Journal of Business Research 98 (2019) 1–14

Contents lists available at ScienceDirect

Journal of Business Research

journal homepage: www.elsevier.com/locate/jbusres

CEO compensation and earnings management: Does gender really matters?

Oneil Harris[a,*], J. Bradley Karl[a], Ericka Lawrence[b]

[a] East Carolina University, Department of Finance, United States of America
[b] East Carolina University, Department of Management, United States of America

ARTICLE INFO

Keywords:
Executive compensation
Earnings management
Gender
Equity-based compensation

ABSTRACT

A number of earlier studies suggest that earnings quality improves when females are in senior management because of gender differences in risk-taking and ethical attitude. We extend this literature by using gender socialization theory and agency theory to examine the earnings management behavior of female Chief Executive Officers (CEOs) conditional on their equity incentives. We show that female CEOs do not necessarily reduce earnings management. At lower levels of equity-based compensation, female CEOs manipulate earnings to a lesser degree than their male counterparts. However, at higher levels of equity-based compensation, female and male CEOs exhibit very similar earnings management behaviors. Thus, given high equity incentives, all CEOs – regardless of gender – undertake a greater degree of earnings management activities. Consequently, there is little evidence that the gender of a CEO mitigates the propensity to increase the value of equity-based compensation by manipulating earnings.

1. Introduction

The revelation of financial reporting improprieties and the successive conviction of top managers of well-known firms such as Enron, WorldCom (Fazrad, 2005), and Bernard L. Madoff Investment Securities (New York Times, 2009) have fueled ongoing research into corporate misconduct (Harris & Bromiley, 2007; Ndofor, Wesley, & Priem, 2015: Shawver & Clements, 2015). The scale and scope of these, and similar, accounting scandals motivated policymakers to consider more rigorous financial reporting regulations (O'Connor, Priem, Coombs, & Gilley, 2006; Zhang, Bartol, Smith, Pfarrer, & Khanin, 2008) and, in accord, Congress enacted the Sarbanes-Oxley Act (SOX). However, in response to the enhanced regulatory scrutiny imposed on financial reporting by this legislation, managers promptly shifted away from accounting manipulation of earnings to more real activities manipulation (see Cohen, Dey, & Lys, 2008; Cohen & Zarowin, 2010; Farooqi, Harris, & Ngo, 2014; Zang, 2012).

Multidisciplinary research suggests that earnings management (accrual and real activities manipulation) involves various techniques employed by managers to produce financial reports that provide a positive depiction of their firms' business activities and financial position.[1] Chief executive officers (CEOs) have a vested interest in financial reporting activities because financial statements convey information about performance that is often extrapolated as a reflection of management capabilities and effectiveness. Financial reports may therefore directly impact managers' personal wealth, which provides substantial incentives to manipulate earnings.

Indeed, a large body of literature presents empirical evidence that managers manipulate reported earnings in order to increase the value of their equity-based compensation packages. For instance, there is substantial evidence that CEO equity incentives influence accruals management and the likelihood of beating analyst forecasts (Bergstresser & Philippon, 2006; Cheng & Warfield, 2005). Relatedly, Jiang, Petroni, and Wang (2010) report that measures of earnings management are more sensitive to the equity incentives of the firm's chief financial officer (CFO) than those of its CEO, suggesting that CFO equity incentives may play a stronger role in earnings management.

The increased presence of female executives and directors in recent years has resulted in a subset of the literature suggesting that gender plays a major role in earnings management (e.g. Kyaw, Olugbode, & Petracci, 2015; Lakhal, Aguir, Lakhal, & Malek, 2015; Peni & Vahamaa, 2010; Srinidhi, Gul, & Tsui, 2011). These studies generally report that the presence of a female executive or board member reduces the degree to which reported earnings are manipulated. The rationale offered for the documented difference in earnings management between men and women is that females are more risk-averse and more likely to abide by

* Corresponding author at: College of Business, Department of Finance, East Carolina University, Greenville, NC 28590, United States of America.
E-mail addresses: Harriso@ecu.edu (O. Harris), Karlj@ecu.edu (J.B. Karl), Lawrencee@ecu.edu (E. Lawrence).

[1] See studies by Dechow and Sloan (1991), Graham, Harvey, and Rajgopal (2005), Roychowdhury (2006), Cohen and Zarowin (2010), Badertscher (2011), Dechow, Ge, Larson, and Sloan (2011) and Zang (2012).

https://doi.org/10.1016/j.jbusres.2019.01.013
Received 5 February 2018; Received in revised form 8 January 2019; Accepted 9 January 2019

ethical standards (Barua, Davidson, Rama, & Thiruvadi, 2010; Bosquet, de Goeij, & Smedts, 2014; Watson & McNaughton, 2007). Hence, male executives tend to exhibit more hubris in corporate decision making than their female counterparts (Huang & Kisgen, 2013).

While prior research has provided some insight into the role of gender on earnings management, the literature is nascent and the reported results are mixed. For example, Peni and Vahamaa (2010) and Barua et al. (2010) find that female CFOs are associated with less earnings management, whereas female CEOs are not. Yet, Lakhal et al. (2015) conclude that more female directors reduce earnings management, but that female CEOs and female CFOs do not affect earnings management. Finally, Ye, Zhang, and Rezaee (2010) offer evidence that gender does not influence earnings management. These earlier studies, however, fail to consider the role of equity-based compensation as a boundary condition of the gender and earnings management relationship. This angle may help to explain why prior studies report conflicting results.

It is worthwhile to empirically examine the role of equity-based incentives on the relationship between gender and earnings management for several reasons. First, this inquiry is well-timed as women have made great strides in climbing the corporate ladder in recent years and the noted compensation gap between male and female executives has declined (Perryman, Fernando, & Tripathy, 2016). Second, we know that earnings management is shaped by managers' equity incentives (Bergstresser & Philippon, 2006; Jiang et al., 2010). Yet, given that managers have been predominantly male, it is unclear whether the extant earnings management literature can be generalized to include female executives. Third, studies that recently explore the moderating role of gender on the relationship between equity incentive and risk-taking suggest that females display more conservative behaviors than males (e.g. Baixauli-Soler, Belda-Ruiz, & Sanchez-Marin, 2015, 2017). Then again, Khan and Vieito (2013) report that corporate boards provide the same fraction of stock options to female CEOs as they provide to male CEOs, presumably as an incentive to female CEOs to take risks. Thus, the underlying relations between equity-based compensation and risk-taking, at least among female CEOs, may be nonlinear.

Given that equity incentives are stimuli that can shift managers' focus from intrinsic to extrinsic rewards, we theorize that equity-based compensation distorts the gender and earnings management relationship. In particular, we expect that female managers will be less likely to manage earnings relative to their male counterparts in the absence of equity-based compensation incentives. However, at high levels of equity-based compensation, we hypothesize that female and male managers will exhibit similar earnings management behaviors. That is, while females may be generally more ethical than males, we do not expect gender differences in earnings management to remain robust given greater equity incentives.

To examine the validity of our hypothesis, we gather compensation data pertaining to all female CEOs from 1992 through 2014 from ExecuComp and then match each female CEOs in our sample with a male CEO based on equity compensation level, industry, year and firm size. We then merge this CEO compensation database with firm accounting data from Compustat, which allows us to estimate several measures of accrual-based and real activities-based earnings management. Our method differs from earlier studies in that we pair female CEOs with comparable male CEOs to control for confounding effects related to gender pay disparities and the fact that women are less likely to hold the title of CEO (Bertrand & Hallock, 2001). Prior studies fail to account for such confounding effects when examining the relation between gender and earnings management and, as such, we believe our econometric strategy helps to provide more reliable insight into the effects of gender on earnings management. Our results support our main hypothesis.

The remainder of this paper is organized as follows. We discuss the relevant literature and develop testable hypotheses. We then describe our sample selection procedure and discuss the measurement of our main variables. In the following section, we present our empirical findings and discuss their implications.

2. Theoretical background

The surge in the number of females in top management roles has attracted substantial attention in the literature. A growing body of research shows that gender matters in business ethics and risk-taking behaviors (Clikeman, Geiger, & O'Connel, 2001; Weeks, Moore, McKinney, & Longenecker, 1999), thereby affecting firm value. For example, Faccio, Marchica, and Mura (2016) report that female-led firms have lower leverage, less volatile earnings, and a higher chance of survival than other firms. Perhaps these findings may be explained by results indicating that male executives exhibit more hubris in corporate decision-making than female executives (see Huang & Kisgen, 2013). Consequently, we draw upon gender socialization theory and agency theory to examine the relationship between gender, equity incentives, and earnings management.

2.1. Gender socialization theory (GST)

The business ethics literature overwhelmingly suggests that females are more ethical than males (Cohen, Pant, & Sharp, 2001; Deshpande et al., 2006; Fleischman & Valentine, 2003). Under GST, men and women bring varying values, ethical views, and attitudes to the workplace because gender roles are dictated during childhood and reinforced over time through social norms (Dawson, 1992; Gilligan, 1982). As a result, gender differences have been found in leadership styles, communication skills, and ethical decision making (Betz, O'Connell, & Shepherd, 1989; Ross & Robertson, 2003; Roxas & Stoneback, 2004). GST is also supported in the accounting and finance literature. Shawver, Bancroft, and Sennetti (2006) report that females are less likely to offer bribes and engage in unfair loan practices. Likewise, female CFOs are associated with higher quality accruals (Barua et al., 2010). Other studies suggest that women are more risk-averse than men when making investment choices (Hinz, McCarthy, & Turner, 1997; Powerll & Ansic, 1997) and that they issue less debt and engage in fewer mergers and acquisitions (Huang & Kisgen, 2013).

However, while several studies suggest that men engage in riskier business decisions than women and that women are more likely to abide by ethical standards, Deaux and Major (1987) suggest that contextual factors (e.g., work environment, expectations, and individual goals) also affects the way males and females behave. Likewise, Dalton and Ortegren (2011) argue that the relationship between gender and ethical decision-making is not straightforward because females are more prone to the social desirability response bias. When social desirability bias is controlled for, the gender effect in ethical decision-making weakens. Jurkus, Park, and Woodard (2011) suggest that, while there is evidence that firms with a greater percentage of female officers present lower agency costs, the negative relation is not robust when considering the endogeneity of diversity. They report that gender diversity does not reduce agency costs for all firms, only in firms in less competitive markets, suggesting beneficial effects for firms where strong external governance is absent.

2.2. Earnings management overview

A large body of literature suggests that managers are more focused on the short-term performance of the firm rather than long-term performance (e.g. Dichev, Graham, Harvey, & Rajgopal, 2013; Graham et al., 2005). This so-called “managerial short-termism,” whereby managers take measures to maximize the stock price by sacrificing long-term growth opportunities in an effort to inflate current earnings (Stein, 1989), manifests itself in a variety of managerial behaviors, most notably, earnings management. Studies show that, in an effort to pursue short-term objectives, managers manipulate earnings in ways that have

a largely detrimental effect on long-term shareholder wealth (see Farooqi et al., 2014; Graham et al., 2005).

Because there exist significant economic consequences for the firm when earnings management occurs, many studies have extensively examined a variety of topics pertaining to the propensity to manage earnings. Some of this literature examines differences between real earnings management and accrual-based earnings management,[2] and documents differences in the ways that managers use each method (Cohen et al., 2008; Cohen & Zarowin, 2010). Other studies provide evidence that managers manipulate earnings to avoid reporting annual operating losses (Roychowdhury, 2006). Still, other studies examine earnings management in the context of liquidity (Chen, Rhee, Veeraraghavan, & Zolotoy, 2015), equity offerings (Cohen & Zarowin, 2010), and compensation incentives (Bergstresser & Philippon, 2006; Jiang et al., 2010; Laux & Laux, 2009).

2.3. CEO gender and earnings management

The psychology and management literature imply that gender-based differences in ethical decision-making are manifested in the workplace because males have a higher tendency to break the rules (Roxas & Stoneback, 2004). However, as it relates to earnings management, prior research provides varied results. Srinidhi et al. (2011) conclude that female directors reduce earnings management. Lakhal et al. (2015) confirm this finding, but suggest that female CEOs and female CFOs do not affect earnings management. Whereas, Krishnan and Parsons (2008) demonstrate that earnings quality is positively related to gender diversity in upper-level management, which is consistent with the view that female executives follow more conservative financial reporting strategies.

Na and Hong (2017) suggest that male CEOs use aggressive discretionary accruals and real activities operations in order to report small positive earnings or small earnings increases, whereas female CEOs do not. Compared to male CFOs, El Mahdy (2015) finds that female CFOs are less likely to manage earnings through real activity operations. Then again, as previously noted, Peni and Vahamaa (2010) and Barua et al. (2010) report that female CFOs are associated with less earnings management, while female CEOs are not. Even though the bulk of the literature suggests gender plays a non-trivial role in earnings management, a few studies find no evidence that gender influences earnings management (e.g. Ye et al., 2010).

3. Hypothesis development

As aforementioned, prior studies fail to consider the role of equity incentives as a boundary condition of the gender and earnings management relationship; we believe this oversight may explain the conflicting results reported in the literature. Consequently, this paper offers insights into the moderating role of equity-based compensation on the relationship between gender and earnings management. Baixauli-Soler et al. (2017) recently report that it is important to consider an executive's decision-making freedom (by means of hierarchy) in order to predict risk preferences according to gender. Therefore, we focus our analysis on the CEO position, as this individual is the most powerful member of the management team, and has the highest authority and discretion in corporate decisions making (e.g. Finkelstein & Hambrick, 1996).

Considered in their entirety, the multidisciplinary findings in the literature support the view that women are more risk averse than men (e.g., Watson & McNaughton, 2007), and therefore, more likely to abide by ethical standards (e.g., Barua et al., 2010). According to GST, female CEOs engage in less earnings management than male CEOs because of their inherent risk aversion, and their innate care for their organizations and its stakeholders. To the extent that female CEOs are less likely to manipulate earnings than male CEOs, we anticipate that firms with women at the helm engage in less earnings management than firms with men at the helm. We therefore propose the following hypothesis:

H1. Firms managed by female CEOs engage in less earnings management than firms managed by male CEOs.

3.1. The moderating effect of equity incentives

Stock options are used in executive compensation to align the interests of managers and shareholders. While there are benefits to using stock options as performance based incentives, there can be detrimental effects when incentives reach exorbitant levels because executives may engage in improprieties to achieve or maintain stock price appreciation (see Harris & Bromiley, 2007). For example, excessive stock options can result in enhanced risk-taking because stock options provide top managers with unrestricted upside for potential gains while significantly reducing their potential for losses (Rajgopal & Shevlin, 2002; Sanders, 2001; Zhang et al., 2008). Therefore, it comes as no surprise that CEO equity incentives are associated with more accrual manipulation and a higher likelihood of beating analyst forecasts (see Bergstresser & Philippon, 2006; Cheng & Warfield, 2005). In accord, O'Connor et al. (2006) find that managers misreport financial performance to cover up risky positions that incurred losses.

Using a behavioral agency model, Baixauli-Soler et al. (2015) explore the moderating role of gender on the relationship between equity incentive and risk-taking and find that gender-diverse management females exhibit more conservative behavior than all-male management teams when more executive stock options (ESO) are granted. In addition, Baixauli-Soler et al. (2017) suggest that CEOs exhibit riskier behavior than non-CEO executives in response to ESO, and that gender differences in the ESO risk-taking effect are strongly present at the level of CEO due to their discretion to behave according to their own risk profile. Yet, while firm risk is lower when the CEO is a woman, corporate boards presumably are encouraging risk-taking behavior by providing the same proportion of stock options to female CEOs as they provide to male CEOs (see Khan & Vieito, 2013). Hence, the underlying relation between CEO gender, stock-based compensation and risk-taking may be non-linear. In fact, studies based on the Behavioral Agency Model (BAM) report a non-monotonic relationship between executive risk-taking behavior and stock incentives (Baixauli-Soler et al., 2015, 2017).

Therefore, while female CEOs may be less inclined to manage earnings than male CEOs, we posit that higher equity-based compensation distorts this mitigating effect. Agency theory suggests that higher stock-based pay induces managers to take more risks than anticipated by shareholders because ESOs allow them to participate in potential limitless upside gains while providing a floor to buffer potential losses (Rajgopal & Shevlin, 2002; Sanders, 2001; Tufano, 1996; Wiseman & Gomez-Mejia, 1998). Thus, higher equity-based compensation may allow female CEOs to overcome their risk aversion.

To the extent that boards create equity incentives to facilitate risk-taking, we posit that female CEOs are likely to diverge from conservative and risk-averse decision-making in order to capitalize on the increased level of compensation. Motivated by agency theory, this argument predicts that in the absence of significant equity-based compensation female managers will be less likely to manage earnings relative to their male counterparts. However, at high levels of equity-based compensation, female and male managers will exhibit similar earnings management behaviors. In other words, we theorize that while

[2] As discussed later, accrual-based manipulations involve the use of accounting maneuvers to manage earnings, whereas real activities manipulation represent real economic actions that change the timing or structuring of an operation, investment, or financing transaction to manage earnings (see Cohen et al., 2008; Cohen & Zarowin, 2010; Farooqi et al., 2014; Graham et al., 2005; Zang, 2012).

females are generally more ethical than males, we do not expect gender differences in earnings management to remain robust given greater equity incentives. As such, we hypothesize that:

H2. At higher levels of equity based compensation, firms managed by female CEOs exhibit similar earnings management as firms managed by male CEOs.

Employment risk may also contribute to this curvilinear relationship. Since a termination results in the complete loss of current income and jeopardizes future income,[3] Larraza-Kintana, Wiseman, Gomez-Mejia, and Welbourne (2007) suggest that employment risk represents the ultimate threat to a CEO's wealth; this peril compounds the loss context from the BAM perspective, and so encourages risk-taking. Provided that a female CEO appointment is unconventional, female CEOs arguably face more scrutiny and employment risk than their male counterparts. As such, given the increased use of performance-based compensation and the fact that CEOs are often fired after bad firm performance caused by factors beyond their control (Jenter & Kanaan, 2015), it is possible that female CEOs move away from conservative and risk-averse decision-making at higher levels of stock incentives in order to mitigate their employment risk. This view is also consistent with agency theory.

4. Data and methodology

4.1. Data and sample selection

We compile a dataset of female CEOs using information from ExecuComp, which contains executive compensation information on the largest U.S. firms. We define the CEO in a given year as the person who is identified as the Chief Executive Officer of the firm by ExecuComp (where CEOANN = CEO) and collect the name and compensation of all female CEOs (where GENDER = FEMALE) from 1992 through to 2014. This yields an initial sample of 877 firm-year observations. We refine the sample by eliminating firms in the financial services (SIC 6000–6999) and utilities industries (SIC 4900–4999) because of their special regulatory environment. We also remove firm-year observations with incomplete financial data available in Compustat to compute at least one of the earnings management variables used in the study. This selection process yields a final sample of 687 female CEO firm-year observations from a total of 132 individual firms.

Panel A of Table 1 provides the distribution of female CEO-led firms each year. The table shows that there has been a rapid increase in female CEOs in recent years. For instance, there were only 20 female CEOs in 1999 (account for 2.91% of the sample), but this more than doubled to 50 by 2011 (7.42% of the sample). Thus, female CEOs are becoming more prevalent. Panel B provides descriptive statistics on firm characteristics. The accounting data is collected from Computstat. Market capitalization is the stock price multiplied by share outstanding at year end. The mean market value of female lead firms is about $7.74 million; on average female CEO have roughly $7.06 million of total assets under management. *FSIZE* is the natural logarithm of total assets used to proxy firm size, which averages about 7.10.

Panel B of Table 1 also reports statistics on several other key profitability and leverage ratios. Return on assets (*ROA*) is net income scaled by total assets at the fiscal year-end and the average firm in our sample has an ROA of approximately 0.03. Market-to-book ratio (*MTB*), which serves as a proxy for growth prospects, is approximately 2.92 for the average firm with a female CEO in our sample. Our proxy for financial leverage, the debt-to-asset ratio (*DTA*), has a mean value of approximately 0.20 and the mean value of our measure of financial distress, Altman's *Z*-score (*ZSCORE*), is 6.02. As indicated by *CEOSTOWN*, the average CEO in our sample of female-led firms owns approximately 2.24% of total shares outstanding. Institutional investors own, on average, 73.76% of the outstanding stock of a given female CEO led firm, as indicated by *INSTOWN*.

Descriptive statistics on female CEO pay is also reported. For brevity, we focus on equity-based compensation since only these incentives are known to influence earnings management. Our main compensation variable is equity-based compensation as a proportion of total compensation (*PEBC*). We define equity-based compensation as the value of restricted stocks plus stock options granted during the fiscal year.[4] We use ExecuComp variable TDC1 to proxy total compensation. Female CEOs are paid, on average, roughly $5.51 million in total compensation each year (the median is $2.96 million). The annual equity-based compensation amounts to approximately $3.62 million on average (median = $1.49 million). As a proportion of total pay, equity pay represents approximately 45.82% of the typical female CEO's total annual compensation; the median is about 52.48%.

We then match each female CEO firm-year observation in our sample with a male CEO firm-year observation based on the proportion of equity compensation level, industry (same 2-digit SIC code), year and firm size. This four-dimensional matching system controls for the variation in CEO compensation among firms, across industries, and over time, as well as for confounding effects related to gender pay disparities and the fact that women are less likely to hold the title of CEO (Bertrand & Hallock, 2001). Panel C of Table 1 shows that the mean difference in the percent equity compensation between female and male CEOs is not statistically significant (*t*-statistic = 0.21), implying that the equity incentives of a female CEO in a given industry-year are the same as those of the matched male CEO. As such, our matching process pairs each female CEO with a reliable and comparable male CEO for a given industry-year. Hence, to the extent that equity incentives influence the propensity for the CEO to manage earnings, this matching process yields an appropriate control firm. Prior studies also conduct analyses by matching samples based on industry, firm size and fiscal year (see Adhikari, 2012).

4.2. Earnings management

The literature differentiates between real and accrual-based earnings management. Prior research defines accrual manipulation as the use of accounting maneuvers to manage earnings, and real activities manipulation as economic actions taken to change the timing or structuring of an operation, investment, or financing transaction in order to manage earnings (Cohen & Zarowin, 2010; Farooqi et al., 2014; Graham et al., 2005). Since accrual manipulation is easier to detect than real activities manipulation, managers shifted away from accrual-based earnings management after the passage of SOX to more real earnings management due to the enhanced scrutiny in the regulation (Cohen et al., 2008). Thus, the distinction between real and accrual-based earnings management is important to recognize in our analysis.

As in earlier studies, we use discretionary accruals to measure accounting earnings management based on the following model:

$$TA_t/A_{t-1} = \alpha_0 + \alpha_1(1/A_{t-1}) + \alpha_2(\Delta S_t/A_{t-1}) + \alpha_3(PPE_t/A_{t-1}) + \varepsilon_t \quad (1)$$

where TA_t is the total accruals in year t defined as earnings before extraordinary items and discontinued operations minus operating cash flows (from continuing operations). A_{t-1} denotes the total assets in year $t-1$, while ΔS_t is the change in net sales from year $t-1$ to year t. PPE_t is the gross value of property, plant, and equipment.

We use abnormal production costs and abnormal discretionary expenses to measure real earnings management activities. Cohen et al.

[3] See Eckbo and Thorburn (2003), Jensen and Murphy (1990), and Mehran, Nogler, and Schwartz (1998).

[4] Which is the sum of Execucomp variables BLK_VALUE + RSTKGRANT until 2006, and OPTION_AWARD_FV + STOCK_AWARD_FV thereafter.

Table 1
Frequency distribution and descriptive statistics on female CEO lead firms.

Panel A – sample distribution of female CEO by year

Year	N	Percent	Year	N	Percent
1992	1	0.15%	2004	27	3.93%
1993	4	0.58%	2005	33	4.80%
1994	7	1.02%	2006	36	5.24%
1995	8	1.16%	2007	44	6.40%
1996	11	1.60%	2008	46	6.70%
1997	12	1.75%	2009	46	6.70%
1998	18	2.62%	2010	51	7.42%
1999	20	2.91%	2011	50	7.28%
2000	24	3.49%	2012	54	7.86%
2001	25	3.64%	2013	58	8.44%
2002	28	4.08%	2014	54	7.86%
2003	30	4.37%	–	–	–

Panel B – descriptive statistics on female CEO lead firms

	N	Mean	Median
Market capitalization (millions)	679	$ 7739.12	$ 1050.10
Total assets (millions)	687	$ 7059.51	$ 958.62
Firm size (*FSIZE*)	687	7.10	6.87
Return-on-assets (*ROA*)	687	0.03	0.05
Market-to-book ratio (*MTB*)	679	2.92	2.11
Debt-to-asset ratio (*DTA*)	678	0.20	0.15
Altman z-score (*ZSCORE*)	671	6.02	3.58
CEO ownership (*CEOSTOWN*)	672	2.24%	0.28%
Institutional ownership (*INSTOWN*)	670	73.76%	78.29%
Total compensation (000 s)	687	$ 5512.74	$ 2960.20
Equity-based compensation (000 s)	687	$ 3618.74	$ 1489.63
Percent equity compensation (*PEBC*)	687	46.29%	52.48%

Panel C – identifying a control firm

	Female CEO (1)		Male CEO (2)		Difference (1)–(2)	
	Mean	*t*-Statistic	Mean	*t*-Statistic	Mean	*t*-Statistic
PEBC	0.463	43.21***	0.461	43.05***	0.003	0.21

Panel A provides the distribution of female CEO led firms each year. Panel B provides descriptive statistics on firm characteristics. The accounting data is collected from Computstat. Market capitalization is the stock price multiplied by share outstanding at year end. *FSIZE* is the natural logarithm of total assets and *ROA* is net income scaled by total assets at the fiscal year-end. Market-to-book ratio (*MTB*) is a proxy for growth prospects, the debt-to-asset ratio (*DTA*) is a proxy for financial leverage, and the Altman's *Z*-score (*ZSCORE*) is a measure of financial distress. *CEOSTOWN* and *INSTOWN* respectfully denote CEO ownership and institutional investor ownership relative to total shares outstanding. Total pay is the sum of salary, bonus, the total value of restricted stocks and stock options granted during the fiscal year, long-term incentive payouts, and all other compensation (*TDC1*, in Execucomp). Equity-based pay is the sum of the value of restricted stocks and the value of stock options granted during the fiscal year; it is calculated as the sum of *OPTION_AWARDS_BLK_VALUE* and *RSTKGRNT* before the introduction of FAS123R in 2006 and the sum of *OPTION_AWARDS_FV* and *STOCK_AWARDS_FV* after 2006. Percent equity compensation (*PEBC*) is equity-based pay relative to Total pay. In Panel B, we match each female CEO firm-year observation with a male CEO based on the proportion of equity compensation level, industry (by 2-digit SIC code), year and firm size. This four-dimensional match controls for variation in CEO compensation among firms, across industries and over time. The symbol *** indicates statistical significance at the 1% level.

(2008), Farooqi et al. (2014), Roychowdhury (2006) and Zang (2012) show that these two measures effectively capture real activities manipulation. Pursuant to the literature, the normal level of production costs is measured as:

$$PROD_t/A_{t-1} = \alpha_0 + \alpha_1(1/A_{t-1}) + \alpha_2(S_t/A_{t-1}) + \alpha_3(\Delta S_t/A_{t-1}) + \alpha_4(\Delta S_{t-1}/A_{t-1}) + \varepsilon_t \quad (2)$$

where $PROD_t$ is the sum of the cost of goods sold in year t and the change in inventory from year $t-1$ to year t. A_{t-1} is total assets in year $t-1$, S_t is the net sales in year t, and ΔS_t is the change in net sales from year $t-1$ to year t. The normal level of discretionary expenditures is measured as:

$$DISX_t/A_{t-1} = \alpha_0 + \alpha_1(1/A_{t-1}) + \alpha_2(S_{t-1}/A_{t-1}) + \varepsilon_t \quad (3)$$

where $DISX_t$ is the discretionary expenditures (i.e., the sum of advertising, R&D, and SG&A expenditures) in year t. A_{t-1} and S_t denote total assets and net sales in year t, respectively.

All the accounting variables are taken from Compustat. We estimate each of these models cross-sectionally each year by industry (by 2-digit SIC code) with at least 15 observations so as to control for year and industry fixed effects. Discretionary accruals are given as the estimated residual from Eq. (1), which we denote *AM*. Higher values of *AM* suggest more accrual-based earnings management (Farooqi et al., 2014; Zang, 2012).

The estimated residuals from Eq. (2) are used to proxy abnormal production costs (*R_PROD*). Higher values of *R_PROD* suggest the overproduction of inventory, which decreases reported cost of goods sold, so the firm may reports better operating margins (Roychowdhury, 2006). The residuals from Eq. (3) are used to proxy abnormal discretionary expenditures (*R_DISX*). Pursuant to earlier studies, we multiply *R_DISX* by −1, such that higher values indicate greater cuts in discretionary expenses to manipulate earnings upwards (Farooqi et al., 2014). We then add *R_PROD* and *R_DISX* into a composite score to capture the total level of real activities manipulation, which we denote *RM*. Cohen and Zarowin (2010) and Zang (2012) suggest that higher values of *RM* imply more aggressive real earnings management.

Table 2 provides summary statistics on the earnings management variables and reports test results based on CEO gender. The earnings manipulation variables are all winsorized at the 1% level to avoid noise from extreme observations. Panel A provides summary statistics on the measure of accrual-based earnings management (*AM*) and the measures of real earnings management (*R_PROD*, *R_DISX*, and *RM*); it also examines mean differences in these measures between male and female CEOs. As shown in the table, we find no evidence of statistically significant differences in accrual earnings management between male and female CEOs. However, we do find evidence that mean values of all three proxies of real earnings management are statistically different between male and female CEOs. The most significant difference, both in terms of statistical and economic significance, is found in *RM* which indicates that female CEOs are less likely to engage in real earnings management than male CEOs, ceteris paribus.

Panel B of Table 2 provides the Pearson correlation matrix of the earnings management variables, as well as the measure of equity based compensation, *PEBC*. Note that, with one exception, the statistically significant correlations indicate that equity-based compensation is positively related to both accrual and real earnings management. The one exception is that *R_PROD* is negatively correlated with the proportion of equity based CEO compensation. However, the other three measures provide strong support for the expectation that equity-based compensation incentivizes managers to engage in higher levels of earnings management and highlights the importance of considering equity incentives when evaluating the role of gender on earnings management.

Table 2
Descriptive statistics and correlation matrix.

Panel A – summary statistics

	Female CEO (1)				Male CEO (2)				Difference (1)–(2)	
	N	Mean	Median	*t*-Statistic	N	Mean	Median	*t*-Statistic	Mean	*t*-Statistic
AM	685	0.07	0.04	8.95***	685	0.09	0.04	10.16***	−0.01	−1.25
R_PROD	682	−0.09	−0.04	−8.37***	682	−0.07	−0.05	−7.85***	−0.03	−1.87*
R_DISX	649	0.09	0.08	5.72***	649	0.13	0.10	9.27***	−0.04	−2.14**
RM	649	−0.01	0.07	−0.49	649	0.06	0.07	3.38***	−0.08	−2.69***

Panel B – Pearson correlation matrix

	Female	*PEBC*	*AM*	*R_PROD*	*R_DISX*	*RM*
FEMALE	1.00					
PEBC	0.01 (0.83)	1.00				
AM	−0.03 (0.28)	0.11*** (0.00)	1.00			
R_PROD	−0.05* (0.08)	−0.06** (0.03)	−0.06** (0.02)	1.00		
R_DISX	−0.05* (0.08)	0.13*** (0.00)	0.23*** (0.00)	0.46*** (0.00)	1.00	
RM	0.07*** (0.01)	0.06** (0.04)	0.12*** (0.00)	0.79*** (0.00)	0.91*** (0.00)	1.00

This table provides summary statistics (in Panel A) and the Pearson correlation matrix (in Panel B) for the key variables in the paper. We compile our dataset of 687 female CEOs using information from ExecuComp (where CEOANN = 'CEO' and GENDER = 'FEMALE') from 1992 to 2014. We eliminate firm-year observations in the financial services and utilities industries (SIC codes 4900–4999, 6000–6999). We also remove firm-year observations with incomplete financial data in Compustat to compute at least one of the four earnings management variables. We then match each firm-year observation in the fele CEO sample with an appropriate male CEO in the same 2-digit SIC code and year with the closest percent of equity-based compensation (PEBC) and firm size (proxied as the natural logarithm of total assets). *PEBC* is the CEO equity-based compensation as a proportion of total compensation. Equity-based pay is the sum of the value of restricted stocks and the value of stock options granted during the fiscal year; it is calculated as the sum of *OPTION_AWARDS_BLK_VALUE* and *RSTKGRNT* before the introduction of FAS123R in 2006 and the sum of *OPTION_AWARDS_FV* and *STOCK_AWARDS_FV* after 2006. Total pay is defined as Execucomp compensation variable *TDC1*. $FEMALE_t$ equals 1 if the firm has a woman CEO in a fiscal year; zero otherwise. *AM* denotes accrual-based earnings management; it is the discretionary accruals estimated as the residuals from Eq. (1). *R_PROD* proxies abnormal production cost, which is given as the estimated residuals from Eq. (2). Likewise, *R_DISX* proxies abnormal discretionary expenditures, which is given as the estimated residuals from Eq. (3) multiplied by −1. *RM* captures the level of total real activities manipulation; it is the sum of *R_PROD* and *R_DISX*. Panel B reports the Pearson correlation coefficients and their *p*-values. The symbol ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

5. Results

5.1. Univariate results

Table 3 provides univariate test results. Panel A displays the mean differences in the earnings management proxies between female and male CEOs at low equity-based compensation levels (i.e. observations of female CEO equity-based compensation below the median). Here, we find no statistically significant difference in accrual-based earnings management activities (*AM*) between male and female CEOs. However, we find that the mean levels of all three real earnings management measures are lower for female CEOs than male CEOs and these differences are statistically significant at conventional levels. This univariate finding suggests that, in the absence of significant levels of equity-based compensation, female CEOs engage in less real earnings management, which supports our first hypothesis.

Table 3
Univariate results of gender on earnings management conditional on equity-based compensation.

	Women CEO (1)				Men CEO (2)				Difference (1)–(2)	
	N	Mean	Median	*t*-Statistic	N	Mean	Median	*t*-Statistic	Mean	*t*-Statistic
Panel A – low equity-based compensation (below median)										
AM	343	0.05	0.03	4.69***	343	0.07	0.03	5.81***	−0.02	−1.04
R_PROD	341	−0.10	−0.03	−5.72***	341	−0.04	−0.02	−3.57***	−0.06	−3.10***
R_DISX	326	0.03	0.05	1.25	326	0.09	0.09	4.46***	−0.06	−2.27**
RM	326	−0.08	0.04	−2.21**	326	0.07	0.05	2.43**	−0.13	3.09***
Panel B - high equity-based compensation (above median)										
AM	342	0.01	0.05	7.89***	342	0.11	0.06	8.50***	−0.01	−0.73
R_PROD	341	−0.08	−0.05	−6.37***	341	−0.10	−0.08	−7.38***	0.01	0.71
R_DISX	323	0.16	0.11	6.99***	323	0.17	0.11	8.75***	−0.01	−0.65
RM	323	0.06	0.10	2.07**	323	0.08	0.07	3.07***	−0.02	−0.53

This table reports univariate results on the impact of gender on earnings management conditional on equity-based compensation. We divide the sample of 687 female CEOs into two portfolios based on the median female CEO equity-based compensation as a proportion of total compensation (*PEBC*), as defined earlier. Female CEOs (and their matched firm) with *PEBC* below the median score are placed in the portfolio denoted Low (in Panel A), while those with a score above the median score are placed in the portfolio denoted High (in Panel B). *AM* denotes accrual-based earnings management; it is the discretionary accruals estimated as the residuals from Eq. (1). *R_PROD* proxies abnormal production cost, which is given as the estimated residuals from Eq. (2). Likewise, *R_DISX* proxies abnormal discretionary expenditures, which is given as the estimated residuals from Eq. (3) multiplied by −1. *RM* captures the level of total real activities manipulation; it is the sum of *R_PROD* and *R_DISX*. Panel B reports the Pearson correlation coefficients and their *p*-values. The symbols *** and ** indicate the statistical significance at the 1% and 5% levels, respectively.

However, in Panel B of the table, a different story emerges. The table reports the differences between earnings management activities of male and female CEOs who are compensated with high levels of equity (i.e. equity based compensation levels above the median). Here, we find no statistically significant difference in earnings management activities between female and male CEOs, suggesting that, at higher levels of equity based compensation, female and male CEOs engage in approximately the same level of accrual-based and real earnings management activities. These univariate results are therefore consistent with our second hypothesis that female CEOs react to environmental stimuli and alter their earnings management behaviors in response to the presence of higher levels of equity-based compensation.

5.2. Regression analyses

We jointly test the effects of equity incentives and gender on earnings management by taking advantage of the model developed by Zang (2012) that accounts for the trade-offs between accrual and real activities manipulation based on relative costs. Zang (2012) argues that there is a sequential substitutive relationship between the two - real and accrual manipulation - wherein managers adjust discretionary accruals at fiscal year-end based on the outcome of their real activities manipulation during the fiscal year. She shows that an unexpectedly high (low) level of real earnings management is directly offset by a lower (higher) level of abnormal accruals. Farooqi et al. (2014) employ a similar method. Our trade-off model is given as follows:

$$RM_t = \beta_0 + \beta_1 FEMALE_t + \beta_2 PEBC_t + \beta_3 FEMALE_t \times PEBC_t + \sum_k \beta_{4,k} Cost\ of\ RM_{k,t} + \sum_l \beta_{5,l} Cost\ of\ AM_{l,t} + \sum_m \beta_{6,m} \text{Other } Controls_{m,t} + u_t. \quad (4)$$

$$AM_t = \gamma_0 + \gamma_1 FEMALE_t + \gamma_2 PEBC_t + \gamma_3 FEMALE_t \times PEBC_t + \sum_k \gamma_{4,k} Cost\ of\ AM_{k,t} + \sum_l \gamma_{5,l} Cost\ of\ RM_{l,t} + \sum_m \gamma_{6,m} \text{Other } Controls_{m,t} + \gamma_7 Un\exp lained\ RM_t + v_t \quad (5)$$

We have three main variables of interest. The variable *FEMALE* is an indicator variable equal to 1 if the firm has a female CEO in year *t* and zero otherwise. *PEBC* is the CEO equity-based compensation for a given fiscal year as a proportion of total compensation (as defined earlier). *FEMALE* × *PEBC* is an interaction term between the main gender variable denoting female CEOs (*FEMALE*) and their proportion of equity-based pay (*PEBC*) in a given year.

Real earnings management is negatively related to the costs associated with real activities manipulation but positively related to the costs associated with accrual manipulation (and vice versa). Zang (2012) identifies various cost proxies for real activities manipulation. Market share at the beginning of the year (*MKTSHARE*) is used to control for status in the industry, whereas the Altman's *Z*-score (*ZSCORE*) is used to proxy financial health (Zang, 2012). She argues that higher institutional ownership also reflects higher real earnings management costs. Therefore, we also control for the percent of institutional ownership at the beginning of the year (*INST*).

The costs of accrual manipulation reflect scrutiny by auditors and regulators (and the penalty of detection), as well as the flexibility within firms' accounting systems (Zang, 2012). Scrutiny increases with the presence of a Big 8 audit firm (Cohen & Zarowin, 2010) and so this is used to proxy accrual manipulation costs. *BIG8* equals 1 if the firm's auditor is one of the Big 8 or Big 6, Big 5, and Big 4 audit firms in recent years (see Farooqi et al., 2014; Zang, 2012) and zero otherwise. We also use the log of the number of years the auditor has been with the firm (*ATENURE*) and the passage of SOX as proxies for accrual manipulation costs since they are known to alter earnings management behavior (Cohen et al., 2008). *SOX* equals 1 if the fiscal year is after 2003 and is zero otherwise. Accrual flexibility is constrained by prior accrual management activities, but greater when firms have longer operating cycles (Zang, 2012). Net operating assets at the beginning of the year (*NOA*) is used to proxy accrual management in the previous period and the length of the operating cycles (*CYCLE*) to control for other accounting flexibility.[5]

Farooqi et al. (2014) find that large firms engage in less earnings management than small firms. As a result, we also control for firm size (*FSIZE*) using the natural logarithm of total assets as a proxy. Studies also suggest that firms manipulate earnings to conceal poor performance (Dechow et al., 2011; Zang, 2012). Therefore, we use return on assets (*ROA*) as a proxy for profitability and the market-to-book ratio at the beginning of the year (*MTB*) to control for the firm's growth opportunities (Zang, 2012). In addition, we use the one year percent change in sales from in year $t-1$ to year t to account for actual sales growth (*GROWTH*).

Table 4 reports the regression results. Panel A reports the results when total real earnings management (*RM*) is the dependent variable. The coefficient of *FEMALE* is negative and statistically significant at the 1% level. This finding provides support for the notion that female CEOs, ceteris paribus, are less likely to engage in real earnings management activities relative to their male counterparts because of gender differences in risk-taking and ethical attitude, which parallels our first hypothesis. Moreover, there is a strong positive and significant coefficient on the interaction term between the gender variable denoting female CEOs and their proportional equity-based pay in a given year (*FEMALE* × *PEBC*). This result indicates that as the level of equity based compensation increases, so does the propensity for female CEOs to engage in real earnings management, which is consistent with the prediction of Hypothesis 2.

In the interest of robustness, we also estimate separate regression models using the two subcomponents of real earnings management as dependent variables and report the results in Panel B of the table. These model specifications afford similar results and indicate that female CEOs with higher levels of equity-based compensation engage in higher levels of abnormal production costs (*R_PROD*) and abnormal discretionary expenditures (*R_DISX*). Hence, there is robust evidence that given higher levels of equity-base pay, female CEOs deviate from conservative and risk-averse decision-making to manipulate earnings.

Overall, these results attest to the apparent effect of equity incentives on the propensity to engage in earnings management and suggest that the incentive effect of substantial equity-based compensation dominate the effect of gender in the context of real earnings management. By contrast, we fail to find a statistically significant connection between CEO gender, their equity based compensation, and accrual-based earnings management activities. For brevity, we do not compile tables to report these results; no value is added from reporting additional results showing that CEO equity incentives influence accruals management since this is already documented in the literature (see Bergstresser & Philippon, 2006). Instead, we focus the rest of the paper on addressing important robustness checks for our earlier findings. In particular, we attend to potential biases from endogeneity, the matching procedure, and the measurement of equity incentives. Our final analysis considers the likelihood of beating analysts' forecasts as an alternate proxy for earnings management (e.g. Cheng & Warfield, 2005).

[5] NOA is computed as shareholders' equity less cash and marketable securities plus total debt, while CYCLE is computed as days receivable plus days inventory less days payable at the beginning of the year (Dechow, 1994; Zang, 2012).

Table 4
Regression results of gender and equity incentives on real activities manipulation.

	Panel A		Panel B			
			Components of real activities manipulation			
	RM		*R_PROD*		*R_DISX*	
	Coef.	*t*-Stat	Coef.	*t*-Stat	Coef.	*t*-Stat
INTERCEPT	−0.17	−2.27**	−0.03	−0.76	−0.14	−2.70***
$FEMALE_t$	−0.07	−2.65***	−0.02	−2.40**	−0.04	−1.75*
$PEBC_t$	−0.03	−0.57	−0.06	−2.21**	0.04	1.11
$FEMALE \times PEBC_t$	0.00	2.32**	0.00	0.58	0.00	1.84*
$MKTSHARE_{t-1}$	0.12	1.29	0.22	6.10***	−0.11	−1.95**
$ZSCORE_{t-1}$	−0.00	−6.71***	−0.00	−3.63***	−0.00	−4.28***
$INST_{t-1}$	0.01	0.19	−0.02	−1.02	0.02	0.55
$BIG8_t$	−0.11	−2.47**	0.02	0.62	−0.13	−3.78***
$ATENURE_t$	−0.01	−0.4	0.02	1.09	−0.02	−1.17
SOX_t	0.10	2.57***	0.04	2.65***	0.05	1.97**
NOA_{t-1}	0.11	4.17****	0.05	3.60***	0.06	3.07***
$CYCLE_{t-1}$	0.00	2.90***	0.00	−3.88***	0.00	4.06***
$FSIZE_t$	0.03	3.43***	−0.01	−1.70*	0.04	6.55***
ROA_t	−0.43	−3.50***	−0.28	−3.43***	−0.21	−2.85***
MTB_{t-1}	0.00	−0.19	−0.00	−1.13	0.00	1.08
$GROWTH_t$	−0.07	−0.98	0.02	0.30	−0.09	−2.77***
F-statistic	9.54***		11.56***		11.52***	
Adjusted R^2	9.24%		10.69%		11.14%	
Number of obs.	1259		1325		1259	
Year fixed effects	Yes		Yes		Yes	

We report panel data regression results on the relation between gender and real earnings management. Panel A presents the results for total real activities manipulation (*RM*), while Panel B and Panel C present the results for abnormal production cost (*R_PROD*) and abnormal discretionary expenditures (*R_DISX*). *RM* is the sum of *R_PROD* and *R_DISX*, whereas *R_PROD* is the estimated residuals from Eq. (2) and *R_DISX* is the estimated residuals from Eq. (3) multiplied by −1. $FEMALE_t$ equals 1 if the firm has a female CEO for the fiscal year; zero otherwise. $PEBC_t$ is the CEO equity-based compensation as a proportion of total compensation. $FEMALE \times PEBC_t$ is an interaction term between the variables $FEMALE_t$ and $PEBC_t$. $MKTSHARE_{t-1}$ is market share at the beginning of the year, $ZSCORE_{t-1}$ is the Altman's *Z*-score at the beginning of the year, and $INST_{t-1}$ is the percent of institutional ownership at the beginning of the year. $BIG8_t$ equals 1 if the firm's auditor is one of the Big 8; zero otherwise. $ATENURE_t$ is the log of the number of years the auditor has been with the firm. SOX_t equals 1 if the fiscal year is after 2003; zero otherwise. NOA_{t-1} is net operating assets at the beginning of the year, which is computed as shareholders' equity less cash and marketable securities plus total debt. $CYCLE_{t-1}$ is the length of the operating cycles, which is computed as the days receivable plus the days inventory less the days payable at the beginning of the year. $FSIZE_t$ is the natural logarithm of total assets. ROA_t is the return on assets at fiscal year-end. MTB_{t-1} is the market-to-book ratio at the beginning of the year. $GROWTH_t$ is the one year percent change in sales from in year t−1 to year t. The symbol ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

5.3. Endogeneity concerns

Prior research suggests that female CEOs may be not randomly assigned to firms (Mateos de Cabo, Gimeno, & Escot, 2011; Mateos de Cabo, Gimeno, & Nieto, 2012), suggesting a potential for endogeneity bias in our results. Women may self-select into certain types of firms or corporate boards could discriminate based on gender (e.g. Baixauli-Soler et al., 2015; Huang & Kisgen, 2013). In accord, Baixauli-Soler et al. (2017) underscore that due to their higher risk aversion, women may be excluded from positions with firms that are more concerned with risk-taking. Likewise, higher risk-aversion could also lead females to self-select to firms or specific industries which take less risk (see Adhikari, 2012; Baixauli-Soler et al., 2015).

Earlier studies deal with this potential endogeneity problem using a Generalized Method of Moments (GMM) estimation and/or a two-stage least squares (2SLS) instrumental variable estimation. To mitigate possible endogeneity concerns, we focus on the 2SLS instrumental variable approach since the GMM estimator becomes erratic for small-sized panels (see Santos & Barrios, 2011). Moreover, studies by Huang and Kisgen (2013) and Baixauli-Soler et al. (2015, 2017) show that the 2SLS instrumental variable method is an appropriate methodology.

Pursuant to previous studies, our 2SLS approach is based on the exogenous gender equality instrument from Sugarman and Straus (1988). As in Huang and Kisgen (2013), we conjecture that the more friendly a state is to women's equality, the more likely a firm located in that state is to have a female executive. Sugarman and Straus (1988) construct their gender equality index (a continuous measure ranging from 0 to 100) by taking into account various economic, political, and legal indicators and then assign a gender equality score to each of the 50 U.S. states. The location of each firm's corporate headquarter is used to assign gender equality scores, where headquarter location data is taken from Compustat (only firms headquartered in the U.S. are retained in the sample for this analysis).[6] We find a mean *GEN_EQUAL* of 48.8 and a standard deviation is 6.28. These estimates are consistent with prior studies. For instance, Sugarman and Straus (1988) report a mean of 56.04 and a standard deviation of 4.14.

In the first-stage regression, the endogenous female CEO indicator variable (*FEMALE*) is regressed on the instrument (i.e., the gender equality score, denoted *GEN_EQUAL*) and the explanatory variables from Eq. (4) using a model of the general form:

$$FEMALE_t = \beta_0 + \beta_1 GEN\_EQUAL_t + \beta_2 PEBC_t + \sum_k \beta_{4,k} Cost\ of\ RM_{k,t} + \sum_l \beta_{5,l} Cost\ of\ AM_{l,t} + \sum_m \beta_{6,m} \text{Other}\ Control_{m,t} + u_t. \quad (6)$$

All variables were previously specified and are as defined earlier.

[6] Although Compustat reports current headquarters information, Engelberg, Ozoguz, and Wang (2018) and Pirinsky and Wang (2006) show that less than 2.5% of the firms in Compustat relocate. Therefore, we follow authors, including Almazan, Titman, De Motta, and Uysal (2010), Engelberg et al. (2018), Harris (2018), Nielsson and Wójcik (2016), and Pirinsky and Wang (2006), and use the headquarters data from Compustat to proxy corporate location.

Table 5
Gender, equity incentives and real activities manipulation: Instrumental variable approach.

Panel A – first stage regression			Panel B – second stage regression		
	Coef.	*t*-Stat		Coef.	*t*-Stat
INTERCEPT	0.396	3.84***	*INTERCEPT*	0.534	1.93**
GEN_EQUAL_t	0.004	2.16**	$INST\_FEMALE_t$	−1.659	−3.24***
$PEBC_t$	0.025	1.69*	$PEBC_t$	0.476	1.56
$MKTSHARE_{t-1}$	−0.233	−2.62***	$INST\_FEMALE \times PEBC_t$	1.184	2.03**
$ZSCORE_{t-1}$	0.001	2.97***	$MKTSHARE_{t-1}$	0.014	0.10
$INST_{t-1}$	0.043	1.04	$ZSCORE_{t-1}$	−0.002	−3.13***
$BIG8_t$	0.070	1.35	$INST_{t-1}$	0.156	3.35***
$ATENURE_t$	−0.046	−1.54	$BIG8_t$	0.126	2.05**
SOX_t	0.018	0.49	$ATENURE_t$	−0.081	−2.07**
NOA_{t-1}	0.007	0.24	SOX_t	0.159	4.05***
$CYCLE_{t-1}$	0.000	−3.71***	NOA_{t-1}	0.094	3.67***
$FSIZE_t$	−0.016	−1.76*	$CYCLE_{t-1}$	0.000	−2.74***
ROA_t	−0.154	−1.66*	$FSIZE_t$	−0.019	−1.77*
MTB_{t-1}	−0.003	−2.39**	ROA_t	−0.444	−3.87***
$GROWTH_t$	−0.022	−0.48	MTB_{t-1}	−0.008	−4.13***
			$GROWTH_t$	−0.207	−2.98***
F-statistic	2.73***			15.47***	
Adjusted R^2	2.81%			14.41%	
Number of obs.	1324			1259	
Year fixed effects	Yes			Yes	

This table reports regression results from the two-stage least squares (2SLS) instrumental variable approach to mitigate potential endogeneity problems. In the first-stage regression, the endogenous female CEO indicator variable ($FEMALE_t$) is regressed on the instrument (i.e., the gender equality score, denoted GEN_EQUAL_t) and the control variables in Eq. (4). All the control variable are previously specified and are as defined earlier. In the second-stage regression, we use the predicted values from the first stage to re-estimate the relation between female CEO equity incentives and total real earnings management (*RM*). $INST\_FEMALE_t$ is the instrumented female CEO variable from the first stage regression and $INST\_FEMALE \times PEBC_t$ is the interaction term $INST\_FEMALE_t$ and CEO equity-based pay ($PEBC_t$). All other variables were defined earlier. The symbol ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A of Table 5 provides the results from this first-stage regression. Consistent with other studies, we find that the state gender equality measure from Sugarman and Straus (1988) is positive and significantly related to the decision to hire a female CEO (*t*-statistic = 2.16). Hence, since the gender equality score has no influence on firm-level earnings management behavior, this instrument is therefore valid.

For the second-stage regression, we use the predicted values from the first stage to estimate the relation between female CEO equity incentives and earnings management as a robustness check for our earlier findings. We focus here on the total level of real activities manipulation (*RM*) as the dependent variable. Panel B of Table 5 reports the second-stage results, which reveals that the instrumented female CEO variable (denoted *INST_FEMALE*) is negative and significantly related to total real earnings management. In addition, the variable denoting the interaction between the instrumented female CEO variable and equity-based pay (denoted *INST_FEMALE* × *PEBC*) is positive and statistically significant at the 5% level.

This relationship affirms our earlier finding that as the level of equity-based compensation increases, so does the propensity for female CEOs to engage in more real earnings management. Moreover, these documented results suggest that endogeneity is not a major concern for this central finding. We find comparable results using the two sub-components of total real earnings management, but do not formally report those results here in the interest of concision and readability.

5.4. Matching concerns

Thus far, we have provided empirical results obtained from a matched sample based on firm size, the proportion of equity compensation, industry, and fiscal year, which is consistent with Adhikari (2012). To check the robustness of these results, we use a propensity score-based approach to obtain an alternative matched sample (see Huang & Kisgen, 2013; Rosenbaum & Rubin, 1983). As explained by Baixauli-Soler et al. (2017), under this procedure, each female-year observation is paired with a male-year observation, and both executives belong to firms that are virtually indistinguishable in terms of observable characteristics.

First, we compute a propensity score using a Probit model, where the female CEO variable (*FEMALE*) is regressed on firm size, return on equity, market-to-book ratio, debt-to-assets ratio, one-year sales growth rate, CEO percent equity compensation, CEO on the board indicator variable, CEO on compensation committee indicator variable, year dummies and industry dummies. The variables in the model are informed by those from prior literature. As in Huang and Kisgen (2013), we then use the propensity scores to perform a nearest neighbor match with replacement to other firms in a given year and industry. We further require that the maximum difference between the propensity score of the firm with the female-year observation and that of its matching peer cannot exceed 0.1% in absolute terms (see Baixauli-Soler et al., 2017; Faccio et al., 2016).

We then use the female-year observations and their corresponding propensity score paired male-year observations to re-examine the links between CEO gender, their equity incentives, and earnings management and report the results in Table 6. Panel A reports the results where total real earnings management (*RM*) is the dependent variable, while Panel B show results for the two subcomponents: abnormal production costs (*R_PROD*) and abnormal discretionary expenditures (*R_DISX*). Using the propensity score-matched sample, we find a consistently positive and significant coefficient on the interaction term between the female CEO indicator variable (*FEMALE*) and the fraction of equity-based pay (*PEBC*), which we again denote *FEMALE* × *PEBC*. Overall, there results once more indicate that female CEOs with higher levels of equity-based compensation engage in higher levels of real earnings management even after firms are paired by propensity matching. Hence, our main finding is robust to the matching procedure employed.

5.5. Alternative measures of equity incentives

We further assess the robustness of our results to our measurement choice of equity incentives. Prior research suggests that managers whose wealth are more sensitive to changes in the firm's stock price and risk level have greater risk-taking incentives, and so are more prone to misreport (e.g., Armstrong, Larcker, Ormazabal, & Taylor, 2013;

Table 6
Gender, equity incentives and real activities manipulation: Propensity score matched approach.

	Panel A		Panel B			
			Components of real activities manipulation			
	RM		*R_PROD*		*R_DISX*	
	Coef.	*t*-Stat	Coef.	*t*-Stat	Coef.	*t*-Stat
INTERCEPT	−0.117	−1.37	0.000	0.06	−0.105	−1.53
$FEMALE_t$	−0.144	−2.72***	−0.079	−3.33***	−0.064	−1.77*
$PEBC_t$	−0.135	−2.02**	−0.120	−3.71***	0.004	0.09
$FEMALE \times PEBC_t$	0.251	2.69***	0.132	3.03***	0.106	1.66*
$MKTSHARE_{t-1}$	0.308	2.72***	0.362	7.97***	−0.083	−1.04
$ZSCORE_{t-1}$	−0.003	−9.77***	−0.001	−3.88***	−0.002	−6.22***
$INST_{t-1}$	0.028	0.67	−0.009	−0.48	0.016	0.51
$BIG8_t$	−0.223	−3.79***	−0.025	−1.01	−0.190	−4.18***
$ATENURE_t$	0.043	2.66***	0.028	3.92***	0.014	1.18
SOX_t	0.160	4.51***	0.056	3.45***	0.106	4.55***
NOA_{t-1}	0.126	5.02***	0.049	4.07***	0.079	4.01***
$CYCLE_{t-1}$	0.000	1.54	0.000	−0.75	0.000	2.48***
$FSIZE_t$	0.020	2.30**	−0.016	−3.69***	0.034	4.76***
ROA_t	−0.404	−3.26***	−0.221	−5.36***	−0.140	−1.57
MTB_{t-1}	0.001	0.64	−0.001	−1.24	0.002	2.16**
$GROWTH_t$	−0.007	−0.24	0.000	−1.33	−0.026	−1.16
F-statistic	11.02***		14.63***		10.40***	
Adjusted R^2	12.53%		15.35%		11.89%	
Number of obs.	1170		1228		1170	
Year fixed effects	Yes		Yes		Yes	

This table reports regression results on the relation between gender and real earnings management based on a propensity score matched approach. We first compute a propensity score using a Probit model, where the female CEO variable ($FEMALE_t$) is regressed on firm size, return on equity, market-to-book ratio, debt-to-assets ratio, 1-year sales growth rate, CEO percent equity compensation, CEO on the board indicator variable, CEO on compensation committee indicator variable, year dummies and industry dummies. As in Huang and Kisgen (2013), we then use the propensity scores to perform a nearest neighbor match with replacement to other firms in a given year and industry. We further require that the maximum difference between the propensity score of the firm with the female-year observation and that of its matching peer cannot exceed 0.1% in absolute terms (see Baixauli-Soler et al., 2017; Faccio et al., 2016). We then re-examine the links between CEO gender, their equity incentives and earnings management using the propensity score matched sample. Panel A reports the results where total real earnings management (*RM*) is the dependent variable, while Panel B show results for the two subcomponents: abnormal production costs (*R_PROD*) and abnormal discretionary expenditures (*R_DISX*). All the variable in these models are previously specified and are as defined earlier. The symbol ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Bergstresser & Philippon, 2006). Hence, we consider the sensitivity of the CEO's wealth to changes in stock price (portfolio delta) and the sensitivity of the CEO's wealth to changes in return volatility (portfolio vega) as alternate measures of equity incentives. Following Core and Guay (2002), we calculate portfolio delta as the dollar change in the CEO's equity portfolio for a 1% change in stock price; likewise, portfolio vega is the dollar change in the CEO's equity portfolio for a 1% change in stock return volatility. As in Armstrong et al. (2013) and Bergstresser and Philippon (2006), we then deflate the portfolio delta (vega) estimate by CEO total cash compensation, which we denote *DELTA* (*VEGA*).

Table 7 reports the regression results using these two alternative measures of equity incentives. More specifically, we re-examine the links between CEO gender, their equity incentives and total real earnings management (*RM*) using the propensity score matched sample. In addition to the *DELTA* and *VEGA* variable, the other variables of primary interest are: $FEMALE_t$, $FEMALE \times DELTA$ and $FEMALE \times VEGA$. Again, *FEMALE*, equals 1 if the firm has a female CEO for the fiscal year; zero otherwise. $FEMALE \times DELTA$ is an interaction term between the variables *FEMALE* and *DELTA*. Similarly, $FEMALE \times VEGA$ is an interaction term between the variables *FEMALE* and *VEGA*. All the control variable in these models are previously specified and are as defined earlier.

The results are noteworthy. As shown in the table, the coefficient on the *FEMALE* variable is negative, but insignificant in both model specifications. Hence, using these alternate incentive measures, women CEOs have no discerning effect on real earnings management. However, we find a positive and significant relation between real earnings management and both measure of CEO risk-taking incentives. *DELTA* and *VEGA* are both significant at the 5% level, which support the view that managers whose wealth are more sensitive to changes in the firm's stock price and risk level are more prone to engage in earnings management (e.g., Armstrong et al., 2013; Bergstresser & Philippon, 2006). While earlier studies focus on accrual manipulation, our results show that CEO risk-taking incentives also affect real activities manipulation.

Moreover, we also find positive and statistically significant coefficients on both the $FEMALE \times DELTA$ and $FEMALE \times VEGA$ interaction terms. Hence, the results indicate that *female* CEOs whose wealth are more sensitive to changes in their firm's stock price and risk level exhibit a higher propensity to engage in real earnings management. These results support our principal argument that gender differences in earnings management do not remain robust given greater equity incentives. Consistent with our main hypothesis, the incentive effects of equity based compensation dominate the effects of gender on real earnings management.

5.6. Beating analysts' forecasts

The finance literature also uses firms' tendency to beat analysts' earnings forecasts as an outcome-based proxy for earnings management. For instance, firms are more likely to report positive earnings surprises when top management has higher equity incentives, indicating that more equity-based compensation motivates managers to manipulate earnings in order to beat the analysts' forecasts (Cheng & Warfield, 2005; Jiang et al., 2010). Therefore, in this section of the paper, we focus our attention on whether CEO gender affects the likelihood of beating earnings benchmarks in the presence of substantial equity incentive. Again, motivated by agency theory, we predict that

Table 7
Alternative measures of equity incentives.

	Model 1		Model 2	
	Coef.	*t*-Stat	Coef.	*t*-Stat
INTERCEPT	−0.138	−1.54	−0.136	−1.53
$FEMALE_t$	−0.027	−0.95	−0.026	−0.93
$DELTA_t$	0.006	2.07**	–	–
$FEMALE \times DELTA_t$	0.015	4.71***	–	–
$VEGA_t$	–	–	0.006	2.13**
$FEMALE \times VEGA_t$	–	–	0.016	4.67***
$MKTSHARE_{t-1}$	0.057	1.41	0.061	1.52
$ZSCORE_{t-1}$	−0.152	−9.58***	−0.152	−9.56***
$INST_{t-1}$	0.018	0.56	0.018	0.57
$BIG8_t$	−0.133	−4.02***	−0.133	−4.02***
$ATENURE_t$	0.093	2.92***	0.091	2.88***
SOX_t	0.135	4.32***	0.135	4.33***
NOA_{t-1}	0.070	1.28	0.070	1.28
$CYCLE_{t-1}$	0.096	2.11**	0.096	2.12**
$FSIZE_t$	0.082	2.15**	0.082	2.15**
ROA_t	−0.115	−3.22***	−0.115	−3.24***
MTB_{t-1}	0.024	0.85	0.024	0.84
$GROWTH_t$	−0.014	−0.40	−0.015	−0.42
F-statistic	9.42***		9.46***	
Adjusted R^2	10.11%		10.12%	
Number of obs.	1128		1128	
Year fixed effects	Yes		Yes	

This table reports results using the sensitivity of the CEO's wealth to changes in stock price (portfolio delta) and the sensitivity of the CEO's wealth to changes in risk (portfolio vega) as alternative measures of equity incentives. We first compute a propensity score using a Probit model, where the female CEO variable is regressed on firm size, return on equity, market-to-book ratio, debt-to-assets ratio, 1-year sales growth rate, CEO percent equity compensation, CEO on the board indicator variable, CEO on compensation committee indicator variable, year dummies and industry dummies. As in Huang and Kisgen (2013), we then use the propensity scores to perform a nearest neighbor match with replacement to other firms in a given year and industry. We further require that the maximum difference between the propensity score of the firm with the female-year observation and that of its matching peer cannot exceed 0.1% in absolute terms (see Baixauli-Soler et al., 2017; Faccio et al., 2016). We compute CEO portfolio delta (vega) as the dollar change in the CEO's equity portfolio for a 1% change in stock price (return volatility) scaled by total cash compensation (see Armstrong et al., 2013; Bergstresser & Philippon, 2006; Core & Guay, 2002). We then re-examine the links between CEO gender, their equity incentives and total real earnings management (*RM*) using the propensity score matched sample. $FEMALE_t$ equals 1 if the firm has a female CEO for the fiscal year; zero otherwise. $DELTA_t$ and $VEGA_t$ are the CEO's delta and vega equity incentives variables, respectively. $FEMALE \times DELTA_t$ is an interaction term between the variables $FEMALE_t$ and $DELTA_t$. $FEMALE \times VEGA_t$ is an interaction term between the variables $FEMALE_t$ and $VEGA_t$. All the control variable in these models are previously specified and are as defined earlier. The symbol ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

female CEOs follow their conservatism and risk-aversion values in the absence of equity incentives, but depart from conservative and risk-averse decision-making at higher levels of equity incentives to capitalize on the increased level of compensation.

We test this prediction by estimating the following conditional (fixed-effects) logistic regression for matched pairs dataset:

$$\Pr ob(BEAT = 1) = \gamma_1 FEMALE_t + \gamma_2 PEBC_t + \gamma_3 FEMALE_t \times PEBC_t + \sum_m \gamma_{4,m} Control_{m,t} + v_t \quad (7)$$

where the dependent variable *BEAT* equals one if a firm's actual annual earnings per share reported in Institutional Brokers' Estimate System (*IBES*) is greater than the latest consensus earnings forecast from the IBES unadjusted summary file, and zero otherwise. Since women are less likely to hold the title of CEO than men (Bertrand & Hallock, 2001), conditional logistic regression mitigates sparse-data biases that would arise in ordinary logistic regression analysis (note that there is no intercept term).

Table 8
Logistic regression results of gender and equity incentive on beating analysts' forecasts.

	Model 1		Model 2	
	Coef.	Wald X^2	Coef.	Wald X^2
$FEMALE_t$	−0.652	8.37***	−0.633	6.99***
$PEBC_t$	−2.560	1.20	−2.909	1.47
$FEMALE \times PEBC_t$	0.972	5.79**	0.880	4.22**
$NUMEST_t$	−0.077	0.40	−0.209	2.35
$DISPERSION_t$	–	–	−0.221	0.47
$REVUP_t$	–	–	0.655	9.19***
$SHARES_t$	–	–	−0.127	2.16
$FSIZE_t$	0.117	2.63*	0.159	2.95*
$GROWTH_t$	0.074	0.14	0.012	0.00
ROA_t	0.982	2.79*	1.230	3.41*
NOA_t	–	–	0.297	2.56*
LEV_t	−1.123	6.18***	−1.266	6.69***
$LITIGATION_t$	–	–	−0.068	0.03
$IMPLICITCLAIMS_t$	–	–	−0.138	0.05
$BIG8_t$	–	–	1.083	8.66***
Likelihood ratio X^2	24.06***		47.54***	
−2 log likelihood	462.53		483.82	
Number of obs.	1358		1354	

We report logistic regression results on the impact of CEO gender and equity incentives on the likelihood of beating analysts' earnings forecasts. The dependent variable equals 1 if a firm's actual annual earnings per share reported in IBES is greater than the latest analyst consensus forecast from the IBES unadjusted summary file; zero otherwise. $FEMALE_t$ equals 1 if the firm has a female CEO for the fiscal year; zero otherwise. $PEBC_t$ is the CEO equity-based compensation as a proportion of total compensation. $FEMALE \times PEBC_t$ is an interaction term between the variables $FEMALE_t$ and $PEBC_t$. We use the following set of control variables. $NUMEST_t$ is the natural logarithm of the number of analysts whose forecasts are included in the IBES consensus annual earnings forecast. $DISPERSION_t$ is the coefficient of variation of the consensus forecast (standard deviation divided by the mean of analyst forecasts). $REVUP_t$ equals 1 if at least one analysts revised his/her forecast upward in the three months prior to the earnings announcement for fiscal year t (0 otherwise). $SHARES_t$ is the number of common shares outstanding at fiscal year-end. $FSIZE_t$ is the natural logarithm of total assets. $GROWTH_t$ is the one year percent change in sales from in year t−1 to year t. ROA_t is the return on assets at fiscal year-end. NOA_{t-1} is net operating assets at the beginning of the year, which is computed as shareholders' equity less cash and marketable securities plus total debt. LEV_t is the debt-to-asset ratio. $LITIGATION_t$ equals 1 if the firm is in the following industries: pharmaceutical/biotechnology (SIC codes 2833–2826, 8731–8734), computer (3570–3577, 7370–7374), electronics (3600–3674), or retail (5200–5961), and zero otherwise. $IMPLICITCLAIMS_t$ equals one minus the ratio of gross PPE to total assets. $BIG8_t$ equals 1 if the firm's auditor is one of the Big 8; zero otherwise. The symbol ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Our three main variables of interest (i.e. *FEMALE*, *PEBC*, and $FEMALE \times PEBC$) were previously specified in Eq. (4) and are as defined earlier. Pursuant to the literature, we control for the number of analysts making forecasts (*NUMEST*), the variation of the forecasts surrounding a given firm (*DISPERSION*), and whether at least one analyst revised a forecast upward in the three months prior to the earnings announcement (*REVUP*). We also control for the number of common shares outstanding at the end of the fiscal year (*SHARES*), firm size (*FSIZE*), the one year percent change in sales (*GROWTH*), return on assets (*ROA*), net operating assets (*NOA*), and the debt to asset ratio (*LEV*). Also included as a control in the model is *LITIGATION*, which equals one if the firm is in the pharmaceutical/biotechnology, computer, electronics, or retail industries. *IMPLICITCLAIM*, which equals one minus the gross PPE to total assets, and *BIG8*, which is a big eight auditor dummy, are also included as controls.

Table 8 reports the results of the likelihood of beating analysts' forecasts. We report two model specifications that utilize the full sample and include *FEMALE*, *PEBC*, and the interaction term between

Table 9
Logistic regression results of gender, delta and vega on beating analysts' forecasts.

	Model 1		Model 2	
	Coef.	Wald X^2	Coef.	Wald X^2
$FEMALE_t$	−0.208	2.61*	−0.660	8.77***
$DELTA_t$	−0.041	0.17	–	–
$FEMALE \times DELTA_t$	−0.052	0.14	–	–
$VEGA_t$	–	–	−3.215	8.40***
$FEMALE \times VEGA_t$	–	–	3.188	7.40***
$NUMEST_t$	0.023	0.01	0.149	0.51
$DISPERSION_t$	0.113	0.05	−0.018	0.00
$REVUP_t$	0.194	4.57**	0.230	5.16**
$SHARES_t$	−0.280	2.73*	−0.316	3.05*
$FSIZE_t$	0.117	0.64	0.101	0.43
$GROWTH_t$	0.003	0.74	−0.001	0.04
ROA_t	2.331	4.06**	3.722	6.24***
NOA_t	0.031	0.27	0.025	0.22
LEV_t	−0.064	0.02	0.069	0.02
$LITIGATION_t$	0.909	3.37*	1.356	4.70**
$IMPLICITCLAIMS_t$	−0.157	0.09	0.276	0.27
$BIG8_t$	0.661	1.43	0.844	2.06
Likelihood ratio X^2	24.43*		35.28***	
−2 log likelihood	256.98		244.75	
Number of obs.	1124		1124	

We report logistic regression results on the impact of CEO gender and the alternate equity incentives variables on the likelihood of beating analysts' earnings forecasts. The dependent variable equals 1 if a firm's actual annual earnings per share reported in IBES is greater than the latest analyst consensus forecast from the IBES unadjusted summary file; zero otherwise. $FEMALE_t$ equals 1 if the firm has a female CEO for the fiscal year; zero otherwise. $DELTA_t$ and $VEGA_t$ are the CEO's delta and vega equity incentives variables, respectively. $FEMALE \times DELTA_t$ is an interaction term between the variables $FEMALE_t$ and $DELTA_t$. $FEMALE \times VEGA_t$ is an interaction term between the variables $FEMALE_t$ and $VEGA_t$. All the control variable are previously specified and are as defined earlier. The symbol ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

them. The results provide a similar picture of the officious effects of equity based incentives. In particular, While *FEMALE* is significantly negative, the positive and statistically significant coefficient on the interaction term in both models suggests that females with higher levels of equity based compensation are more likely to beat analysts' forecasts which is consistent with the notion that equity based compensation incentivizes females to engage in higher levels of earnings management.

For robustness, Table 9 reports results using the *DELTA* and *VEGA* variables as alternate measures of equity incentives. While there is no evidence that CEO gender or their *DELTA* related incentives influence the likelihood of beating analysts' forecasts (in Model 1), the results show that CEO gender and their *VEGA* related incentives significantly affects the likelihood of beating analysts' benchmarks. As shown in Model 2, the coefficient on the *FEMALE* variable is significantly negative. In contrast, the coefficient on both the *VEGA* and the *FEMALE* × *VEGA* variables is positive and highly significant. Consequently, like their male counterparts, the higher the sensitivity of female CEOs' wealth to changes in their stock return volatility, the more likely they are to beat analysts' forecasts, which provide some support for our main hypothesis.

6. Discussion

Gender socialization theory suggests that earnings quality improves when females are in senior management because of gender differences in risk-taking and ethical attitude, but empirical analyses of the topic yield mixed results. Our study, therefore, seeks to advance and provide clarity to the literature by considering the role of equity-based compensation as a boundary condition of the gender and earnings management relationship. More specifically, our study posits that, at higher levels of equity incentives, males and females exhibit similar behaviors in terms of the propensity to manage earnings.

Our empirical analysis focuses on the CEO and our results indicate that the earnings management behaviors of all CEOs – regardless of gender – are influenced by higher-levels of equity-based compensation. In particular, we find that, at lower levels of equity-based compensation, female CEOs manage earnings to a lesser degree than their male counterparts. Yet, at higher levels of equity-based compensation, female and male CEOs exhibit similar earnings management behaviors. Consequently, our results suggest that, in the presence of substantial equity-based pay, female CEOs diverge from conservative and risk averse behaviors in order to capitalize on the increased level of compensation. That is, the incentive effects of equity-based compensation appear to dominate the mitigating effect of gender on earnings management.

We note that our empirical findings are robust to a variety of model specifications and robustness checks. First, using both univariate and multivariate empirical analyses, we consider the effects of gender and higher-levels of equity-based compensation in terms of both real earnings management as well as the individual subcomponents of real earnings management (abnormal production costs and abnormal discretionary expenditures). We also use a 2SLS instrumental variable approach to confirm that our findings are robust to endogeneity concerns. Further analyses confirm that our results are robust to using a propensity score-matching sample and alternative measures of equity incentives (portfolio delta and portfolio vega). A final robustness exercise provides further support for our main findings and shows that firms led by female CEOs are less likely to beat analysts' benchmarks but, at higher levels of equity-based compensation, no differences exist between firms led by male or female CEOs.

Considered in their entirety, our results suggest that, regardless of gender, managers with higher levels of equity incentives are more likely to manipulate earnings. Our paper, therefore, provides a novel contribution to the earnings management literature by showing that equity incentives are boundary conditions to the CEO gender and earnings management relationship. As a result, we offer a more complete explanation of how gender differences in top management can influence earnings management behavior and thereby help to resolve the conflicting results reported by prior studies. Our paper also aligns with research suggesting that the relationship between gender and ethical decision-making is not straightforward (see Dalton & Ortegren, 2011; Deaux & Major, 1987) and with studies indicating that gender diversity does not reduce agency costs for all firms (e.g. Jurkus et al., 2011). In addition, our study is in accordance with research demonstrating that at some levels, managerial equity increases, rather than decreases, agency costs because of inherent nonlinear incentives (Chen, 2003; Morck, Shleifer, & Vishny, 1988).

6.1. Practical implications

Our findings provide several avenues for consideration by organizations and corporate boards. First, while equity-based compensation is a common means of rewarding top managers for firm performance, our findings suggest that careful consideration should be given to the levels provided in compensation packages. Additionally, growing diversity efforts within organizations have resulted in an increased presence of female CEOs, which has increased firm efficiency and performance. One of the key elements of this success has often been linked to higher levels of risk aversion. Yet, our study indicates that females abandon risk aversion in favor of self-interest when equity-based compensation increases. Therefore, boards should consider the configuration of its compensation packages for all top management members, regardless of gender.

The findings of this study have some limitations that should be considered. First, there were only 20 female CEOs in 1999 which only accounted for 2.82% of our sample. However, the number of CEOs more

than doubled to 50 by 2011 (7.42% of the sample), which enhances the robustness of our findings. Secondly, the use of archival data does not provide access to direct information regarding the psychological decision making processes of the CEOs. Lastly, while our findings are generalizable to larger U.S. firms, care must be taken to not infer the same practices will occur in smaller firms and in privately owned firms, which may have higher levels of monitoring of top management.

6.2. Concluding remarks

This article extends previous research by examining the role of equity-based compensation in the gender–earnings management relationship. Our findings support the notion that female CEOs are less likely to engage in earnings management than their male counterparts. However, in the presence of increased levels of equity compensation, female CEOs engage in manipulation practices that are similar to their male counterparts.

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Oneil Harris, Associate Professor Oneil Harris is a professor of finance at East Carolina University. He teaches undergraduate and graduate courses in corporate finance, financial markets, and financial risk management. Dr. Harris has worked on research projects in many fields of finance. His academic research has been published in a variety of journals including the Financial Review, Journal of Banking and Finance, Journal of Multinational Financial Management, Quarterly Review of Economics and Finance, and other journals.

J. Bradley Karl, Assistant Professor Brad is an Assistant Professor of Finance and Risk Management/Insurance in the College of Business at East Carolina University. His research interests include health insurance market operations, medical professional liability risk, and catastrophic risk. Prior to joining ECU, Brad earned his PhD in Risk Management and Insurance from Florida State University. He is currently a member of the Risk theory Society, the American Risk and Insurance Association, and the Southern Risk and Insurance Association.

Ericka Lawrence, Assistant Professor Ericka R. Lawrence is an Assistant Professor of Management at East Carolina University. She teaches Organizational Development and Change. Her research focuses on a variety of organizational behaviors, including leadership, work-family issues, ethical decision making, and burnout. Dr. Lawrence has previously published work in Journal of Behavioral and Applied Management, Advances in Healthcare Management, and the Journal of Management, Spirituality and Religion among other journals. She has presented her research at the Academy of Management and Southern Management Association annual meetings. Dr. Lawrence also is a Certified Public Accountant. Prior to academia, she served as a tax manager for PricewaterhouseCoopers, LLP in Birmingham, AL.