89	−0.154	−5.49***	−0.078	−2.70**
INCENT_LOSS	+	−0.049	−1.57	−0.027	−1.43	−0.033	−1.60
INCENT_BENCH	+	0.006	0.83	0.006	1.13	0.007	1.23
INCENT_JUSTBEAT	+	0.014	3.12***	0.003	0.97	0.008	2.20**
Industry effect		Included	Included	Included			
Firm effect		Included	Included	Included			
p-value		< 000	< 000	< 000			
R^2		4.1%	5.40%	4.70%			

This table summarizes the results of the OLS Regression of Real Earnings Management (REM1, REM2 & REM3) on Female CFOs (CFO_FEM), firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, year-fixed effect, and industry-fixed effect as control variables. Model (1) presents the results on the regression of REM1 on CFO_FEM, Model (2) summarizes the regression of REM2 on CFO_FEM, and Model (3) displays the association between REM3 and FEM_CFO. The variable of interest in all models is CFO_FEM

*, **, *** represents significance level 10%, 5% and 1% respectively. Definitions of variables are in Appendix A

2 = 0.008, and β_1 in Model 3 = 0.009, one-tailed test).[20] The results of the measures of REM's models provide evidence consistent with an association between female CFOs and REM. The results in Table 4 show a significant negative association between CFOs' performance-based compensation (CFO_PCOM), CEO_BONUS, litigation (LIT), MTB, ROA, analyst recommendations (REC), absolute value of discretionary accruals (ABSDA), and REM measures. The results also show a significant positive association between cash flow from operation (CFFO), firms with incentives to just beat analysts, firm's financial health (Z) and REM measures.

The results in this section provide consistent and statistically significant evidence to support H1 that female CFOs are positively associated with REM. This latter result is consistent with prior research (e.g., Geiger, and North 2006), which suggests that CFOs, in general, have access to accounting numbers and are motivated to manipulate earnings. It is, however, complementing prior research that documents a significant negative association between female CFOs and earnings management, specifically discretionary accruals (Barua et al. 2010) or a significant positive association between female CFOs and accrual quality (Peni, and Vähämaa 2010). This is possibly due to the use of alternative, not illegal, measures of earnings management, which are fundamentally different from manipulating earnings using discretionary accruals (Cohen, and Zarowin 2010). The results in this section complement,[21] not contradict, prior literature and suggest that while male CFOs manipulate accruals, female CFOs manipulate REM. This evidence is also in line with the SST, which predicts that gender differences diminish considering context such as work environment and are not based on heredity and early childhood, contrary to the GST. We repeated the analyses using individual REM instead of aggregate REM variables and the results are, overall, consistent.

To create the pressure index, we rely on prior literature, which suggests that gender diversity improves the firm's informational environment (Gul et al. 2011), is associated with better corporate governance (Hambrick et al. 2008; Hillman et al. 2008) and affects earnings quality (Krishnan and Parsons 2008; Baolet et al. 2018).[22] Interestingly, Demers and Wang (2010) show that older CEOs manage earnings upward to maximize their retirements while Serwinek (1992) shows that older people are generally more conservative in their ethical orientation as age increases. Prior research also suggests that executive compensation packages may encourage risk-taking behavior or are intended to support the notion that a female executive is deserving of a compensation package (Rajgopal and Shevlin 2002; Zhang et al. 2008; Khan and Vietito 2013). Additionally, Powell (1999) indicates that the obstacles females encounter can become more prominent as they progress farther in their careers, implying that as tenure period prolongs it becomes harder for

[20] The one-tailed test is common in earnings management literature (e.g., Peasnell, Pope, and Young 2000) and empirical accounting research, in general (e.g., Cho and Patten 2007). We utilize the one-tailed test based on our predetermined positive and direct association between female CFOs and REM. The one-tailed test gives us more power in detecting the directional hypothesis, (e.g., the expected positive association between female CFOs and REM).

[21] We run model 6 using the natural log of the absolute value of discretionary accruals (ABSDA) instead of REM and document a statistically significant negative association between ABSDA and female CFOs.

[22] Krishnan and Parsons (2008) investigate whether gender diversity in top management affects earnings quality. They found that firms with more gender diversity are more profitable, have higher stock returns after the initial public offerings, report bad news quicker, have lower earnings smoothing, have a lower probability of loss avoidance, and have greater sustainability of earnings than those with low gender diversity.

female CFOs to progress farther. In this study, we create an index to proxy for four types of pressures females are subjected to in public firms. We compute PRE_TEN as one if CFO's tenure is lower than the sample median and as zero otherwise. Lack of gender diversity is computed as an indicator variable that equals to one if the percentage of female CFOs among total executives is below the sample median, zero otherwise (PRE_DIV). Pressure from pay (PRE_WAGE) is calculated as an indicator variable that equals one if the ratio of CFO's salary and bonus to total compensation is less than the sample median and zero otherwise. PRE_AGE is computed as an indicator variable that equals one if the CFO's age is below the sample median and zero otherwise. The pressure index is calculated as the sum of the four indicator variables and ranges from 0 (absence of pressure) to 4 (exposure to all four types of pressures). We further split the sample into no pressure where pressure = 0 versus a pressure sample where pressure equals any value between 1 and 4. We then run Model 6 for these two samples.

Table 5 reports the results of the regressions of the three aggregate measures (RM1, RM2, and RM3) of REM on female CFOs working under pressure from lack of diversity, wage, age, and/or tenure (Panel A) versus the regression of REM on female CFOs working under no pressure (Panel B).[23] As expected, the significant positive association between REM and female CFOs is only observable among the sample of firms with pressure (Panel A) and this association reverses for the sample of firms with no pressure (Panel B). As shown in Panel A, the associations between REM and CFO_FEM in Models, 1, 2, and 3 are positive and significant at 10%, 5%, and 5% significance levels respectively (β_1 in Model 1 = 0.012, β_1 in Model 2 = 0.009, β_1 in Model 3 = 0.009). This result indicates that pressure is a cause of the presence of REM among female CFOs. The results in Panel B for the sample of firms with no pressure suggest that the associations between REM and CFO_FEM in Models, 1, 2, and 3 are negative and significant at 10%, 5%, and 5% significance levels respectively (β_1 in Model 1 = − 0.022, β_1 in Model 2 = − 0.040, β_1 in Model 3 = − 0.031). The results on the association between the control variables and REM remain the same although weaker for the no pressure sample. This result in this section supports H2. We repeated the analyses using individual REM instead of aggregate REM variables and the results are, overall, the same.

To gain insights into which pressure factors contribute to the positive association between female CFOs and REM, we further divide the sample based on individual pressure factors instead of using the aggregate pressure index and summarize the results in Table 6. Panels A, C, E, and G display the association between female CFOs and REM among firms where female CFOs are under pressure from age, wage, diversity, or tenure, respectively. Panels B, D, F, and H display the association between female CFOs and REM among firms where female CFOs are not subjected to pressure from age, wage, diversity, or tenure, respectively. We identified the firm-year observation as subjected to pressure from age, wage, or tenure if these respective values are below the sample median, otherwise, we

[23] Although we control for the industry- and year-fixed effects in all models, we further control for the firm- and year-fixed effects, and industry-year fixed effect in additional statistical analyses and the results remain constant. For example, we repeated the analysis in Panels A and B in Table 5 after controlling for the firm- and year-fixed effects in models. For the models with high pressure on female CFOs, we find significant positive associations at a 5% level between CFO_FEM and REM1, REM2, & REM3 (β_1 in Model (1) = 0.012, β_1 in Model 2 = 0.009, and β_1 in Model 3 = 0.09, one-tailed test). For the models with no pressure on female CFOs, we find significant negative associations at 10%, 5%, and 1% significance level between CFO_FEM and REM1, REM2, & REM3, respectively (β_1 in Model (1) = − 0.022, β_1 in Model 2 = − 0.040, and β_1 in Model 3 = − 0.031, one-tailed test).

Table 5 The moderating effect of pressure index on the association between female CFOs and real earnings management

		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Panel A: The association between female CFOs working under pressure (using the pressure index) and REM (n = 7,122)							
Intercept	?	1.554	34.68***	1.596	57.24***	1.571	48.32***
CFO_FEM	+	0.012	1.92*	0.009	2.22**	0.009	2.04**
CFO_AGE	−	0.001	1.86*	0.000	0.66	0.000	1.32
CFO_NEW	±	−0.004	−0.66	0.000	0.08	−0.003	−0.59
CFO_PCOM	+	−0.007	−1.81*	−0.004	−1.68*	−0.005	−1.84*
CFO_TEN	±	−0.001	−1.29	0.000	−0.22	−0.001	−0.88
CFO_SALARY	+	−0.006	−0.84	−0.002	−0.44	−0.003	−0.48
CFO_BONUS	+	0.001	0.53	0.001	0.67	0.000	0.37
CEO_FEM	±	0.007	0.83	0.009	1.66*	0.008	1.16
CEO_AGE	±	0.001	1.72*	0.000	0.19	0.000	1.16
CEO_NEW	±	0.012	1.38	0.011	2.09**	0.010	1.61
CEO_PCOM	+	0.002	1.02	0.000	0.18	0.001	0.7
CEO_TEN	±	0.000	0.63	0.000	0.87	0.000	0.79
CEO_SALARY	+	0.000	0.00	0.002	0.70	0.002	0.43
CEO_BONUS	+	−0.005	−2.87***	−0.003	−3.18***	−0.003	−2.82***
BIG4	−	−0.005	−0.65	−0.005	−0.87	−0.006	−0.95
LIT	+	−0.028	−4.35***	−0.011	−2.62***	−0.018	−3.73***
FOR	+	−0.002	−0.49	−0.001	−0.36	−0.002	−0.49
EXTRA	+	0.007	1.28	0.009	2.69***	0.008	2.10**
MTB	−	−0.002	−2.70***	−0.002	−4.21***	−0.002	−3.53***
BUSY	+	−0.004	−0.81	−0.001	−0.50	−0.002	−0.67
CFFO	−	0.016	5.84***	0.006	3.85***	0.010	5.18***
ROA	−	−0.100	−2.13**	−0.034	−1.13	−0.061	−1.79*
Z	+	0.006	2.30**	0.008	4.63***	0.007	3.81***
REC	−	−0.003	−7.72***	−0.001	−5.64***	−0.002	−7.54***
ABSDA	−	−0.029	−0.79	−0.135	−4.81***	−0.067	−2.23**
INCENT_LOSS	+	−0.051	−1.49	−0.026	−1.32	−0.033	−1.47
INCENT_BENCH	+	0.009	1.10	0.009	1.64	0.009	1.52
JUST_BEAT	+	0.016	3.23***	0.007	2.11**	0.011	2.76***
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			4.26%		5.60%		4.80%
Panel B: The association between female CFOs working under no-pressure (pressure index = 0) and REM (n = 1,166)							
Intercept	?	1.482	9.26***	1.685	14.08***	1.572	12.71***
CFO_FEM	−	−0.022	−1.43*	−0.040	−2.18**	−0.031	−2.47***
CFO_AGE	−	−0.002	−0.85	0.000	−0.29	−0.001	−0.47
CFO_NEW	±	0.000	0.00	0.000	0.00	0.000	0.00
CFO_PCOM	+	−0.012	−1.52	−0.004	−0.8	−0.008	−1.36
CFO_TEN	±	0.000	0.09	0.001	0.72	0.001	0.40

Table 5 (continued)

		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
CFO_SALARY	+	0.031	0.92	−0.009	−0.42	0.013	0.57
CFO_BONUS	+	0.006	1.63	0.001	0.50	0.003	1.16
CEO_FEM	±	0.015	0.38	0.040	1.50	0.028	0.89
CEO_AGE	±	0.001	1.75*	0.001	1.45	0.001	1.81*
CEO_NEW	±	0.001	0.05	−0.011	−0.47	−0.009	−0.37
CEO_PCOM	+	0.000	0.06	0.001	0.27	0.000	0.08
CEO_TEN	±	0.002	1.94*	0.001	1.40	0.002	1.81*
CEO_SALARY	+	−0.015	−0.94	−0.013	−1.31	−0.016	−1.32
CEO_BONUS	+	−0.003	−0.81	−0.001	−0.33	−0.002	−0.67
BIG4	–	0.032	0.89	0.001	0.03	0.015	0.61
LIT	+	−0.078	−2.58***	−0.025	−1.45	−0.047	−2.28**
FOR	+	−0.010	−1.1	−0.012	−1.72*	−0.009	−1.24
EXTRA	+	0.005	0.37	0.012	1.15	0.010	0.94
MTB	–	−0.001	−0.39	−0.001	−0.58	−0.001	−0.49
BUSY	+	−0.001	−0.07	0.016	1.50	0.005	0.47
CFFO	–	0.008	1.50	0.010	2.36**	0.008	2.06**
ROA	–	−0.166	−1.98**	−0.083	−1.26	−0.132	−1.82*
Z	+	0.000	−0.10	−0.002	−0.70	−0.001	−0.20
REC	–	−0.001	−1.69*	−0.001	−1.28	−0.001	−1.73*
ABSDA	–	−0.056	−0.51	−0.366	−3.03***	−0.203	−2.02**
INCENT_LOSS	+	−0.050	−1.28	−0.048	−1.31	−0.052	−1.41
INCENT_BENCH	+	0.000	−0.02	−0.011	−0.72	−0.003	−0.18
JUST_BEAT	+	0.000	−0.02	−0.022	−2.57**	−0.011	−1.38
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			<000		<000		<000
R^2			6.10%		9.20%		7.60%

This table summarizes the results of the OLS Regression of Real Earnings Management (REM1, REM2 & REM3) on Female CFOs, firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, year-fixed effect, and industry-fixed effect as control variables. Panel A displays the results on the association between REM and female CFO who are working under pressures from Diversity, Wage, Age, and Tenure as represented by the pressure index. Panel B displays the results on the association between REM and female CFO who are not working under any of the above four types of pressures

*, **, *** represents significance level 10%, 5% and 1% respectively. Definitions of variables are in Appendix A

ruled out the presence of pressure. For the pressure from diversity measure, we identify the firm-year observation as subjected to pressure from diversity if this variable is greater than one but less than 50%. We predict that the positive association between female CFOs and REM will be pronounced among the sample of firms where female CFOs are subjected to any of the four pressures. Consistent with the study's predictions, we find strong evidence that female CFOs manipulate REM when they are subjected to pressure from

Table 6 The moderating effect of individual pressure factors on association between the female CFOs and real earnings management

		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Panel A: The association between female CFOs working under pressure from age and REM (n = 3,779)							
Intercept	?	1.530	19.07***	1.590	33.43***	1.562	27.76***
CFO_FEM	+	0.018	2.04**	0.017	3.18***	0.017	2.64***
Control variables			Included		Included		Included
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			5.07%		6.10%%		5.80%
Panel B: The association between female CFOs working under no pressure from age and REM (n = 4,509)							
Intercept	?	1.564	25.77***	1.580	38.17***	1.561	33.26***
CFO_FEM	−	0.002	0.29	− 0.003	− 0.45	− 0.001	− 0.16
Control variables			Included		Included		Included
Industry effect			Included		Included		Included
Year Effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			3.90%		6.0%%		4.50%
Panel C: The association between female CFOs working under pressure from wage and REM (n = 4,144)							
Intercept	?	1.481	23.86***	1.575	38.25***	1.527	31.86***
CFO_FEM	+	0.011	1.27	0.009	1.51	0.010	1.36
Control variables			Included		Included		Included
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			4.81%		5.40%%		5.00%
Panel D: The association between female CFOs working under no pressure from wage and REM (n = 4,144)							
Intercept	?	1.650	23.88***	1.673	35.34***	1.654	31.74***
CFO_FEM	−	0.012	1.58	0.008	1.57	0.009	1.58
Control variables			Included		Included		Included
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			4.20%		5.90%%		5.00%
Panel E: The association between female CFOs working under pressure from diversity and REM (n = 2,930)							
Intercept	?	1.550	22.68***	1.555	36.36***	1.550	30.79***
CFO_FEM	+	0.018	2.33***	0.014	2.69***	0.015	2.47***
Control variables			Included		Included		Included
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000

Table 6 (continued)

Parameter		Model (1) dv = REM1 Estimate	*t*-value	Model (2) dv = REM2 Estimate	*t*-value	Model (3) dv = REM3 Estimate	*t*-value
R^2			4.68%		6.60%%		5.30%
Panel F: The association between female CFOs working under no pressure from diversity and REM (n = 5,358)							
Intercept	?	1.556	30.70***	1.628	49.95***	1.589	42.49***
CFO_FEM	−	− 0.010	− 0.96	− 0.009	− 1.18	− 0.011	− 1.29
Control variables			Included		Included		Included
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			4.30%		5.30%%		4.90%
Panel G: The association between female CFOs working under pressure from tenure and REM (n = 3,919)							
Intercept	?	1.513	30.01***	1.523	49.61***	1.520	39.79***
CFO_FEM	+	0.007	0.74	0.006	1.06	0.007	1.04
Control variables			Included		Included		Included
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			5.71%		7.70%%		6.70%
Panel H: The association between female CFOs working under no pressure from tenure and REM (n = 4,369)							
Intercept	?	1.609	24.68***	1.665	39.60***	1.626	34.25***
CFO_FEM	−	0.017	2.16**	0.011	1.88*	0.012	1.83*
Control variables			Included		Included		Included
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			4.10%		5.40%%		4.50%

This table summarizes the results of the moderating effect of individual pressure factors on the OLS Regression of Real Earnings Management (REM1, REM2 & REM3) on Female CFOs, firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, year-fixed effect, and industry-fixed effect as control variables. Panel A presents the results on the regression of pressure from age sample. Panel B presents the results on the regression of no pressure from age sample. Panel C presents the results on the regression of pressure from wage sample. Panel D presents the results on the regression of no pressure from wage sample. Panel E presents the results on the regression of pressure from diversity sample. Panel F presents the results on the regression of no pressure from diversity sample. Panel G presents the results on the regression of pressure from tenure sample. Panel G presents the results on the regression of no pressure from tenure sample. The variable of interest in all models is CFO_FEM

*, **, *** represents significance level 10%, 5% and 1% respectively. Definitions of variables are in Appendix A

Table 7 The moderating effect of managerial ability on the association between female CFOs and real earnings management

		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Panel A: The association between female CFOs and REM among high managerial ability sample of firms (n = 4,487)							
Intercept	?	1.636	31.27***	1.643	48.5***	1.641	42.96***
CFO_FEM	+	0.014	1.88**	0.013	2.35**	0.012	1.89**
CFO_AGE	−	0.001	2.05**	0.001	1.97**	0.001	1.92**
CFO_NEW	±	−0.008	−1.20	−0.001	−0.22	−0.005	−0.91
CFO_PCOM	+	−0.004	−1.36	−0.003	−1.13	−0.003	−1.30
CFO_TEN	±	−0.002	−1.66*	−0.001	−1.12	−0.001	−1.53
CFO_SALARY	+	−0.008	−0.86	−0.005	−0.83	−0.004	−0.64
CFO_BONUS	+	0.003	1.50	0.002	1.44	0.002	1.40
CEO_FEM	±	0.014	1.79*	0.015	2.96***	0.014	2.26**
CEO_AGE	±	0.001	1.31	0.000	−0.08	0.000	0.70
CEO_NEW	±	0.018	2.00**	0.015	2.32**	0.015	2.07**
CEO_PCOM	+	−0.002	−1.02	−0.001	−0.73	−0.002	−1.07
CEO_TEN	±	0.000	0.29	0.000	0.82	0.000	0.60
CEO_SALARY	+	−0.009	−1.30	−0.004	−0.79	−0.006	−1.20
CEO_BONUS	+	−0.006	−2.50**	−0.003	−2.64***	−0.004	−2.54**
BIG4	−	0.000	−0.02	−0.003	−0.40	−0.002	−0.24
LIT	+	−0.003	−0.44	0.007	1.43	0.003	0.43
FOR	+	−0.002	−0.29	−0.001	−0.22	0.000	−0.11
EXTRA	+	0.004	0.61	0.011	2.34**	0.008	1.57
MTB	−	−0.001	−0.82	−0.001	−1.58	−0.001	−1.36
BUSY	+	−0.008	−1.36	−0.002	−0.5	−0.005	−1.14
CFFO	−	0.010	2.90***	0.004	1.58	0.006	2.26**
ROA	−	−0.058	−0.80	0.013	0.31	−0.010	−0.21
Z	+	0.009	2.20**	0.010	3.97***	0.010	3.44***
REC	−	−0.002	−4.36***	−0.001	−2.49**	−0.001	−3.83***
ABSDA	−	0.021	0.38	−0.123	−2.72***	−0.038	−0.84
INCENT_LOSS	+	−0.068	−1.44	−0.041	−1.46	−0.045	−1.49
INCENT_BENCH	+	−0.004	−0.38	0.004	0.57	0.000	0.04
JUST_BEAT	+	0.015	2.35**	0.001	0.29	0.007	1.41
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			2.47%		3.20%		2.50%

Table 7 (continued)

		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Panel A: The association between female CFOs and REM among low managerial ability sample of firms (n = 3,801)							
Intercept	?	1.435	21.5***	1.547	37.98***	1.484	30.69***
CFO_FEM	+	0.006	0.73	0.002	0.40	0.005	0.73
CFO_AGE	−	0.000	0.18	−0.001	−1.51	0.000	−0.36
CFO_NEW	±	0.000	0.02	0.002	0.25	0.000	−0.06
CFO_PCOM	+	−0.009	−1.63	−0.005	−1.48	−0.006	−1.67*
CFO_TEN	±	−0.001	−0.59	0.000	0.58	0.000	−0.16
CFO_SALARY	+	−0.001	−0.07	−0.001	−0.18	0.000	0.04
CFO_BONUS	+	0.001	0.34	0.000	0.38	0.000	0.22
CEO_FEM	±	−0.002	−0.16	0.002	0.21	−0.001	−0.05
CEO_AGE	±	0.001	1.64	0.000	0.91	0.001	1.54
CEO_NEW	±	0.005	0.35	0.005	0.53	0.004	0.37
CEO_PCOM	+	0.005	1.86*	0.002	1.21	0.003	1.72*
CEO_TEN	±	0.001	1.01	0.000	0.92	0.001	1.04
CEO_SALARY	+	0.009	1.54	0.008	1.78*	0.008	1.84*
CEO_BONUS	+	−0.003	−1.45	−0.002	−1.54	−0.002	−1.32
BIG4	−	−0.004	−0.23	−0.005	−0.60	−0.007	−0.62
LIT	+	−0.054	−5.53***	−0.027	−4.67***	−0.037	−5.32***
FOR	+	−0.005	−0.74	−0.004	−0.93	−0.005	−0.98
EXTRA	+	0.005	0.65	0.005	0.96	0.005	0.88
MTB	−	−0.002	−2.91***	−0.002	−4.29***	−0.002	−3.39***
BUSY	+	−0.001	−0.23	0.000	0.08	−0.001	−0.11
CFFO	−	0.019	5.71***	0.010	4.90***	0.014	5.70***
ROA	−	−0.050	−0.85	−0.033	−0.88	−0.045	−0.99
Z	+	0.001	0.48	0.003	1.49	0.003	1.28
REC	−	−0.003	−5.07***	−0.001	−4.29***	−0.002	−5.33***
ABSDA	−	−0.061	−1.38	−0.170	−5.18***	−0.099	−2.73***
INCENT_LOSS	+	−0.019	−0.81	−0.005	−0.34	−0.014	−0.76
INCENT_BENCH	+	0.017	1.48	0.007	0.80	0.013	1.50
JUST_BEAT	+	0.012	1.87*	0.003	0.78	0.007	1.44
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			6.30%		8.20%		7.20%

This table summarizes the results of the OLS Regression of Real Earnings Management (REM1, REM2 & REM3) on Female CFOs, firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, year-fixed effect, and industry-fixed effect as control variables under a management of able versus less able CFOs. Panel A presents the results on the regression of high managerial ability sample of firms. Panel B presents the results on the regression of low managerial ability sample of firms. The variable of interest in all models is CFO_FEM

*, **, *** represents significance level 10%, 5% and 1% respectively

Table 8 The Moderating Effect of Institutional Investors on the Association between Female CFOs Real Earnings Management

Parameter		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Panel A: The association between female CFOs and REM among high institutional investors sample of firms (n = 4,144)							
Intercept	?	1.615	23.88***	1.675	39.41***	1.643	33.53***
CFO_FEM	+	0.016	1.67*	0.010	1.54*	0.011	1.53*
CFO_AGE	−	0.000	− 0.19	0.000	− 0.80	0.000	− 0.65
CFO_NEW	±	− 0.011	− 1.13	− 0.008	− 1.24	− 0.009	− 1.23
CFO_PCOM	+	0.002	0.53	0.002	0.73	0.001	0.43
CFO_TEN	±	− 0.002	− 1.25	− 0.001	− 0.87	− 0.001	− 1.06
CFO_SALARY	+	− 0.012	− 0.96	− 0.009	− 1.12	− 0.007	− 0.81
CFO_BONUS	+	0.002	0.88	0.001	0.63	0.001	0.68
CEO_FEM	±	0.018	1.86*	0.013	2.09**	0.016	2.02**
CEO_AGE	±	0.001	1.33	0.000	0.68	0.000	1.09
CEO_NEW	±	0.018	1.55	0.009	1.26	0.011	1.25
CEO_PCOM	+	− 0.001	− 0.81	− 0.002	− 2.12**	− 0.002	− 1.46
CEO_TEN	±	0.000	0.54	0.000	0.65	0.000	0.67
CEO_SALARY	+	0.003	0.34	− 0.001	− 0.24	0.000	0.05
CEO_BONUS	+	− 0.005	− 2.12**	− 0.002	− 2.04**	− 0.003	− 1.99**
BIG4	−	− 0.010	− 0.68	− 0.007	− 0.75	− 0.010	− 0.92
LIT	+	− 0.031	− 3.07***	− 0.008	− 1.37	− 0.017	− 2.41**
FOR	+	− 0.013	− 2.05**	− 0.012	− 2.61***	− 0.012	− 2.36**
EXTRA	+	0.011	1.46	0.012	2.36**	0.012	2.16**
MTB	−	− 0.002	− 1.5	− 0.001	− 2.02**	− 0.002	− 2.12**
BUSY	+	− 0.002	− 0.32	0.003	0.68	0.001	0.15
CFFO	−	0.016	3.90***	0.008	3.00***	0.011	3.55***
ROA	−	− 0.135	− 2.13**	− 0.078	− 2.02**	− 0.092	− 2.03**
Z	+	0.007	1.84*	0.007	2.80***	0.008	2.73***
REC	−	− 0.003	− 6.97***	− 0.001	− 4.65***	− 0.002	− 6.67***
ABSDA	−	− 0.033	− 0.56	− 0.151	− 3.39***	− 0.076	− 1.67*
INCENT_LOSS	+	− 0.003	− 0.17	0.011	0.80	0.002	0.16
INCENT_BENCH	+	− 0.003	− 0.25	− 0.004	− 0.45	− 0.002	− 0.21
JUST_BEAT	+	0.021	3.24***	0.008	1.78*	0.013	2.54**
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p- value			< 000		< 000		< 000
R^2			3.95%		4.80%		4.50%
Panel B: The association between female CFOs and REM among low institutional Investors sample of firms (n = 4,144)							
Intercept	?	1.490	31.79***	1.534	49.79***	1.510	42.4***
CFO_FEM	+	0.007	1.00	0.006	1.17	0.006	1.15
CFO_AGE	−	0.001	2.80***	0.001	1.70*	0.001	2.54**
CFO_NEW	±	0.005	0.74	0.009	1.73*	0.005	0.88

Table 8 (continued)

Parameter		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
CFO_PCOM	+	−0.017	−2.71***	−0.010	−2.92***	−0.012	−2.93***
CFO_TEN	±	0.000	−0.39	0.001	0.87	0.000	0.09
CFO_SALARY	+	0.002	0.20	0.004	0.71	0.003	0.51
CFO_BONUS	+	0.001	0.68	0.001	0.90	0.001	0.63
CEO_FEM	±	−0.009	−0.69	0.002	0.29	−0.004	−0.35
CEO_AGE	±	0.001	1.50	0.000	−0.13	0.000	1.02
CEO_NEW	±	0.003	0.28	0.009	1.19	0.006	0.68
CEO_PCOM	+	0.005	1.80*	0.003	1.97**	0.004	1.93*
CEO_TEN	±	0.000	0.60	0.001	1.17	0.000	0.88
CEO_SALARY	+	−0.002	−0.53	0.005	1.29	0.001	0.40
CEO_BONUS	+	−0.004	−2.13**	−0.003	−2.49**	−0.003	−2.22**
BIG4	−	0.004	0.42	−0.002	−0.32	0.000	0.06
LIT	+	−0.034	−4.07***	−0.016	−2.93***	−0.024	−3.76***
FOR	+	0.006	1.04	0.006	1.53	0.005	1.20
EXTRA	+	0.002	0.34	0.007	1.64	0.005	1.03
MTB	−	−0.002	−2.60***	−0.003	−4.45***	−0.002	−3.18***
BUSY	+	−0.005	−0.93	−0.003	−0.75	−0.004	−0.99
CFFO	−	0.013	4.39***	0.005	2.57**	0.008	3.77***
ROA	−	−0.102	−1.88*	−0.012	−0.31	−0.061	−1.45
Z	+	0.004	1.57	0.006	3.63***	0.005	2.75***
REC	−	−0.003	−4.63***	−0.001	−3.89***	−0.002	−4.70***
ABSDA	−	−0.024	−0.63	−0.157	−4.61***	−0.075	−2.17**
INCENT_LOSS	+	−0.114	−1.64	−0.079	−2.07**	−0.082	−1.89*
INCENT_BENCH	+	0.016	1.64	0.015	2.49**	0.015	2.19**
JUST_BEAT	+	0.008	1.36	0.000	−0.09	0.004	0.85
Industryeffect			Included		Included		Included
Year effect			Included		Included		Included
p-value			<000		<000		<000
R^2			5.70%		7.90%%		6.30%

This table summarizes the results of the OLS Regression of Real Earnings Management (REM1, REM2 & REM3) on Female CFOs, firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, year-fixed effect, and industry-fixed effect as control variables. Panel A presents the results on the regression of high institutional investors sample of firms. Panel B presents the results on the regression of low institutional investors. The variable of interest in all models is CFO_FEM

*, **, *** represents significance level 10%, 5% and 1% respectively. Definitions of variables are in Appendix A

age (younger), and diversity, as shown in Panel A, and E of Table 6.[24] The coefficients of CFO_FEM in all models in Panel A are positive and significant in Model 2 at 1%, and in Models 1 and 3 at 5% with coefficients (β_1 in Model 1 = 0.018, β_1 in Model 2 = 0.017, and β_1 in Model 3 = 0.017. The coefficients of CFO_FEM in all models in Panel E are positive and significant at 1% with coefficients (β_1 in Model 1 = 0.018, β_1 in Model 2 = 0.014, and β_1 in Model 3 = 0.015). Interestingly, the association between female CFOs and REM changes into a negative, although non-significant, association among firms that do not face pressure from age, and diversity as shown in Panel B, and F of Table 6. The results on the association between the control variables and REM remain the same. The results in this section, overall, support H2 and provide insights into the settings where REM occurs by female CFOs among firms. We use the SST to argue that female CFOs not only may behave like their male counterparts but at the height of pressure, female CFOs manage REM more than their male counterparts. We argue that females are especially prone to social desirability response bias (Bagley et al. 2012) and are under increased pressure to show equal performance like their male counterparts.

Table 7 shows the results of the regressions of REM on CFO_FEM among high versus low managerial abilities.[25] The variable of interest in all three models displayed in Table 7 is CFO_FEM. We split the sample based on the median of managerial ability. Firms above the sample median were categorized as firms with high managerial ability (Panel A) and firms below the sample median were classified as firms with low managerial ability (Panel B). Surprisingly, the positive and significant association between REM measures and CFO_FEM was only observable among firms with high managerial abilities as shown in Panel A. The coefficients of CFO_FEM in all models in Panel A are positive and significant at 5% significance level with coefficients (β_1 in Model 1 = 0.014, β_1 in Model 2 = 0.013, and β_1 in Model 3 = 0.012). These results support H3 that managerial ability moderates the association between female CFOs and REM. The results in Panel B among firms with low managerial ability suggest a positive but non-significant association between REM measures and CFO_FEM. The results in this section contend that gender differences can be explained by knowledge differences as suggested by Dwyer et al. (2002) and that able female CFOs are possibly using their industry knowledge and expertise opportunistically to utilize REM, which is not illegal but improves the firm's performance in the short-term. We repeated the analyses using individual REM instead of aggregate REM variables and the results are, overall, consistent with the main test.

To examine the moderating effect of institutional investors on the association between female CFOs and REM, we run Eq. 6 after splitting the sample into high versus low institutional investors based on the sample median. Table 8 shows the results on the association between female CFOs and REM among firms with high institutional investors (panel A) and low institutional investors (panel B). We repeated the analyses using individual REM instead of aggregate REM variables and the results are, overall, the same.

[24] We repeated the analysis in this section after controlling for the firm- and year-fixed effects and again after controlling for the industry-year fixed effect and the results remain the same. For example, the results of the regression Models in Panel A and E after controlling for the firm- and year-fixed effects are still showing a statistical and positive significant association between female CFOs and REM.

[25] Although we control for the industry- and year-fixed effects in all models, we further control for the firm- and year-fixed effects, and industry-year fixed effect in additional statistical analyses and the results remain almost identical to our main results.

Panel A of Table 8 shows that female CFOs who operate in high institutional investor settings are positively associated with REM. The results are significant for all models at the 10% level. The coefficients (β_1 in Model 1 = 0.016, β_1 in Model 2 = 0.010 and β_1 in Model 3 = 0.011). Panel B of Table 7 shows that the association between REM and CFO_FEM disappears (e.g., positive, and non-significant) for firms with low institutional investors. These results in this section provide support for H4, which contends that institutional investors moderate the association between REM and female CFOs. We repeated the analyses using individual REM instead of aggregate REM variables and the results are, overall, consistent with the main test.

The results in this section support the conflict-of-interest hypothesis, which posits that imposing external governance can be detrimental. In this study, institutional investors provide the incentive to behave in a manner unintended by governance (Boal and Cummings 1981), and "crowd out" one's motivation to behave in compliance (Deci and Ryan 2000). The results in this section also support the notion that institutional investors create external pressure on female CFOs to improve the firm's performance using REM.

5 Sensitivity tests

5.1 Controlling for firm-fixed effect

We run the regression in Eq. 6 after controlling for the firm- and year-fixed effects to control for unobservable (e.g., omitted-correlated variables) firm-specific characteristics that may affect the results. As shown in Table 9, the results remain statistically and directionally the same. As shown in Models 1, 2 and 3 on the association between CFO_FEM and REM1, REM2, & REM3, there are significant positive associations at the 5% significance level for Models 1 and 3, and 1% significance level for Model 2 (β_1 in Model (1) = 0.011, β_1 in Model 2 = 0.008, and β_1 in Model 3 = 0.009). We repeated the analyses using individual REM instead of aggregate REM variables and the results are, overall, suggesting that female CFOs are manipulating REM using APROD (β_1 = 0.004, positive and statistically significant at 5%), and ADISC (β_1 = 0.007, positive and statistically significant at 10%). The association between female CFOs and ACFO was positive but non-significant. The results in this section are in line with our main predictions, analyses, and results.

5.2 Two-stage OLS regression

While we predict that female CFOs manipulate REM, it is likely that firms with high REM appoint female CFOs. We, therefore, use two-stage OLS regression to overcome the possible endogeneity between REM and gender of CFOs. As shown in Model (1) of Table 10, in the first regression we choose the mean female CFOs (CFO_FEM_Mean) in each two-digit SIC code and firm-year as an instrumental variable. This variable is likely associated with the presence of female CFOs in a firm, so it satisfies the relevance condition. The mean female CFOs in industry and year can only be associated with REM through the presence of female CFOs on the executive level. Therefore, the mean female CFOs per industry and year also meets the exclusion criteria. In line with the study's expectations, the variable CFO_FEM_Mean is significantly and positively associated with female CFOs as shown in the first regression (Model 1) in Table 10. The results of the second regression equation (Models 2, 3, and 4) are also consistent with the study's predictions and show that the

Table 9 The Association between Female CFOs and Real Earnings Management

		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Intercept	?	1.559	38.20***	1.605	61.86***	1.579	52.72***
CFO_FEM	+	0.011	1.92**	0.008	2.10***	0.009	1.99**
CFO_AGE	−	0.001	1.45	0.000	0.38	0.000	0.99
CFO_NEW	±	−0.002	−0.40	0.001	0.29	−0.001	−0.30
CFO_PCOM	+	−0.007	−2.07**	−0.004	−1.86*	−0.005	−2.12**
CFO_TEN	±	−0.001	−1.20	0.000	−0.15	0.000	−0.79
CFO_SALARY	+	−0.005	−0.76	−0.003	−0.72	−0.003	−0.49
CFO_BONUS	+	0.002	1.14	0.001	1.13	0.001	0.95
CEO_FEM	±	0.007	0.88	0.010	1.88*	0.008	1.29
CEO_AGE	±	0.001	2.02**	0.000	0.44	0.000	1.50
CEO_NEW	±	0.011	1.29	0.009	1.77*	0.009	1.40
CEO_PCOM	+	0.001	0.97	0.000	0.24	0.001	0.64
CEO_TEN	±	0.001	1.18	0.001	1.49	0.001	1.43
CEO_SALARY	+	−0.001	−0.25	0.001	0.45	0.000	0.05
CEO_BONUS	+	−0.005	−2.94***	−0.003	−3.12***	−0.003	−2.88***
BIG4	−	−0.002	−0.29	−0.004	−0.81	−0.004	−0.71
LIT	+	−0.033	−5.07***	−0.012	−3.11***	−0.021	−4.40***
FOR	+	−0.003	−0.73	−0.002	−0.78	−0.003	−0.79
EXTRA	+	0.006	1.20	0.009	2.76***	0.008	2.16**
MTB	−	−0.002	−2.82***	−0.002	−4.31***	−0.002	−3.63***
BUSY	+	−0.003	−0.76	0.000	0.15	−0.001	−0.45
CFFO	−	0.015	6.24***	0.007	4.57***	0.010	5.75***
ROA	−	−0.111	−2.61***	−0.042	−1.51	−0.072	−2.27***
Z	+	0.006	2.34**	0.006	4.33***	0.007	3.76***
REC	−	−0.003	−8.42***	−0.001	−6.25***	−0.002	−8.28***
ABSDA	−	−0.031	−0.89	−0.154	−5.49***	−0.078	−2.70**
INCENT_LOSS	+	−0.049	−1.57	−0.027	−1.43	−0.033	−1.60
INCENT_BENCH	+	0.006	0.83	0.006	1.13	0.007	1.23
INCENT_JUSTBEAT	+	0.014	3.12***	0.003	0.97	0.008	2.20**
Firm effect			Included		Included		Included
Year effect			Included		Included		Included
p–value			< 000		< 000		< 000
R^2			4.10%		5.40%		4.70%

This table summarizes the results after controlling for the firm and year-fixed effect in the Regression of Real Earnings Management (REM1, REM2 & REM3) on Female CFOs (CFO_FEM), firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, firm-fixed effect, and industry-fixed effect as control variables. Model (1) presents the results on the regression of REM on CFO_FEM, Model (2) summarizes the regression of REM2 on CFO_FEM, and Model (3) displays the association between REM3 and FEM_CFO. The variable of interest in all models is CFO_FEM

*, **, *** represents significance level 10%, 5% and 1% respectively. Definitions of variables are in Appendix A

Table 10 Two-stage least square estimation on the association between real earnings management and female CFOs

		Model (1)		Model (2)		Model (3)		Model (4)	
		dv = CFO_FEM		dv = REM1		dv = REM2		dv = REM3	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Intercept	?	− 0.004	− 0.03	1.580	26.62***	1.582	39.84***	1.575	35.16***
CFO_FEM_ Mean	+	1.003	28.44***						
AT	+	0.002	0.99						
LIT	+	0.029	3.47***						
EXTRA	+	− 0.015	− 1.75*						
ROA	−	0.049	1.39						
CFO_FEM_ Pred	+			0.014	2.17**	0.009	2.03**	0.010	2.13**
Control Variables	+				Included		Included		Included
Industry effect			Included		Included		Included		Included
Year Effect			Included		Included		Included		Included
p- value			< 000		< 000		< 000		< 000
R^2			9.73%		5.11%		5.87%		5.41%

This table summarizes the results of the Two-Stage OLS Regression of Real Earnings Management (REM1, REM2 & REM3) on Female CFOs, firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, year-fixed effect, and industry-fixed effect as control variables. Model (1) presents the results of the first-stage regression of CFO_FEM on the instrumental variable CFO_FEM_ Mean, which is the mean female CFOs per two-digit SIC and firm-year and other control variables, in addition to other firm-specific characteristics. Model (2), (3), and (4) summarize the regression results of REM variables (REM1, REM2 & REM3) respectively on CFO_FEM_Pred, which is the predicted value of female CFOs from the first regression, and other control variables

*, **, *** represents significance level 10%, 5% and 1% respectively. Definitions of variables are in Appendix A

predicted value from the first regression (CFO_FEM_Pred) is significantly and positively associated with REM in models 2, 3, and 4. The coefficients (β_1 in Model 2) = 0.014 and significant at 5%, β_1 in Model 3 = 0.009 and significant at 5%, and β_1 in Model 4 = 0.010 and significant at 5%). The result in this section supports H1 and rules out endogeneity, if any, in the main results.

We augmented the results in this section by examining the presence of endogeneity using the Hausman test. We first ran a model with female CFOs (CFO_FEM) as the dependent variable and the average number of female CFOs per two-digit industry code and firm year (CFO_FEM_Mean) as the instrumental variable (IV). We calculate the error term from this regression model and add it to Eq. 6. We further test whether the coefficient of the error term after adding it to Eq. 6 is significantly different from zero. Overall, in most models, the coefficients of the error term were not significant. The results suggest that there is no correlation between the error term and exogenous variables and that the results from the IV tests are not significantly different, ruling out the presence of endogeneity in our sample.

Table 11 The association between the change from male to female CFOs and real earnings management

		Model (1)		Model (2)		Model (3)	
		dv = REM1		dv = REM2		dv = REM3	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Panel A: The association between the change from male to female CFOs and aggregate REM (n = 178)							
Intercept	?	1.974	9.53***	1.867	12.85***	1.918	11.09***
MALE_FEMALE	+	0.049	1.93**	0.038	1.98**	0.043	1.98**
CFO_AGE	−	−0.002	−1.38	−0.001	−1.09	−0.002	−1.28
CFO_PCOM	+	−0.020	−2.33**	−0.014	−1.84*	−0.017	−2.14**
CFO_SALARY	+	−0.013	−0.58	−0.010	−0.70	−0.011	−0.64
CFO_BONUS	+	−0.001	−0.30	0.000	−0.06	−0.001	−0.18
CEO_FEM	±	−0.088	−0.73	−0.058	−0.84	−0.072	−0.77
CEO_AGE	±	−0.001	−0.51	0.000	−0.40	−0.001	−0.47
CEO_NEW	±	−0.032	−1.23	−0.023	−1.05	−0.027	−1.17
CEO_PCOM	+	−0.020	−1.31	−0.021	−1.36	−0.021	−1.35
CEO_TEN	±	−0.001	−0.36	−0.002	−0.77	−0.002	−0.57
CEO_SALARY	+	−0.024	−0.88	−0.015	−0.76	−0.019	−0.83
CEO_BONUS	+	0.007	2.00**	0.005	1.99**	0.006	2.02**
BIG4	−	−0.024	−0.93	−0.023	−1.29	−0.024	−1.12
LIT	+	−0.085	−3.03***	−0.070	−2.92***	−0.077	−3.02***
FOR	+	0.036	1.96**	0.019	1.55	0.027	1.81*
EXTRA	+	0.016	0.69	0.014	0.79	0.015	0.75
MTB	−	0.001	0.85	0.002	1.56	0.002	1.18
BUSY	+	−0.024	−1.27	−0.022	−1.61	−0.023	−1.45
CFFO	−	−0.044	−0.29	−0.215	−2.07**	−0.132	−1.05
ROA	−	−0.109	−0.80	−0.056	−0.55	−0.080	−0.7
Z	+	0.013	2.42	0.004	0.85	0.008	1.74*
REC	−	0.001	0.87	0.001	1.24	0.001	1.05
ABSDA	−	0.072	0.85	0.030	0.32	0.051	0.57
INCENT_BENCH	+	0.012	0.36	0.036	0.71	0.024	0.87
JUST_BEAT	+	0.009	0.49	0.010	12.85	0.009	0.59
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			39.30%		44.00%		41.70%
		Model (1)		Model (2)		Model (3)	
		dv = ACFO		*dv = APROD*		*dv = ADISC*	
Parameter		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Panel B: The association between the Change from Male to Female CFOs and Individual REM (n = 178)							
Intercept	?	1.583	30.78***	1.674	21.1***	1.883	14.63***
MALE_FEMALE	+	0.016	2.04**	0.027	2.55***	0.018	1.17
CFO_AGE	-	0.000	0.37	-0.001	-0.81	-0.001	-1.30
CFO_PCOM	+	-0.003	−0.96	−0.009	−2.49**	−0.010	−1.69*
CFO_SALARY	+	−0.001	−0.27	−0.005	−0.52	−0.008	−0.58

Table 11 (continued)

Parameter		Model (1)		Model (2)		Model (3)	
		dv = *ACFO*		*dv* = *APROD*		*dv* = *ADISC*	
		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
CFO_BONUS	+	0.001	0.54	0.000	0.13	−0.001	−0.37
CEO_FEM	±	−0.016	−1.31	−0.044	−0.77	−0.037	−0.64
CEO_AGE	±	0.000	1.05	0.000	0.18	−0.001	−1.05
CEO_NEW	±	−0.013	−1.11	−0.018	−1.51	−0.014	−0.87
CEO_PCOM	+	−0.003	−1.33	−0.002	−0.58	−0.018	−1.27
CEO_TEN	±	−0.001	−1.08	0.000	−0.16	−0.001	−0.49
CEO_SALARY	+	0.001	0.08	−0.006	−0.50	−0.014	−0.8
CEO_BONUS	+	0.002	1.48	0.004	2.14**	0.003	1.41
BIG4	−	0.002	0.28	−0.001	−0.13	−0.023	−1.40
LIT	+	−0.029	−4.03***	−0.042	−3.82***	−0.035	−1.72*
FOR	+	0.003	0.55	0.018	2.05**	0.014	1.37
EXTRA	+	0.003	0.34	0.005	0.51	0.013	0.81
MTB	−	0.001	1.54	0.000	0.26	0.001	0.99
BUSY	+	−0.005	−1.21	−0.007	−0.92	−0.016	−1.35
CFFO	−	−0.052	−1.2	0.095	1.16	−0.161	−2.19**
ROA	−	−0.148	−3.15***	−0.177	−2.71***	0.086	1.08
Z	+	−0.006	−3.58***	0.002	1.08	0.010	2.70***
REC	−	0.000	0.13	0.000	−0.14	0.001	1.28
ABSDA	−	−0.100	−1.54	−0.069	−1.59	0.141	2.83***
0.0120.360.0361.540.0240.87INCENT_BENCH	+	0.003	0.41	−0.024	−1.69*	0.032	1.51
JUST_BEAT	+	−0.001	−0.15	−0.003	−0.35	0.011	0.97
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			<000		<000		<000
R^2			62.50%		49.80%		31.70%

This table summarizes the results of the OLS Regression of Real Earnings Management (REM1, REM2 & REM3) on 89 pairs of a matched sample of firms that changed from male-to-female CFOs versus female-to-male CFOs, and after controlling for firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, year-fixed effect, and industry-fixed effect as control variables. The analysis in this table is conducted using a Propensity Score Matching (PSM) sample of 89 firms that switched from female-to-male CFOs versus 89 firms that switched from male-to-male CFOs. Panel A shows the association between aggregate REM (REM1, REM2 & REM3) and male-to-female CFOs and panel B displays the association between individual REM (ACFO, APROD, & ADISC) and male-to-female CFOs

*, **, *** represents significance level 10%, 5% and 1% respectively. Definitions of variables are in Appendix A

5.3 Change analysis (male-to-female or vice-versa) and real earnings management

To further alleviate any potential endogeneity because female executives are not randomly assigned to firms, we follow Huang and Kisgen's (2013) and use a difference-in-difference approach and examine REM for a treatment sample that includes transitioning male-to-female CFOs with a control sample of transitioning male-to-male CFOs. Using

Table 12 The Association between the Female CFOs and Individual Real Earnings Management

		Model (1)		Model (2)		Model (3)	
		dv = ACFO		dv = APROD		dv = ADISC	
		Estimate	*t*-value	Estimate	*t*-value	Estimate	*t*-value
Intercept		1.607	187.75***	1.573	143.74***	1.604	58.98***
CFO_FEM	?	0.001	0.86	0.004	2.21**	0.007	1.62*
CFO_AGE	+	0.000	−1.11	0.000	1.04	0.000	0.42
CFO_NEW	−	0.001	0.89	−0.001	−0.70	0.001	0.17
CFO_PCOM	+	0.000	−0.54	−0.003	−4.41***	−0.003	−1.41
CFO_TEN	+	0.000	2.16**	0.000	−0.18	0.000	−0.72
CFO_SALARY	+	0.001	0.49	0.002	1.05	−0.002	−0.49
CFO_BONUS	±	0.000	−1.59	−0.001	−1.86*	0.002	1.53
CEO_FEM	±	−0.001	−0.83	−0.004	−1.24	0.010	2.14**
CEO_AGE	±	0.000	−2.61***	0.000	0.49	0.000	1.41
CEO_NEW	+	−0.002	−1.20	−0.003	−1.29	0.010	1.76*
CEO_PCOM	±	0.000	−1.66*	0.000	−0.78	0.000	0.47
CEO_TEN	+	0.000	−1.49	0.000	−0.13	0.001	1.92*
CEO_SALARY	+	0.004	3.29***	0.003	2.40**	−0.003	−1.16
CEO_BONUS	−	0.001	1.97**	0.000	1.25	−0.003	−3.34***
BIG4	+	0.001	0.45	0.001	0.40	−0.004	−0.70
LIT	+	−0.002	−1.97**	−0.015	−10.71***	−0.012	−2.73***
FOR	+	0.000	−0.48	0.002	1.31	−0.003	−1.2
EXTRA	−	0.002	1.90*	0.001	1.09	0.006	1.88*
MTB	+	−0.001	−5.14***	−0.001	−4.98***	−0.001	−2.50**
BUSY	−	−0.001	−0.69	−0.003	−3.03***	0.000	0.16
CFFO	−	−0.003	−5.26***	0.002	3.47***	0.010	6.05***
ROA	+	−0.094	−10.52***	−0.119	−10.93***	0.035	1.28
Z	−	0.001	1.88*	0.001	2.25**	0.005	2.87***
REC	−	0.000	4.77***	−0.001	−9.80***	−0.002	−7.48***
ABSDA	+	−0.104	−10.89***	0.009	1.04	−0.034	−1.35
INCENT_LOSS	+	0.007	1.13	−0.006	−1.11	−0.029	−1.43
INCENT_BENCH		0.002	1.44	0.003	1.62	0.004	0.82
JUST_BEAT		0.000	0.12	0.007	5.67***	0.004	1.35
Industry effect			Included		Included		Included
Year effect			Included		Included		Included
p-value			< 000		< 000		< 000
R^2			16.80%		11.30%		2.70%

This table summarizes the results of the OLS Regression of Individual Real Earnings Management (ACFO, APROD & ADISC) on Female CFOs (CFO_FEM), firm-specific variables, CFOs characteristics, CEOs characteristics, earnings management incentives, year-fixed effect, and industry-fixed effect as control variables. Model (1) presents the results on the regression of ACFO on CFO_FEM, Model (2) summarizes the regression of APROD on CFO_FEM, and Model (3) displays the association between ADISC and FEM_CFO. The variable of interest in all models is CFO_FEM

*, **, *** represents significance level 10%, 5% and 1% respectively. Definitions of variables are in Appendix A

the full sample of firms between 1996 and 2018, we identified 89 new CFOs who transitioned firms from a male-to-female, and 4,496 new CFOs who transitioned firms from a male-to-male. We then created a matching sample based on the Propensity-Score Matching technique to control for selection bias (Rosenbaum and Rubin 1983). The match was conducted by calculating the propensity scores of each firm-year observation based on firm size, performance, and litigation risk. We conduct a 1:1 match of firms that switched from male-to-female CFOs with a sample of firms that switched from male-to-male CFOs based on a propensity score within the 0.01 range/caliber of propensity scores. The matching is performed based on the likelihood of selecting female CFOs as executives based on the criteria selected as covariates. We reached 178 matched samples of firms that transitioned from male-to-female (89 firms) and male-to-male CFOs (89 firms). We then reran Eq. 6 with an indicator variable that equals one if the transition was a male-to-female and zero if it was a male-to-male. As expected, the results are very similar to our main analysis and show a positive and significant association between male-to-female CFOs and all aggregates measures of REM and two individual measures of REM.

Panel A of Table 11 summarizes the results on the association between aggregate REM and firms that transitioned from male-to-female. The coefficients (β_1 in Model 1 = 0.049 and significant at 5%, β_1 in Model 2 = 0.038 and significant at 5%, and β_1 in Model 3 = 0.043 and significant at 5%).[26] Panel B of Table 11 illustrates the results on the association between individual REM and firms that transitioned from male-to-female, the coefficients (β_1 in Model 1 = 0.016 and significant at 5%, β_1 in Model 2 = 0.027 and significant at 1%, and β_1 in Model 3 = 0.018 but non-significant). Overall, the results in this section support our main tests and provide additional evidence on the absence of endogeneity in our main analyses.

5.4 Individual REM and female CFOs

We rerun Eq. 6 using individual, instead of aggregate REM, and document a position association between individual REM and CFO_FEM.[27] The individual measures of REM are abnormal cash flow from operation (ACFO), abnormal production costs (APROD), and abnormal discretionary expenses (ADISC). We run this test to disentangle the main source of REM among female CFOs. It seems that the main source of REM among female CFOs is coming from manipulating abnormal production costs (APROD) as shown in Model 2 of Table 12 (β_1 in Model 2 = 0.004 and significant at 5%). There is also mild evidence of the presence of REM using ADISC among female CFOs as shown in Model 3 of Table 12 (β_1 in Model 3 = 0.007 and significant at 10%). The results in this section support our main conclusion that female CFOs manipulate REM and further provide evidence on the source of REM.

[26] Although we control for the industry- and year-fixed effects in all models, we further control for the firm- and year-fixed effects, and industry-year fixed effect in additional statistical analyses and the results remain consistent.

[27] Although we control for the industry- and year-fixed effects in all models, we further control for the firm- and year-fixed effects, and industry-year fixed effect in additional statistical analyses and the results remain constant.

5.5 Additional analyses

To further control for selection bias due to observable characteristics (Rosenbaum and Rubin 1983), we use the propensity scores matching sample method. We composed a matching sample of male CFOs and female CFOs based on firm size, litigation, industry, and year-fixed effect. We use a Stepwise Logistic Regression Model to regress gender of CFOs on firm size, litigation, and year-fixed effect. We then calculate the propensity score for each firm-year observation. The Stepwise Logistic Regression is statistically significant (Chi-Square = 24.50 and significant at 1%) and shows a significantly positive (negative) association between female CFOs and trade industries (whole and retail) and litigation (mining industries, and year 10). We then conduct a 1:1 match of female CFOs with male CFOs based on a propensity score within 0.01 range/caliber of propensity scores. The matching is performed based on the likelihood of selecting female CFOs as executives based on the criteria selected as covariates. The final sample is composed of 663 (1,822) firms (firm-year observations), with 911 matched pairs of male and female CFOs. The untabulated results on the association between REM and CFO_FEM remain positive and statistically significant at 10%.

We also added an indicator variable for the financial crisis that equals one for years 2007 and 2008, zero otherwise and reran Eq. 6 after adding the variable crisis as an additional control variable. The untabulated results on the association between REM measures and CFO_FEM remain positive and statistically significant at 5% in all models. We divided the sample into firms with high versus low firm efficiency based on the median sample. Firm efficiency is retrieved from Demerjian et al. (2013). While the results in the main tests suggest that more able female CFOs manipulate REM, we argue that perhaps female CFOs may use their knowledge and expertise in manipulating earnings when the firm is less efficient. In line with the study's predictions, we find the positive association between female CFOs and REM is only observable among a less efficient sample of firms.

6 Summary and conclusion

The study investigates the relationship between female CFOs and REM. We focus on REM because, unlike accrual earnings management, REM is difficult to differentiate from optimal business operations. Basing the study's hypotheses on the SST and the opposing GST, we conjecture that female CFOs facing pressure use REM as an opportunity to overcome these pressures. We argue that managerial abilities and institutional holdings moderate the association between female CFOs and REM. The results show that contrary to proponents of the GST and consistent with the SST, in the right circumstances, female CFOs behave opportunistically by managing REM above and beyond that of their male counterparts. The findings suggest that female CFOs are positively and significantly associated with REM, and this association is observable among samples of female CFOs facing pressure from age, diversity, and institutional investors. The results support the notion that internal and external pressure factors lead female CFOs to opportunistically manage REM, a phenomenon we label the Glass Rock because these pressure factors are normally invisible in the workplace. We also find that REM among female CFOs is more pronounced among female CFOs with high managerial abilities. These results are robust across different subsamples and specifications. These results promote diversity and call for removing the barriers for women at the C-Suite level. The results also support the notion that managerial ability and

external governance mechanisms in certain circumstances may lead to unintended consequences. Overall, our results corroborate the findings of prior research that female CFOs are primarily risk-averse because when faced with pressure, they resort to REM instead of utilizing discretionary accruals.

As expected, REM by female CFOs who are facing pressure (e.g., internal, or external), is likely to cause a ripple effect on other firm outcomes such as the firm valuation. Prior research provides inconclusive evidence on firm valuation by female CFOs. While Brinkhuis and Scholtens (2018) did not find a market response to firms that replace male CFOs with female CFOs, Doan and Iskandar-Datta (2021) document that investors respond less (more) favorably to the appointment of female CFOs among firms with high (low) uncertainty. Furthermore, prior research suggests that female CFOs grow their firms slower than their male counterparts, are less likely to issue debt, engage less in mergers and acquisitions (Huang and Kisgen 2013), and pay lower premiums while bidding in mergers and acquisitions (Levi et al. 2008). Therefore, future research may investigate the consequences of REM by female CFOs on firm valuation.

Appendix A

Variable(s)	Definition and measurement	Source
CFO_FEM	An indicator variable equals 1 if the CFO is a female, zero otherwise	Execucomp
REM1	The natural log of the first aggregate measure of REM, estimated as in Cohen and Zarowin (2010) and is equal to (− 1* ADISC) + APROD.	Compustat
REM2	The natural log of the second aggregate measure of REM, estimated as in Cohen and Zarowin (2010) and is equal to (− 1* ACFO) + (− 1*ADISC)	Compustat
REM3	The natural log of the third aggregate measure of REM estimated as [APROD + (− 1* ACFO)]/2 + (− 1* ADISC)	Compustat
ABSDA	The natural log of the absolute value of discretionary accruals as in Kothari et al. (2005)	Compustat
ACFO	The natural log of abnormal cash flow from operation as in Roychowdhury (2006)	Compustat
ADISC	The natural log of abnormal discretionary expense as in Roychowdhury (2006)	Compustat
APROD	The natural log of abnormal production cost as in Roychowdhury (2006)	Compustat
CFO_AGE	Natural logarithm of age of CFO	Execucomp
CFO_NEW	An indicator variable equals 1 if the CFO is new, zero otherwise	Execucomp
CFO_SALARY	Natural logarithm of CFO salary	Execucomp
CFO_BONUS	Natural logarithm of CFO bonuses	Execucomp
CFO_TEN	Tenure of CFOs	Execucomp
CFO_PCOM	CFOs' performance-based compensation measured as the percentage of stock options, restricted stocks and bonuses of total compensation	Execucomp
CEO_FEM	An indicator variable equals 1 if the CEO is a female, zero otherwise	Execucomp

Variable(s)	Definition and measurement	Source
CEO_AGE	Natural logarithm of age of CEO	Execucomp
CEO_NEW	An indicator variable equals 1 if the CEO is new, zero otherwise	Execucomp
CEO_SALARY	Natural logarithm of CEO salary	Execucomp
CEO_BONUS	Natural logarithm of CEO bonuses	Execucomp
CEO_TEN	Tenure of CEOs	Execucomp
CEO_PCOM	CEOs' performance-based compensation measured as the percentage of stock options, restricted stocks and bonuses of total compensation	Execucomp
BIG4	An indicator variable equals 1 if the auditor is a big4, zero otherwise	Compustat
LIT	An indicator variable equals 1 if the firm is in a litigious industry, zero otherwise	Compustat
FOR	An indicator variable equals 1 if the firm engaged in foreign activities, zero otherwise	Compustat
EXTRA	An indicator variable equals 1 if the firm reported extraordinary activities, zero otherwise	Compustat
MTB	Market to Book ratio	Compustat
BUSY	An indicator variable equals 1 if the firm fiscal year end is December, zero otherwise	Compustat
CFFO	Natural logarithm of cash flow from operation scaled by total assets at the beginning of the year	Compustat
ROA	Income before Extraordinary items divided by total assets at the beginning of the year	Compustat
Z	Altman Z score	Compustat
REC	Number of analysts' recommendations	IBES
INCENT_LOSS	An indicator variable equals 1 if net income before extraordinary items scaled by total assets is in the interval [0, 0.005), zero otherwise	Compustat
INCENT_BENCH	An indicator variable equals 1 if change in net income before extraordinary items scaled by total assets is in the interval [0, 0.005), zero otherwise	Compustat
JUST_BEAT	An indicator variable equals 1 if actual EPS in year t beats the last median final analyst earnings forecast before the earnings announcement by either 1 cent (small beat) or up to more than 1 cent (big beat), 0 otherwise	IBES
ABLE	Managerial ability score as in Demerjian et al. (2013)	Demerjian et al. (2013)
PRE_DIV	An indicator variable equals 1 if percentage of female CFOs among total executives is greater than zero but less than 0.5, zero otherwise	Execucomp
PRE_WAGE	An indicator variable equals 1 if CFO compensation (salary and wages) is less than the sample median, zero otherwise	Execucomp
PRE_AGE	An indicator variable equals 1 if CFO age is less than the sample median, zero otherwise	Execucomp
PRE_TEN	An indicator variable equals 1 if CFO tenure is less than the sample median, zero otherwise	Execucomp
PRESSURE	An index ranges between 0 and 4, and is calculated as the sum of PRE_DIV, PRE_WAGE, PRE_TEN AND PRE_AGE	
INST_INVST	Percentage of ownership by institutional investors	Compustat

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