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Are female CFOs more ethical to the occurrences of financial reporting fraud? Theoretical and empirical evidence from cross-listed firms in the US

Occurrences of
financial
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fraud

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Abstract

Purpose – The purpose of this study is to examine whether female chief financial officers (CFOs) are associated with the occurrences of financial reporting fraud. This study offers new theoretical and empirical evidence on whether firms with more female CFOs are more (less) likely to engage in financial reporting fraud.

Design/methodology/approach – This study is based on a sample of US-listed firms from 2011 to 2021. The authors speculate that female CFOs play a weaker role in the occurrences of financial reporting fraud. So, firms with a proportional number of female CFOs should be less likely to commit financial reporting fraud.

Findings – The data provide support for the predictions of this study. This study suggests a negative and significant association between the dummy variables for female CFOs and the occurrences of financial reporting fraud. The authors find that this association is contingent on governance mechanisms [e.g. ownership structure, politically connected CEOs and firms' conditions that do (or do not) invest in a gender-diverse board].

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Originality/76 – This study offers different perspectives on the impact of female CFOs on the occurrences of financial reporting fraud. The results of this study are distinguishable from prior studies. This study moves the analytical focus from the macro level (gender diversity or female corporate leaders) to the micro level (female CFOs) to understand firms' propensity to commit financial reporting fraud. Additionally, this study is based on factual financial reporting fraud cases, considering the US firms' fraud characteristics.

Keywords Governance mechanisms, Female CFOs, Financial reporting fraud, US firms' fraud characteristics

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Paper type Research paper

1. Introduction

This study investigates whether female chief financial officers (CFOs) are associated with the occurrences of financial reporting fraud. Extant research has focused on how female CFOs affect earnings management (Liu *et al.*, 2016; Alkebees *et al.*, 2021a; Fang *et al.*, 2022; Liu *et al.*, 2021; Jiang *et al.*, 2022; Christensen *et al.*, 2022). Financial reporting fraud and earnings management are not synonymous. Those are different. We take financial reporting fraud as a focus of the study, as 93 as a tremendous effect on society and beyond. According to a recent work completed by the Association of Certified Fraud Examiners (ACFE) (2022), compared to other categories of occupational fraud, financial reporting fraud is the least common but costliest fraud category.

Similarly, Gupta *et al.* (2020) mention that financial reporting fraud is the most prevalent fraud scheme in the US listed companies, and the consequences are usually significant. If referring to KPMG's (2020) study, the fraud cases in the US-listed companies are attributed to compliance issues. In corporate settings, the compliance issues often attributed to the cases of fraud and earnings management are primarily related to the CFOs' primary 111 ties (Christensen *et al.*, 2022). Given their oversight and advisory responsibility, CFOs play an essential role in controlling the quality of financial reporting. Then they can significantly affect accounting quality (Osma *et al.*, 2022).

The idea of our study linking CFO gender with financial reporting fraud emerges from prior studies, suggesting that firms with female CFOs are always associated with a higher quality of accruals than firms with male CFOs (Arun *et al.*, 2015; Li *et al.*, 2021; Janahi *et al.*, 2021). They argue that female CFOs are more conservative than male CFOs in financial reporting. They also note that female CFOs are more cautious and less aggressive than men in a variety of decision-making contexts. A similar view can be seen in the work of Taleatu *et al.* (2020) that female CFOs are likely to be more ethical in their judgement and behaviour than men. So it is acceptable to expect that female CFOs are less likely to encourage financial reporting fraud and help companies reduce opportunistic behaviours.

Substantially, the current study is to answer a recent call on a study whether female CFOs can constrain financial reporting fraud (Luo *et al.*, 2020; Sakawa and Watanabel, 2021). There has been extensive theoretical and empirical work on the causes and consequences of financial reporting fraud. For example, many prior studies document a positive relationship between board diversity and accounting fraud (Maulidi, 2022; Wang *et al.*, 2022; Wahid, 2019; Ning *et al.*, 2022; Pathak *et al.*, 2021). Another study suggests that gender diversity on boards serves as a significant moderator for fraudulent occurrences (Cumming *et al.*, 2015), but they do not observe the role of female CFOs. We believe that, to date, there has been less work exclusively examining whether female CFOs are positively or negatively associated with the frequency and severity of financial reporting fraud (Velte, 2021, conducting a systematic study for further review). We seek to address this research gap with a closer look at the US firms' fraud characteristics.

We take the US setting as a focus of study because of some critical reasons. *First*, a study linking female CFOs and financial reporting fraud based on the US firm samples is lacking.

Second, many institutional features in the US market are not really mature yet. For example, the recent [Ellahie and Kaplan's \(2021\)](#) study highlights that the nature of the US capital market and, in some senses, reflects political goals. They examine the association between dividend smoothing and agency conflicts by differentiating it in terms of institutional qualities. The result shows that even though the nature of the US capital market is found as a semi-strong institution, it can still potentially encourage insiders of a company to exacerbate firm-level information and act in their interests.

Additionally, [Ellahie and Kaplan \(2021\)](#) find that a firm within non-strong institutions is often associated with a higher speed of adjustment to the dividend payment. In this respect, future investors can sceptically view the delay of dividend payment. As a result, firms with non-strong institutions care more about attracting prospective investors. The USA is the second-most observed of their samples, ranking 17th in the category of institutional quality (p. 623). In this situation, it becomes a severe challenge for executives. It involves monetary and ethical dilemmas for executives. Indeed, smooth dividends or manipulative documents can be an alternative to attract future shareholders ([Ellahie and Kaplan, 2021](#)). In effect, the work atmosphere in the boardroom tends to create a decision that reflects a self-serving decision that represents the self-interest of the board members. Within these pressures, we expect that female CFOs might reduce the tendency of companies to perform such acts. As previously mentioned, female corporate leaders are more likely to behave ethically and are more risk-averse decision makers compared to male corporate leaders.

Third, the US Government's [26](#) involvement in corporate governance is negatively related to the CEO's leadership ([Ullah et al., 2019](#); [Quan et al., 2021](#); [Cao et al., 2017](#)) and the quality of corporate governance ([Alger et al., 2021](#); [Hacker et al., 2022](#)). The US Governments have great motivation to maintain good relations with the firms ([Bottenberg et al., 2017](#)). Although the dimensions of business-government relationships are associated with higher profitability ([Fichtner et al., 217](#); [Admati, 2017](#)) and firm performance ([Piscopo and Muntean, 2018](#)), firms run by politically connected CEOs are more likely to have boards populated by other bureaucrats with less professional background. [Scherer and Voegtlin \(2020\)](#) note that, in the USA, the rate of political interventions in the boards' decisions is relatively high. We agree with their argument that state control is one of the sources of firms' financial resource inefficiencies. The primary reason is its dominance in [46](#) board's decision-making processes. Then, politically connected CEOs tend to pursue political or socio-economic goals and use their control to divert firms' resources to achieve their goals ([Zaman et al., 2022](#)). Indeed, these situations can give a different direction of understanding the role of minorities (e.g. female CFOs) in facing governance issues ([Boujelben et al., 2020](#); [Liu et al., 2016](#); [Baker et al., 2019](#); [Guizani and Abdalkrim, 2021](#)). To understand better the vital role of female CFOs on governance issues (e.g. financial reporting fraud), we conduct a different test in the context of state-owned enterprises (SOEs) and private firms.

In light of the preceding points, we believe our study is comprehensive and insightful regarding the role of female CFOs with respect to the likelihood of financial [63](#) statement fraud. Our research extends the current conversation in the literature on the [relationship between the presence of females in the composition of CFOs and financial statement fraud](#) by offering further theory development and large-scale systematic empirical evidence concerning such a relationship. In this regard, our study also provides insight into the *mechanism* in which the likelihood of financial statement fraud is [104](#) pronounced. While advocates for gender diversity often speculate that diversity in top management can improve the quality of financial reporting, most studies do not explicitly examine which channel is responsible for the (reduced) likelihood of financial statement fraud. Additionally, our study introduces new

evidence and insights on the role of female CFOs with respect to the possibility of financial statement fraud (51), where research on this topic focusing on the US setting is sparse.

The rest of the paper is organised as follows: the second section presents the “Theoretical framework and research question”. The third section describes “Research design”. The fourth section, “Results of empirical analyses”, presents the findings. The fifth section presents “Conclusion and implication”.

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2. Theoretical framework and hypothesis development

2.1 Critical mass theory; female chief financial officers

The critical mass theory is the standard theory used in the management field to study the presence of females on boards or important committees (e.g. CEO and CFOs). The theory emphasises the impact of a minority on group policymaking, as well as tokenism. Most critical mass studies start with Kanter’s (1977a) research on women’s actions in corporations. In essence, she contends that females, as minorities, have little chance to impact the firm with a high number of men on its committees. To better understand how gender diversity in a group influences group dynamics, Kanter (1977b) investigates the role of females who worked in a male-dominated firm. She defines the members of the majority as “dominants”, while the remaining minority members are labelled as “tokens”. The result suggests that female representation in the committee structure has long been significantly underrepresented. Her arguments can be understood that, because of under-representation, the presence of minorities (e.g. female CFOs) is viewed as just a symbol or a token.

In her ground-breaking work on the subject, it is noted that minorities are easily marginalised when their presence in a larger group is modest. Kanter (1977a) exhibits that gender-unbalanced groups are most problematic and even underperform uniform-gender groups. As long as a specific “critical mass” is reached, the mere presence of decision makers from an underrepresented group in the overall decision-making environment may be sufficient to have a noticeable impact on the output of that environment (Kanter 1977a, 1977b). These results are congruent with recent studies on corporate governance linking female CFOs and firm governance (Osma *et al.*, 2022; Lapointe-Antunes *et al.*, 2022). In general, they find that the existence of female CFOs is not spotted by the dominant males. They express that the ideal representation of females and male attributes will lead to fruitful conversations, which will contribute to positive outcomes at both the governance and firm levels.

Several recent studies into the relationship between gender diversity, the boardroom and financial reporting quality (Dobija *et al.*, 2022; Fleischer, 2022; Chen *et al.*, 2022) indicate the importance of a critical mass of women on boards or important committees. Women must occupy a minimum of 30% of board positions to improve financial reporting quality. It is noted that “a critical mass of three or more females on top management can enhance the internal corporate governance practices, and act as a controlling lever on other members and top management team members”. From a governance perspective, it is suggested that companies with higher representation of women on the CFOs team influence the creation of corporate ethics codes, as women tend to be more sensitive to reputation issues, improving the company’s reputation and increasing public trust (Boujelben *et al.*, 2020; Fang *et al.*, 2022; Arun *et al.*, 2015). In the process of acquiring and maintaining resources, the female CFOs are more likely to propose tougher questions and put stronger arguments forward against any opportunistic goals (Dobija *et al.*, 2022; Baker *et al.*, 2019; Krishnan *et al.*, 2011).

2.2 Female chief financial officers and accounting matters in the US context

Doron *et al.* (2019) discuss the evolution of the CFOs in the USA. The term “CFO” emerged by the 1960s. Historically, the main duty of CFOs is responsible for managing the financial

activities of their company, “accounting work”. They are known as “controllers”. Because of an increased ethic of accountability in society (e.g. the Enron Corporation and WorldCom scandals), their main focus are no longer limited to such technical accounting management roles. CFOs become crucial for identifying the underperforming business units and helping them to expand and increase their efficiency. By the early 2000s, many firms were broadening the position of the CFO to include activities like actively managing relationships with shareholders and keeping tabs on market trends and expectations (p. 47).

Doron *et al.*'s (2019) study emphasises the importance of CFOs. Companies must put the CFOs in a more prominent place at the management table if they want to deal with the unprecedented expansion in the number and complexity of accounting standards (p.49). Beyond financial capabilities, Schobel and Pond (2020) argue that the evolution of CFO roles in the USA continues to evolve. They realise that the role of CFOs in the USA becomes proficient in strengthening compliance programs and internal controls, developing people in the finance organisation and executing continuous finance process improvements. The Sarbanes-Oxley Act of 2002 requires the CFO of publicly traded companies to issue a statement certifying that the accompanying financial statements and disclosures fairly present, in all material respects, the operations and financial condition of the company. Because some representations, in some senses, are being prepared purposively, the CFOs should practice “preventive management” to protect their firm and themselves against the potential adverse effects of financial reporting fraud (Chang, 2019).

There is empirical evidence that the CFO personally plays a substantially increased role in the financial reporting disclosure process. For instance, Gupta *et al.* (2020) examine the presence of women on a corporate executive team by using US firms. They specifically conceptualise the CFO gender on financial irregularities. The results suggest that firms with female CFOs, compared to firms with male CFOs, have a lower likelihood of financial irregularities. As argued, their roles are contingent on governance mechanisms (e.g. institutional ownership). Our study is distinguishable from Gupta *et al.*'s (2020) analyses. Our study examines fraud and serious fraud attributed to the factual cases in US firms. Then, we look at the impact of female CFOs by considering the involvement of political intervention in board decision-making. We also examine the effects of female CFOs' representation on the likelihood of financial reporting fraud in gender-diverse and non-gender-diverse boards. Our study perceives that the representation of female CFOs is not only influenced by governance mechanisms. Our study suggests that the organisation's internal and external characteristics (Davis and Garcia-Cestona, 2021; Din and Iskandar-Datta, 2021; Donatella and Tagesson, 2021) bring considerable effects on whether and when the gender of the CFOs is associated with the firm's propensity to commit financial statement fraud.

2.3 Female chief financial officers and financial reporting fraud

The advantages of increasing female representation in upper-level management and boards of directors have been the subject of numerous studies (Wahid, 2019; Zalata *et al.*, 2022; Cabeza-Garcia *et al.*, 2018; Al-Shaer and Zaman, 2016; Carvajal *et al.*, 2022; Reguera-Alvarado *et al.*, 2017). The findings give an apparent legitimisation for hiring females as top executives. The discussion is centred on the topics revealing that men and women view and operate corporate activities differently. For instance, empirical evidence suggests that female representation on committees is much more concerned with the quality of financial reporting than their male counterparts (Zalata *et al.*, 2022; Maulidi, 2022). Indeed, gender diversity leads to unique human capital on the board because females are more likely to convey different attributes in the boardrooms (Bzeouch *et al.*, 2019). Moreover, females tend to have different management styles

and professional experiences. Their representation is assumed to be effective control of the earnings management practices (Gull *et al.*, 2018). As found, they are more active in their monitoring activities. In line with these views, others find that female CFOs are more ethical in their professional lives and less likely than men to act in immoral ways for their firms (Guizani and Abdalkrim, 2021; Harakeh *et al.*, 2019; Dobija *et al.*, 2022).

Studies on differences in gender characteristics have also been discussed in decision-making processes. Some studies highlight that female representation on top executive teams (CFOs and CEOs) is increasingly viewed as a significant determinant of the monitoring management in acute agency settings (Baker *et al.*, 2019; Jiang *et al.*, 2010; Peni and Jämsämaa, 2010; Jalan *et al.*, 2020). Female CFOs show greater diligence and independence than men in various decision-making contexts (Li *et al.*, 2022) and exhibit less overconfidence or aggression, promoting stricter ethical standards that can help manage ethical issues in an appropriate way (Huang and Liu, 2022). Fan *et al.* (2019) examine how women on committees influence bank earnings management. The regressions support the hypothesis that companies with female CFOs have lower income discretionary accruals, indicating that these executives use more cautious financial reporting strategies.

Furthermore, Liu *et al.* (2016) examine the association between CFO gender and earnings management and find that firms with female CFOs have lower discretionary accruals than firms with male CFOs. A similar conclusion is made by Harris *et al.* (2019), who look at the relationship between the genders of the CFO and CEO and earnings management. They discover that firms with female CFOs have income-decreasing discretionary accruals, indicating that female CFOs are more likely to adhere to more conservative financial reporting standards. This finding is generally in line with the body of research on how risk aversion and conservatism vary by gender. In light of this, earlier research suggests that gender diversity promotes divergent and critical thinking, which lessens personal biases and prejudices and leads to improved decision-making and problem-solving (Janahi *et al.*, 2021). Additionally, gender diversity on CFOs teams can ensure the compliance of financial reporting with the law and the company's policies. As such, the presence of women in a group of CFOs can increase the overall supervision of a company's financial information (Davis and Garcia-Cestona, 2021; Boachie and Mensah, 2022).

In this paper, we further examine whether the gender of the CFO affects the occurrences of financial reporting fraud. CFOs have a decisive role in companies because of their primary responsibility of financial reporting. Even though the CFO is somewhat subordinate to the CEO, the CFO is the top manager with the most direct and significant influence on the financial system. CFOs are responsible for supervising the application of accounting standards, preparing financial reports and making major accounting decisions (Liu *et al.*, 2022). Other note that the CFOs can manage the earnings target by choosing inappropriate accounting methods (Gounopoulos and Pham, 2018; Ferramosca and Allegrini, 2018). Therefore, given substantial differences in ethical sensitivity and risk aversion, as discussed above, we speculate that female CFOs generally behave more conservatively and ethically when making their financial reporting decisions. We, hence, propose the hypothesis as follows:

H1. Female chief financial officers play a weaker role in the occurrences of financial reporting fraud.

3. Research methods

3.1 Data

Our sample is created by integrating three separate databases. First, we get information from Accounting and Auditing Enforcement Releases regarding fraudulent companies.

Davidson (2022) argues that this database provides unique advantages compared to other proxies for fraud. It offers information about the involvement of management levels in financial statement fraud (p.4). As a focus of the study, we followed Maulidi's (2022) study that takes the fraud sample observations from the past ten years, from 2011 to 2021. As explained, the idea is that the number of firms sectioned because of corporate fraud peaked during such periods. Second, we obtain the required financial data from the annual Compustat File Compustat for firm financial statements and firm characteristics. Third, we use Execucomp for CFO gender and other top management characteristics.

Following general practice in the literature, we omit financial firms from our sample because of the variations in financial reporting requirements between the financial and non-financial sectors (Maulidi, 2022; Ghafoor *et al.*, 2019; Davidson, 2022). For a firm-year observation to be included in the sample, data for all study variables in the main analysis (as explained below) must be available. Therefore, firms with missing financial data are excluded from our expectation models and other control variables calculations. The final sample is 12,013 firm-year observations.

3.2 Variables and measures

3.2.1 Main variable. The primary variable as a focus of the study is the *Female CFO*. It is an indicator variable that identifies CFO gender. To measure it, we construct a dummy variable for Female CFO that equals 1 if the CFO of the firm is female and 0 otherwise (Gupta *et al.*, 2020).

3.2.2 Dependent variables. The dependent variable of our study is financial reporting fraud. To measure it, we shadow the work of Luo *et al.* (2020). It is a dummy variable. We score a value of 1 if the firm commits fraud in the year at least once and 0 otherwise. We code this *Fraud dummy* by the year the fraud was perpetrated, not by the time it was discovered (Luo *et al.*, 2020). In addition, the Accounting and Auditing Enforcement Releases offer information about the number of years affected by the financial violation. So it is necessary to examine and include it in our model. According to Conyon and He (2016), a fraud that affects numerous financial years is likely to be more dangerous than one that simply affects one year. As a result, we use the number of affected years as a proxy for the severity of the violation and create a continuous variable called "Serious fraud". We make a *Serious Fraud dummy* by scoring a value of 1 if the enforcement action influences multiple financial years and 0 otherwise (Conyon and He, 2016; Liao *et al.*, 2019). Our study is different from recent studies by Maulidi (2022) and Davidson (2022), only examining fraudulent occurrences in general. They do not analyse the severity of the violation that affects numerous financial years, "Serious fraud".

3.2.2 Control variables. We take the SOEs as the first concern for examining the relationship between CFO gender and the likelihood of financial-reporting-related corporate fraud. The measure of SOEs is created by a dummy variable which equals 1 if the ultimate controller of a listed firm is state or state agencies and 0 otherwise.

Furthermore, we control for *CFO age* and *CFO directorships*. Those are shown to influence corporate financial decision-making (Cai and Li, 2022). We include CFO age because it is used as a proxy for risk aversion. As found, a person tends to become more risk averse as she/he ages (Liu *et al.*, 2022; Ferramosca and Allegrini, 2021). We expect that the older CFOs are less likely to be optimistic. We collect information about *CFO directorships* to understand their effect on the relationship between CFO gender and the likelihood of financial-reporting-related corporate fraud. In the literature, it is broadly known as *CFO Duality*. We define *CFO Duality* as the practice in which CFO has more than

one position in the firm. It is a dummy variable which equals to 1 if the CFO also simultaneously has directorships in the same firm and 0 otherwise.

Furthermore, it is found that firms with good corporate governance are more likely to limit any opportunistic condition associated with fraud propensity. Particularly in US firms, firms with gender-diverse boards have fewer instances of problematic business practices (e.g. fraud action) (Maulidi, 2022). Accordingly, we consider several corporate governance variables in our research model (Luo *et al.*, 2020). These are *Supervisory board size* (the number of supervisors), *Supervisory board meetings* (the number of supervisory board meetings held in a year), *Independent director ratio* (ratio of independent directors as a fraction of the number of independent directors divided by the number of total board members), *Board size* (the number of board members), *Management ownership* (the percentage of shares owned by managers) and *Foreign ownership* (the proportion of shares held by foreign investors). In addition, we control for *Political connection*. It is captured by a dummy variable *Political CEO*. We score a value of 1 if the CEO is currently or was formerly an officer within the central or local government or the military and 0 otherwise.

According to Maulidi (2022), political interventions significantly influence CEO appointments in US companies. In effect, the decisions of the CEOs affiliated with a political party have an enormous impact on the unhealthy of their corporate governance or instance, politically connected CEOs affect how a company spends money (Cohen *et al.*, 2019). Kong *et al.* (2019) argue that the presence of politically connected CEOs seems to influence the monitoring of corporate misconduct. This evidence is consistent with Kuvvet and Maskara's (2018) study that politically connected CEOs are able to bring a firm certain privileges in the regulatory environment, which implies that the enforcement actions in the form of fines and administrative punishment against the firm can be alleviated or circumvented. Indeed, they reduce the chances of being caught for fraud, lowering the expected cost of committing corporate misconduct (Amin *et al.*, 2021).

Furthermore, the existing research also implies that external auditors have an impact on a company's capacity to influence the quality of financial reporting (Nagar *et al.*, 2021; Peng and Huang, 2021); thus, we control for external auditors' quality (*BIG4*). We give the value of 1 if the external auditor is one of the big 4 audit firms and 0 otherwise. We expect that big 4 auditors compared to non-big 4 auditors, can provide a superior quality of audit and are more likely to deter accrual-based earnings management (Nagar *et al.*, 2021; Berrill *et al.*, 2021) and fraud propensity (Lee and Ha, 2021; Yang and Tang, 2022). We also control for other firms' characteristics influencing the relationship between CFO gender and the likelihood of financial-reporting-related corporate fraud. In particular, we control *Firm size* (*SIZE*), *Return on assets* (*ROA*) and *Leverage* (*LEV*).

We include *Firm size*, which is the logarithm of a company's total assets because small firms are less prone to conduct fraud, while large firms are more likely to engage in serious deception of financial reporting to accomplish their financial goals (Chen *et al.*, 2021; Chahine *et al.*, 2021). We include *Return on assets*, which is measured as net income over total assets, to control for firm profitability and accounting performance (Amiram *et al.*, 2020; Dimitras *et al.*, 2015; Chang and Stone, 2019). Zalata *et al.* (2022) and Lee *et al.* (2006) argue rapid growth is significantly related to the perpetration of corporate fraud. Moreover, Lee and Ha (2021) find that firms are more likely to be involved in corporate fraud when they are more levered. In our study, *Leverage* is calculated as the sum of short- and long-term debts divided by total assets. We assume that it might influence the likelihood of corporate fraud propensity.

4. Result and analysis

This section reports the empirical result of our study and its analysis.

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4.1 Descriptive statistics

Panel A of Table 1 reports the descriptive statistics for the variables used in this study. On average, 34.1% of the sample firms have female CFOs. In terms of the involvement of governmental agencies or SOEs, they have control in 53.3% of the sample firms.

The average CFO age is 52 years, with the youngest 32 and the oldest 73. On average, 37.3% of CFO hold a directorship simultaneously. For corporate governance variables, the average supervisory board size is 5 people, with a minimum of 3 and a maximum of 16. It also informs the average of supervisory board meetings, suggesting that 6 times of meetings

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Panel A: summary statistics of the variables

Variables	Observations	Mean	SD	Minimum	Maximum
Fraud	12,013	0.126	0.121	0	1
Serious fraud	12,013	0.154	0.231	0	1
Female CFO	12,013	0.341	0.154	0	1
SOEs	12,013	0.535	0.330	0	1
CFO age	12,013	52	6,161	32	73
CFO duality	12,013	0.373	0.151	0	1
Supervisory board size	12,013	5	0.228	3	16
Supervisory board meetings	12,013	6	1.241	0	20
Independent director ratio	12,013	0.542	0.148	0.062	0.814
Board size	12,013	7	1,041	5	18
Management ownership	12,013	0.021	0.227	0	0.531
Foreign ownership	12,013	0.343	0.410	0	0.686
Political CEO	12,013	0.193	0.381	0	1
BIG 4	12,013	0.031	0.245	0	1
Firm size	12,013	27,853	1,103	13,421	32,425
Leverage	12,013	0.531	0.132	0.104	1,693
ROA	12,013	0.104	0.421	-1,241	2,412

Panel B: t-test of differences between firms with male and female CFOs

Variables	Female CFO		Male CFO		Difference	t
	Observations	Mean	Observations	Mean		
Fraud	4,864	0.062	7,149	0.128	-0.066	-2.103**
Serious fraud	4,864	0.036	7,149	0.104	-0.068	-2.126**
SOEs	4,864	0.246	7,149	0.351	-0.105	-2.732***
CFO age	4,864	48.05	7,149	45.01	3.040	5.381*
CFO duality	4,864	0.352	7,149	0.404	-0.052	-2.013**
Supervisory board size	4,864	4.052	7,149	4.103	-0.051	-2.047**
Supervisory board meetings	4,864	4.121	7,149	4.063	0.058	2.032***
Independent director ratio	4,864	0.204	7,149	0.253	-0.049	-1.186
Board size	4,864	5.032	7,149	5.127	-0.095	-1.543
Management ownership	4,864	0.013	7,149	0.014	-0.001	-0.425*
Foreign ownership	4,864	0.135	7,149	0.164	-0.029	-0.641**
Political CEO	4,864	0.065	7,149	0.142	-0.077	-2.852***
BIG 4	4,864	0.010	7,149	0.126	-0.116	-3.041
Firm size	4,864	26.012	7,149	26.962	-0.95	-7.253*
Leverage	4,864	0.431	7,149	0.524	-0.093	-4.491**
ROA	4,864	0.218	7,149	0.193	0.025	5.213**

Note: Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 1.

Descriptive statistics

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were held in a year with a minimum of 0 and a maximum of 20. In relation to the independent director ratio, its average is 54.5% of independent directors of the sample. According to Panel A of Table 1, we get information about the board size of the sample. We see that the average board size is 7 directors with a minimum of 5 and a maximum of 18. Furthermore, it shows that 2.1% of shares are owned by managers, and 34.3% of shares are owned by foreign investors. Interestingly enough, within the sample firms, 19.3% of CEOs are politically connected.

In this preliminary analysis, we also conduct a *t*-test to examine the differences between firms with male and female CFOs. By doing so, we can see the position of female CFOs in the occurrences of financial-reporting-related corporate fraud. According to Panel B of Table 1, the percentage of female CFOs is lower than their male counterparts. Then, its *t*-statistic is negative and significant, meaning that female CFOs are likely to involve in corporate fraud. If referring to this data, then it can be assumed that the higher the percentage of female CFOs, the less likely should be firms to commit financial reporting fraud.

Moreover, the *t*-statistic of SOEs is negative and significant, meaning that the percentage of female CFOs in firms with a state-owned background remains underrepresented in the boardrooms. The existence of female CFOs does not bring a significant effect on enhancing group ethical decision-making and governance quality. Generally, within these two subsamples, the patterns of the variables that we expect to influence the fraudulent occurrences are different. The detail of the explanation is supplemented by further analyses.

4.2 Main result: hypothesis testing and robustness checks

The literature suggests that female CFOs are not randomly assigned to firms (Francis *et al.*, 2014; Francis *et al.*, 2013; Xu *et al.*, 2019). Firms focusing more on the quality of financial reporting may be more likely to hire female CFOs because they are more risk-averse than male CFOs (Francis *et al.*, 2013). Therefore, a proper evaluation of the effect of female CFOs on fraudulent financial reporting should take into account the endogeneity of the choice of female CFOs. To address this issue, we start by using two types of methods, such as propensity score matching (PSM) and Heckman's two-stage analysis, to account for the bias caused by self-selection in the firms' choices of female CFOs.

4.2.1 Propensity score matching analysis. We run a probit model in the initial step to predict the likelihood of having a female CFO using the full sample. The dependent variable is a female CFO. Dissimilar to Liao *et al.* (2019), we include the firm size, leverage and ROA in the regression. Then, we also control for industry and year effects. The result of this test is provided in Table 2. In the second step, we apply the data from Table 2 to perform the PSM analysis (Table 3).

Table 2 shows that the determinant of a female CFO selection is significantly associated with some aspects. As found, the coefficient of a firm with a state-owned background (SOEs) is negative, and its significance is 1%. It suggests that the likelihood of having a female CFO is likely lower in a firm with a state-owned background (SOEs). Perhaps, it is because of political interests. This claim can be confirmed in the coefficient of Political CEO suggesting negative and significant at 1% level. Table 2 also shows a similar result to the work of Francis *et al.* (2013), suggesting the firm characteristics influence the likelihood of having a female CFO in the firm. For example, a firm with more debt is more unlikely to recruit a female CFO. Then, the bigger the firm size and the more profitable the firm, the more likely should be the firm to recruit a female CFO. These results give support to the literature that a selection of a female CFO in a firm is not a random form.

As previously mentioned, we run the PSM analysis from the data in Table 2. Based on the procedure of PSM analysis, we identify and analyse 8,542 firm-year observations for the control

Variables	Female CFO	Occurrences of financial reporting fraud
SOEs	-0.032*** (-0.541)	
CFO age	0.032 (0.041)	
CFO duality	0.431 (0.172)	
Supervisory board size	-0.073 (-0.043)	
Supervisory board meetings	0.194 (0.151)	
Independent director ratio	-0.082 (-0.073)	
Board size	-0.360 (-0.211)	
Management ownership	-0.346 (-0.121)	
Foreign ownership	-0.304 (-0.118)	
Political CEO	-0.464*** (-0.054)	
BIG 4	-0.326 (-0.133)	
Firm size	0.043*** (-0.421)	
Leverage	-0.032** (-0.261)	
ROA	0.121* (0.324)	
Industry effects	Y	
Year effects	Y	
Number of observations	12,013	
Pseudo R^2	0.743	

Table 2. The determinant of a female chief financial officer selection

Note: Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Variables	Fraud Model 1	Serious fraud Model 2	Fraud Model 3	Serious fraud Model 4	Female chief financial officers and financial reporting fraud – propensity score models
Female CFO	-0.143** (-0.432)	-0.125*** (-0.301)	-0.153** (-0.439)	-0.132** (-0.235)	
SOEs	0.132* (0.054)	0.121** (0.051)	0.141** (0.037)	0.133** (0.024)	
CFO age	0.417 (0.143)	0.391 (0.126)	0.433 (0.151)	0.361 (0.094)	
CFO duality	-0.105 (-0.084)	-0.124 (-0.081)	-0.112 (-0.174)	-0.127 (-0.165)	
Supervisory board size	0.145 (0.118)	0.121 (0.122)	0.143 (0.117)	0.142 (0.125)	
Supervisory board meetings	-0.105 (-0.062)	-0.124 (-0.072)	-0.166 (-0.135)	-0.151 (-0.102)	
Independent director ratio	-0.354 (-0.108)	-0.285 (-0.118)	-0.373 (-0.124)	-0.362 (-0.119)	
Board size	-0.313 (-0.141)	-0.324 (-0.132)	-0.326 (-0.143)	-0.337 (-0.138)	
Management ownership	-0.321 (-0.112)	-0.338 (-0.130)	-0.357 (-0.103)	-0.328 (-0.127)	
Foreign ownership	-0.431 (-0.104)	-0.410 (-0.136)	-0.433 (-0.112)	-0.431 (-0.141)	
Political CEO	0.323* (0.129)	0.357** (0.105)	0.326* (0.126)	0.552* (0.136)	
BIG 4	-0.241** (-0.119)	-0.227*** (-0.120)	-0.232** (-0.124)	-0.381** (-0.152)	
Firm size	-0.043 (-0.211)	-0.106 (-0.108)	-0.193 (-0.201)	-0.172 (-0.224)	
Leverage	0.124* (0.332)	0.127** (0.282)	0.143* (0.35)	0.231*** (0.391)	
ROA	-0.106 (-0.112)	-0.118 (-0.125)	-0.134 (-0.132)	-0.131 (-0.128)	
Industry effects	Y	Y	Y	Y	
Year effects	Y	Y	Y	Y	
Number of observations	12,013	12,013	8,542	8,542	
Pseudo R^2	0.754	0.654	0.672	0.675	

Table 3. Female chief financial officers and financial reporting fraud – propensity score models

Note: Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

groups with female CFOs and male CFOs. We realise that there is a reduction in the sample size. But it does not negatively affect the results (for further review, see Xie *et al.*, 2012). By applying a matching algorithm, it allows us to compare the control groups to statistically similar controls (Abadie and Imbens, 2016; Huber *et al.*, 2013). Liao *et al.* (2019) note that when

two companies fall into the same propensity category but belong to different groups (companies with a female CFO or a male CFO), it means that these two groups of companies are more likely to be randomly assigned to the treatment (having a female CFO). The results of the PSM analysis are illustrated in Table 3.

There are four columns in Table 3. The estimates illustrated in Columns 1 and 2 are the result of analyses using the entire sample of 12,013 firm-year observations. In line with our expectation, the dummy variable for female CFO in both columns is significantly negative in association with *fraud* and *serious fraud*. To re-assure the accuracy of the result, we examine the impact of female CFO on the occurrences of financial-reporting-related corporate fraud by using the PSM sample. The results are reported in Columns 3 and 4. As we can see, the results remain consistent with the previous tests (in Columns 1 and 2). In both columns, the dummy variable for female CFO is significantly negative in association with *fraud* and *serious fraud*. Based on this consistency, it can be noted that the higher the proportion of female CFO in a firm, the more unlikely should be the firm to engage in financial reporting fraud. We believe it is because female CFOs are more conservative in their financial reporting than their male counterparts (Schopohl *et al.*, 2021; Francis *et al.*, 2015; Li *et al.*, 2022). As the management of a firm's financial reporting system is the primary responsibility of the CFOs, it is then a firm with more female CFOs should be less likely to commit financial reporting fraud.

Furthermore, in all columns of Table 3, the coefficients of SOEs are positive and significant at a 1% level to fraud measures. It indicates that state ownership in the sample firms is more likely to make listed companies' internal control mechanisms less effective, which presents the opportunity for management to engage in accounting fraud. This result is congruent with recent studies (Haß *et al.*, 2019; Zhang *et al.*, 2022; Liang *et al.*, 2022) that state ownership significantly contributes to agency problems. We argue that this situation happens because of corporate political connections (i.e. the political connections of top management teams.) It can be confirmed in the coefficient of Political CEO suggesting positive and significant at 1% and 5% levels.

Table 3 also supports the literature, suggesting that the role of the Big 4 audit firms is essential to weaken the likelihood of fraud propensity. It is indicated by the coefficients of BIG4 being significant and negative to fraud measures. In contrast, the coefficients of Leverage are negative and significant. It means that firms are more likely to be involved in corporate fraud when they are more levered. So it is rational if firms are more unlikely to be involved in corporate fraud or earning management practices when they are in good profitability (Kapoor and Goel, 2017).

4.2.2 Heckman's two-stage analysis. In the first stage, to deal with the concern that the observed relationship between female CFOs and financial reporting fraud is caused by unobservable related variables, we run a probit regression by incorporating all control variables. The first stage of regression analysis is the same as Columns 1 and 2 of Table 3 (using the full sample firms). Then, we calculate the *Inverse Mills Ratio* based on the regression estimate. In the second stage, we run OLS and logit regressions, including the *Inverse Mills Ratio*, obtained from the first-stage probit regression, to control for the endogeneity of the choice of female CFOs. We expect that the *Inverse Mills Ratio* is able to capture all unobserved differences between the treatment and control groups because of selection bias. The results of Heckman's two-stage analysis are illustrated in Table 4. It shows that when the inverse Mills ratio is controlled for, the estimated coefficients of the female CFOs are negative and statistically significant. This result clarifies the prior results that the relationship between female CFOs and the likelihood of financial-reporting-related corporate fraud is acceptable and valid. So this study supports the theoretical framework

Variables	Fraud	Serious fraud
Female CFO	-0.151*** (-0.331)	-0.142** (-0.302)
SOEs	0.124** (0.034)	0.148** (0.041)
CFO age	0.406 (0.142)	0.372 (0.108)
CFO duality ⁶	-0.114 (-0.073)	-0.128 (-0.062)
Supervisory board size	0.151 (0.128)	0.148 (0.131)
Supervisory board meetings	-0.112 (-0.046)	-0.117 (-0.067)
Independent director ratio	-0.286 (-0.098)	-0.286 (-0.124)
Board size	-0.271 (-0.103)	-0.318 (-0.126)
Management ownership	-0.323 (-0.121)	-0.336 (-0.121)
Foreign ownership	-0.418 (-0.121)	-0.416 (-0.126)
Political CEO	-0.294*** (-0.114)	-0.342** (-0.129)
Inverse Mills Ratio	-0.310 (-0.024)	-0.439 (-0.132)
²⁹ 4	0.252** (-0.109)	0.248** (-0.174)
Firm size	-0.264 (-0.232)	-0.247 (-0.211)
Leverage	0.136* (0.251)	0.164* (0.287)
ROA	-0.125 (-0.128)	-0.143 (-0.127)
Industry effects	Y	Y
Year effects	Y	Y
Number of observations	12,013	12,013
Pseudo R ²	0.714	0.783

Occurrences of financial reporting fraud

Table 4. Female chief financial officers and financial reporting fraud – Heckman’s two-stage analysis

³¹ Note: Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

that female CFOs are negatively related to a firm’s propensity to perpetrate financial reporting fraud.

In general, for other variables, there are no significant changes between the data illustrated in Tables 3 and 4. For instance, the coefficients of SOEs, Political CEO, BIG 4 and Leverage, in both tables, suggest similar patterns to fraud measures. Therefore, according to Tables 3 and 4, the proposed hypothesis (H1) is accepted. The data show that female CFOs are negatively related to a firm’s propensity to perpetrate financial reporting fraud. It indicates that female CFOs play a weaker role in the occurrences of financial reporting fraud.

4.3 Additional analyses

Because the recent study (Maulidi, 2022) finds that female corporate leaders in US firms do not significantly impact group ethical decision-making and governance quality, it is necessary to re-examine the role of female corporate leaders by focusing on the impact of female CFOs on the fraudulent occurrences. As Maulidi (2022) explained, firms with a state-owned background have substantial control over the involvement of female corporate leaders in boardroom decision-making. Based on this characteristic ⁵⁵ the subsequent analyses are focused on the differentiation of the role of CFO females on the likelihood of financial-reporting-related corporate fraud in the SOEs and Non-SOEs. We divide the propensity score matched sample of 8,542 firm-year observations into two subsamples. We term the SOEs subsample when an SOE or government agency is the controlling shareholder and the private subsample when a private firm is the controlling shareholder. The results are portrayed in Table 5.

Table 5 shows dissimilarity in data patterns between the subsamples of SOEs and non-SOEs. As reported, our study, in the subsample of SOEs, does not find empirical evidence

Variables	SOEs		Non-SOEs	
	Fraud	Serious fraud	Fraud	Serious fraud
Female CFO	-0.154 (-0.021)	-0.134 (0.061)	-0.142** (-0.032)	-0.137*** (0.058)
CFO age	0.363 (0.063)	0.131 (0.061)	0.321 (0.060)	0.137 (0.062)
CFO duality ⁶	-0.133 (-0.052)	-0.129 (-0.022)	-0.128 (-0.021)	-0.137 (-0.031)
Supervisory board size	0.167 (0.037)	0.167 (0.064)	0.156 (0.031)	0.140 (0.041)
Supervisory board meetings	-0.173 (-0.029)	-0.187 (-0.085)	-0.169 (-0.039)	-0.164 (-0.074)
Independent director ratio	-0.481 (-0.028)	-0.583 (-0.065)	-0.397 (-0.019)	-0.578 (-0.051)
Board size	-0.302 (-0.032)	-0.387 (-0.274)	-0.292 (-0.028)	-0.354 (-0.242)
Management ownership	-0.241 (-0.053)	-0.273 (-0.067)	-0.239 (-0.013)	-0.251 (-0.047)
Foreign ownership	-0.321 (-0.101)	-0.354 (-0.142)	-0.371 (-0.114)	-0.343 (-0.141)
Political CEO	-0.269* (-0.106)	-0.384** (-0.120)	-0.258 (-0.084)	-0.361 (-0.143)
Firm size ¹³	0.239 (-0.129)	0.275 (-0.131)	0.245* (-0.136)	0.258** (-0.129)
Leverage	-0.065 (-0.028)	-0.084 (-0.032)	-0.078 (-0.018)	-0.077 (-0.028)
ROA ¹¹	0.159 (0.082)	0.175 (0.087)	0.149* (0.073)	0.158* (0.074)
Industry effects	-0.144 (-0.012)	-0.164 (-0.015)	-0.143 (-0.012)	-0.159 (-0.014)
Year effects	Y	Y	Y	Y
Number of observations	3,765	3,765	4,777	4,777
Pseudo R ²	0.664	0.674	0.634	0.584

Note: Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

Table 5.

Female chief financial officers and financial reporting fraud – state-owned enterprises versus non-state-owned enterprises

for the significant relationship between the estimated coefficients of the female CFO and fraud measures. In the subsample of non-SOEs, however, our study finds significant and negative correlations between the female CFO and fraud measures. These results indicate that female CFOs, when they are in the work environment of non-SOEs, seem to be more proactive in maintaining the quality of financial reporting, thereby discouraging manipulation and fraud. Surprisingly enough, their roles are not apparent when they are in the SOEs work environment. These results indirectly bring empirical support to prior results illustrated in Tables 3 and 4. Table 5 suggests that the coefficients of Political CEO, in the subsample of SOEs, are positive and significant to the fraudulent occurrences. When, in the subsample of non-SOEs, they are insignificant. Taken together, we perceive that when political connections between firms and governments or politicians are prevalent, the role of female CFOs remains underrepresented (Maulidi, 2022). Essentially, they cannot bring about positive corporate monitoring and oversight outcomes.

To get more clarity on the effect of political CEO on the relationship between female CFOs and fraudulent occurrences, we conduct a further test. In doing so, we divide the propensity score matched sample of 8,542 firm-year observations into the Political CEO subsample and the non-Political CEO subsample. The results are reported in Table 6.

According to the data in Table 6, the coefficients of the female CFOs, in the Political CEO subsample, are insignificant. In the non-Political CEO subsample, they are negative and significant to fraud measures. These results indicate that CEOs' political connection can be considered one of the determinants of female CFOs' performance in enhancing ethical behaviours. As found, the accountability performance of firms run by politically connected CEOs was worse than that of otherwise comparable firms. The evidence suggests that the female CFOs in politically unconnected firms are more likely to lower the likelihood of fraud propensity. If females are believed to be more ethical than men (Harakeh *et al.*, 2019; Gull *et al.*, 2018; Ghaleb *et al.*, 2021), we perceive that female CFOs can be more likely to

Variables	Political CEO subsample		Non-Political CEO subsample	
	Fraud	Serious fraud	Fraud	Serious fraud
Female CFO	-0.187 (-0.121)	-0.167 (-0.135)	-0.158* (-0.146)	-0.144*** (-0.138)
SOEs	0.154*** (0.107)	0.175* (0.110)	0.165 (0.117)	0.154 (0.127)
CFO age	0.464 (0.162)	0.474 (0.164)	0.464 (0.135)	0.453 (0.132)
CFO duality	-0.176 (-0.221)	-0.164 (-0.216)	-0.175 (-0.227)	-0.167 (-0.226)
Supervisory board size	0.284 (0.104)	0.275 (0.115)	0.274 (0.132)	0.264 (0.128)
Supervisory board meetings	-0.184 (-0.108)	-0.175 (-0.086)	-0.183 (-0.107)	-0.173 (-0.098)
Independent director ratio	-0.476 (-0.124)	-0.465 (-0.115)	-0.458 (-0.117)	-0.448 (-0.104)
Board size	-0.364 (-0.096)	-0.372 (-0.103)	-0.364 (-0.121)	-0.358 (-0.117)
Management ownership	-0.285 (-0.085)	-0.284 (-0.083)	-0.274 (-0.063)	-0.274 (-0.062)
Foreign ownership	-0.369 (-0.137)	-0.385 (-0.139)	-0.374 (-0.128)	-0.372 (-0.125)
BIG 4	0.298 (-0.138)	0.207 (-0.115)	0.254 (-0.125)	0.237 (-0.107)
Firm size	-0.058 (-0.174)	-0.054 (-0.168)	-0.074 (-0.162)	-0.064 (-0.158)
Leverage	0.186* (0.107)	0.183* (0.106)	0.165 (0.123)	0.158 (0.094)
ROA	-0.186 (-0.106)	-0.178 (-0.103)	-0.177 (-0.125)	-0.169 (-0.118)
Industry effects	Y	Y	Y	Y
Year effects	Y	Y	Y	Y
Number of observations	3,427	3,427	5,115	5,115
Pseudo R ²	0.685	0.764	0.752	0.729

Occurrences of
financial
reporting
fraud

Table 6.
Female chief
financial officers and
financial reporting
fraud – political chief
executive officer
subsampling versus
non-political chief
executive officer
subsampling

Note: Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

believe that fraud propensity is an impermissible act and, thus, will seek to influence the committee's decision-making. As expected, a majority of the audit committee directors might choose to act against any financial reporting fraud. This study is in line with other studies, suggesting that female corporate leaders are more effective in monitoring the corporate financial accounting process (Ali Aribi *et al.*, 2021; Harris *et al.*, 2019; Qi *et al.*, 2018). In reducing the earning management practice and opportunity for fraud, however, it is more pronounced with female CFOs than female CEOs (Gull *et al.*, 2018; Brennan, 2021). It is because they are less tolerant of opportunistic behaviour when making organisational decisions (Brennan, 2021; Jalan *et al.*, 2020; Li and Thibodeau, 2019) and are highly sensitive to reputational loss and the risk of lawsuits (Gull *et al.*, 2018; Duong and Evans, 2016).

Table 6 also reports that the coefficients of SOEs in the political CEO subsample are positively and significantly associated with fraud measures. However, in the non-political CEO subsample, they are not significantly associated with fraud measures. These results imply that the occurrences of fraudulent financial reporting are more likely attributed to SOEs, mainly when politically connected CEOs run the firms. We argue it is because politically connected CEOs contribute significantly in helping firms to obtain privileges or favourable treatment from the governments (Zhang, 2018; Qian and Chen, 2021). It is in line with our expectation that the political connections between the governments, in this situation as the controlling shareholder, and CEOs often end up in regulatory violations (Latif and Al-Dhamari, 2020; Shin and Ahn, 2021).

Prior studies note that the presence of a gender-diverse board is an essential determinant of corporate decision-making (Doan and Iskandar-Datta, 2021; Fang *et al.*, 2020; Joo *et al.*, 2021). Some scholars find that it is significantly associated with the performance of CFOs in enhancing the quality of financial information (Xu *et al.*, 2019; Hsieh *et al.*, 2020; Wang *et al.*, 2021; Li and Lee, 2022). We believe this situation might affect the relationship between female CFOs and the fraudulent occurrences. The rationale is that the fraudulent

occurrences are closely attributed to top management, including CFOs (de Almeida and Lemes, 2019), and the presence of gender-diverse boards moderates the relationship between the role of CFOs and the fraudulent occurrences (Khan, 2019). Consequently, we conduct a comparative analysis of subsamples with gender-diverse and non-gender-diverse boards. In doing so, we divide the propensity score matched sample of 8,542 firm-year observations into these two subsamples. We report the results in Table 7.

Table 7 shows that the coefficients of the female CFOs, in the subsamples of a gender-diverse board, are negative and significant to fraud measures. However, they are not significant in the non-gender-diverse board. These results mean that the representation of female CFOs plays a weaker role in firms' propensity to mislead the users of financial statements. Particularly, it is when the environment in the boardroom is gender-friendly. According to some studies, by considering the gender diversity of the board, firms can enhance problem-solving because a variety of perspectives and opinions is available from a more diverse board (González *et al.*, 2020; Brahma *et al.*, 2021). Substantially, a more gender-diverse board may reduce the discrimination against the presence of female CFOs. We believe that female CFOs' role in the subsamples of a gender-diverse board is proportionally represented. The idea is that within the gender-diverse board, female CFOs have equality in decision-making (Ting *et al.*, 2021), meaning that they might decide and know correctly about what ought to be done for their firm. This situation is totally different in the subsamples of a non-gender-diverse board. As found, our study does not find a significant relationship between female CFOs and fraud measures. This result might be caused by gender inequality (Azmat and Boring, 2020). As a consequence, the role of female CFOs is poorly represented because of male dominance.

Furthermore, our study finds that the coefficients of SOEs in the non-gender-diverse board are positive and significant at 1% and 5% levels to fraud measures. Then, we do not find a significant relationship between SOEs and fraud measures in the gender-diverse board. This

Variables	Gender-diverse board		Non-gender-diverse board	
	Fraud	Serious fraud	Fraud	Serious fraud
Female CFO	-0.152* (-0.133)	-0.143*** (-0.126)	-0.144 (-0.126)	-0.152 (-0.163)
SOEs	0.146 (0.132)	0.154 (0.125)	0.163** (0.137)	0.153* (0.127)
CFO age	0.341 (0.125)	0.351 (0.126)	0.431 (0.117)	0.417 (0.113)
CFO duality	-0.164 (-0.214)	-0.136 (-0.142)	-0.163 (-0.213)	-0.158 (-0.214)
Supervisory board size	0.264 (0.125)	0.245 (0.136)	0.274 (0.132)	0.243 (0.127)
Supervisory board meetings	-0.175 (-0.114)	-0.164 (-0.107)	-0.153 (-0.113)	-0.163 (-0.017)
Independent director ratio	-0.464 (-0.163)	-0.423 (-0.132)	-0.452 (-0.153)	-0.453 (-0.127)
Board size	-0.383 (-0.174)	-0.342 (-0.153)	-0.374 (-0.128)	-0.351 (-0.137)
Management ownership	-0.273 (-0.064)	-0.284 (-0.054)	-0.267 (-0.072)	-0.273 (-0.064)
Foreign ownership	-0.352 (-0.132)	-0.364 (-0.143)	-0.374 (-0.128)	-0.354 (-0.136)
BIG 4	0.254 (-0.134)	0.253 (-0.125)	0.258 (-0.121)	0.253 (-0.128)
Firm size	-0.067 (-0.142)	-0.063 (-0.132)	-0.073 (-0.127)	-0.054 (-0.138)
Leverage	0.182 (0.124)	0.175 (0.121)	0.162 (0.116)	0.164 (0.053)
ROA	-0.121 (-0.113)	-0.132 (-0.127)	-0.132 (-0.128)	-0.151 (-0.131)
Industry effects	Y	Y	Y	Y
Year effects	Y	Y	Y	Y
Number of observations	4,652	4,652	3,890	3,890
Pseudo R ²	0.534	0.604	0.763	0.748

Table 7. Female chief financial officers and financial reporting fraud – gender-diverse board versus non-gender-diverse board

Note: Significance at the 10, 5 and 1% levels are indicated by *, ** and ***, respectively

result illustrates that SOEs with a gender-diverse board may have fewer agency problems, resulting in reduced managerial opportunism behaviour. The gender-diverse board is often associated with better internal control, which reduces agency conflict and increases firms' ethical decision-making (Usman *et al.*, 2019; Alkebeese *et al.*, 2021a, 2021b). We agree with Guizani and Abdalkrim (2021) that a board of directors with different backgrounds, especially gender, provides valuable resources, thus promoting firm accountability. So it might be rational if the occurrences of corporate fraud are only associated with SOEs that do not invest in gender-diverse boards. As previously discussed, the role of female CFOs is not influential in non-gender-diverse firms. The poor participation of female CFOs on the corporate boards is because of male dominance. When male board members dominate the decision process of the board, they then give less weightage to the opinions and ideas of the female CFOs. Therefore, a firm operated by a higher percentage of female CFOs is more unlikely to deceive another person or group by misrepresenting the amounts and disclosures of corporate financial statements.

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5. Conclusion and implications

The primary aim of this study is to examine the relationships between female CFOs and the occurrences of financial reporting fraud by using US firm-level panel data. The rationale of this study is that we lack theoretical and empirical evidence discussing the role of female CFOs in the occurrences of financial reporting fraud, focusing on US firm samples. Our findings provide support for the theoretical framework, suggesting that the higher the proportion of female CFOs, the lower the likelihood should be firm to engage in financial reporting fraud. As found, they are more unlikely to tolerate any opportunistic practices, emerging the likelihood of corporate fraud. Especially when they are working in the firms that do not be either wholly or partially owned by a government and in the firms focusing on gender diversity and politically unconnected CEOs, the presence of female CFOs and the likelihood of financial reporting fraud become significantly negative.

In contrast, our study suggests that the role of female CFOs becomes weak when they are in firms with strong political ties between firms and governments or politicians. This result is consistent with the literature that government involvement in corporate governance is an essential issue for the role of female CFOs in improving the financial disclosure quality. Even though politics and corporate governance exist to enhance the quality of the decision-making process, it does not mean that a firm can foster the greater levels of honesty in financial reporting. We find that firms with strong political ties to governments or politicians have the dominant contribution to the occurrences of financial reporting fraud. In this sense, female CFOs tend to have less opportunity to make moral judgments about fraud propensity. We perceive interventions from governments tend to exercise control over the role of female CFOs. We accept that female CFOs tend to adopt more conservative financial reporting policies and are less overconfident in making significant corporate decisions. However, their representation in top management will not improve the task performance of the top management team to limit the number of fraud risks when males dominate at management and executive levels.

There are theoretical and practical implications for this study. In terms of theoretical implications, our study offers significant contributions to three bodies of literature. *First*, the findings contribute to the gender literature examining the role of female corporate leaders in fraud commission and detection (Wang *et al.*, 2022; Niu *et al.*, 2019; Davidson, 2022; Maulidi, 2022). Those studies, in general, posit that boards with female directors have fewer financial irregularities, which tend to be indicative of financial manipulation. Our study contributes to those studies by exclusively building theoretical work that focuses on the role of female CFOs in the occurrences of financial statement fraud. Our study brings novel empirical

evidence that the greater the female CFOs on top management teams, the more likely they can reduce firms' propensity to engage in corporate fraud.

Second, the current study contributes to the corporate governance literature that examines the determinants of female CFOs selection (Francis *et al.*, 2014; Schopohl *et al.*, 2021). Our study suggests the likelihood of having female CFOs on top management teams is highly influenced by work environments with high governmental controls (SOEs), focusing on non-gender diversity and politically connected CEOs. Within such work environments, our study reports that the presence of female CFOs is poorly represented, particularly in board-level strategic decision-making. As such, they are less likely to limit the firms' propensity to engage in corporate fraud. This result directly extends prior studies (Wang *et al.*, 2022; Luo *et al.*, 2020; Wahid, 2019; Arnaboldi *et al.*, 2021), arguing that female corporate leaders' involvement in fraud control is contingent upon female representation in top management teams. We propose different perspectives by highlighting both dynamics of internal and external organisational factors.

Third, this study extends theoretical and empirical works in the area of gender diversity and associated organisational outcomes such as firm performance (Fernando *et al.*, 2020; Li and Chen, 2018; Mohsni *et al.*, 2021) and transparency (Kao *et al.*, 2020; Holmelin, 2019). The study adds to the existing evidence on the link between female CFOs and the risk of corporate fraud. Our analysis answers the central research question of "when female CFOs make a difference impact to" and "how the substantive representation of female CFOs makes a less contribution to" fraud controls. This study moves the analytical focus from the macro level (gender diversity or female corporate leaders) to the micro level (female CFOs) to encourage ethical behaviours and curb organisational misconduct. In accordance with critical mass theory, our study supports the presence of three or more female corporate leaders or directors (Lauring and Villesèche, 2019; Buertey, 2021; Amorelli *et al.*, 2020; Birindelli *et al.*, 2019). Especially, our study contributes to the topics of a critical mass theory by offering timely empirical evidence that the level of female CFOs representation is more effective in reducing the occurrence of financial reporting fraud. As found, a greater proportion of female CFOs is associated with a lower likelihood of such a lawsuit.

As for the managerial implications of our study, *first*, our result implies that female CFOs can enhance the monitoring processes so that the company's financial reports are accurate and compliance with applicable regulatory or other legal requirements. Additionally, they can reduce the likelihood of financial reporting fraud. As such, by adding the female voices to the members of the C-suite, a term used to describe the most important executives in a company, the opportunity for corporate fraud is controllable or even preventable. Compared to other developed countries, the rate of female representation as a member of the C-suite in US firms remains a serious issue. Given this result, we suggest that the US Government or regulators consider the impact of female CFOs on reducing financial reporting fraud.

Second, it is essential for the US Government or regulators to reduce the influence of state or political intervention in listed firms because it is positively associated with the prevalence of corporate fraud. As found, it is also negatively influencing the effectiveness of the role of CFOs in enhancing the quality of financial reporting and reducing the opportunity for corporate fraud.

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