Gender Diversity and Securities Fraud

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Abstract

We formulate theory and set forth a first-ever empirical analysis of the impact of board of director gender diversity on the broad spectrum of securities fraud, generating three main insights. First, the examined data show strong evidence consistent with the view that the importance of women on boards in mitigating securities fraud lies in the mechanism of diversity itself, such that the optimal percentage of women on boards is 50% with respect to minimizing securities fraud. We find less direct support for the alternative proposition that women are more ethically sensitive and less likely to risk committing fraud, such that the optimal percentage of women on boards would be 100% with respect to mitigating securities fraud. Second, we show that the market response to fraud from a more gender-diverse board is significantly less pronounced. Third, we show that women are more effective in mitigating both the presence and severity of fraud in male-dominated industries, which again supports the notion of diversity. All our findings are robust to controls for endogeneity and propensity score matching, among other robustness checks.

Keywords: corporate governance; ethical sensitivity; fraud; gender diversity; risk aversion

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Abstract

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INTRODUCTION

Fraud is a global problem (Kang, 2008; Karpoff, Koester, Lee & Martin, 2012; Zahra, Rasheed, & Priem, 2005). The Association of Certified Fraud Examiners (2010)[1] estimates that each year the typical organization loses about 5% of its annual revenue to fraud, which translates to an annual potential total loss of more than $2.9 trillion worldwide. The relative scarcity of women on boards of directors is likewise a global problem. Terjesen, Sealy & Singh (2009) report the percentage of women on boards across 43 countries, and show that only one country averages more than 20% women on boards (Slovenia, at 22%), while the United States averages 15%, and China and Australia are typical, averaging 10% women on boards. Many European countries, such as Portugal, France, Denmark, and Germany have roughly 5% women representation on boards. Ten countries have less than 5% women representation, with Japan the lowest at less than 1%.[2] In the past two decades, a growing number of women have taken up executive positions (e.g., chairpersons, general managers, board directors) in U.S. firms (Farrell & Hersch, 2005; Rosener, 2003). Some European countries have recently introduced legislation that requires firms to have a minimum percentage of women on boards. Hoel (2008) reports that Norway is the first European Union member state to require that listed firms have at least 40% female board representation by 2008. Cabo, Gimeno, and Nieto (2011) report minimum quotas for female representation on boards across Europe: 40% in large Spanish listed firms by 2015, 40% in large French listed firms by 2017,

[1] The Association of Certified Fraud Examiners (2010) report is based on data compiled from a study of 1,843 cases of fraud that occurred worldwide (106 countries) between 2008 and 2009.

[2] Earlier statistics show lower percentages of women on the board. According to the Ethical Investment Research Service reports (Maier, 2005) and the European Professional Women's Network (2006), only three developed counties have double-digit percentages of female board directors: the U.S. (12.7%), Sweden (20%) and Norway (25%). Vanhala (1999) reports that 25% of managerial and 2–3% of chief executive positions are held by women, and Lilius (2003) finds that 11% of board directors in Finnish firms are women. Kang et al. (2007) show that 33% of Australian firms have no female directors on their boards. Cheng et al. (2010) show that 4% of Chinese firms are chaired by women.

30% in Italian-listed and state-owned enterprises (SOEs) by 2015, and 30% in large Dutch firms by January 2016.

In response to increasing pressure for board and gender diversity beginning in the 1990s, the number of women occupying senior positions (such as chairpersons, general managers, and directors) has risen dramatically in U.S. firms (Farrell & Hersch, 2005; Rosener, 2003).[3] There has since been extensive work on the causes and consequences of the presence of women on boards; most of this work focuses on the impact of women in relation to corporate financial performance and corporate social performance, such as charitable gifting (see Terjesen et al., 2009, for a recent comprehensive review). In general, this prior work finds that the presence of female directors on a board can be seen as a favorable signal to the market that the firm is socially responsible and pays attention to minority groups. A number of studies also show that firms with a higher proportion of female board directors have better corporate reputations (Bernardi, Bosco, & Vassill, 2006; Brammer, Millington, & Pavelin, 2009). Carter, Simkins, and Simpson (2003) find that there is a positive relation between firm value and percentage of female board directors. Bernardi et al. (2009) find a positive association between the number of female directors on a firm's board and that firm's appearance on *Ethisphere* magazine's World's Most Ethical Companies list. A number of research studies also examine the impact of gender on firm performance and governance (Adams & Ferreira, 2009; Carter et al., 2003).

There has been extensive work on the causes and consequences of securities fraud. For example, several studies show a relation between board composition, interlocking boards, audits, and accounting fraud (Beasley, 1996; Beasley, Carcello, Hermanson, & Lapides, 2000; Kang, 2008), and between insiders and fraud (Dunn, 2004). But there has been a dearth of research

[3] In addition to increasing representation in the business world, a growing number political leaders are female. Chattopadhyay and Duflo (2004) show that women hold 13.8% of all parliament seats in the world. Dollar et al. (2001) examine whether women are more effective in promoting honest government, and find that as female representation increases, the level of political corruption decreases.

examining the relation between the presence of women on boards of directors and securities fraud. As far as we are aware, there are only a few published studies that directly examine the impact of gender on fraud risk; these studies focus on insurance and accounting fraud in the U.S. and China, and find differing results. Owhoso (2002) studies the role of women in U.S. big-5 accounting firms and finds no evidence from gender in subjective assessment of accounting fraud risk, based on surveys of 80 male and 80 female auditors. Tennyson (1997) examines whether there are gender differences in consumer attitudes toward insurance fraud; based on 1585 survey responses, this author finds little difference between the attitudes of men and women. Thiruvadi and Huang (2011) examine the role of women in 299 audits in the U.S. and find that earnings management is less pronounced when a woman is on the audit committee. By contrast, Ye, Zhang, and Rezaee (2010) find that, based on a sample of 5,216 firms in China over the 2001–2006 period, there is no impact from female executives on apparent earnings management. Ye et al. (2010) and Thiruvadi and Huang (2011) examine accounting information and share prices to infer earnings management; they do not examine actual fraud cases.

The present paper adds to the literature on the relation between securities fraud and the presence of women on boards of directors. We assemble a large data set, spanning the period 2001–2010, of all detected fraud cases (a total of 1422 cases) in China from the China Securities Regulatory Commission (CSRC). We use secondary data, not survey data, which avoids issues associated with potential response bias. We examine actual fraud cases, since proxies for fraud based on earnings management, for example, may pick up unexpected movements in earnings, and hence the inferences drawn can depend on the underlying model used to generate expected earnings. Moreover, securities fraud is a much broader concept than earnings or accounting manipulation. We merge our data on actual fraud with other secondary data from the China Securities Markets and Accounting Research CSMAR database on gender diversity on the corporate boards of

fraudulent companies. We also create a matched sample of non-fraudulent companies, as discussed herein. We use data from China for a number of reasons. First, China is a typical country in respect of both the frequency of fraud and board of director gender diversity. As discussed above, China has a typical percentage (10%) of women on boards compared to other countries (Terjesen et al., 2009). Furthermore, the frequency of fraud detected in China is very comparable to that found in the United States (detected fraud cases are found in 3 to 5% of listed companies each year in both China and the U.S.; Cumming & Johan, 2013). Second, as the second largest economy in the world based on GDP, it is of natural interest academically and in practice to study China. Third, in China, the record keeping and data details on securities fraud (including but not limited to accounting fraud) and boards of directors are extremely detailed. The CSRC is responsible for enforcing securities regulations within listed firms, stock exchanges, and securities firms. In addition, the CSRC is charged with investigating accusations of corporate fraud and imposing enforcement actions on firms that violate securities regulations. When listed firms violate the regulations of the CSRC, the Shanghai and Shenzhen stock exchanges, or other regulatory authorities (e.g., the Finance Department), information about the firms committing the violations, as well as the nature of the violations, is disclosed by the relevant authorities and published by media outlets designated by the CSRC (e.g., *Securities Times* and *Shanghai Securities Daily*). There are many types of violation events; the major ones include illegal share buybacks, reporting inflated profits, asset fabrication, unauthorized change in fund use, violations in capital contributions, shareholder embezzlement, share price manipulation, illegal guarantees, and speculation. The violations may involve a firm itself, firm management, and shareholders. Following investigation, violations may trigger penalties, including fines, public criticism, administrative punishment, warnings, and delisting.

We test three propositions in novel ways not undertaken in the literature on gender diversity and fraud. First, we run a horse race between the "women are more ethically sensitive" securities fraud hypothesis and the "gender diversity" securities fraud hypothesis. The women are more ethically sensitive securities fraud hypothesis predicts a linear negative relation between the proportion of women on the board and the frequency of fraud, with the optimal percentage of women on the board being 100%. The gender diversity securities fraud hypothesis, by contrast, predicts that diversity between men and women gives rise to more ethical decision-making, and as such, there is an inverted U-shaped relation between the proportion of women on the board and the frequency of fraud. Second, we test the effect of women on boards on the severity of fraud as proxied by the impact on share prices following discovery of fraud. Third, we compare the effect of women on boards in male- versus female-dominated industries. We provide a number of companion analyses and robustness checks of these tests, as detailed herein.

The examined data are more supportive of the gender diversity hypothesis relative to the women are more ethically sensitive hypothesis. In our data set, the maximum percentage of women on the board in any one firm is 50%. We observe the marginal effect of adding more women up to 50% as increasing at a decreasing rate. From the average percentage of female directors (13.2%), a one standard deviation increase in the proportion of women directors (9.1%) is associated with a 14.6% reduction in the probability of fraud. Also, the data indicate that the impact of gender diversity is more pronounced in male-dominated industries. In particular, a one standard deviation increase in the proportion of female directors from the mean level gives rise to a 15.4% [13.4%] reduction in the likelihood of fraud among male-dominated industries [female-dominated industries]. Further, the data indicate that the market response to fraud, as measured by abnormal share price reaction, committed by firms with a gender-diverse board is significantly less pronounced. This market response to fraud is more pronounced for

male-dominated industries than female-dominated industries. These findings are robust to a variety of controls and econometric approaches, including but not limited to propensity score matching.

The impact of gender diversity on fraud in China is of interest to academics, practitioners, and policymakers around the world, including but not limited to those with an interest in China. No prior work has linked gender diversity on boards of directors to actual real detected fraud cases in any country, and no prior work has considered the relation between board of directors gender diversity and fraud in contexts other than accounting and auditing fraud. Our analysis considers actual fraud cases for the complete range of types of securities fraud. It is important to study the ethical attitudes and standards of entrepreneurs and business people. Bucar, Glas, and Hisrich (2003) argue that societies with low business ethics standards may have higher costs of regulation and policing. Although there are a number of studies on fraud (e.g., Beasley, 1996; Beasley et al., 2000; Karpoff et al., 2012; Uzun, Szewczyk, & Varma, 2004), few examine the relation between gender diversity and fraud (Terjesen et al., 2009), and in particular, financial or securities fraud. Although there is a global call for gender diversity on boards of directors, women are still under-represented (Terjesen et al., 2009). We find evidence that board of directors gender diversity facilitates improved corporate governance, insofar as that the likelihood and severity of securities fraud is mitigated, implying that regulators and policymakers should consider the worldwide call for more gender-diverse boards.

BACKGROUND AND HYPOTHESIS

We focus our analysis on gender diversity among boards of directors and senior management in the context of an analysis of the effect of diversity on fraud. The Association of Certified Fraud Examiners (2010) finds that senior management and boards affect corporate culture, and that

fraudulent acts cause more damage when they are committed by high-level actors. Further, the Association of Certified Fraud Examiners (2010) finds that owner/executive fraud is more than three times as costly as manager fraud and nine times as costly as employee fraud.

We conjecture two mechanisms through which women on boards of directors can mitigate the likelihood of securities fraud. The first mechanism is through organizational diversity (see generally Nederveen, Pieterse, van Knippenberg & van Dierendonck, 2013; Nielsen & Nielsen, 2013; Pfeffer, 1983; Williams & O'Reilly, 1998). Diversity of board members may take a variety of forms that are not limited to gender, and prior research is consistent with the view that diversity mitigates the likelihood of fraud. The literature on corporate and financial fraud, mostly based on U.S. data, shows that a number of factors are related to the incidence of fraud. In an examination of accounting and auditing enforcement actions by the SEC in the U.S., Beasley (1996) shows that the incidence of financial statement fraud is negatively related to proportion, tenure, and share ownership of outside directors. Uzun et al. (2004) analyze U.S. corporate fraud cases collected from *The Wall Street Journal*, and find similar results for the proportion of independent outside directors. While Beasley (1996) finds that the presence of an audit committee has no effect on financial statement fraud, Dechow, Sloan, and Sweeney (1996) and Beasley et al. (2000) report that audit committees help minimize fraud in the U.S. However, Agrawal and Chadha (2005) suggest that the likelihood of earnings misstatement among U.S. firms is lower only if at least one outside director on the board and on the audit committee has an accounting or finance background. Karpoff et al. (2012) summarize a broader array of literature from the U.S. and note that some differences across studies are attributable to apparent data inconsistencies. Nevertheless, overall, this body of research suggests that diversity among boards in a variety of forms can mitigate fraud, and there may be reasons why other forms of board of director diversity, such as gender diversity, may likewise mitigate fraud.

It is noteworthy that one form of diversity comes from women's distinct leadership style. The social role theory of leadership (Eagly & Carli, 2007; Eagly & Johnson, 1990; Eagly, Karau, & Makhijani, 1995) outlines that female leaders are more likely to show concern for people and look out for their welfare (communion), while male leaders are more likely to have traits (agency) that reinforce competition and hierarchy. Similarly, it is often reported in practice that women are better listeners and seek better listeners, particularly in relation to matters of finance.[4] We may expect that these sensitivities, morality concerns, and risk-trait differences between women and men should be reflected in their compliance with corporate regulations.

It is further noteworthy that another form of diversity comes from talent. By considering women on the board, there is a greater pool of talent from which to draw, which can facilitate firm performance (Erhardt, Werbel, & Shrader, 2003). Talent is of course multidimensional (Simonton, 2001), and larger pools of people draw a more diverse and multifaceted talent pool.

The second mechanism through which female presence on boards of directors may affect fraud is through the notion that women are more ethically sensitive. The psychology, ethics, and finance literature shows that women are more ethically sensitive and risk averse[5] (Bruns & Merchant, 1990; Cohen, Pant, & Sharp, 1998; Sundén & Surette, 1998). However, there is some evidence of differences across countries; for example, Lam and Shi (2008) find from a sample of personal interviews that females are less accepting of unethical behaviors in Hong Kong but not in mainland China. It is possible that firms with more female board directors would be less likely to violate rules and commit fraud, irrespective of whether the board of directors exhibits gender diversity.

[4] http://www.reuters.com/article/2014/01/17/column-yourpractice-idUSL2N0KP15720140117

[5] A risk-averse individual is typically less willing to commit fraud for fear of being caught.

In the psychology, ethics, and business literature, women are portrayed as being more ethically sensitive than men, particularly in dilemma situations. One explanation for gender differences in ethical sensitivity stems from the gender socialization theory. According to this theory (Dawson, 1997), men and women learn different sex roles, related values, and concerns, which form their masculine and feminine personalities in childhood. Consequently, men and women exhibit psychological and cognitive differences in moral principles. Carlson (1972) suggests that men are guided by argentic goals, focusing more on the pursuit of personal achievement, while women are guided by communal goals, which put more emphasis on the development of interpersonal relations.[6] If it is assumed that women are socialized to embody communal values more than men, then women should be more likely to react ethically in dilemma situations (Mason & Mudrack, 1996). However, empirical evidence showing whether women are more or less ethical than men is mixed.

There is conflicting evidence in the literature regarding gender and ethics, depending on the specific issue considered, sample size, data sets, use of surveys versus secondary data, empirical methods, and the institutional context considered. These papers are summarized in the Online Appendix accompanying this paper.[7] On one hand, a number of studies show that there is no significant difference between men and women in terms of ethical preferences (Jaffee & Hyde, 2000; Radtke, 2000). Weait (2001) even suggests that women can be more liberal than men in terms of ethical views. Owhoso (2002) examines whether the presence of positive ethical information mitigates previously observed superiority of female ethical sensitivity in evaluating the likelihood of fraud risk when performing audits. The results show that given positive ethical signals in fraud risk assessment, female auditors lose their superior ethical sensitivity in ethical

[6] For instance, women are more nurturing, less aggressive, and less likely to be harmful to others (Radtke, 2000).
[7] The exact web address will be provided at a future date. For now, the material is copied in the last few pages of this file.

dilemmas, suggesting that gender does not affect ethical sensitivity. Further, Velthouse and Kandogan (2007) find that male managers value personal and ethical concerns significantly more highly than do female managers.[8]

On the other hand, some studies show that gender can explain differences in ethical decision-making behavior. Women are found to have stronger feelings than men about ethical issues concerning disclosure (Roxas & Stoneback, 2004). In an eight-country ethical dilemma study of accounting students (Australia, Canada, China, Germany, Philippines, Thailand, Ukraine, and the U.S.), Roxas and Stoneback (2004) generate evidence that women are more ethical than men. Agency theory suggests that there should be an appropriate mix of experience and capabilities on corporate boards to successfully perform the necessary monitoring duties, (Hillman & Dalziel, 2003). In the accounting literature, Bruns and Merchant (1990) and Cohen et al. (1998) show that women are more aware of ethical issues in making dilemma decisions. Carter et al. (2003) argue that a more diverse board enhances board independence and better monitors firm management. Adams and Ferreira (2009) find a positive relation between gender diversity and effective firm governance and conclude that a gender-diverse board is a tougher monitor. Given the differences across studies, we believe it is important to generate further large sample evidence. Accordingly, we set forth new tests with national-level data spanning an entire decade in our empirical tests below.

Although gender difference may affect individual ethical decisions, given that female executives are more sensitive to ethical issues than male executives (Bruns & Merchant, 1990; Cohen, Pant, & Sharp, 1998; Sundén & Surette, 1998), it remains unclear whether board gender composition affects ethical decisions made by firms as a whole. Fondas and Sassalos (2000) and

[8] Velthouse and Kandogan (2007, p. 159) report that female managers score particularly low in "not compromising own standards" and "providing accurate information" in personal ethics and in "adhering to regulations" in codified concern.

Hillman and Dalziel (2003) argue that gender diversity facilitates board monitoring of management and protection of shareholder interests more effectively, by broadening board expertise, experience, and quality. Ibrahim, Angelidis and Tomic (2009) survey 286 managers on their perception of codes of ethics, and show that gender has a significant impact on the attitudes of managers toward business ethics, with female managers being more positive with respect to the impact of an ethics code and more confident that the code raises ethical standards in business.

In addition, in the psychology and finance literature, women are found to be less overconfident, more risk averse, and more conservative than men (e.g., Barber & Odean, 2001; Byrnes, Miller, & Schafer, 1999; Sundén & Surette, 1998).[9] Overconfident investors tend to hold more risky portfolios (Odean, 1998). Powell and Ansic (1997: 622) report that "females are less risk propensive, they tend to focus on strategies which avoid the worst situation to gain security." Female entrepreneurs are more concerned about the risk associated with fast-paced growth and more likely to adopt a measured expansion rate (Cliff, 1998). Using various risk measures (return volatility, beta, size), Barber and Odean (2001) show that men invest in riskier portfolios than women. Olsen and Cox (2001) find that professionally trained female investors place greater weight on security considerations and loss potential when making investment decisions. Agnew, Balduzzi, and Sunden (2003) and Agnew, Anderson, Gerlach, and Szykman (2008) show that when facing financial decisions about retirement investment plans, women are more likely to choose less risky assets and annuities. One explanation proposed for the underperformance of female-owned firms relative to male-owned firms is the propensity to take risk (Sexton & Bowman-Upton, 1990). Watson and Robinson (2003) find that female-controlled small- and

[9] Byrnes et al. (1999) show that women are less likely to engage in such risky activities as changing jobs, speeding, and drug abuse. Jianakoplos and Bernasek (1998) and Sundén and Surette (1998) find that women are more likely to invest in financial assets with low risk or return volatility.

medium-sized enterprises (SMEs) have significantly lower risk compared to male-controlled SMEs.

Finally, we note that it is possible that gender diversity may give rise to conflicts amongst board members (on gender differences and conflict, see generally Sen, 1990). However, conflict arising out of gender diversity is more likely to give rise to increased scrutiny over board members if people are less trusting of one another, thereby curtailing the frequency of corporate fraud.

In sum, gender diversity suggests that there is an inverted U-shaped relationship between the proportion of women on boards and fraud, and that the optimal proportion of women is 50%. Ethical sensitivity, by contrast, suggests that there is a linear relationship between women on boards and fraud, and that the optimal proportion of women is 100%. These two notions are not completely independent of one another, since differences in ethical sensitivity may be one important component of gender diversity. If women are more ethical and risk averse than their male counterparts, female senior executives may be more likely than male executives to decide that it is unethical, illegal, or risky to violate securities regulations or to commit fraud. To protect the best interests of shareholders, the firm, and themselves, female senior executives, then, would be more likely to choose not to violate rules. Based on gender differences in ethical sensitivity and risk aversion, we conjecture that increasing gender diversity on corporate boards would minimize the likelihood and severity of fraud (Hypothesis 1a). We also consider the alternatively framed hypothesis (Hypothesis 1b) that female ethical sensitivity, by itself, directly translates into a reduced likelihood of fraud.

Hypothesis 1a: *Gender diversity on boards of directors mitigates fraud, and as such there is an inverted U-shaped relationship between the proportion of women on boards and the frequency of fraud.*

Hypothesis 1b: *Women are more ethically sensitive than men, and as such there is a negative linear relation between the proportion of women on boards and the frequency of fraud.*

The consequences of committing fraud can be measured in a variety of ways, such as abnormal share price reactions ('abnormal' meaning relative to what was expected based on a market model), and changes in corporate conduct, like charitable giving and CEO turnover, among other indicators. We refer to and study the consequences of committing fraud in terms of abnormal share price reaction, since this is the most common and widely accepted method of studying the severity of corporate fraud (Campbell, Lo & MacKinlay, 1997; Karpoff et al., 2012). Abnormal share price reactions are a direct measure of public perception of the severity of fraud, and do not depend on further corporate decision-making (such as in the case of charitable giving and CEO turnover).

It is widely recognized that there are significant long-term costs to firms facing enforcement actions for fraud. In the U.S., Karpoff et al. (2012), among others, show that there are pronounced long-term consequences from committing fraud in terms of lost reputation, as proxied by lower share prices; these costs significantly outweigh the direct costs of sanctions in the form of fines. In China, Chen, Firth, Gao, and Rui (2005) show that there is a negative stock price reaction to the announcement of enforcement actions, and Chen, Firth, Gao, and Rui (2006) show the impact of ownership structure and boardroom characteristics on corporate financial fraud. Chen et al. (2006) find that boardroom characteristics are significant factors in explaining the incidence and severity of fraud, including outside directors, number of board meetings, and tenure of chairman; however, they do not examine board gender composition.

As far as we are aware, there is no literature that assesses the impact of board of director gender diversity on share price reaction to corporate fraud. We expect that more gender-diverse boards will have less pronounced share price reactions to fraud enforcement actions, for the following reasons. First, if women are more ethically sensitive than men, as discussed above, fraud is less likely to be viewed by shareholders as being severe. Second, if board of director diversity curtails the presence of fraud, as discussed above, then diversity is more likely to mitigate the occurrence of severe fraud than more trivial forms of fraud. In other words, relatively trivial forms of fraud may go unchecked or unnoticed even by a diverse board, whereas severe forms of fraud are much more salient and much less likely to occur among firms with a greater proportion of women on the board.

Hypothesis 2a: *A more gender-diverse board mitigates the severity of fraud, such that there is an inverse U-shaped relationship between the proportion of women on the board and the abnormal share price reaction.*

Hypothesis 2b: *A greater proportion of women on the board mitigates the severity of fraud, such that there is a linear relationship between the proportion of women on the board and the abnormal share price reaction.*

Finally, we may conjecture that gender diversity on boards of directors influences the frequency and severity of fraud to a different degree depending on the industry involved. Sex segregation theory (Cejka & Eagly, 1999; Glick, 1991) shows that different industries require different degrees of masculinity to achieve success. Some industries, such as food processing, clothing (textile, garment) manufacturing, medicine and biological product manufacturing, clothing retail trade, food and beverage services, hotels, tourism, radio, film and television, and publishing, have been characterized as female-dominated industries. For example, the Workplace

Gender Equality Agency of the Australian Government (www.wgea.gov.au) provides uniquely detailed data on the percentage of female employees in each industry, to classify industries as either male- or female-dominated. We classify an industry with more than 50% female employees as a female-dominated industry.

As reviewed above, boards of directors can mitigate the frequency and severity of fraud by monitoring the actions of employees and managers of the company. Just as a gender-diverse board facilitates improved governance within the board itself (Hypotheses 1a and 2a), a gender-diverse board may be more effective in a male-dominated industry than a male-only board if the diversity introduced by women enables more effective governance over the firm and its predominantly male employees and management. Put differently, in a male-dominated industry where a masculine personality is viewed as being required for success (Cejka & Eagly, 1999; Glick, 1991), there may be exacerbated risk taking that may (although of course not necessarily) lead to fraud. This behavior is more likely to be curtailed or monitored effectively by a board of directors that includes women than a male-only board of directors, particularly given the different leadership styles between men and women (Eagly & Carli, 2007; Eagly & Johnson, 1990; Eagly et al., 1995).

Hypothesis 3: *The impact of female directors will be stronger in reducing the frequency and severity of fraud in male-dominated industries than female-dominated industries.*

RESEARCH METHOD

Data and Sample Selection

Our sample covers a 10-year period, 2001–2010. Data on regulatory violations or fraud are from enforcement action announcements made by the CSRC. We collect data on enforcement action announcements, board and firm characteristics as well as financial statements from

CSMAR. Over the 10-year study period, there are 742 enforcement action announcements. In Table 1, we report the types of violations (Panel A), yearly distribution of firms (Panel B), industry distributions of firms (Panel C), and number of male and female directors in male- versus female-dominated industries (Panel D). The violations include illegal share buybacks, reporting inflated profits, asset fabrication, unauthorized change of fund use, disclosure postponement, false statements, violations in capital contributions, failure to disclose information, shareholder embezzlement, share price manipulation, illegal guarantee, and illegal speculation.

[Insert Table 1 about here]

In Panel A, the number of violations is greater than 742 because firms often commit multiple violations. Among the 12 types of violations, we note three: false statement, disclosure postponement, and major failure to disclose information. If a firm violates rules against inflated profits, unauthorized change of fund use, or embezzlement, it is very likely that the firm also violates rules against false statement and postponing or failing entirely to disclose information. In Panel B, the statistics show that the number of violations is higher during the 2001–2004 period. In Panel C, we observe a higher incidence of enforcement actions in the conglomerates sector (as a percentage of total firms in the industry sector). Among the 742 firms in the sample, however, most are in the industrial and manufacturing sectors. In Panel D, we observe a slightly higher average number of female directors (and higher average proportion of female directors) in female-dominated industries than male-dominated industries.

We employ a control firm approach to select firms for analysis. Following Agrawal and Chadha (2005) and Chen et al. (2006), we create a group of control firms (no-fraud firms) that have not incurred enforcement actions. We use three criteria for selecting no-fraud firms for the control firm group: stock exchange location, industry type, and firm size. For each fraud firm, we find a no-fraud firm that is listed on the same stock exchange (Shanghai Stock Exchange or

Shenzhen Stock Exchange), is in the same industry sector (utilities, property and construction, conglomerates, industrial and manufacturing, or commercial) and is similar in size. To select firms with similar size, we divide all firms into five categories by total assets. Firms are considered to be similar in size if they are in the same firm size category (from 1 to 5). Using these three criteria, we are able to assign 742 no-fraud firms to the control firm group; this control group is then analyzed alongside the 742 fraud firms in the sample firm group.

Regression Models

We explore whether gender diversity makes a difference in a linear (Hypothesis 1b) or nonlinear (Hypothesis 1a) way for the likelihood of securities rule violations and fraud. Based on Hypothesis 1b, that firms with a lower percentage of female directors are more likely to commit fraud, we use the following model to examine the relation between the likelihood of fraud and gender diversity, controlling for governance factors and firm characteristics.

$$\begin{aligned} Fraud = {} & \alpha_0 + \beta_1 \, Female\ Director\ Ratio + \beta_2 \, CHFemale + \beta_3 \, GMFemale \\ & + \beta_4 \, Multiple\ Director\ Ratio + \beta_5 \, Average\ Age + \beta_6 \, Average\ Education \\ & + \beta_7 \, Independent\ Director\ Ratio + \beta_8 \, CEO\ Duality + \beta_9 \, Board\ Size + \beta_{10} \, Board\ Meeting \\ & + \beta_{11} \, Supervisor\ Meeting + \beta_{12} \, Firm\ Size + \beta_{13} \, Leverage + \beta_{14} \, ROA + \beta_{15} \, Central\ SOE \\ & + \beta_{16} \, Local\ SOE + \beta_{17} \, Female\text{-}dominated\ Industry + \beta_t \sum_t Year_t + \beta_j \sum_j Industry_j \end{aligned}$$

All variables are defined in the Appendix. Notably for the key variables of interest, *Fraud* is a dummy variable that takes a value of 1 if the firm is subject to an enforcement action on violation of a regulation or fraud, and 0 otherwise. We use *Female Director Ratio* (proportion of female directors on the board) as the measure of gender diversity on a board. As an additional test to examine whether gender affects the likelihood of fraud in a male-dominated society like China, we include *CHFemale* and *GMFemale* in the models. *CH* represents chairperson and *GM*

represents general manager. The chairperson is the head of the board of directors, and the general manager is the president of the corporation and is hired by the board of directors. *CHFemale* is a dummy variable that takes a value of 1 if the firm is led by a female chairperson, and 0 otherwise. *GMFemale* is a dummy variable that takes the value of 1 if the firm is led by a female general manager, and 0 otherwise. If women are more ethical and risk averse than men, female senior executives should commit less fraud. Therefore, *Fraud* should be negatively related to *Female Director Ratio*, *CHFemale*, and *GMFemale*.

We compare the linear model using the proportion of female directors with a nonlinear specification to test Hypothesis 1a versus 1b. Hypothesis 1a asserts that gender diversity is relevant in mitigating the likelihood of fraud, and as such we expect an inverted U-shaped relation between the proportion of women on the board and fraud, with the optimal proportion of women on the board at 50%. In our data set, however, the maximum proportion of women on the board is 50%. As such, we test for the presence of a concave relation between increasing the proportion of women on the board in relation to the frequency of fraud. In particular, we use a logarithmic specification to test Hypothesis 1a where *Female Director Ratio (LN) = ln(1+ Female Director Ratio)*. We compare the regression model with a logarithmic specification in Hypothesis 1a versus the linear specification in Hypothesis 1b, via a likelihood ratio test.

Aguilera, Filatotchev, Gospel and Jackson (2008) and Carter, D'Souza, Simkins and Simpson (2010) suggest that the impact of gender diversity on firm performance and governance depends on other factors, including board and firm characteristics. We therefore include seven board characteristics and five firm characteristics as control variables in the logit model. *Multiple Director Ratio* is the proportion of directors with multiple board directorships. Multiple directorships can be a measure of expertise or busyness; additional board seats allow a director to gain more experience but may also render that director too busy to engage in effective monitoring

(Fich & Shivdasani, 2006). Beasley (1996) shows that financial statement fraud in the U.S. is lower when outside directors hold fewer directorships in other firms. *Average Age* is mean age of directors on the board. *Average Education* is mean years of education completed by the members of the board. Top managers who are younger in age and less educated are generally more conservative and risk averse than their counterparts (Hambrick & Mason, 1984; Wally & Baum, 1994).

Effective governance is positively related to board independence (Xie, Davidson, & DaDalt, 2003). Beasley et al. (2000) and Dunn (2004) find that there is a negative relation between board independence and fraudulent financial reporting. Therefore, we expect firms with a larger proportion of independent directors to commit less fraud, since independent directors more effectively monitor the management and help to prevent the occurrence of fraud (Agrawal & Chadha, 2005). *Independent Director Ratio* is the proportion of independent directors on a board. *CEO Duality* is a dummy variable that takes the value of 1 if the chairperson and general manager are the same person, and 0 otherwise. While Beasley (1996) and Uzun et al. (2004) show no relation between fraud and chairperson/CEO duality, Dechow et al. (1996) find that fraud is more likely in a firm with chairperson/CEO duality.

Prior studies provide mixed evidence regarding the relation between board size and likelihood of fraud. Jensen (1993) and Yermack (1996) suggest that it is easier for CEOs to control large boards, hence large boards are less effective in monitoring management. However, Uzun et al. (2004) find no relation between board size and fraud. *Board Size* is the number of directors on the board. Board activity should be positively related to the level of monitoring. Schminke, Wells, Peyrefitte, and Sebora (2002) find that it is more likely for active leadership to achieve consensus in ethical decisions. Since more meetings should imply more monitoring and less fraud, there should be a negative relation between the likelihood of fraud and the number of

board meetings. We use the number of board meetings (*Board Meeting*) and supervisor meetings (*Supervisor Meeting*) to proxy for board activity.

We use *Firm Size* (log of total assets) to control for firm size in the model. *Leverage* and *ROA* are our two indicators of financial health. *Leverage* is a measure of leverage, which is estimated by the ratio of debt to assets. *ROA* measures profitability, proxied by return on assets. Beasley (1996) argues that firms in financial distress (e.g., high debt and losses) are more likely to commit financial statement fraud, such as inflating earnings and making false statements. We expect *Fraud* to be positively associated with *Leverage* and negatively associated with *ROA*.

Central SOE and *Local SOE* are ownership variables that assess whether ownership structure has an impact on the likelihood to commit fraud. *Central SOE* is a dummy variable that takes the value 1 if the firm is an SOE controlled by the central government, 0 otherwise. *Local SOE* is a dummy variable that takes the value 1 if the firm is an SOE controlled by a province, city, or county government, 0 otherwise. During the enterprise reform process initiated in the late 1970s, a number of SOEs were carved out. Although these SOEs are publicly listed, the central and local governments retain significant shareholdings, allowing these governments to have controlling stakes in the SOEs.[10] If a firm is an SOE, the central or local government has power over firm management. Some studies show that high state ownership is beneficial to firm performance (Bortolotti & Faccio, 2009; Gupta, 2005).[11] Chen et al. (2006) argue that state shareholders are less likely to influence firms to commit fraud. Since SOEs can seek financial protection from the central and local governments, SOEs are less motivated to commit financial fraud, such as inflating

[10] Chen et al. (2006) show that about 30% of shares in SOEs are held by the central government (and its ministries), local governments, or regional governments. Another 30% of shares are in the hands of legal entities (e.g., an SOE) that are also owned by the central government.

[11] Bortolotti and Faccio (2009) find that privatized SOEs with high state ownership have better financial performance as measured by market-to-book ratio. Gupta (2005) finds similar results, reporting that privatized SOEs have higher sales, profits and labor productivity.

profits and making false financial statements.[12] Therefore, we expect *Central SOE* and *Local SOE* to be negatively related to *Fraud*.

Female-dominated Industry Dummy is a dummy coded 1 if the firm is in a female-dominated industry, 0 otherwise. According to Industry Canada (2003), there is below-rate participation by female majority owners in manufacturing, knowledge-based industries, agriculture, forestry, and energy sectors in Canada. In the UK, surveys also show that women are under-represented in the manufacturing, construction, transportation, and agricultural sectors (Carter, Tagg, & Brierton, 2002). Based on data on gender diversity by industry compiled by the Workplace Gender Equality Agency of the Australian Government for each year between 2004 and 2012 (www.wgea.gov.au), we calculate the average of the percentage of female employees over these years for each industry class to determine whether the industry is female-dominated or male-dominated. An industry class with more than 50% female employees is classified as a female-dominated industry. Then, we match the industry sectors in Australia with those in China. Consequently, we define the sectors of food processing, clothing (textile, garment) manufacturing, medicine and biological product manufacturing, clothing, retail trade, food and beverage services, hotels, tourism, radio, film and television, and publishing as female-dominated industries. Using this definition, we have 319 firms in female-dominated industry sectors in our sample of 1,484 firms. We run our tests on subsamples of the data to test Hypothesis 3, regarding whether the presence of women on boards of directors matters more in male-dominated industries.

In the next section, we first provide tests of Hypotheses 1a and 1b, as well as Hypothesis 3, for the frequency of fraud in several industries. Thereafter, we discuss the econometric methods used

[12] An alternative explanation is that SOEs have an easier time avoiding penalties due to their political connections. Both explanations are consistent with our prediction, but we are not able to distinguish between the two.

to test the severity of fraud in Hypothesis 2, and present results pertaining to the severity of fraud in different industries for Hypothesis 3.

RESULTS AND DISCUSSION

Determinants of Fraud

Our sample comprises a total of 1,484 observations, with 742 sample firms and 742 control firms. Descriptive statistics for each variable are reported in Table 2. The mean percentage of female board directors is 14%. There are 84 and 105 female chairpersons and general managers in the sample and control firms, respectively. On average, there are 9.51 directors on each board. The proportion of directors holding multiple directorships is 14%. Mean age and mean years of education are 47.49 and 3.32, respectively. About one-third of directors are independent directors. Only 254 firms have CEO/chairperson duality. On average, directors and supervisors meet 8.19 times and 4.09 times per year, respectively. In total, there are 818 SOEs, with 219 central SOEs and 599 local SOEs. We report the Pearson correlations between variables in Table 3. None of the correlation coefficients has a value greater than 0.38, suggesting that correlations among the independent variables are not high.

[Insert Tables 2 and 3 about here]

Before we test the relation between gender and likelihood of fraud in a logit regression model, we employ univariate tests to compare characteristics between sample firms and control firms to determine whether significant differences exist. We report the results in Table 4.[13] The sample firm group has a lower proportion of female directors (10.59%) than the control firm group (16.58%), and the difference is significant at the 0.01 level. Of the 742 firms subject to

[13] Besides using the parametric t-test for equality of means, we also conduct a non-parametric Mann-Whitney test for significant difference in median values. The results are similar to those of the parametric test for mean values.

enforcement actions for fraud, only 20 firms and 44 firms have female chairpersons and general managers, respectively. The 742 control firms have 64 female chairpersons and 61 female general managers. The Pearson Chi-square test shows that there is a significant difference between the sample firm and control firm groups in terms of the number of female chairpersons ($p < 0.01$), but not female general managers ($p > 0.05$). These results provide some preliminary evidence for our hypothesis that gender makes a difference in the likelihood of the incidence of fraud.

[Insert Table 4 about here]

Among the control variables, there are no significant differences between the fraud and no-fraud firm subsamples in terms of the proportion of directors with multiple board directorships, proportion of independent directors, CEO duality, board size, number of supervisor meetings, total assets, and number of central SOEs. However, there are significant differences in the mean age of directors, mean years of education of directors, number of board meetings, leverage, and return on assets ($p < 0.01$). The mean age of directors in the fraud firms is lower, suggesting that younger boards commit more fraud. The mean years of education for directors in non-fraud firms is significantly higher than that in fraud firms. The greater number of board meetings in the sample firm group indicates that firms with more board meetings are more likely to violate securities regulations and commit fraud. Finally, there is no statistically significant difference between the sample and control firms for the proportion of female-dominated industries, adding support to the representativeness of the control sample.

In Table 5, we show the results of the logit regression to examine whether the proportion of female directors on a board affects the likelihood of fraud. In the first two regressions, we compare the logarithmic specification (Hypothesis 1a) with the linear specification (Hypothesis 1b). We report the marginal effects of the logit regressions in the tables (see, e.g., Hoetker, 2007; Petersen, 1985). In addition, we divide the fraud sample into two categories: disclosure-related fraud and

non-disclosure-related fraud. Disclosure-related fraud includes inflated profits, disclosure postponement, false statements, and failure to disclose information. The non-disclosure-related fraud category consists of firms committing illegal share buybacks, asset fabrication, unauthorized change of fund use, violation in capital contributions, shareholder embezzlement, share price manipulation, illegal guarantees, and illegal speculation. Consistent with prior work on fraud (e.g., Karpoff et al., 2012), we assess the robustness of our analysis to subsets of the data by type of fraud. Of the 742 observations of fraud, 433 are disclosure-related fraud and 309 are non-disclosure-related fraud.

[Insert Table 5 about here]

Consistent with the comparison tests in Table 4, in Table 5 we find that *Female Director Ratio (LN)*, *Female Director Ratio*, and *CHFemale*, but not *GMFemale*, are negatively and significantly related to *Fraud*. In the full sample, the marginal effect (not the logit coefficient) on *Female Director Ratio* is -1.786 ($p < 0.01$), implying that if the female board director ratio increases by one standard deviation (9.1%), the likelihood of fraud decreases by 16.3%. The marginal effect on *Female Director Ratio (LN)* is -1.786 ($p < 0.01$). Regarding economic significance, consider that first, starting from the average percentage of female directors (13.2%), and then a one standard deviation increase in the proportion of women directors (9.1%) is associated with a 14.6% reduction in the probability of fraud. By contrast, a move from 0% [40.9%] women directors to 9.1% [50%] directors is associated with an 18.3% [13.2%] reduction in the probability of fraud. To assess whether the linear model is more appropriate than the nonlinear model, we compare the log likelihood functions with the likelihood ratio test. The chi-squared test statistic is 8.16 [= 2*(-858.49+862.57)] and the *p*-value of this test statistic is 0.017, which supports the nonlinear specification. Similarly, based on regressions from subsamples of the data by industry, type of fraud, and year (not explicitly reported but available

on request), the data support the nonlinear model. As such, the data are more supportive of the gender diversity hypothesis (Hypothesis 1a) relative to the women are more ethically sensitive hypothesis (Hypothesis 1b), since we observe a better fit by modeling the marginal effect of adding more women to the board (up to the maximum of 50% women in the sample) as increasing at a decreasing rate.

In the nonlinear specification in the full sample, *CHFemale* has a marginal effect of -0.141, which is also statistically significant ($p < 0.05$). The results suggest that firms with female chairpersons are 14.1% less likely to commit fraud, which is consistent with both Hypothesis 1a and Hypothesis 1b. When we divide the sample into disclosure-related and non-disclosure-related categories, *Female Director Ratio (LN)* is significant in both categories, though *CHFemale* is significant in the non-disclosure-related category. In addition, the coefficient on *Female Director Ratio (LN)* in the non-disclosure-related category (-2.3641) is lower than that in the disclosure-related category (-2.0115), suggesting that women have greater influence in reducing the likelihood of non-disclosure-related fraud.

Table 6 provides further robustness checks on the results reported in Table 5 by segregating the sample to test Hypothesis 3 for the frequency of fraud in male- versus female-dominated industries. The data indicate that the marginal effect for *Female Director Ratio (LN)* is greater in the full sample and in both the non-disclosure-related and disclosure-related subsamples of the data for male-dominated industries. In the full sample results, the data indicate that a one standard deviation increase in the proportion of female directors from the mean level gives rise to a 15.4% [13.4%] reduction in fraud in male-dominated industries [female-dominated industries]. The marginal effects for *Female Director Ratio (LN)* in subsamples for non-disclosure-related and disclosure-related fraud show similar differences between male- and female-dominated industries. Overall, this evidence provides robust support for Hypothesis 3.

[Insert Table 6 about here]

China instituted share structure reform in 2005. To determine whether this share structure reform affects the relation between the proportion of female directors on a board and the likelihood of fraud, we divide the sample into two time periods: 2001–2005 and 2006–2010. The results are reported in Table 7. In both periods, our results show that there is a negative relation between the proportion of female directors on a board and a firm's propensity for fraud, consistent with Hypothesis 1a. The results are stronger for male-dominated industries, again consistent with Hypothesis 3. The only regression where *Female Director Ratio (LN)* is statistically insignificant is for female-dominated industries in the 2006–2010 period.

[Insert Table 7 about here]

On January 1, 1998, the CSRC announced that when a firm exhibits abnormal financial conditions, that firm should be subjected to special treatment (ST). In addition, the Shanghai Stock Exchange and Shenzhen Stock Exchange were required to begin placing a prefix "ST" on the stock codes of these firms to alert investors to the abnormality in the financial conditions of these firms. The most common reasons for firms being placed under ST include losses for two consecutive years, failure to correct errors in financial statements, and misappropriation of funds. Since it is expected that firms under ST are more likely to violate securities rules and commit fraud, to better examine the relation between gender diversity and likelihood of fraud, we re-run the analysis using a subsample of firms (fraud firms in the sample group and no-fraud firms in the control group) that have not been classified as "special treatment" firms during the sample period. Similar to the results shown in Tables 5–7, there is a negative relation between the proportion of female directors on a board and the propensity toward fraud. These results were reported in an earlier draft of this paper and are not reported here for conciseness, but are available on request.

To address the potential endogeneity problem between the likelihood of fraud and the number of female directors on a board, we employ a two-stage least-squares regression approach to generate the fitted value of the proportion of female directors on a board. In the first-stage regression model, we estimate the determinants of the proportion of female directors by using the lag variables that capture the personal characteristics of chairpersons and general managers (gender, age, and number of years in office), board characteristics (proportion of independent directors, proportion of female independent directors, board size, frequencies of board and supervisor meetings, and CEO duality), firm characteristics (return on assets, sales revenue, number of employees, total assets, and leverage), and ownership structure (local or central SOE) (Campbell & Mínguez-Vera, 2008; DiMaggio & Powell, 1983; Farrell & Hersch, 2005; Hillman, Shropshire, & Cannella, 2007). The fitted value is then used to repeat the analysis in Table 5. The results using the fitted value are reported in Table 8. In Table 8, the marginal effect on fitted value of *Female Director Ratio (LN)* is -0.1756 in the full sample, and -0.2050 in the subsample of male-dominated industries, both of which are statistically significant ($p < 0.01$). By contrast, for female-dominated industries, the marginal effect of the fitted value for *Female Director Ratio (LN)* is insignificant. These results suggest that our finding that gender diversity can minimize the likelihood of fraud (Hypothesis 1a), particularly in male-dominated industries (Hypothesis 3), remains the same even after controlling for potential endogeneity between the likelihood of fraud and the proportion of female directors.

[Insert Table 8 about here]

When the female-dominated industry and several other industry dummies are put in the same regression models (Table 5, and the first model in Table 8), we exclude some other industry dummies to avoid perfect collinearity. Excluding the female-dominated industry dummy

altogether and including the other industry dummies (and other combinations of dummy variables) does not affect our main results of interest for *Female Director Ratio (LN).*

Our other control variables in Tables 5–8 indicate the following. We find in many specifications that the coefficient on *Average Age* ($p < 0.01$) is negatively and significantly related to *Fraud* (see, e.g., Table 5), suggesting that a younger board is more likely to commit fraud. Beasley et al. (2000) and Dunn (2004) show that firms with a higher proportion of independent directors are less likely to commit fraud. However, *Independent Director Ratio* is not significant in most of the models (except in Table 7 for 2001–2005 male-dominated, and in Table 8 for female-dominated). Jensen (1993) and Yermack (1996) find that a large board is less effective in monitoring management. In some specifications in Tables 5–8, we observe a positive relation between *Board Size* and *Fraud*. Since securities regulation violations (e.g., false financial statement, embezzlement, unauthorized use of funds) are committed by people, the greater the number of board directors, the higher the probability that fraud will occur. We expect that a higher number of board meetings is associated with more effective monitoring (i.e., a negative relation between *Fraud* and *Board Meeting*). However, in the disclosure-related category in Table 5 and the female-dominated industries in Tables 6-8, the marginal effect on *Board Meeting* is positive and significant, a result that is consistent with Chen et al. (2006). Chen et al. (2006) explain that directors may simply meet more often to discuss questionable activities that the firm has engaged in or is about to engage in; hence, there may be a positive relation between *Fraud* and *Board Meeting*.[14]

It is expected that fraud firms have poorer performance, in terms of leverage and profitability, than no-fraud firms. We find *Leverage* and *ROA* to be positively and negatively

[14] One possible explanation for this result is that board meetings are endogenous to fraud; that is, firms have more board meetings when they commit fraud. Given that we do not know the timing of the meetings, we are unable to accurately empirically test this proposition with our data set, but we believe this issue is worthy of further research.

related to *Fraud*, respectively. *Leverage* is statistically significant in the full sample and the disclosure-related sample ($p < 0.05$) (Table 5), although this effect is not robust in the subsamples by male- and female-dominated industries (Table 6). The coefficients on *ROA* are negative and significant ($p < 0.01$) in all regressions in Tables 5–8, consistent with the intuition that poorly performing firms have greater incentives to engage in fraud. The results show that the two ownership variables, *Central SOE* and *Local SOE*, have the expected sign (negative) (with the sole exception of Central SOE in Table 7 for male-dominated in 2001–2005) and are significant in a number of specifications in Tables 5–8. The negative relation suggests that a firm's ownership structure has an impact on the propensity toward fraud, with SOEs less likely to commit fraud.

Event Study

In this subsection, we present an event study on the effect of fraud on share prices to test Hypotheses 2a and 2b. We follow a standard methodology of first estimating the market model (the share prices as a function of market returns; Campbell et al., 1997),[15] then infer the abnormal returns following announcement of fraud as our dependent variable in the results reported in Tables 9 through 12. Summary statistics are provided in Table 9. Table 10 presents regression results for the full sample, while Tables 11 and 12 present regression results for the male- and female-dominated industries, respectively. In our regression evidence, we explain abnormal returns as a function of the same variables used in the prior regressions.

[Insert Tables 9-12 about here]

[15] Our results from this event study are robust to a variety of robustness checks for the underlying method to measure abnormal returns, including a control firm approach and propensity score matching. When we use a benchmark return measured using the control firm approach, the control firm is chosen by stock exchange location, industry type, and firm size. Alternatively when the benchmark return is measured using the propensity score matched-firm approach, the propensity score is estimated by stock exchange location, industry type, event year, firm size and leverage. The nearest neighbor propensity score technique is used to obtain the propensity score matched sample. The findings from each of these methods are extremely similar, and available on request in an earlier draft of this paper.

In Table 9, the summary statistics indicate that the data are highly consistent with the view that abnormal share price reactions are less severe for firms with gender-diverse boards, consistent with Hypotheses 2a and 2b. Table 9 further shows that in male-dominated industries, there is a statistically significant difference in terms of less pronounced abnormal share price reductions with female directors in each of the periods of days 0 to +3, days 0 to +5, days 0 to +10, days 0 to +15, and days 0 to +20. The evidence is similar for female-dominated industries, except that the differences are statistically significant only for the periods of days 0 to +15 and days 0 to +20. The differences in the statistical significance of the cumulative abnormal returns over these periods thus support Hypothesis 3. We note, however, that the size of the effect is larger for female-dominated industries than male-dominated industries over the periods of days 0 to +15 and days 0 to +20. Also, we note that these are merely comparison tests in Table 9, without controlling that other factors are equal. Thus, we proceed with the regression evidence in Tables 10–12.

In the regression analysis in Table 10, the data indicate that fraud among female director firms is less pronounced (i.e., the reduction in share price is less negative, as indicated by the positive coefficient). The results show increasing marginal effects for *Female Director Ratio (LN)* for longer event windows: for days 0 to +3 it is 4.8%; for days 0 to +5 it is 6.0%; for days 0 to +10 it is 11.26; for days 0 to +15 it is 16.9; and for days 0 to +20 it is 27.0%. All these findings are consistently significant at at least the 5% level, and are robust to the use of various control variables in the regressions. Comparing Tables 11 and 12, the data indicate that the impact of gender diversity is more pronounced in male-dominated industries. For example, over the 20-day period following announcement of fraud, the economic significance of *Female Director Ratio (LN)* shows cumulative abnormal share prices that are 27.6% higher for male-dominated

industries and 24.5% higher for female-dominated industries. Overall, the findings support Hypotheses 2a and 2b, and Hypothesis 3.

In Tables 10–12, unlike the regressions in Table 5, comparing linear to nonlinear effects associated with women on boards of directors, the event study evidence is inconclusive as to whether there is a better fit in the data for a nonlinear versus a linear specification.[16] As such, our data do not enable us to conclusively distinguish between Hypotheses 2a and 2b, and instead support both hypotheses. Further research is warranted using other samples. Likewise, in the next section, we discuss other limitations, extensions, and future research ideas.

LIMITATIONS, ALTERNATIVE EXPLANATIONS, AND FUTURE RESEARCH

This study examines the impacts that gender diversity has on the likelihood of fraud in China, after controlling for other board and firm characteristics. The use of data from China presents both opportunities and potential limitations or questions on generalizability. On one hand, China is a representative or typical country in respect of its proportion on women on corporate boards (Terjesen et al., 2009), and detected fraud rates are comparable between China and the U.S. (Cumming & Johan, 2013). On the other hand, the findings from data from any given country may not necessarily be generalizable to any other country. For example, in China there are multiple classes of stock for foreign versus domestic investors. However, there is no apparent reason to expect that female directors would matter more in reference to one type of shares versus another. Further, China's economic and institutional environment has changed dramatically over the years. China has been one of the fastest growing emerging markets since its economic transformation began in the 1970s; it is currently the world's second largest economy as measured by GDP.

[16] For conciseness, we do not present the event study regressions with linear specifications on Female Director Ratio, as they are not materially different to the regressions presented in Tables 10–12. (These regressions are available on request.)

Despite its rapid economic growth, China is still immature in terms of its legal system and investor protection mechanisms, relative to other developed markets. In addition, Chinese firms are characterized by a high concentration of shares held by the central and local governments. Therefore, it is also important to assess the development and practice of corporate governance in this growing market. Finally, China is a male-dominated society. Traditionally, most senior positions in Chinese firms are occupied by men rather than women. Since the 1949 revolution, despite government policy requiring gender equality in employment, and relatively high female employment overall, most women still work on the production line or in low-tech industries (Stacey, 1984; Yi-hong, 1992). Few managers (8.9%) are women (Hildebrandt & Liu, 1988). Korabik (1992) finds that the higher the post in a firm, the lower the likelihood that it will be occupied by a woman, and Cheng, Chan & Leung (2010) show that only 4% of chairpersons are women. Examination of countries other than China should be undertaken regarding gender diversity and fraud in future research, as more data become available.

This paper suggests that gender diversity may influence how decisions are made in several ways. First, management teams may take on the values of the dominant characteristic represented on the team. Second, more women in top positions broadens the talent pool and potentially paves the way for a more talented board. Third, gender diversity allows for a diversity of views, leading to greater discussion. Fourth, gender diversity may give rise to categorization effects, leading potentially to more conflict between board members, less trust, and hence increased scrutiny and less fraud. One limitation of our data set is that we are unable to test which of these mechanisms is more important. Further research using different data may offer additional insights as to which mechanism is more apparent and under what conditions. Relatedly, it would be of interest to know more about interactions among board members in detail, in the spirit of Westphal and

Milton (2000) and Westphal and Bednar (2005). While our data do not offer such details, this type of information might shed light on specific roles for male versus female directors.

We note that we have information on detected fraud, and not actual fraud. Detected fraud rates in China are quite similar to that in the U.S. (Cumming & Johan, 2013). We of course cannot obtain data on actual fraud. It is possible that the CSRC does not look deeply into fraud committed where women hold powerful positions, but we have no reason to believe this to be the case.

Another data limitation in our study is that we are unable to classify male- versus female-dominated industries based in male versus female employment statistics in China; rather, we had to use industry data from Australia to create these subsets of industries (as described above and in the Appendix). It is possible that there are gender differences across countries in terms of the percentage of women in different industries, but we know of no reason why there would be pronounced differences that would influence our inferences herein.

This paper uses matched pair methods to ascertain comparison with non-fraud firms appropriate to include in the analysis. We match based on stock exchange location, industry type, and firm size. Our approach is consistent with that used in other leading fraud studies in the U.S. (Agrawal & Chadha, 2005) and China (Chen et al., 2006). We compare methods used to select benchmark firms and find our results to be quite robust. For example, we find the event study results based on alternative methods to be highly consistent, as discussed in the text accompanying Tables 10–12. An alternative approach would be to select a random sample of firms and follow them over time, noting those that did and those that did not commit fraud and when, which would avoid sampling difficulties (see, e.g., Allison, 1984). This alternative methodology would permit capture of a viable sample of firms “at risk” of committing fraud. By modeling the timing of the fraud, one could control for much of the unobserved heterogeneity across firms as well. One difficulty of this alternative approach, however, is that fraud firms comprise roughly 3–5% of

listed companies each year in both China and the U.S. (Cumming & Johan, 2013). To obtain a sufficiently large sample of fraudulent companies, and to study subsamples of the fraudulent firms by industry, year, and type of fraud, one must have a very large sample with complete details on the entire population of firms. This data hurdle presents a different type of challenge, which perhaps will become feasible as other data become available in the future.

We take care to account for alternative explanations in the following ways. First, the range of women on boards in our sample ranges from 0% to 50%. We explicitly test for a linear versus nonlinear effect of increasing the presence of women on boards. The data are consistent with the view that the effect of women directors on the frequency of fraud is nonlinear. Second, we consider subsets of the data by industry, type of fraud, and time. The results pertaining to gender diversity on boards hold in each of these subsamples, and in ways that are expected (such as by industry for male- versus female-dominated industries). Third, we control for endogeneity with board composition, as indicated in Table 8 and accompanying text. We do not have control variables for select dimensions such as international partners, and such other variables could be considered in other follow-up work, data permitting.

There are other more specific issues that might give rise to additional research. For instance, we know the gender of the chairperson and general manager in our data set. It is possible that specific details associated with gender or other characteristics in different corporate roles could be relevant in understanding whether men engage in more fraud because they are more likely to occupy positions where fraud is possible.

CONCLUSION

This paper examines whether gender diversity within a firm's board of directors affects that firm's likelihood of committing fraud or violating securities regulations. Fraud is not uncommon in

the business world. On average, an organization loses about 5% of revenue to fraud annually (2010 Report to the United Nations on Occupational Fraud & Abuse). In the past few decades, there have been a growing number of women occupying high-level positions in the business world. Research shows that there is a gender difference in ethical sensitivity and degree of risk aversion, with women being more ethical and risk averse than men. Recently, there has been an increasing focus on board diversity, particularly gender diversity, as a means for improving corporate governance. Hence, there is a global call for gender diversity on boards of directors. In this study, we empirically compare the gender diversity hypothesis, which predicts a nonlinear relation between women on boards and fraud, versus the women are more ethical hypothesis, which predicts a linear relation between women on boards and fraud. We test the effect of women on boards on both the frequency and severity of fraud. Further, we test differences among male- versus female-dominated industries, different types of fraud, and different time periods. We test for endogeneity, and employ different approaches to matched samples, such as propensity score matching. These findings are robust to all methods, as well as robust to different sets of control variables for other corporate governance and firm characteristics.

We find strong evidence that the relation between women on boards and the probability of fraud is nonlinear: the positive impact of women increases at a decreasing rate, up to a maximum of 50% women on the board in our sample. Also, the data indicate that women mitigate the severity of fraud, but the data do not suggest any better fit as between a linear and nonlinear relationship. Further, the impact of women is stronger in male-dominated industries in respect of both mitigating the frequency and severity of fraud.

This study contributes to improved understanding of gender differences in ethical sensitivity, particularly at the top management level (chairperson, CEO, and board directors). We add to the gender and management literature by generating evidence about gender diversity and fraud. While

our data are from one country, we hope the insights from the theory and evidence inspire new work in other contexts in future years. Our findings have implications for researchers, practitioners, policy makers, and regulators alike; they should strongly consider the issue of more gender-diverse boards.

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Table 1

Summary Statistics of Enforcement Actions 2001-2010

Panel A: Breakdown by Type of Violation

	Frequency	Percentage
Illegal share buybacks	122	8.58%
Inflated profits	108	7.59%
Asset fabrication	29	2.04%
Unauthorized change of fund use	44	3.09%
Disclosure postponement	413	29.04%
False statement	210	14.77%
Violation in capital contribution	1	0.07%
Major failure to disclose information	303	21.31%
Major shareholder embezzlement	114	8.02%
Share price manipulation	14	0.98%
Illegal guarantee	58	4.08%
Illegal speculation	6	0.42%
Total	1422	100%

Panel B: Breakdown by Year

	Frequency	Percentage
2001	93	12.53%
2002	83	11.19%
2003	87	11.73%
2004	94	12.67%
2005	55	7.41%
2006	51	6.87%
2007	57	7.68%
2008	58	7.82%
2009	102	13.75%
2010	62	8.36%
Total	742	100%

Panel C. Breakdown by Industry

	Male-dominated Industries		Female-dominated Industries	
	Number of Firms	% of Total Number of Firms	Number of Firms	% of Total Number of Firms
Agriculture, Forestry, Fishing and Hunting	34	4.58%		
Mining	8	1.08%		
Food Manufacturing and Beverages	16	2.16%		
Food Processing			21	2.83%
Textile and Garments			46	6.20%
Furniture Manufacturing	2	0.27%		
Paper Products Manufacturing	24	3.23%		
Petroleum, Chemical and Plastic Products Manufacturing	104	14.02%		
Electronic Products Manufacturing	19	2.56%		
Non-metallic Mineral and Metal Products Manufacturing	64	8.63%		
Machinery Equipment and Automobile Manufacturing	133	17.92%		
Medicine and Biological Products Manufacturing			41	5.53%
Other Manufacturing	7	0.94%		
Utilities	15	2.02%		
Construction and Decoration	17	2.29%		
Pipeline Transportation and Warehousing	21	2.83%		
Communication and Computer Services	48	6.47%		
Wholesale	4	0.54%		
Clothing Retail Trade			29	3.91%
Estate Development and Operation	15	2.02%		
Food and Beverages Service, Hotels and Tourism			19	2.56%
Publishing, Radio, Film and Television			7	0.94%
Conglomerates	48	6.47%		
	579		163	

Panel D: Breakdown by Number of Male and Female Directors in Male- and Female-dominated Industries

	Number of Directors	Number of Female Directors	Female Director Ratio	Number of Male Directors	Male Director Ratio
All Sample Firms	9.5984	1.0189	0.1059	8.5795	0.8941
- in Male-dominated Industries	9.4836	0.9793	0.1029	8.5043	0.8971
- in Female-dominated Industries	10.0061	1.1595	0.1167	8.8466	0.8833
All Control Firms	9.4232	1.5660	0.1658	7.8571	0.8342
- in Male-dominated Industries	9.3515	1.5341	0.1638	7.8174	0.8362
- in Female-dominated Industries	9.6923	1.6859	0.1734	8.0064	0.8266
All Firms	9.5108	1.2925	0.1359	8.2183	0.8641
- in Male-dominated Industries	9.4172	1.2584	0.1335	8.1588	0.8665
- in Female-dominated Industries	9.8527	1.4169	0.1444	8.4357	0.8556

Table 2
Descriptive Statistics

	Mean	Median	Maximum	Minimum	Standard Deviation
Fraud	0.5000	0.5000	1.0000	0.0000	0.5002
Female Director Ratio (LN)	0.1236	0.1178	0.4055	0.0000	0.0871
CHFemale	0.0566	0.0000	1.0000	0.0000	0.2312
GMFemale	0.0708	0.0000	1.0000	0.0000	0.2565
Multiple Director Ratio	0.1437	0.1111	0.7778	0.0000	0.1334
Average Age	47.4949	47.4444	60.1111	35.1111	3.9967
Average Education	3.3292	3.5000	7.1111	0.0000	1.6978
Independent Director Ratio	0.2981	0.3333	0.6000	0.0000	0.1190
CEO Duality	0.1712	0.0000	1.0000	0.0000	0.3768
Board Size	9.5108	9.0000	19.0000	4.0000	2.1142
Board Meeting	8.1860	8.0000	26.0000	2.0000	3.3095
Supervisor Meeting	4.0930	4.0000	16.0000	1.0000	1.7888
Firm Size	20.9792	20.8880	25.9615	15.3764	0.9462
Leverage	0.4844	0.4993	0.9069	0.0091	0.1853
ROA	0.0148	0.0256	0.4573	-0.5280	0.0850
Central SOE	0.1476	0.0000	1.0000	0.0000	0.3548
Local SOE	0.4036	0.0000	1.0000	0.0000	0.4908
Female-dominated Industry Dummy	0.2150	0.0000	1.0000	0.0000	0.4109

Notes: Variables are defined in the Appendix.

Table 3

Correlation Table

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	*Fraud*	1																
2	*Female Director Ratio (LN)*	-0.31**	1															
3	*CHFemale*	-0.13**	0.25**	1														
4	*GMFemale*	-0.04	0.23**	0.18**	1													
5	*Multiple Director Ratio*	-0.04	-0.09**	0.00	-0.01	1												
6	*Average Age*	-0.08**	-0.03	-0.02	-0.06*	0.11**	1											
7	*Average Education*	-0.09**	0.01	0.00	0.02	0.28**	-0.03	1										
8	*Independent Director Ratio*	0.00	0.07**	-0.02	0.03	0.26**	0.18**	0.37**	1									
9	*CEO Duality*	-0.04	0.09**	0.00	-0.03	0.01	-0.01	0.06*	0.10**	1								
10	*Board Size*	0.04	0.00	0.02	-0.02	0.04	0.02	-0.01	-0.10**	-0.11**	1							
11	*Board Meeting*	0.08**	0.00	-0.01	-0.03	0.07**	-0.03	0.03	0.19**	-0.04	-0.02	1						
12	*Supervisor Meeting*	0.04	0.00	0.03	-0.02	0.04	0.03	0.02	0.13**	0.02	-0.03	0.38**	1					
13	*Firm Size*	-0.02	-0.07**	-0.01	0.01	0.14**	0.24**	0.09**	0.08**	-0.05*	0.15**	0.11**	0.11**	1				
14	*Leverage*	0.16**	-0.05	-0.07**	-0.02	0.06*	-0.05	0.02	0.06*	-0.03	0.08**	0.16**	0.01	0.28**	1			
15	*ROA*	-0.26**	0.09**	0.07*	0.02	0.05*	0.08**	0.09**	0.07**	0.08**	-0.01	-0.03	0.08**	0.13**	-0.31**	1		
16	*Central SOE*	0.00	-0.03	0.00	-0.09**	0.08**	0.10**	-0.03	-0.07**	-0.02	0.10**	-0.06*	-0.11**	0.05*	-0.05	0.04	1	
17	*Local SOE*	-0.08**	-0.05	-0.05*	-0.03	0.00	0.04	-0.02	-0.07**	-0.10**	0.05*	-0.01	0.01	0.19**	0.07**	-0.06*	-0.34**	1
18	*Female-dominated Industry Dummy*	0.01	0.05	-0.03	0.10**	-0.01	-0.03	-0.03	0.01	-0.02	0.09**	-0.03	0.00	-0.10**	-0.05*	0.00	-0.05	0.01

Notes: Variables are defined in the Appendix.
* and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 4

Sample Comparison

	Sample Firm	Control Firm	Mean Difference	Sample t-test *p*-value	Pearson Chi-square Test *p*-value
Female Director Ratio (LN)	0.0966	0.1506	-0.0540	0.00**	
CHFemale	20	64	-44		0.00**
GMFemale	44	61	-17		0.09
Multiple Director Ratio	0.1387	0.1486	-0.0099	0.15	
Average Age	47.1672	47.8225	-0.6553	0.00**	
Average Education	3.1735	3.4849	-0.3114	0.00**	
Independent Director Ratio	0.2986	0.2977	0.0009	0.88	
CEO Duality	117	137	-20		0.17
Board Size	9.5984	9.4232	0.1752	0.11	
Board Meeting	8.4596	7.9124	0.5472	0.00**	
Supervisor Meeting	4.1577	4.0283	0.1294	0.16	
Firm Size	20.9583	21.0001	-0.0418	0.40	
Leverage	0.5139	0.4549	0.0590	0.00**	
ROA	-0.0076	0.0371	-0.0447	0.00**	
Central SOE	109	110	-1		0.94
Local SOE	270	329	-59		0.00**
Female-dominated Industry Dummy	163	156	7		0.20

Notes: Variables are defined in the Appendix.
* and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 5

Regression Analysis: Main Results for Determinants of Fraud

	Full Sample		Full Sample		Disclose-related		Non-Disclose-related	
	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value
Intercept	2.7767	0.08	2.7329	0.08	0.6349	0.76	6.9350	0.01
Female Director Ratio (LN)	-2.1074	0.00**			-2.0115	0.00**	-2.3641	0.00**
Female Director Ratio			-1.786	0.00**				
CHFemale	-0.1421	0.05*	-0.141	0.05*	-0.0196	0.82	-0.4420	0.01*
GMFemale	0.0661	0.28	0.063	0.31	0.0808	0.29	0.1069	0.34
Multiple Director Ratio	-0.2165	0.08	-0.209	0.09	-0.4351	0.02*	0.1759	0.32
Average Age	-0.0144	0.00**	-0.014	0.00**	-0.0051	0.36	-0.0266	0.00**
Average Education	-0.0294	0.00**	-0.030	0.00**	-0.0363	0.01**	-0.0302	0.07
Independent Director Ratio	0.4622	0.06	0.456	0.06	0.3664	0.29	0.5521	0.15
CEO Duality	0.0023	0.95	0.003	0.93	-0.0328	0.53	0.0635	0.31
Board Size	0.0170	0.02*	0.017	0.02*	0.0173	0.07	0.0142	0.24
Board Meeting	0.0075	0.15	0.007	0.15	0.0162	0.03*	-0.0006	0.94
Supervisor Meeting	0.0037	0.70	0.004	0.67	-0.0007	0.96	0.0065	0.69
Firm Size	0.0024	0.90	0.001	0.96	0.0029	0.91	-0.0103	0.76
Leverage	0.2197	0.02*	0.221	0.02*	0.3036	0.02*	0.0743	0.62
ROA	-1.9684	0.00**	-1.979	0.00**	-1.8223	0.00**	-2.4702	0.00**
Central SOE	-0.0293	0.52	-0.028	0.53	0.0343	0.57	-0.1621	0.03*
Local SOE	-0.1359	0.00**	-0.136	0.00**	-0.1736	0.00**	-0.0792	0.17
Female-dominated Industry Dummy	0.0340	0.52	0.082	0.29	0.1021	0.17	-0.0070	0.94
Year Dummies Included	Yes		Yes		Yes		Yes	
Industry Dummies Included	Yes		Yes		Yes		Yes	
McFadden R-square	0.1654		0.1614		0.1732		0.2021	
Log likelihood	-858.49		-862.57		-496.31		-341.78	
LR statistic	340.27		332.11		207.92		173.17	
p-value	0.00		0.00		0.00		0.00	
N	1484		1484		866		618	

Notes: Variables are defined in the Appendix.
* and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 6

Regression Analysis: Main Results for Determinants of Fraud by Industry

	Full Sample				Non-Disclose-related				Disclose-related			
	Male-dominated		Female-dominated		Male-dominated		Female-dominated		Male-dominated		Female-dominated	
	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value
Intercept	4.2873	0.01	-4.5646	0.29	2.2547	0.33	-8.5670	0.10	7.2615	0.01	-3.2128	0.81
Female Director Ratio (LN)	-2.222	0.00**	-1.936	0.00**	-2.090	0.00**	-1.759	0.01**	-2.606	0.00**	-1.784	0.05*
CHFemale	-0.098	0.20	-0.394	0.16	0.032	0.73	-0.437	0.37	-0.511	0.01**	-0.455	0.31
GMFemale	0.100	0.18	0.055	0.67	0.093	0.33	0.074	0.66	0.190	0.15	-0.158	0.61
Multiple Director Ratio	-0.148	0.27	-0.567	0.08	-0.393	0.06	-0.427	0.28	0.271	0.16	-0.636	0.28
Average Age	-0.017	0.00**	0.001	0.96	-0.009	0.18	0.013	0.37	-0.030	0.00**	-0.007	0.76
Average Education	-0.020	0.08	-0.077	0.00**	-0.024	0.12	-0.075	0.02*	-0.023	0.20	-0.080	0.17
Independent Director Ratio	0.367	0.18	1.030	0.08	0.224	0.57	0.616	0.44	0.638	0.15	1.340	0.29
CEO Duality	0.007	0.88	0.080	0.39	-0.012	0.85	-0.061	0.60	0.052	0.45	0.386	0.04
Board Size	0.012	0.13	0.044	0.01**	0.008	0.45	0.057	0.03*	0.019	0.16	0.054	0.10
Board Meeting	0.004	0.50	0.031	0.04*	0.015	0.06	0.022	0.28	-0.006	0.47	0.023	0.45
Supervisor Meeting	0.015	0.17	-0.047	0.04*	0.003	0.85	-0.010	0.73	0.026	0.17	-0.114	0.03*
Firm Size	-0.011	0.62	0.066	0.21	-0.006	0.84	0.057	0.38	-0.019	0.59	0.116	0.51
Leverage	0.247	0.02*	-0.044	0.84	0.299	0.04*	0.436	0.15	0.177	0.29	-0.881	0.05*
ROA	-1.922	0.00**	-2.649	0.00**	-1.916	0.00**	-1.770	0.00**	-2.105	0.00**	-6.119	0.02*
Central SOE	0.013	0.80	-0.184	0.13	0.088	0.21	-0.140	0.36	-0.129	0.12	-0.705	0.05*
Local SOE	-0.079	0.04*	-0.352	0.00**	-0.092	0.07	-0.461	0.00**	-0.067	0.31	-0.299	0.08
Year Dummies Included	Yes		Yes		Yes		Yes		Yes		Yes	
Industry Dummies Included	Yes		Yes		Yes		Yes		Yes		Yes	
McFadden R-square	0.1618				0.1641		0.2820		0.2086		0.3827	
Log likelihood	-676.88				-381.20		-103.35		-278.12		-47.47	
LR statistic	261.23				149.63		81.18		146.60		58.86	
p-value	0.00				0.00		0.00		0.00		0.00	
N	1165		319		507		111		658		208	

Notes: Variables are defined in the Appendix.

* and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 7

Regression Analysis: Robustness Checks for Determinants of Fraud by Year

	2001-2005				2006-2010			
	Male-dominated		Female-dominated		Male-dominated		Female-dominated	
	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value
Intercept	4.0555	0.14	-1.5241	0.85	3.4830	0.18	-5.8887	0.36
Female Director Ratio (LN)	-2.693	0.00**	-4.402	0.00**	-2.010	0.00**	-0.281	0.66
CHFemale	-0.092	0.41	-0.161	0.75	-0.134	0.22	-0.490	0.13
GMFemale	-0.092	0.41	0.085	0.69	0.277	0.01**	-0.136	0.49
Multiple Director Ratio	-0.176	0.39	-0.407	0.43	-0.069	0.71	-0.686	0.15
Average Age	-0.025	0.00**	-0.009	0.62	-0.013	0.04*	0.010	0.50
Average Education	-0.057	0.00**	-0.111	0.01**	-0.002	0.89	-0.069	0.03*
Independent Director Ratio	0.723	0.05*	1.241	0.17	-0.137	0.79	2.093	0.07
CEO Duality	0.030	0.66	0.050	0.75	-0.042	0.51	0.085	0.52
Board Size	0.000	0.97	0.074	0.02*	0.038	0.01**	0.050	0.13
Board Meeting	0.004	0.65	0.057	0.03*	0.006	0.50	0.023	0.34
Supervisor Meeting	0.029	0.07	-0.011	0.74	0.001	0.94	-0.138	0.01
Firm Size	0.008	0.83	0.013	0.89	-0.007	0.80	0.062	0.40
Leverage	0.430	0.01**	0.138	0.69	-0.004	0.98	-0.431	0.25
ROA	-1.523	0.00**	-2.264	0.01**	-2.688	0.00**	-3.849	0.00**
Central SOE	0.144	0.04*	0.082	0.64	-0.144	0.06	-0.443	0.03*
Local SOE	-0.008	0.88	-0.286	0.03	-0.146	0.02*	-0.372	0.00**
Year Dummies Included	Yes		Yes		Yes		Yes	
Industry Dummies Included	Yes		Yes		Yes		Yes	
McFadden R-square	0.2146		0.3903		0.1569		0.2865	
Log likelihood	-351.66		-75.22		-303.26		-69.60	
LR statistic	192.23		96.31		112.87		55.91	
p-value	0.00		0.00		0.00		0.00	
N	646		178		519		141	

Notes: Variables are defined in the Appendix.

* and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 8

Regression Analysis with Two-stage Estimates of Determinants of Fraud

	Full Sample		Male-dominated		Female-dominated	
	Marginal Effect	*p*-value	Marginal Effect	*p*-value	Marginal Effect	*p*-value
Intercept	-0.1603	0.92	1.3516	0.44	-6.687	0.11
Fitted Value of Female Director Ratio (LN)	-0.1756	0.00**	-0.205	0.00**	-0.04	0.71
CHFemale	-0.2153	0.00**	-0.182	0.01**	-0.438	0.14
GMFemale	-0.0155	0.79	0.018	0.79	-0.095	0.45
Multiple Director Ratio	-0.1076	0.36	-0.028	0.83	-0.404	0.21
Average Age	-0.0116	0.00**	-0.013	0.00**	-0.001	0.9
Average Education	-0.0282	0.00**	-0.019	0.07	-0.07	0.00**
Independent Director Ratio	0.2358	0.16	0.182	0.49	1.329	0.03*
CEO Duality	-0.0221	0.57	-0.024	0.6	0.075	0.4
Board Size	0.0144	0.04*	0.009	0.23	0.043	0.01**
Board Meeting	0.0060	0.23	0.003	0.51	0.03	0.05*
Supervisor Meeting	0.0072	0.43	0.018	0.09	-0.041	0.07
Firm Size	0.0011	0.96	-0.017	0.42	0.076	0.14
Leverage	0.2002	0.03*	0.211	0.04*	-0.026	0.9
ROA	-2.0587	0.00**	-2.011	0.00**	-2.814	0.00**
Central SOE	-0.0367	0.41	0.007	0.88	-0.219	0.06
Local SOE	-0.1440	0.00**	-0.078	0.04*	-0.402	0.00**
Female-dominated Industry Dummy	0.0324	0.59				
Year Dummies Included	Yes		Yes		Yes	
Industry Dummies Included	Yes		Yes		Yes	
McFadden R-square	0.1094		0.1037		0.2227	
Log likelihood	-916.11		-723.76		-171.81	
LR statistic	225.04		167.47		98.46	
p-value	0.00		0		0	
N	1484		1165		319	

Notes: Variables are defined in the Appendix.

* and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 9
Summary Statistics for Event Study

	Full Sample							Female-dominated Industries							Male-dominated Industries						
	All (N = 742)		With Female Directors (N = 481)		Without Female Directors (N = 261)		With vs. Without	All (N = 163)		With Female Directors (N = 109)		Without Female Directors (N = 54)		With vs. Without	All (N = 579)		With Female Directors (N = 372)		Without Female Directors (N = 207)		With vs. Without
Date	Abn. Return	t-value	Abn. Return	t-value	Abn. Return	t-value	Mean Diff	Abn. Return	t-value	Abn. Return	t-value	Abn. Return	t-value	Mean Diff	Abn. Return	t-value	Abn. Return	t-value	Abn. Return	t-value	Mean Diff
0	-0.003	-1.39	-0.002	-1.14	-0.006	-0.94	0.004	-0.0015	-0.45	-0.0007	-0.20	-0.0035	-0.50	0.0027	-0.0037	-1.32	-0.0023	-1.18	-0.0063	-0.86	0.0041
1	-0.004	-1.69	-0.002	-1.34	-0.007	-1.18	0.005*	-0.0023	-0.65	-0.0012	-0.32	-0.0048	-0.69	0.0036	-0.0044	-1.57	-0.0026	-1.34	-0.0077	-1.07	0.0052*
2	-0.004	-1.91	-0.003	-1.76	-0.007	-1.21	0.004*	-0.0052	-1.51	-0.0034	-0.89	-0.0097	-1.41	0.0063	-0.0042	-1.51	-0.0028	-1.47	-0.0068	-0.94	0.0040
3	-0.002	-0.75	-0.002	-1.03	-0.002	-0.31	0.000	-0.0042	-1.21	-0.0046	-1.21	-0.0032	-0.47	-0.0014	-0.0011	-0.38	-0.0009	-0.46	-0.0015	-0.21	0.0005
4	-0.003	-1.15	-0.001	-0.49	-0.007	-1.08	0.006*	0.0020	0.59	0.0030	0.80	-0.0007	-0.10	0.0037	-0.0039	-1.40	-0.0020	-1.01	-0.0078	-1.08	0.0058**
5	-0.002	-0.75	-0.003	-1.52	0.000	0.01	-0.003	-0.0063	-1.82	-0.0097	-2.54*	0.0012	0.17	-0.0109**	-0.0005	-0.19	-0.0006	-0.32	-0.0002	-0.03	-0.0003
6	-0.003	-1.18	-0.002	-1.39	-0.003	-0.56	0.001	-0.0040	-1.16	-0.0029	-0.77	-0.0063	-0.92	0.0034	-0.0024	-0.85	-0.0022	-1.12	-0.0026	-0.36	0.0006
7	-0.003	-1.18	-0.003	-1.94	-0.002	-0.29	-0.002	-0.0049	-1.42	-0.0062	-1.63	-0.0021	-0.31	-0.0041	-0.0022	-0.77	-0.0024	-1.26	-0.0016	-0.23	-0.0008
8	0.000	0.07	0.001	0.77	-0.002	-0.32	0.003	0.0027	0.78	0.0062	1.62	-0.0049	-0.71	0.0111*	-0.0005	-0.19	-0.0001	-0.07	-0.0012	-0.17	0.0011
9	-0.006	-2.46*	-0.006	-3.36**	-0.006	-0.96	0.000	-0.0050	-1.43	-0.0045	-1.17	-0.0062	-0.90	0.0018	-0.0059	-2.11*	-0.0060	-3.11**	-0.0057	-0.79	-0.0002
10	-0.003	-1.28	-0.002	-1.35	-0.004	-0.72	0.002	-0.0057	-1.64	-0.0074	-1.93	-0.0017	-0.25	-0.0056	-0.0023	-0.81	-0.0008	-0.42	-0.0049	-0.68	0.0041
11	-0.001	-0.43	0.000	0.06	-0.003	-0.47	0.003	-0.0008	-0.24	0.0015	0.39	-0.0060	-0.86	0.0074	-0.0010	-0.37	-0.0003	-0.15	-0.0022	-0.30	0.0021
12	-0.003	-1.28	-0.001	-0.77	-0.006	-1.04	0.005**	-0.0041	-1.19	-0.0022	-0.57	-0.0085	-1.23	0.0063*	-0.0027	-0.94	-0.0010	-0.54	-0.0058	-0.80	0.0047*
13	0.000	0.18	0.000	0.15	0.001	0.12	0.000	0.0006	0.18	0.0037	0.98	-0.0066	-0.95	0.0103*	0.0004	0.13	-0.0007	-0.38	0.0023	0.32	-0.0032
14	0.001	0.42	0.002	1.04	-0.001	-0.10	0.002	0.0071	2.05*	0.0071	1.85	0.0073	1.05	-0.0002	-0.0007	-0.25	0.0002	0.10	-0.0024	-0.33	0.0025
15	0.000	-0.03	0.000	0.17	-0.001	-0.13	0.001	-0.0006	-0.19	0.0014	0.37	-0.0054	-0.78	0.0068*	0.0001	0.03	0.0000	-0.02	0.0003	0.04	-0.0003
16	-0.002	-0.91	-0.002	-0.93	-0.003	-0.53	0.002	-0.0037	-1.06	-0.0010	-0.27	-0.0096	-1.38	0.0085*	-0.0017	-0.60	-0.0017	-0.89	-0.0017	-0.23	-0.0002
17	0.001	0.27	0.001	0.64	0.000	-0.04	0.001	0.0006	0.18	0.0043	1.12	-0.0075	-1.08	0.0118*	0.0006	0.23	0.0001	0.07	0.0015	0.21	-0.0014
18	-0.001	-0.42	0.000	0.05	-0.003	-0.51	0.003	-0.0010	-0.29	0.0004	0.10	-0.0042	-0.61	0.0046	-0.0010	-0.34	0.0000	0.00	-0.0028	-0.39	0.0027
19	0.000	-0.02	0.003	1.56	-0.005	-0.88	0.008**	0.0008	0.22	0.0024	0.63	-0.0035	-0.51	0.0059	-0.0003	-0.10	0.0027	1.39	-0.0057	-0.79	0.0084**
20	-0.001	-0.53	0.002	0.89	-0.007	-1.08	0.008**	0.0008	0.23	0.0032	0.84	-0.0052	-0.75	0.0084	-0.0018	-0.64	0.0010	0.50	-0.0069	-0.95	0.0079**
0+3	-0.013	-2.87**	-0.009	-2.64**	-0.022	-1.82	0.013**	-0.0133	-1.91	-0.0100	-1.31	-0.0212	-1.53	0.0112	-0.0134	-2.39*	-0.0086	-2.23*	-0.0223	-1.54	0.0137*
0+5	-0.018	-3.12**	-0.012	-2.97**	-0.029	-1.92	0.016**	-0.0175	-2.06*	-0.0166	-1.78	-0.0206	-1.22	0.0040	-0.0179	-2.60**	-0.0112	-2.36*	-0.0303	-1.71	0.0191**
0+10	-0.032	-4.12**	-0.025	-4.38**	-0.046	-2.28*	0.021**	-0.0344	-2.99**	-0.0315	-2.48*	-0.0420	-1.83	0.0105	-0.0312	-3.35**	-0.0227	-3.55**	-0.0464	-1.93	0.0237**
0+15	-0.035	-3.70**	-0.023	-3.47**	-0.056	-2.29*	0.032**	-0.0323	-2.33*	-0.0199	-1.31	-0.0612	-2.21*	0.0413**	-0.0351	-3.13**	-0.0247	-3.19**	-0.0541	-1.87	0.0294**
0+20	-0.038	-3.58**	-0.020	-2.55*	-0.074	-2.66**	0.054**	-0.0348	-2.19*	-0.0107	-0.61	-0.0911	-2.88**	0.0804**	-0.0392	-3.05**	-0.0226	-2.55**	-0.0696	-2.10*	0.0470**

Notes: * and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 10

Event Study with Abnormal Return Measured by Market Return

	0 to +3		0 to +5		0 to +10		0 to +15		0 to +20	
	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value
Intercept	-0.1183	0.01**	-0.1085	0.06	-0.2047	0.00**	-0.1965	0.01**	-0.1997	0.01**
Female Director Ratio (LN)	0.0482	0.03*	0.0601	0.02*	0.1126	0.00**	0.1688	0.00**	0.2700	0.00**
CHFemale	0.0239	0.02*	0.0284	0.02*	0.0391	0.05*	0.0313	0.24	0.0394	0.03*
GMFemale	-0.0154	0.12	-0.0232	0.07	-0.0204	0.29	-0.0041	0.88	-0.0239	0.36
Multiple Director Ratio	-0.0216	0.14	-0.0127	0.47	-0.0258	0.26	-0.0212	0.45	0.0126	0.66
Average Age	0.0011	0.04*	0.0014	0.03*	0.0022	0.01**	0.0021	0.03*	0.0021	0.05
Average Education	0.0024	0.04*	0.0014	0.31	0.0029	0.09	0.0020	0.35	0.0032	0.17
Independent Director Ratio	-0.0057	0.84	0.0038	0.87	0.0008	0.99	-0.0474	0.55	-0.0170	0.82
CEO Duality	0.0060	0.19	0.0093	0.10	0.0117	0.10	0.0137	0.13	-0.0011	0.91
Board Size	0.0006	0.50	0.0013	0.16	0.0012	0.29	0.0019	0.20	0.0031	0.05*
Board Meeting	-0.0001	0.94	-0.0002	0.80	0.0017	0.08	0.0009	0.51	0.0010	0.48
Supervisor Meeting	-0.0015	0.23	-0.0001	0.92	-0.0024	0.18	-0.0027	0.25	-0.0050	0.04*
Firm Size	0.0028	0.17	0.0010	0.69	0.0038	0.21	0.0048	0.18	0.0023	0.57
Leverage	-0.0068	0.59	-0.0099	0.53	-0.0244	0.22	-0.0523	0.05	-0.0371	0.15
ROA	0.0248	0.21	0.0234	0.37	-0.0196	0.56	-0.0063	0.88	0.0072	0.87
Central SOE	-0.0028	0.65	-0.0115	0.09	-0.0129	0.14	-0.0161	0.15	-0.0225	0.05*
Local SOE	-0.0067	0.13	-0.0104	0.04*	-0.0075	0.25	-0.0097	0.23	0.0000	1.00
Female-dominated Industry Dummy	-0.0057	0.39	0.0176	0.05*	-0.0262	0.08	-0.0231	0.17	-0.0218	0.21
Year Dummies Included	Yes		Yes		Yes		Yes		Yes	
Industry Dummies Included	Yes		Yes		Yes		Yes		Yes	
Adj. R-square	0.040		0.046		0.048		0.031		0.0739	
Log likelihood	1169.55		1064.06		865.51		672.81		657.59	
F	1.93		1.99		2.08		1.67		2.60	
p-value	0.00		0.00		0.00		0.01		0.00	
N	742		742		742		742		742	

Notes: Variables are defined in the Appendix.
* and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 11

Event Study with Abnormal Return Measured by Market Return, for Male-dominated Industries Subset

	0 to +3		0 to +5		0 to +10		0 to +15		0 to +20	
	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value
Intercept	-0.1843	0.00**	-0.1915	0.01**	-0.2525	0.00**	-0.2055	0.03*	-0.1921	0.04*
Female Director Ratio (LN)	0.0719	0.01**	0.0946	0.00**	0.1468	0.00**	0.1713	0.00**	0.2758	0.00**
CHFemale	0.0221	0.05*	0.0282	0.03*	0.0429	0.03*	0.0387	0.18	0.0347	0.09
GMFemale	-0.0144	0.28	-0.0219	0.2	-0.0127	0.63	0.0151	0.69	0.0044	0.9
Multiple Director Ratio	-0.025	0.13	-0.0131	0.5	-0.0202	0.4	-0.025	0.42	-0.0043	0.89
Average Age	0.0012	0.07	0.0016	0.04*	0.0023	0.01**	0.002	0.1	0.0023	0.07
Average Education	0.0033	0.01**	0.0017	0.29	0.0032	0.09	0.0024	0.31	0.0032	0.22
Independent Director Ratio	-0.0265	0.45	-0.0243	0.37	-0.0658	0.35	-0.1474	0.16	-0.0799	0.4
CEO Duality	-0.0023	0.67	0.0051	0.43	-0.0079	0.34	0.009	0.4	-0.0032	0.76
Board Size	0.0009	0.39	0.0014	0.19	0.0012	0.41	0.0021	0.25	0.0033	0.07
Board Meeting	0	0.96	-0.0002	0.84	0.0016	0.12	0.0003	0.83	0.0011	0.48
Supervisor Meeting	-0.0019	0.18	-0.0004	0.82	-0.0022	0.3	-0.0019	0.49	-0.0028	0.31
Firm Size	0.0057	0.02*	0.0048	0.1	0.0068	0.05*	0.007	0.1	0.0019	0.67
Leverage	-0.0085	0.6	-0.0224	0.26	-0.0401	0.11	-0.0562	0.09	-0.0152	0.63
ROA	0.0239	0.3	0.0016	0.96	-0.0406	0.31	-0.0271	0.6	-0.0071	0.89
Central SOE	-0.0061	0.38	-0.0162	0.04*	-0.0183	0.07	-0.0177	0.17	-0.0282	0.03*
Local SOE	-0.0085	0.11	-0.0125	0.03*	-0.0095	0.19	-0.0131	0.18	-0.0074	0.44
Year Dummies Included	Yes		Yes		Yes		Yes		Yes	
Industry Dummies Included	Yes		Yes		Yes		Yes		Yes	
Adj. R-square	0.048		0.049		0.055		0.026		0.063	
Log likelihood	893.32		811.97		666.84		498.91		512.89	
F	1.97		1.97		2.09		1.5		2.13	
p-value	0		0		0		0.04		0	
N	579		579		579		579		579	

Notes: Variables are defined in the Appendix.
* and ** denote significance at 0.05 and 0.01 levels, respectively.

Table 12

Event Study with Abnormal Return Measured by Market Return, Female-dominated Industries Subset

	0 to +3		0 to +5		0 to +10		0 to +15		0 to +20	
	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value
Intercept	0.1504	0.09	0.298	0.00**	-0.0199	0.86	-0.2206	0.07	-0.3271	0.06
Female Director Ratio (LN)	-0.0188	0.62	-0.0333	0.43	0.0426	0.51	0.1565	0.04*	0.2446	0.01**
CHFemale	-0.007	0.85	-0.0151	0.67	-0.0327	0.63	-0.0847	0.10	-0.0563	0.14
GMFemale	-0.0147	0.25	-0.0261	0.03*	-0.0385	0.11	-0.0357	0.17	-0.0466	0.17
Multiple Director Ratio	0.0233	0.56	0.0435	0.34	0.0101	0.85	0.0421	0.42	0.0284	0.72
Average Age	0.0009	0.37	0.0013	0.27	0.0018	0.26	0.0013	0.44	0.0011	0.59
Average Education	-0.0032	0.28	-0.0018	0.65	-0.001	0.85	-0.0055	0.34	-0.0008	0.92
Independent Director Ratio	0.0811	0.08	0.0814	0.10	0.1466	0.05	0.2707	0.00**	0.1208	0.31
CEO Duality	-0.0135	0.13	0.0152	0.17	-0.0145	0.29	0.0266	0.1	0.017	0.45
Board Size	0.0001	0.96	0.0002	0.92	0.0008	0.7	0.0018	0.45	0.0042	0.24
Board Meeting	0.0008	0.57	0.001	0.56	0.0032	0.15	0.0053	0.02*	0.0011	0.73
Supervisor Meeting	-0.002	0.36	-0.0011	0.68	-0.0054	0.18	-0.0056	0.2	-0.0113	0.04
Firm Size	-0.0099	0.02	-0.0176	0.00**	-0.0081	0.27	0.0038	0.56	0.0119	0.22
Leverage	-0.0186	0.34	0.0089	0.68	0.0093	0.79	-0.0911	0.01**	-0.1153	0.02*
ROA	0.0388	0.33	0.1324	0.01**	0.0834	0.14	0.0613	0.38	0.0941	0.41
Central SOE	0.0127	0.26	0.0213	0.10	0.0203	0.28	-0.0105	0.53	0.0038	0.88
Local SOE	0.0058	0.55	0.0044	0.68*	0.0082	0.58	-0.0001	1.00	0.0394	0.07
Year Dummies Included	Yes		Yes		Yes		Yes		Yes	
Industry Dummies Included	Yes		Yes		Yes		Yes		Yes	
Adj. R-square	0.07		0.165		0.075		0.168		0.074	
Log likelihood	299.24		-280.19		216.21		203.03		657.59	
F	1.46		2.23		1.53		2.42		2.6	
p-value	0.09		0		0.07		0		0	
N	163		163		163		163		163	

Notes: Variables are defined in the Appendix.
* and ** denote significance at 0.05 and 0.01 levels, respectively.

APPENDIX

Variable Definitions

Fraud	Dummy variable that takes the value 1 if the firm is subject to an enforcement action on violation of regulation or fraud, 0 otherwise. Fraud encompasses many types of violation events; the major ones include illegal share buybacks (repurchasing a company's own stock), reporting inflated profits, asset fabrication, unauthorized change in fund use (using capital for purposes other than what was approved), violation in capital contribution (making false capital contributions or illegally withdrawing capital contributions), shareholder embezzlement, share price manipulation, illegal guarantee, and speculation. These different types of fraud are defined at http://www.csrc.gov.cn/pub/csrc_en/laws/, and enforced by the Chinese Securities Regulatory Commission (CSRC)
Female Director Ratio (LN)	Proportion of female directors on the board in logarithm form [measured as ln(1+female director ratio)]
CHFemale	Dummy variable that takes the value 1 if the firm is led by a female chairperson, 0 otherwise
GMFemale	Dummy variable that takes the value 1 if the firm is led by a female general manager, 0 otherwise
Multiple Director Ratio	Proportion of directors with multiple board directorships
Average Age	Mean age of directors on the board
Average Education	Mean years of education completed by members of the board
Independent Director Ratio	Proportion of independent directors on the board
CEO Duality	Dummy variable that takes the value 1 if the chairperson and general manager are the same person, 0 otherwise
Board Size	Number of directors on the board
Board Meeting	Number of board meetings
Supervisor Meeting	Number of supervisor meetings
Firm Size	Total assets in logarithm form

Leverage	Ratio of debt to assets
ROA	Return on assets
Central SOE	Dummy variable that takes the value 1 if the firm is an SOE controlled by the central government, 0 otherwise
Local SOE	Dummy variable that takes the value 1 if the firm is an SOE controlled by a province, city, or country government, 0 otherwise
Female-dominated Industry	Dummy variable that takes the value 1 if the firm is in an industry dominated by women, 0 otherwise. Based on data on gender diversity by industry compiled yearly by the Workplace Gender Equality Agency of the Australian government between 2004 and 2012 (www.wgea.gov.au). We calculate the average of the percentage of female employees over these years for each industry class to determine whether the industry is female-dominated or male-dominated. We select Australia because data on female-dominated industries are available in Australia and not in China, and because the average percentage of female directors is the same in China and Australia (Terjesen et al., 2009). An industry class with more than 50% female employees is classified as female-dominated. Then, we match the industry sectors in Australia with those in China. Consequently, we define the sectors of food processing, clothing (textile, garment) manufacturing, medicine and biological product manufacturing, clothing, retail trade, food and beverage services, hotels, tourism, radio, film and television, and publishing as female-dominated industries. Using this definition, we have 319 firms in female-dominated industry sectors in our sample of 1,484 firms.

ONLINE APPENDIX TO "GENDER DIVERSITY AND SECURITIES FRAUD"

Paper	Country(ies) Studied	Empirical (Yes/No)	Sample Size (# observations) or if Meta study indicate # studies reviewed	Survey Data (Yes/No)	Finding that women are more ethical or risk averse?
Adams, R. B., Ferreira, D., 2009. Women in the boardroom and their impact on governance and performance, Journal of Financial Economics, 94, 291-309.	US	Yes	86,714 directorships on 1,939 firms	No	Yes
Agnew, J., Anderson, L. R., Gerlach, J. R., Szykman, L. R., 2008. Who chooses annuities? An experimental investigation of the role of gender, framing and defaults, American Economic Review: Papers & Proceedings, 98 (2), 418-422.	US (greater Williamsburg, Virginia)	Yes	843	Yes (controlled experiment)	Yes
Agnew, J., Balduzzi, P., Sunden, A., 2003. Portfolio choice and trading in a large 401(k) plan, American Economic Review, 93 (1), 193-215.	US	Yes	6,778	Main sample data is not; but survey data is used as a reference to show to what extent the sample can represent the US population	Yes
Barber, B. M., Odean, T., 2001. Boys will be boys: Gender, overconfidence, and common stock investment, The Quarterly Journal of Economics, 116 (1), 261-292.	US	Yes	over 35,000	No (survey data is only used as a reference)	Yes
Bruns, W. J. Jr., Merchant, K. A., 1990. The dangerous morality of managing earnings, Management Accounting, 72 (2), 22-25.	US	Yes	649	Yes	Yes
Byrnes, J. P., Miller, D. C., Schafer, W. D., 1999. Gender differences in risk raking: A meta-analysis, Psychological Bulletin, 125, 367-383.	US (cannot identify other countries in 150 cited studies)	Yes	meta-analysis of 150 studies	Yes	Yes
Cejka, M.A., Eagly, A.H., 1999. Gender-stereotypic images of occupations correspond to the sex segregation of employment, Personality and Social Psychology Bulletin 25, 413-423.	US	Yes	189	Yes	*Findings showed that, to the extent that occupations were female dominated, feminine personality or physical attributes were thought more essential for success; to the extent that occupations were male dominated, masculine personality or physical attributes were thought more essential. Demonstrating the role of gender stereotypes in justifying gender hierarchy, occupations had higher prestige in that participants believed that they required masculine personality or cognitive attributes for success, and they had higher earnings to the extent that they were thought to require masculine personality attributes.*

(Online Appendix, Continued) Paper	Country(ies) Studied	Empirical (Yes/No)	Sample Size (# observations) or if Meta study indicate # studies reviewed	Survey Data (Yes/No)	Finding that women are more ethical or risk averse?
Cliff, J. E., 1998. Exploring the relationship between attitudes towards growth, gender and business size, Journal of Business Venturing, 13, 523-542.	Canada	Yes	229	Yes	Yes
Cohen, J. R., Pant, L. W., Sharp, D. J., 1998. The effect of gender and academic discipline diversity on the ethical evaluations, ethical intentions and ethical orientation of potential public accounting recruits, Accounting Horizons, 12 (3), 250-270.	US (northeastern area)	Yes	645	Yes	Yes
Eagly, A.H., Johnson, B.T., 1990. Gender and leadership style: A meta-analysis, Psychological Bulletin, 108, 233-256.	US, Canada	Yes - meta analysis	Meta-analysis from Psychological Abstracts, Dissertation Abstracts International, ERIC, Social Science Citation Index, Sociological Abstracts - 162 studies	Yes, but only applies to a part of study	*women tended to adopt a more democratic or participative style and a less autocratic or directive style than did men. This sex difference appeared in all three classes of leadership studies, including those conducted in organizations. These and other findings are interpreted in terms of a social role theory of sex differences in social behavior.*
Eagly, A.H., Karau, S.J., Makhijani, M.G., 1995. Gender and the effectiveness of leaders: A meta-analysis, Psychological Bulletin 117, 125-145.	US	Yes - meta analysis	Meta-analysis from databases of Psychological Abstracts, Dissertation Abstracts International, ERIC and ABI/INFORM - 96 Studies	Yes, but only applies to a part of study	*men were more effective than women in roles that were denned in more masculine terms, and women were more effective than men in roles that were defined in less masculine terms. Also, men were more effective than women to the extent that leader and subordinate roles were male-dominated numerically*
Eagly, A.H., Wood, W., 1999. The origins of sex differences in human behavior: Evolved dispositions versus social roles, American Psychologist 54, 408-423.	37 cultures, from 33 nations, 54% from Europe and North America	Yes (meta is used, for one previous study)	The paper focuses on reanalysis of one study and contrasts social structural explanations of sex differences with those based on evolutionary psychology.	No	*yielded cross-cultural variation that supports the social structural account of sex differences in mate preferences*
Farrell, K. A., Hersch, P. L., 2005. Additions to corporate board: The effect of gender, Journal of Corporate Finance, 11, 85-106.	US	Yes	2974	No	*not related to ethics or risk, just about firm value. Women tend to serve on better performing boards. Likelihood of adding another women decreases with the number of current women serving.*
Fondas, N., Sassalos, S., 2000. A different voice in the boardroom: How the presence of women directors affects board influence over management, Global Focus, 12, 13-22.	US	Yes	115 firms	Yes	Yes
Hillman, A. J., Dalziel, T., 2003. Boards of directors and firm performance: Integrating agency and resource dependence perspectives, Academy of Management Review, 28, 383-396.	US	No	N/A	No	Yes

(Online Appendix, Continued) Paper	Country(ies) Studied	Empirical (Yes/No)	Sample Size (# observations) or if Meta study indicate # studies reviewed	Survey Data (Yes/No)	Finding that women are more ethical or risk averse?
Ibrahim, N., Angelidis, J., Tomic, I. M., 2009. Managers' attitudes toward codes of ethics: Are there gender difference?, Journal of Business Ethics, 90, 343-353.	US (southeastern and northeastern)	Yes	286 managers (Male 163, Female 123)	Yes	Yes
Jaffee, S., Hyde, J. S., 2000. Gender differences in moral orientation: A meta-analysis, Psychological Bulletin, 126(5), 703-726.	US	Yes	Meta-analysis of a sample of 113 studies from PsycLIT, ERIC and Dissertation abstracts computerized databases	No	No
Jianakoplos, N. A., Bernasek, A., 1998. Are women more risk averse?, Economic Inquiry, 36, 620-630.	US	Yes	3143 households	Yes	Yes
Olsen, R. A., Cox, C. M., 2001. The influence of gender on the perception and response to investment risk: The case of professional investors, Journal of Psychology and Financial Markets, 2 (1), 29-36.	US	Yes	483 (Male 342, Female 141)	Yes	Yes
Owhoso, V., 2002. Mitigating gender-specific superior ethical sensitivity when assessing likelihood of fraud risk, Journal of Managerial Issues, 54 (3), 360-374.	US	Yes	160 (Male 80, Female 80)	Yes	No
Powell, M., Ansic, D., 1997. Gender differences in risk behavior in financial decision-making: An experimental analysis. Journal of Economic Psychology, 18 (6), 605-628.	UK	Yes	126 (Male 64, Female 62)	Yes	Yes
Radtke, R. R., 2000. The effect of gender and setting on accountants' ethically sensitive decisions, Journal of Business Ethics, 24 (4), 299-312.	US	Yes	51 practicing accountants	Yes	No
Roxas, M. L., Stoneback, J. Y., 2004. The importance of gender across cultures in ethical decision-making, Journal of Business Ethics, 50, 149-165.	US, Canada, Australia, China, Philippines, Thailand, Germany, Ukraine	Yes	750 (Male 52.3%, Female 47.7%)	Yes	Yes
Sexton, D. L., Bowman-Upton, N., 1990. Female and male entrepreneurs: Psychological characteristics and their role in gender-related discrimination. Journal of Business Venturing, 5 (1), 29-36.	US (Columbus, Ohio, area)	Yes	174 entrepreneurs (Male 69, Female 105)	Yes	Yes
Sundén, A. E., Surette, B. J., 1998. Gender differences in the allocation of assets in retirement savings plans, American Economic Review, 88, 207-211.	US	Yes	3906 household in 1992 & 4299 household in 1995	Yes	Yes
Velthouse, B., Kandogan, Y., 2007. Ethics in practice: What are managers really doing?, Journal of Business Ethics, 70, 151-163.	US	Yes	only ratios are provided; the smallest possible sample based on the ratios is 1000	Yes	No

(Online Appendix, Continued) Paper	Country(ies) Studied	Empirical (Yes/No)	Sample Size (# observations) or if Meta study indicate # studies reviewed	Survey Data (Yes/No)	Finding that women are more ethical or risk averse?
Watson, J., Robinson, S., 2003. Adjusting for risk in comparing the performances of male- and female-controlled SMEs, Journal of Business Venturing 18, 773-778.	Australia	Yes	2367 firms (2236 controlled by a male and 131 controlled by a female)	Yes	Yes
Weait, M., 2001. The workplace ethic: Is it crime? Management Today, January, 52-57.	UK	Yes	more than 800 directors, managers and partners.	Yes	No