FEMALE CEO AND INTERNAL CONTROL WEAKNESSES

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Abstract

This study examines how the gender of CEOs affects internal controls over financial reporting. According to the upper echelon theory, managers' demographics can determine the choices of strategies. Prior literature documents the characteristics of CEOs relevant to internal controls, such as the CEO's age, entrenchment (Lin, Wang, Chiou, & Huang, 2014), and experience (Oradi, Asiaei, & Rezaee, 2020); however, the impact of the CEO's gender on internal controls has not been explored. We hypothesize that female CEOs are negatively associated with internal control weaknesses because they are reported to act more conservatively and ethically than male CEOs. We use logit and Poisson regression models to test the association between the CEO's gender and internal control weaknesses of U.S. public companies from 2004 to 2020. Our results show that female CEOs are less likely to report an internal control weakness both in the current year and in the future years. We follow You (2021) and use a two-stage model to address the potential endogeneity concerns and show that our findings are not biased. Our study documents an important factor that influences internal controls, and we provide evidence of the benefits of female CEOs on the quality of financial reports.

Keywords: Female CEO, Gender Diversity, Internal Control, Financial Reporting, Corporate Governance

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1. INTRODUCTION

The United States congress passed Sarbanes-Oxley Act (SOX) in 2002 in response to major corporate accounting scandals, such as Enron, WorldCom, Tyco, and Sunbeam. The regulators emphasize the importance of internal controls and require top management to take responsibility for establishing and maintaining internal controls. Internal control, an important part of corporate governance, is a process that is designed to provide reasonable assurance regarding the reliability of financial reporting, effectiveness and efficiency of operations, and compliance with applicable laws and regulations (Public Company Accounting Oversight Board [PCAOB], 2010). An effective internal control assures

the reliability of the financial information (PCAOB, 2007); on the contrary, internal control weaknesses are reported to be positively correlated with the likelihood of restatement (Chan, Farrell, & Lee, 2008) and financial reporting fraud (Cumming, Leung, & Rui, 2015). Despite SOX's requirements that CEOs certify the effectiveness of internal controls on the 10-K filings (Securities and Exchange Commission [SEC], 2003), agency conflicts may exist. The agency theory argues that the interests of executives may not align with those of shareholders, and executives have the incentive to put more effort and attention into projects that benefit themselves rather than shareholders. For example, Lin et al. (2014) provide evidence that top management might override the internal control systems or use internal control weaknesses to achieve better performance or higher compensation.

In the meantime, the upper echelon theory points out that managers' demographics can determine the choices of strategies (Hambrick & Mason, 1984) and, therefore, can shape CEO behaviors related to internal controls. Previous researchers investigate what characteristics of CEOs are relevant to internal controls and found that CEOs' age, entrenchment (Lin et al., 2014), and financial experience (Oradi et al., 2020) are negatively correlated with internal control weaknesses. Gender is another important CEO characteristic. Generally, women's leadership style tends to be more sympathetic, receptive, caring, and cooperative than men's (Kim, 2013). Previous studies find that greater female representation on the board is associated with less earnings management (Damak, 2018) and a lower likelihood of disclosing internal control weaknesses (Chen, Eshleman, & Soileau, 2016). Furthermore, female CEOs are reported to act more conservatively and ethically than male CEOs and should be effective supervisors in financial reporting. However, studies examining the effect of female CEOs on financial reporting are sparse in the literature, and no study specifically investigates how female CEOs affect internal controls. To this end, we are interested in exploring whether the CEO's gender matters to internal controls over financial reporting.

We examine the relation between the presence of a female CEO and internal control weaknesses for U.S. public firms on the Compustat database from 2004 to 2020. We test the likelihood of reporting internal control deficiencies and the number of reported internal control deficiencies by logit regression and Poisson regression models, respectively. We find that companies with female CEOs are less likely to report internal control weaknesses and report a smaller number of internal control deficiencies than companies with male CEOs. These findings support our prediction that women CEOs are negatively associated with internal control weaknesses.

We recognize that potential endogeneity issues, such as endogenous matching, reverse causality, and omitted variables, may bias our findings. To address these endogeneity concerns, we follow You (2021) and use a two-stage model to ensure the relationship between the gender of CEOs and internal control weaknesses is not biased. We identify two instrumental variables, the average tenure of the board of directors and departure of female directors, that are determinants of female CEO appointments but not found to be related to internal control weaknesses. We use the two instruments to predict the likelihood of appointing a female CEO in the first stage. Then, we run our basic model with the predicted likelihood as the independent variable in the second stage. We show that the predicted likelihood of a female CEO being appointed is significantly negatively associated with the likelihood of disclosing internal control weaknesses, suggesting that our main findings on the negative association between female CEOs and internal control weaknesses is not biased.

We also conduct additional analysis on the internal control weaknesses changes in the future years. We document that internal control weaknesses are significantly improved in the next five years for companies with female CEOs, compared with those with male CEOs, further supporting that female CEOs are more likely to maintain internal control quality.

Our contributions are fourfold. First, we are the first few studies to document the positive impact of top female management on financial reporting quality. Specifically, we show that female CEOs can influence internal controls positively. Prior literature reports a higher proportion of female directors on the board enhances internal control quality (Damak, 2018; Chen et al., 2016); nonetheless, it is managers who implement the internal control system and operate within the system on a day-to-day basis. Some other studies explore the impact of female CEOs. For example, Na and Hong (2017) examine CEO gender and earnings management, and Francis, Hasan, Park, and Wu (2015) study how female CFOs affect firms' accounting conservatism. Our study is different from these female-CEO works in two ways. Firstly, earnings management and accounting conservatism are measures that reflect a company's financial reporting quality; and internal control used in our study is an important element of corporate governance that can determine the financial reporting quality. Secondly, these studies may indicate a relationship between female CEOs and financial reporting; however, as we discuss in Section 2, there are tensions in this relationship and it is an empirical question worth exploring. Our study is the first to directly probe how internal controls are affected by the CEO's gender.

Second, besides characteristics of a company's financial performance (Doyle, Ge, & McVay, 2007), the expertise of the board (Hoitash, Hoitash, & Bedard, 2009), and incentives of management (Balsam, Jiang, & Lu, 2014), we add to the literature another critical factor, gender of CEOs, that affects the quality of financial information.

Third, studying how female CEOs affect internal controls also provides important insights for companies as they appoint executives. The number of female CEOs who run the Fortune 500 global companies broke the record again in 2021; yet, the percentage of female CEOs in the U.S. is still significantly lower than that in the rest of the world (Hinchliffe, 2021). Female CEOs are reported to manage more effectively and take less risk (Faccio, Marchica, & Mura, 2016) than male CEOs; however, most female "chiefs" are merely responsible for human resources, administration, or legal

functions rather than core businesses (Fuhrmans, 2020). Our findings show one of the important values of a female CEO and may give insight to companies when top executives are selected.

Finally, our findings have policy implications. The digital age makes social and environmental vulnerabilities surface rapidly and directly impact corporate performance, and the fight for equality is one of the top five topics in environmental, social, and governance (ESG) reporting. SEC has responded to investors' demand for information on companies' workplace diversity by preparing rules for disclosing human capital (Gensler, 2021). Our evidence suggests that the diversity of the executive team can be considered one of the disclosing matrices.

The rest of this paper is structured as follows. Literature review and hypothesis development are in Section 2, followed by the research design in Section 3. Results are reported in Section 4, and Section 5 concludes the paper.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. CEOs and internal controls

The Committee of Sponsoring Organizations of the Treadway Commission (COSO)'s *Internal Control — Integrated Framework* provides guidance on designing and implementing an effective internal control system that is expected to detect and prevent fraud and improve financial reporting quality (COSO, 2013). Researchers find empirical evidence that internal control weaknesses, especially at the company level, are significantly associated with lower quality financial reporting (Doyle et al., 2007). Consistently, regulators also link internal control weakness and fraudulent financial reporting (PCAOB, 2007). In response to the financial scandals in the early 2000s, Section 302 of SOX requires the CEOs and CFOs of the listed companies to establish and maintain effective internal controls over financial reporting and report any internal control deficiencies in their quarterly and annual reports. Section 404 of SOX further requires the management to assess and report the effectiveness of the internal controls (SEC, 2003). Additionally, the companies must include their external auditor's opinion on the effectiveness of the internal controls in their annual reports (SEC, 2003).

Top management takes responsibility for establishing and maintaining the effectiveness of internal controls not only because of the regulatory requirements; CEOs should also have incentives to do so because internal control weaknesses may lead to significant penalties for them. Besides the criminal penalties imposed by the SOX regulation, reputational damage is another concern for CEOs who report regular internal control weaknesses (Yazawa, 2015). Moreover, reporting internal control weaknesses results in lower stock prices (Ashbaugh-Skaife, Collins, Kinney, & LaFond, 2008; Chen, Chan, Dong, & Zhang, 2017), which in turn decreases the CEO's personal wealth (Kobelsky, Lim, & Jha, 2013). Furthermore, lower quality internal control is associated with a higher cost of capital (Ashbaugh-Skaife et al., 2008), lower operating efficiency (Cheng, Goh, & Kim, 2018), and lower net incomes (Feng, Li, & McVay, 2009). Consistently, Hoitash, Hoitash, and Johnstone (2012) find that disclosing internal control weaknesses leads to decreased CEO compensations. Lastly, Kobelsky et al. (2013) argue that the board of directors may interfere when regular internal control material weaknesses are detected and even terminate the CEO's employment.

On the other hand, agency problems exist in the internal control setting. CEOs may have incentives to maintain weak internal controls for their own interests. For example, inadequate internal controls that lack formal policies and procedures provide the opportunity for managers to select accounting estimates and methods that benefit their own interests, leading to low-quality financial information (Doyle et al., 2007; Ashbaugh-Skaife et al., 2008). Studies also show that managers may take advantage of the internal control material weaknesses and misappropriate the companies' assets if they are not effectively monitored (Lin et al., 2014; Lisic, Neal, Zhang, & Zhang, 2016).

With the contrasting incentives for top management, it is an empirical question of how CEOs affect internal controls. In studying factors that shape CEO behaviors related to internal controls, the demographic characteristics are important information to explore. Because the upper echelon theory suggests that organizational strategic choices and performance are outcomes of the demographic information of top managers (Hambrick & Mason, 1984). Demographic information reflects managers' personality, values, and cognitive bases, which impact their eventual perceptions and information processing (Hambrick & Mason, 1984; Chuang, Nakatani, & Zhou, 2009). A series of empirical studies support the notion of the upper echelon theory and find a significant association between managers' characteristics and performance variations, organizational growth, technological innovation, information technology adoption, financial disclosure, accounting choices, cash policies, and financial leverage decisions (Kitchell, 1997; Chuang et al., 2009; Ge, Matsumoto, & Zhang, 2011; Orens & Reheul, 2013; Ting, Azizan, & Kweh, 2015).

It is especially critical to examine CEO characteristics when studying internal control questions. COSO framework includes five components of internal control: control environment, risk assessment, control activities, information and communication, and monitoring activities, among which the control environment is the most fundamental and pervasive element (McNally, 2013). Top management establishes the tone of the company regarding the importance of integrity and ethical values, which is essential in maintaining an effective internal control structure. Thus, according to the echelon theory, the demographic characteristics of a CEO, such as personality, ethical values, background, and ability, should play a critical role in building a firm's internal control environment. For example, Lin et al. (2014) state that firms with higher CEO entrenchment and younger CEOs are less likely to report an internal control material weakness. However, using Japanese data, Yazawa (2015) finds that longer management tenure decreases the likelihood of disclosing internal control material weaknesses. Lisic et al. (2016) show that powerful CEOs weaken audit committees' effects on internal

control quality, resulting in more internal control weaknesses. Previous scholars also investigate the effect of CEOs' compensation on internal controls. Kobelsky et al. (2013) report that CEOs' long-term incentives are negatively associated with the internal control weakness disclosure. Liu and Liu (2017) separate CEOs' equity portfolios into the ones that are sensitive to stock price and the ones that are sensitive to stock return volatility. They find that CEOs more (less) promptly remedy the internal control material weaknesses when their equity portfolios more depend on the price (volatility) of the stocks. In addition, CEOs' reputation, overconfidence, financial background, and duality are significantly associated with firms' internal control quality (Michelon, Bozzolan, & Beretta, 2015; Lee, 2016; Khlif & Samaha, 2019; Oradi et al., 2020).

2.2. Female CEOs and internal controls

Previous studies suggest that psychological and biological differences between males and females cause different personalities (Costa, Terracciano, & McCrae, 2001). First, females have a more vigorous ethical nature compared to males. For example, Betz O'Connell, and Shepard (1989) find evidence that males are more likely to engage in unethical actions, such as trading stocks using insider information than females. Weeks, Moore, McKinney, and Longenecker (1999) conducted a survey and reported that females maintain a stricter ethical standard than their male counterparts. Lund (2008) documents that female marketing professionals show significantly higher ethical attitudes than males. Similarly, compared to their male counterparts, female accountants rank ethics in a higher position when recruiting entry-level public accountants (Ibrahim & Angelidis, 2009). Further, Cumming et al. (2015) state that female directors and chairpersons are less likely to commit fraud than males. Na and Hong (2017) also find that male CEOs engage in accrual and real earnings management to avoid a net loss while female CEOs do not.

Second, females are found to be more risk-averse and conservative than males. Khan and Vieito (2013) report a negative association between female executives and business risks. Niessen and Ruenzi (2006) state that female mutual fund managers are less likely to take risks than males. Similarly, Palvia, Vähämaa, and Vähämaa (2015) find that banks led by female CEOs are more conservative and hold higher levels of capital. In terms of firm operations, Huang and Kisgen (2013) find evidence that female executives are more cautious in making financial decisions, such as acquisition and debt issuance. Likewise, Faccio et al. (2016) suggest that female CEOs tend to avoid taking risky opportunities, leading to lower leverages and earnings volatility. Lastly, a series of prior literature find that firms with female leaders are associated with more conservative financial reporting (Barua, Lin, & Sbaraglia, 2010) or tax filing (Francis, Hasan, Wu, & Yan, 2014).

As female CEOs are more ethically sensitive and more risk averse, they are less likely to take advantage of a weak internal control system for personal interests. Therefore, we expect female CEOs to be more likely to establish and maintain a higher quality internal control system, compared to their male counterparts. We state our hypothesis as follows:

H1: A female CEO is negatively associated with internal control material weaknesses.

Alternatively, some arguments are against our hypothesis. Frye and Pham (2018) argue that female CEOs, who can make it to the top of their industry, may behave similarly to male CEOs. Atkinson, Baird, and Frye (2003) find no difference in risk tolerance between male and female executives. Interestingly, Berger, Kick, and Schaeck (2014) find that boards with more female members increase bank portfolio risks. Further, Zalata, Ntim, Aboud, and Gyapong (2019) study the earning classification shifting and conclude that female CEOs are not necessarily more ethical than male CEOs. Therefore, whether female CEOs lead to higher quality internal controls remains an empirical question worth exploring.

3. RESEARCH METHODOLOGY

We are interested in the relationship between the female CEO and the overall internal control status of the company, being whether the company discloses any material weakness in its internal controls and the number of internal control weaknesses that are reported in the financial statements. Because of the discrete nature of the internal control weakness data, the logit regression and Poisson regression models are appropriate for binary variables and count variables respectively. In addition, the association between female CEO and internal control weaknesses can suffer endogeneity. We follow You's (2021) two-stage procedure to ensure our finding is robust. We will discuss the endogeneity issue with our test design in Subsection 3.2 and Subsection 4.2.

3.1. Model

We start our analysis by the logit regression model that regresses the disclosure of internal control weaknesses on the gender of the CEO:

$$\Pr(WEAK = 1_{i,t}) = \beta_0 + \beta_1 CEOFEMALE_{i,t} + \sum \beta Controls_{i,t} + \varepsilon \quad (1)$$

The dependent variable in the main test, *WEAK*, is a dummy variable that equals one when the company reports at least one internal control weakness and zero otherwise. $CEOFEMALE_{i,t}$ is the variable of interest, which is equal to one if the company *i* employs a female CEO in year *t* and zero otherwise. Next, we use the number of weaknesses reported (*COUNT_WEAK*) as the dependent variable and run Poisson regression to check whether the finding from equation (1) continues to hold. We also test the association between female CEOs and the improvement of internal control quality in the future by observing whether the total number of internal control weaknesses in the next *n* years is greater than that of the current year (*IC_WORSE = 1*). Our hypothesis suggests that we would observe negative β_1 in all tests.

Following prior literature, we control the characteristics of CEOs, boards, audit engagement, and the company's financial performance. Chen et al. (2016) find a negative association between the percent of female directors on the board (*FEMPCTBD*) and internal control weakness; therefore, we expect the sign of this control to be negative. CEO's age (*CEOAGE*) is found to be negatively associated with the announcement of restatement (Huang, Rose-Green, & Lee, 2012). Therefore, we control the age of the CEO and expect the variable to be negatively associated with the occurrence of internal control weaknesses (Oradi et al., 2020). CEOs who are also the chairman of the board of directors (*DUALCEO*) may lack balance against CEO's power and impede the financial reporting quality (Tsui, Jaggi, & Gul, 2001). We add the duality of the CEO and expect it to be positively associated with internal control weakness. Moreover, previous studies report that a larger board (*BOARDSIZE*), more independent directors on the board (*INDEP*), and financial expertise on the audit committee (*FINEXP*) are associated with a lower likelihood of disclosing internal control weaknesses (Hoitash et al., 2009), hence we include then in the model as well.

We control company characteristics as prior literature finds their correlation with financial reporting quality. For example, Abernathy, Beyer, Masli, and Stefaniak (2014) report that larger (*LOGASSETS*) and more profitable (*ROA*) companies announce earnings less timely. In addition, Hoitash et al. (2012) show that companies with fast-growing sales (*SALEGROWTH*), foreign operations (*FOR*), and restructuring activities (*RESTR*) are more likely to disclose internal control weaknesses. Finally, Doyle et al. (2007) document that financially distressed (*ALTMAN*) companies are more likely to disclose internal control weaknesses. These factors represent the complexity of the business which increases the challenges of internal controls; therefore, we control these factors in our regression models and predict positive correlations with internal control weaknesses.

Auditors are required to assess the effectiveness of the company's internal controls when they audit the company's financial statements (PCAOB, 2007); therefore, the characteristics of the audit engagement will affect the disclosure of internal control weaknesses. We use the brand name (*BIG4*) of auditors to surrogate the specialty and capability of the auditor. An announcement of restatement of financial statements (*RESTATE*) is a direct sign of internal control issues (Francis & Michas, 2013), hence we include these controls. Finally, auditors need to exert more effort in testing when internal controls are not effective; therefore, we control a percentage of audit fees in the total fees (*AUDITPCT*) and expect a positive association with internal control weaknesses.

3.2. Endogeneity

There could be endogeneity concerns in our testing. First, a common cause of both the independent variable (*CEOFEMALE*) and dependent variable (*WEAK*) may be missed. For example, a company that intends to hire a female CEO is itself less likely to have internal control weaknesses. Second, the causal relation could be reversed, i.e., we assume that it is female CEOs who enhance the quality of the internal controls; however, it is also possible that effective internal controls can attract female CEOs to work for the company. Lastly, some potentially omitted variables, such as financial expertise on the board, may affect internal control quality. To address these endogeneity concerns, we follow You (2021) to use a two-stage procedure with instrumental variables to ensure the relation between the gender of CEOs and internal control weaknesses is not biased.

3.3. Sample selection and data

We start by downloading 107,231 firm-years of the board of directors' information from the BoardEx North America database from 2004, when the requirement of assessing internal control effectiveness went effective, to the latest available data as we commenced the project. After merging with the Execucomp database to calculate the personal traits of CEOs (30,142 firm-years remain), we continue to match firm-years of the Audit Analytics database to link the internal control results and auditor-related information (20,980 firm-years remain). Lastly, we use the Compustat database to calculate control variables for financial information about the companies. We eliminate financial institutions (SIC starts with 6). The final sample has 9,423 firm-years spanning from the fiscal year 2004 to 2020 (Table 1). About 80% of our observations are from manufacturing (53.61%), services (18.29%), and wholesale and retail trade (11.51%) industries.

Table 1. Sample distribution (Panel A: Distribution by fiscal years)

Fiscal year	*n*	*%*
2004	292	3.10
2005	542	5.75
2006	551	5.85
2007	630	6.69
2008	617	6.55
2009	650	6.90
2010	690	7.32
2011	696	7.39
2012	662	7.03
2013	642	6.81
2014	612	6.49
2015	605	6.42
2016	567	6.02
2017	507	5.38
2018	522	5.54
2019	526	5.58
2020	112	1.19
Total	9,423	100.00

Table 1. Sample distribution (Panel B: Distribution by industries)

1st Digit SIC	*Industry*	*n*	*%*
0	Agriculture	21	0.22
1	Mining and construction	543	5.76
2 and 3	Manufacturing	5,052	53.61
4	Transportation, communications, electric, and gas	990	10.51
5	Wholesale and retail trade	1,085	11.51
7 and 8	Services	1,723	18.29
9	Others	9	0.10
Total		9,423	100.00

Table 2 shows the descriptive statistics of the full sample and sub-samples of male CEOs and female CEOs. All of the continuous variables are

winzorized at 1% and 99%. Only 3.7% of firm-years have female CEOs in our sample period, and 5% of our observations report internal control weaknesses (*WEAK = 1*). Companies led by male CEOs are more likely to disclose internal control weaknesses (5%) than companies led by female CEOs (2%), and the companies with male CEOs have a higher number of weaknesses (0.10) than companies with female CEOs (0.05). Our hypothesis receives initial confirmation from the t-test. The average percentage of female directors on the board (*FEMPCTBD*) is 14%, and firms with female CEOs appear to have a higher percentage of female directors on board (20%) than firms with male CEOs (14%), which is consistent with the finding in previous studies (Chen et al., 2016; Gupta & Raman, 2014).

Table 2. Descriptive statistics

Variable	*Full sample (n = 9,423)*					*Male (n = 9,076)*	*Female (n = 347)*	*Male-Female*		
	Mean	*Min.*	*Med.*	*Max.*	*STD*	*Mean*	*Mean*	*Diff.*	*t-value*	*p-value*
CEOFEMALE	0.04	0	0	1	0.19					
WEAK	0.05	0	0	1	0.21	0.05	0.02	0.03	3.05	0.00***
COUNT_WEAK	0.10	0	0	18	0.64	0.10	0.05	0.05	2.51	0.01**
FEMPCTBD	0.14	0	0.14	0.50	0.12	0.14	0.20	-0.05	-7.23	<0.001***
CEOAGE	56.55	40	56	75	7.08	56.62	54.75	1.86	7.53	<0.001***
DUALCEO	0.18	0	0	1	0.38	0.18	0.14	0.04	2.37	0.02**
BOARDSIZE	8.42	3	8	20	3.12	8.40	9.03	-0.64	-4.14	<0.001***
INDEP	0.82	0.45	0.83	1	0.12	0.82	0.82	0.00	0.24	0.81
FINEXP	0.28	0	0.25	0.83	0.28	0.28	0.31	-0.03	-2.17	0.03**
TOTAL_ASSETS	8,072	7.74	1,725	362,597	23,053	7,772	15,925	-8,153	-3.87	0.00***
ROA	0.05	-0.41	0.05	0.30	0.10	0.05	0.05	0.00	-0.19	0.85
SALEGROWTH	0.12	-0.46	0.07	2.71	0.37	0.12	0.09	0.04	2.11	0.04**
ALTMAN	7.44	0.00	8.17	13.92	3.76	7.43	7.69	-0.27	-1.29	0.20
FOR	0.43	0	0	1	0.50	0.44	0.30	0.14	5.52	<0.001***
RESTR	0.45	0	0	1	0.50	0.45	0.45	0.00	-0.13	0.89
BIG4	0.91	0	1	1	0.29	0.91	0.94	-0.03	-2.26	0.02**
RESTATE	0.10	0	0	1	0.30	0.10	0.11	-0.01	-0.34	0.73
AUDITPCT	0.90	0.55	0.93	1	0.11	0.90	0.90	-0.01	-1.27	0.20

*Note: * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01. All continuous variables are winzorized at 1% and 99%. Variable definitions are described in Appendix.*

Table 3 is the Pearson correlation matrix. Our key test variable, *CEOFEMALE*, is negatively correlated with the presence of internal control weaknesses (*WEAK*) at a higher than 5% level. *WEAK* is also negatively correlated with the board's gender diversity (*FEMPCTBD*), CEO's age (*CEOAGE*), CEO's dual positions with the chairman of the board (*DUALCEO*), size of the board (*BOARDSIZE*), financial expertise of the audit committee (*FINEXP*), size of the company (*LOGASSETS*), profitability (*ROA*), and being audited by the Big 4 accounting firm (*BIG4*). *WEAK* is positively correlated with the complexity of operation (*FOR* and *RESTR*) and the other common proxies for audit quality (*RESTATE* and *AUDITPCT*). Although *CEOFEMALE* is correlated with many of the control variables, none of the correlations is higher than 0.8, a commonly used threshold, and the untabulated variance inflation factors (VIF) show the highest VIF is 1.82, which is much lower than 10. Therefore, our regression models do not have multicollinearity issues.

Table 3. Pearson correlation matrix (n = 9,423)

Variable	*WEAK*	*CEOFEMALE*	*FEMPCTBD*	*CEOAGE*	*DUALCEO*	*BOARDSIZE*	*INDEP*	*FINEXP*
CEOFEMALE	**-0.02**							
FEMPCTBD	**-0.05**	**0.08**						
CEOAGE	**-0.03**	**-0.05**	0.02					
DUALCEO	**-0.03**	**-0.02**	**0.04**	**0.16**				
BOARDSIZE	**-0.07**	**0.04**	**0.26**	**0.07**	**0.30**			
INDEP	-0.01	0.00	**0.09**	**-0.05**	**-0.23**	**-0.18**		
FINEXP	**-0.05**	**0.02**	**0.13**	**0.02**	0.00	**0.11**	**0.04**	
LOGASSETS	**-0.11**	0.02	**0.31**	**0.10**	**0.21**	**0.53**	**-0.02**	**0.16**
ROA	**-0.08**	0.00	**0.03**	**0.05**	**0.04**	**0.02**	**0.02**	0.01
SALEGROWTH	0.02	-0.02	**-0.08**	**-0.05**	**-0.04**	**-0.09**	-0.01	**-0.06**
ALTMAN	0.00	0.01	**0.14**	**0.06**	**0.14**	**0.30**	**-0.02**	**0.09**
FOR	**0.04**	**-0.05**	0.01	0.02	**-0.04**	0.01	-0.01	**-0.04**
RESTR	**0.04**	0.00	**0.16**	**-0.06**	0.01	**0.14**	0.02	**0.10**
RESTATE	**-0.04**	0.02	**0.18**	0.00	**0.08**	**0.23**	0.01	**0.09**
AUDITPCT	**0.04**	0.00	**-0.05**	0.01	0.01	0.00	0.00	**-0.02**

Variable	*LOGASSETS*	*ROA*	*SALEGROWTH*	*ALTMAN*	*FOR*	*RESTR*	*BIG4*	*RESTATE*
ROA	**0.14**							
SALEGROWTH	**-0.07**	**0.10**						
ALTMAN	**0.41**	**-0.29**	**-0.14**					
FOR	0.00	-0.01	**-0.03**	**-0.05**				
RESTR	**0.15**	**-0.15**	**-0.11**	**0.19**	**0.18**			
BIG4	**0.34**	**0.02**	**-0.04**	**0.18**	**-0.03**	**0.11**		
RESTATE	**-0.03**	**-0.02**	0.01	0.01	**-0.02**	-0.01	-0.01	
AUDITPCT	**-0.06**	**-0.08**	-0.01	**0.05**	**-0.05**	**-0.07**	**-0.13**	**0.04**

Note: Correlation figures are bold if they are significant at the 0.05 level. All continuous variables are winzorized at 1% and 99%. Variable definitions are described in Appendix.

4. RESULTS

4.1. Basic models

Table 4 presents the estimation results of the effect of female CEOs on the likelihood of reporting internal control weaknesses. We find that the coefficient on the independent variable of interest, *CEOFEMALE*, is significantly negative at the 10% level, indicating that companies with female CEOs are less likely to disclose internal control weaknesses than companies with male CEOs, which is consistent with our hypothesis. Importantly, the negative association between female CEO and internal control weaknesses is economically significant. A female-CEO-led company, on average, is 33% less likely to report internal control weaknesses than a male-CEO-led company. Our finding suggests that the gender of the CEO can significantly influence the company's internal control environment.

The coefficients on the control variables are mostly consistent with our expectations. For example, senior CEOs (*CEOAGE*) and larger boards (*BOARDSIZE*) are less likely to disclose internal control weaknesses; and fast-growing companies (*SALEGROWTH*) and financially distressed (*ALTMAN*) companies are more likely to report internal control weaknesses.

Table 4. Logit regression of internal control weakness on female CEO

Variable	*Expected sign*	*Coefficient*	*Wald χ^2*	*p-value*
Intercept		-5.759	0.001	0.970
CEOFEMALE	-	-0.330	3.199	0.074*
FEMPCTBD	-	-0.584	1.439	0.230
CEOAGE	-	-0.013	3.138	0.077*
DUALCEO	+	-0.041	0.256	0.613
BOARDSIZE	-	-0.045	4.018	0.045**
INDEP	-	-0.544	1.687	0.194
FINEXP	-	-0.370	3.361	0.067*
LOGASSETS	-	-0.375	54.280	<0.0001***
ROA	-	-0.938	3.667	0.056*
SALEGROWTH	+	0.054	0.189	0.664
ALTMAN	+	0.074	17.808	<0.0001***
FOR	+	0.208	14.241	0.000***
RESTR	+	0.209	13.511	0.000***
BIG4	+	0.013	0.027	0.870
RESTATE	+	0.177	6.215	0.013**
AUDITPCT	+	1.972	12.321	0.000***
Industry fix effects		Included		
Year fix effects		Included		
n		9,423		
Pseudo R-square		0.1515		

*Note: Dependent variable WEAK = 1 if the firm discloses at least one internal control weakness in year t; 0 otherwise. CEOFEMALE = 1 if the CEO of the firm in year t is female; 0 otherwise. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01. All continuous variables are winzorized at 1% and 99%. Variable definitions are described in Appendix.*

We report in Table 5 the estimation results of the Poisson regression, testing the effect of female CEOs on the number of internal control weaknesses. We replace the dummy variable *WEAK* with the number of internal control weaknesses (*COUNT_WEAK*) as the dependent variable in equation (1). We show that the coefficient on the independent variable of interest, *CEOFEMALE*, is significantly negative at the 5% level. This suggests that female CEOs are associated with fewer internal control weaknesses than male CEOs. The negative relation is also economically significant, with male CEOs reporting 5.5 times as many internal control weaknesses as female CEOs do, ceteris paribus. This finding, together with the results in Table 4, implies the critical role a female CEO plays in establishing and maintaining a high-quality internal control system.

Most of the coefficients on the control variables are also consistent with our expectations. For instance, senior CEOs (*CEOAGE*) and larger boards (*BOARDSIZE*) are associated with fewer internal control weaknesses; and financially distressed (*ALTMAN*) companies and foreign-operating companies (*FOR*) are likely to disclose a greater number of internal control weaknesses.

Table 5. Poisson regression of number of internal control weaknesses on female CEO (Part 1)

Variable	*Expected sign*	*Coefficient*	*Wald χ^2*	*p-value*
Intercept		-2.191	0.160	0.686
CEOFEMALE	-	-0.555	5.040	0.025**
FEMPCTBD	-	-0.534	2.740	0.098*
CEOAGE	-	-0.009	3.650	0.056*
DUALCEO	+	0.316	11.510	0.001***
BOARDSIZE	-	-0.084	30.680	<0.0001***
INDEP	-	-1.136	18.160	<0.0001***
FINEXP	-	-0.098	0.580	0.445
LOGASSETS	-	-0.231	50.990	<0.0001***
ROA	-	-0.970	9.600	0.002***
SALEGROWTH	+	-0.075	0.690	0.405

Table 5. Poisson regression of number of internal control weaknesses on female CEO (Part 2)

Variable	*Expected sign*	*Coefficient*	*Wald χ^2*	*p-value*
ALTMAN	+	0.108	86.100	<0.0001***
FOR	+	0.306	18.640	<0.0001***
RESTR	+	0.386	27.240	<0.0001***
BIG4	+	0.186	2.750	0.097*
RESTATE	+	0.529	39.990	<0.0001***
AUDITPCT	+	3.679	78.020	<0.0001***
Industry dummies			Included	
Year dummies			Included	
Log-likelihood			-2,497	
n			9.423	
Deviance			5,105	
Pearson Chi-square			25,955	

*Note: Dependent variable COUNT_WEAK is the number of disclosed internal control weaknesses in year t. CEOFEMALE = 1 if the CEO of the firm in year t is female; 0 otherwise. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01. All continuous variables are winzorized at 1% and 99%. Variable definitions are described in Appendix.*

4.2. Additional tests

As discussed earlier, there could be some endogeneity concerns that cause the association between female CEOs and internal control weaknesses to be over- or under-identified. Following You (2021), we identify two instrumental variables, the average tenure of the board of directors (*AVGDIRTENURE*) and whether female director(s) leaves the board (*FEMDIRDEPART*), to predict the likelihood of appointing a female CEO in the first stage. Next, the predicted likelihood of hiring a female CEO in the first stage is included in the second stage to replace *CEOFEMALE* in the basic model. We choose the average tenure of directors because when the tenure of directors is longer, the less likely there will be a vacancy on the board, and the board is less likely to appoint a female director to fill the seat. There is no theory to suggest that the tenure of directors affects the internal control effectiveness. We choose the other instrument variable *FEMDIRDEPART*, whether female director(s) leaves the board, because when a director leaves the board, the board is likely to fill the seat with the same gender (Tinsley, Wade, Main, & O'Reilly, 2017), and there is no theory that indicates the departure of female directors is related to internal controls.

Table 6 reports the estimation results of the two-stage model. In the first-stage model, the instrumental variables are significantly associated with *CEOFEMALE*, indicating the instruments are qualified. In the second-stage model, the predicted likelihood of a female CEO being appointed from the first stage is significantly, at the 1% level, negatively associated with the likelihood of disclosing internal control weaknesses. These results suggest that our main findings on the negative association between female CEOs and internal control weaknesses are not biased.

Table 6. Instrumental variable regression results predicting likelihood of disclosure of internal control weaknesses

Variables	*First stage Dependent variable = CEOFEMALE*		*Second stage Dependent variable = WEAK*	
	Coefficient	*Wald χ^2*	*Coefficient*	*Wald χ^2*
Intercept	33.517	0.001	-2.063	0.000
AVGBDTENURE	0.094	30.718***		
FEMDIRDEPART	-0.967	34.414***		
FEMPCTBD	-2.166	18.661***	-1.022	4.029**
CEOAGE	0.039	17.416***	-0.007	0.794
DUALCEO	0.134	2.306	-0.020	0.061
BOARDSIZE	-0.036	2.789*	-0.052	5.316**
INDEP	0.301	0.335	-0.528	1.586
FINEXP	-0.267	1.628	-0.402	3.948**
LOGASSETS	0.065	1.789	-0.357	49.274***
ROA	0.124	0.035	-0.914	3.481*
SALEGROWTH	0.241	1.484	0.072	0.333
ALTMAN	0.008	0.152	0.076	18.474***
FOR	0.289	19.514*	0.247	19.083***
RESTR	0.129	4.060	0.216	14.407***
BIG4	-0.168	1.881	-0.014	0.028
RESTATE	-0.045	0.238	0.171	5.793**
AUDITPCT	-0.356	0.389	1.924	11.646***
Predicted likelihood			-4.008	8.625***
Industry dummies		Included		Included
Year dummies		Included		Included
n		9,420		9,420
Pseudo R-square		0.1332		0.1524

*Note: The first stage is logit regression of CEOFEMALE on instrument variables AVGBDTENURE and FEMDIRDPART. CEOFEMALE = 1 if the CEO of the firm in year t is female; 0 otherwise. AVGBDTENURE is the average tenure of the board of directors; FEMDIRDEPART = 1 if at least one female director departs the board in year t; 0 otherwise. The second stage is logit regression of WEAK on predicted likelihood, which is the likelihood of employing a female CEO estimated from the first stage. WEAK = 1 if the firm discloses at least one internal control weaknesses in year t; 0 otherwise. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01. All continuous variables are winzorized at 1% and 99%. Variable definitions are described in Appendix.*

We are also interested in the effect of female CEOs on the change of internal control quality beyond the current year. We subtract the number of internal control weaknesses in the current year (*t*) from the total number of internal control weaknesses in future years ($t + n$) and observe whether internal control quality is worsened in the next one to five years. *IC_WORSE* equals one if the total number of internal control weaknesses of year $t + n$ is greater than that of year t, and zero otherwise. In Table 7, we show that female CEOs are significantly negatively associated with *IC_WORSE* in the next one through five years, indicating that female CEOs are more likely to maintain internal control quality than male CEOs at least in the subsequent five years. These findings further highlight the important value female CEOs can be to companies' internal control environment.

Table 7. Logit regression of future worsened internal control effectiveness on female CEO (Part 1)

If internal control is worsened in the nex		*1 year*		*2 years*	
Independent variable	***Expected sign***	***Coefficient***	***p-value***	***Coefficient***	***p-value***
Intercept		73.856	0.976	79.395	0.979
CEOFEMALE	-	-0.437	0.089*	-0.458	0.019**
FEMPCTBD	-	-0.720	0.244	-0.384	0.408
CEOAGE	-	-0.007	0.432	-0.007	0.282
DUALCEO	+	-0.152	0.177	-0.107	0.198
BOARDSIZE	-	-0.071	0.019**	-0.086	0.000***
INDEP	-	-0.460	0.393	-0.627	0.127
FINEXP	-	-0.731	0.006***	-0.631	0.002***
LOGASSETS	-	-0.342	<0.0001***	-0.338	<0.0001***
ROA	+	-0.429	0.502	0.325	0.521
SALEGROWTH	+	-0.037	0.832	0.015	0.906
ALTMAN	+	0.030	0.176	0.050	0.003***
FOR	+	0.213	0.003***	0.230	<0.0001***
RESTR	+	0.265	0.000***	0.229	<0.0001***
BIG4	+	0.074	0.483	0.051	0.524
RESTATE	+	0.085	0.374	0.139	0.053*
AUDITPCT	+	0.469	0.474	0.992	0.050*
Industry fix effects	Included				
Year fix effects	Included				
n	9,423				
Pseudo R-square		0.1145		0.1266	

*Note: Dependent variable IC_WORSE = 1 if the total number of internal control weaknesses in t + n years is greater than that of year t; 0 otherwise. CEOFEMALE=1 if CEO is female; 0 otherwise. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01. All continuous variables are winzorized at 1% and 99%.*

Table 7. Logit regression of future worsened internal control effectiveness on female CEO (Part 2)

If internal control is worsened in the next		*3 years*		*4 years*		*5 years*	
Independent variable	***Expected sign***	***Coefficient***	***p-value***	***Coefficient***	***p-value***	***Coefficient***	***p-value***
Intercept		79.989	0.976	80.028	0.976	81.155	0.972
CEOFEMALE	-	-0.397	0.012**	-0.401	0.011**	-0.373	0.004***
FEMPCTBD	-	-0.257	0.522	-0.260	0.516	-0.110	0.749
CEOAGE	-	-0.007	0.254	-0.007	0.258	-0.007	0.180
DUALCEO	+	-0.040	0.572	-0.042	0.546	0.004	0.940
BOARDSIZE	-	-0.084	<0.0001***	-0.086	<0.0001***	-0.081	<0.0001***
INDEP	-	-0.418	0.248	-0.428	0.236	-0.124	0.692
FINEXP	-	-0.485	0.004***	-0.493	0.004***	-0.304	0.032**
LOGASSETS	-	-0.327	<0.0001***	-0.328	<0.0001***	-0.339	<0.0001***
ROA	+	0.173	0.693	0.183	0.676	0.651	0.092*
SALEGROWTH	+	0.011	0.919	0.040	0.714	-0.046	0.643
ALTMAN	+	0.040	0.007***	0.040	0.007***	0.035	0.006***
FOR	+	0.229	<0.0001***	0.229	<0.0001***	0.214	<0.0001***
RESTR	+	0.192	<0.0001***	0.200	<0.0001***	0.212	<0.0001***
BIG4	+	0.049	0.479	0.047	0.494	-0.001	0.985
RESTATE	+	0.107	0.097*	0.110	0.086*	0.117	0.035**
AUDITPCT	+	0.935	0.031**	0.982	0.024**	0.706	0.052*
Industry fix effects	Included						
Year fix effects	Included						
n	9,423						
Pseudo R-square		0.1213		0.1229		0.1277	

*Note: Dependent variable IC_WORSE = 1 if the total number of internal control weaknesses in t + n years is greater than that of year t; 0 otherwise. CEOFEMALE=1 if CEO is female; 0 otherwise. * p-value < 0.1; ** p-value < 0.05; *** p-value < 0.01. All continuous variables are winzorized at 1% and 99%.*

5. CONCLUSION

In this study, we examine the association between female CEO and internal control quality. The upper echelon theory suggests that managers' demographics can determine the choices of strategies. Gender, as an important demographic feature, should be critical to managers' behaviors and decisions. As prior literature documents that female CEOs act more conservatively and ethically than male CEOs, we predict that a female CEO is negatively associated with internal control material weaknesses. Our findings are consistent with the prediction. We find that a company with female CEO is less likely to report internal control weaknesses. The negative association remains strong when we switch the dependent variable to the number of weaknesses and the change of the number of weaknesses in the subsequent one to five years.

Our study contributes to the literature and has great managerial implications. First, we are the first few studies to document the positive impact of top female management on financial reporting quality. Specifically, we show that female CEOs can influence internal controls positively. Second, we expand the literature by adding another critical factor, the gender of CEOs, that affects the quality of financial information, besides other factors, such as characteristics of a company's financial performance (Doyle et al., 2007), the expertise of the board (Hoitash et al., 2009), and incentives of management (Balsam et al., 2014). Third, our findings on how female CEOs positively affect internal controls provide important insights for companies as they appoint executives.

Our study has a few limitations, which, at the same time, may indicate directions for future research. First is the transferability to other countries, since our study focuses on the U.S. companies. After the U.S. passed Section 404 of SOX in 2002, many countries in the world also started the reform of internal controls and risk management in the financial markets, such as Australia in 2004, Hong Kong in 2005, European Union in 2006, and Japan in 2008 (Brown, Pott, & Wömpener, 2014). These jurisdictions suggest COSO as the framework, upon which the U.S.' internal control assessment is based. The similar time period and the principles may allow us to predict the same association between CEO gender and internal control effectiveness outside the U.S., however, different countries have different law systems (e.g., common law versus civil law), gender roles in the society (e.g., agentic versus communal), and structures of boards (e.g., large versus little government shareholders), we recommend future research to study how macro-economic factors affect the extent female CEOs affect internal controls. Second, we do not include the impact of CFOs on internal controls in our testing. However, the CFO should also have an important impact on a company's internal control system. Section 302 of SOX requires both the CEOs and CFOs to establish and maintain effective internal controls over financial reporting. Hoitash et al. (2012) also reported significant relations between internal control weaknesses and CFO compensation. Therefore, we recommend that future research explore how female CFOs influence the internal control environment, either the independent effect or the interaction with CEOs.

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APPENDIX. VARIABLE DEFINITIONS

Variable	*Definition*	*Data source*
Test variable		
CEOFEMALE	1 if the firm has a female CEO in year *t*; 0 otherwise.	Execucomp
Dependent variables		
WEAK	1 when firm *i*'s SOX 404 report contains at least one internal control deficiency in year *t*; 0 otherwise.	Audit Analytics
COUNT_WEAK	The number of internal control deficiencies in SOX 404 report of firm *i* in year *t*.	Audit Analytics
IC_WORSEn	1 if the total number of internal control weaknesses in $t + n$ years is greater than that of year *t*; 0 otherwise.	Audit Analytics
Instrument variables		
AVGDIRTENURE	Average tenure of directors.	BoardEx
FEMDIRDPART	1 if at least one female director departs the board in year *t*; 0 otherwise.	BoardEx
Board control variables		
FEMPCTBD	The number of female directors divided by the number of directors on the board.	BoardEx
CEOAGE	Age of CEO in year *t*.	Execucomp
DUALCEO	1 if CEO is the chairman of the board in year *t*; 0 otherwise.	BoardEx
BOARDSIZE	The number of directors on the board in year *t*.	BoardEx
INDEP	The proportion of independent directors on the board in year *t*.	BoardEx
FINEXP	The proportion of financial experts on the audit committee in year *t*.	BoardEx
Firm control variables		
LOGASSETS	The natural log of total assets (AT) in year *t*.	Compustat
ROA	Net income (NI) divided by total assets (AT) in year *t*.	Compustat
SALEGROWTH	Sales (SALE) in year *t* less sales in year $t - 1$, divided by sales in year $t - 1$.	Compustat
ALTMAN	Altman's (1968) bankruptcy score modified by Hillegeist, Keating, Cram, and Lundstedt (2004). $1000e^x/(1+e^x)$, where $x = -4.34 - 0.08 \times (WCAP/AT) + 0.04 \times (RE/AT) - 0.1 \times (PI + XINT - IDIT)/AT - 0.22 \times (PRCC\_F\ x\ CSHO)/LT + 0.06 \times (SALE/AT)$	Compustat
FOR	1 if there is foreign exchange income or loss (FCA) in year *t*; 0 otherwise.	Compustat
RESTR	1 if there is restructuring cost after-tax (RCA) in year *t*.	Compustat
Audit control variables		
BIG4	1 if the auditor is a Big 4 auditors in year *t*; 0 otherwise.	Audit Analytics
RESTATE	1 if the firm reports a restatement in year *t*; 0 otherwise.	Audit Analytics
AUDITPCT	The proportion of audit fees in total fees in year *t*.	Audit Analytics