Does cooperation of women in top positions enhance or impede firm performance?

Lu Xing, Angelica Gonzalez and Vathunyoo Sila[1]

Abstract

Based on the notion that women cooperate more with women than with men, we investigate whether the cooperation among women at the top of corporate hierarchy in China affects firm performance. We show that the cooperation between female leaders and female directors leads to higher ROA but lower Tobin's q. The opposite effects are a result of earnings management that leads to overstated accounting profits but unfavourable stock market reactions. Further, the significant gender interaction effect arises from the managerial support provided by female executive directors to female leaders. Collectively, we demonstrate that the growing pressure on women to perform leads to 'women helping women', which is detrimental to shareholder interests.

JEL classification: G10, G34
Keywords: Gender diversity, leadership, firm performance, earnings management

[1] The authors are with the University of Edinburgh, 29 Buccleuch Place, EH8 9JY, UK.

1. Introduction

Research on gender diversity has either assessed the effect of board-diversity on firm outcomes or the effect of CEOs/CFOs on firm outcomes. This paper analyses the interaction between female directors and female CEOs/CFOs. We argue that, given the minority status of women in corporate hierarchy and the higher pressure on women to perform, cooperation among women takes place, leading to measurable effects at the firm level.

China offers a unique opportunity to assess the interaction between female directors and female CEOs/CFOs for at least two reasons. First, a large number of professional women have broken the glass ceiling to the top corporate hierarchy. The number of women in top positions in China is considerably higher than that in the U.S. and Europe, which allows for a larger variation in gender-related variables that will enable us to identify, if present, a gender effect on firm outcomes. Put it simply, one cannot study gender-diversity related issues if there are no women in top positions. Second, we argue that, because of the one-child policy in China, it is less likely that our results are affected by tokenism. In China, women are more likely to be given the same opportunities as men in terms of education and upbringing, which in turn reduces the prejudice in market environments against women. Current research that uses U.S. or European data faces the challenge of dealing with women that may be tokens, and this argument has been used to justify the lack of a statistical effect of gender-diversity on firm outcomes.

Gender diversity in corporate organisations has received increasing attention of governments. In 2003, Norway enacted a law requiring that public firms had at least 40% female representation on boards by 2008. Since then, a growing number of developed countries, such as Spain, Iceland, Finland and France, have proposed such laws or introduced similar gender-related governance codes. Among developing countries, China has witnessed a steadily increasing number of women taking up director or executive positions. In 2000, only 9% of directors were women, while the ratio rose to 14% in 2014. Between 2000 and 2014, women occupied, on average, 11% of board seats in Chinese public firms. Women also play an important

role in top management. In particular, 25.6% of CFOs in China are women, even though women only comprise 4.9% of CEO positions. [2]

Prior literature has revealed that women are different from men in their core values and behaviours. Some studies have shown that women are more averse to risk and competition than men (Sunden & Surette 1998; Croson & Buchan 1999; Adams & Ferreira 2009; Sapienza *et al.* 2009; Faccio *et al.* 2016), while other studies have found either women being more risk loving and less security oriented than men (Adams & Funk 2012) or no different to men when assessing risky corporate investment (Sila *et al.* 2016). It has been shown, at the firm level, that female executives are more conservative than male executives (Huang & Kisgen 2013) and that female directors are more diligent in monitoring managerial behaviours than their male counterparts (Adams & Ferreira 2009).

Importantly, the studies of Matsa and Miller (2011) and Tate and Yang (2015) suggest that, within the firm, women cooperate more with women than with men. In addition, there is anecdotal evidence of the higher interdependence and better cooperation among women. Avon Products Inc. is currently led by a female CEO, Sheri McCoy. It is striking to notice that out of all eleven directors on its board, seven are women.[3] To facilitate the work of female directors, Sheri McCoy especially arranges a women's room right next to the boardroom for these female directors to use during board meeting breaks, while the men's room is distant from the boardroom (The Wall Street Journal, November 11, 2014).[4] Furthermore, the cases of General Motors Corp., DuPont Corp. and PepsiCo Inc. show that female-led firms tend to add more women to the boards.

A large literature has documented a significant influence of gender diversity on a wide array of corporate outcomes, such as profitability (Ahern & Dittmar 2012; Dezsö & Ross 2012; Matsa & Miller

[2] The differences between China and the U.S. in terms of women's occupancy in top corporate hierarchy are striking. In U.S. firms, women occupied 10% of board seats, 2% of CEO positions and 8% of CFO positions.
[3] This number is well above the industry median.
[4] See http://www.wsj.com/articles/female-ceos-make-room-for-female-directors-1415732625

2013; Liu *et al.* 2014), corporate governance (Adams & Ferreira 2009; Beck *et al.* 2013), acquisitions (Levi *et al.* 2014), earnings quality (Srinidhi *et al.* 2011; Francis *et al.* 2015) and stock price informativeness (Gul *et al.* 2011). However, little is known about whether and how the cooperation between female executives and female directors affects firm performance.

Since CEOs and CFOs are senior executives who are most likely to make an impact on firm outcomes, we define both of them as female leaders and focus our analysis on the cooperation effect of female leaders and female directors on firm performance. Due to women's tendency to cooperate with women rather than with men, the presence of female leaders in top management is likely to have a larger effect at the firm level when there are more women sitting on the board. We posit that the cooperation between female leaders and female directors can affect firm performance in two competing ways. On the one hand, this cooperation could improve firm performance. This is because the high female representation in the boardroom can cultivate a female-friendly corporate culture that potentially brings out women's beneficial attributes, such as efficient communication and diligence, to corporate decision making. Given the efficient information exchange, female leaders are also likely to receive extra advice and support from female directors. On the other hand, the cooperation between women can deteriorate firm performance. Since the independence of the board of directors is important to board monitoring that aims to mitigate agency conflicts between managers and shareholders, the cooperation of female leaders and female directors, in a sense, connects the board of directors to managers, which could undermine the effectiveness of the monitoring mechanism. Thus, 'women helping women' could give rise to insufficient monitoring of managerial misbehaviours, such as earnings management, which in turn impairs firm performance.

To test the hypotheses, we collect a sample of 2,328 listed firms in China for the period between 2000 and 2014. We firstly show that high female representation on the board leads to female leadership in top management but not the reverse, reflective of cooperation among women in Chinese firms. After controlling for common factors that have been identified in gender diversity literature as explanatory factors of firm performance, our regression results further show that the interaction between female leaders and female

representation on the board significantly increases ROA but decreases Tobin's q. The results suggest that the presence of female leaders in top management is more likely to improve accounting returns but diminish stock value in firms with more women present on the board. We employ instrumental variables (IVs) to re-examine the relations. The IVs include (1) the industry average percentage of *female directors* in the province where the firm is headquartered; (2) the industry average percentage of *female executives* in the province where the firm is headquartered, (3) the interaction between the first two instruments, and (4) the fraction of male directors with external board connections to female directors. The regression results based on the IVs remain qualitatively unchanged. Moreover, we find that only the interaction between female leaders and female *executive* directors have a significant effect on firm performance, while the effect disappears when examining female *independent* directors. This indicates that the cooperation between female leaders and female directors requires women's managerial power to exert an impact at the firm level. Thus, female leaders can affect firm performance only when they can obtain support from other women at the top corporate hierarchy to strengthen the women's managerial power.

The female cooperation effect becomes stronger with more women directors added to the board. One may argue that this relation reflects the critical mass argument of board gender diversity that 'one is a token, two is a presence, and three is a voice', rather than the better cooperation among women. We use dummy indicators for the different numbers of female directors present on the board to test the validity of this alternative explanation. We find no evidence of the critical mass effect. Furthermore, since female leadership is closely linked to female board representation, it may be concerned that the interaction between female leadership and female directors captures the effect of a quadratic term of female board representation. We thus include the squared percentage of female directors on the board in the model and find the effect of female interaction on firm performance remains unchanged. In addition, our results provide no support for the argument that male leaders cooperate with male directors to affect firm performance, which means that the gender interaction effect is specific to women.

The opposite results on ROA and Tobin's q suggest that stock investors perceive female interaction as an unfavourable practice and respond negatively as a result even though the female interaction improves the firm's accounting returns. To verify the negative perception of investors about female interaction, we examine the changes in cumulative abnormal return (CAR) around the announcements of female CEO appointments. We document that the stock market reacts more negatively to the appointments of female CEOs announced by firms with higher female board representation. Further, we find that only female membership as *executive* directors matters in the determination of stock price reactions to female CEO appointments, while female membership as *independent* directors has no significant impact on the stock price reactions.

Next, we try to explain the opposite results for the effect of female cooperation on two different measures of firm performance – ROA and Tobin's q. ROA is a backward-looking measure of accounting returns, which is likely to be distorted by differences in financial policy and, more critically, by earnings manipulation. By comparison, Tobin's q captures investors' expectations about future cash flows. We interpret the negative relation between Tobin's q and the interaction between female leaders and female directors as a result of investors' negative perceptions about female cooperation that leads to insufficient monitoring of managerial misbehaviours, such as earnings management. The inclusion of an accrual-based earnings management measure in our baseline regression model shows that earnings management increases ROA but decreases Tobin's q. This result suggests that, although the accounting return can be managed by firms to a certain degree, the manipulated earnings numbers will be finally discerned by investors, which in turn diminishes firm value. More importantly, we find that the cooperation between female leaders and female directors increases earnings management. We further show that it is the cooperation of female leaders with female *executive* directors that contributes to this effect. Our findings are thus consistent with the argument of Tate and Yang (2015) that women within firms tend to help each other, but we extend it by showing that the interaction effect may hurt shareholder interests because of the resultant earnings manipulation that leads to higher ROA but lower Tobin's q.

Finally, the significant gender interaction effect on firm performance and earnings management is shown to be present only when women initially take up their leadership roles, and the effect vanishes when women hold their leadership roles for longer than one year because, as they sit in office for longer periods, they become more entrenched in their firms and experience lower performance pressure. The results thus demonstrate that the pressure on women to perform induces female leaders to cooperate with female directors to affect firm performance via earnings manipulation, which corresponds to overstated earnings numbers but unfavourable stock market responses.

This paper contributes to extant literature in several ways. First, it bridges two strands of literature on female leadership and board gender diversity. Our results suggest that women's representation in the firm should go beyond the board level in order for gender diversity to have an effect on firm outcomes. Specifically, we find that the cooperation between female leaders and female directors leads to higher ROA but lower Tobin's q. Our results are thus consistent with the hypothesis that cooperation between female managers and female directors is associated with greater earnings management that leads to lower Tobin's q and higher ROA. One related study is conducted by Amore *et al.* (2014), who examine private, family firms in Italy and find that the interaction between female CEO and female directors has a positive effect on ROA. Since a market-based performance measure is not available for this Italian sample, our study unveils a key undocumented feature: although cooperation increases ROA, it leads to an increment in earnings managements that ultimately results in a detrimental effect on Tobin's q. We also note that the average Italian firm in the sample of Amore *et al.* (2014) has two CEOs, while in China the firm generally has only one CEO. Thus we expect that our findings are more likely to be extended to other countries.

Second, our paper complements the existing literature on gender diversity, such as Matsa and Miller (2011), Tate and Yang (2015), Faccio *et al.* (2016), Adams and Ferreira (2009), Levi *et al.* (2014) and Liu *et al.* (2014). We also contribute to the general literature on diversity. This body of literature has shown that firm performance is related to different forms of diversity, including racial diversity (Richard 2000; Richard *et al.* 2004), cognitive diversity (Kilduff *et al.* 2000) and top management team heterogeneity

(Pegels *et al.* 2000; Carpenter 2002).

Third, this paper adds to gender-related studies by showing that the cooperation among women affects firm performance only when women are endowed with managerial power. Only the cooperation between female leaders and female *executive* directors has a significant effect on firm performance, whereas the cooperation with female *independent* directors has no such effect. This finding is especially important for policy makers who intend to impose regulatory quotas for female board membership. We suggest that including more women to be independent directors can curb the increasing effect of female cooperation on earnings management, which in turn will not disgruntle stock investors.

The rest of the paper is organised as follows. Section 2 summarises related literature. Section 3 introduces institutional background and develops the hypotheses. Section 4 describes the sample, data and research methodology. Section 5 presents the empirical results. Section 6 concludes this paper.

2. Literature review

2.1. Female leadership

In the workplace, women and men display different work styles. Beck *et al.* (2013) find that female loan officers more effectively screen and monitor bank loans than male officers. Huang and Kisgen (2013) find that female executives are less overconfident than male executives. Female executives undertake fewer acquisitions, issue less debt, produce less precise earnings forecasts and exercise stock options much earlier than male executives. Francis *et al.* (2015) find that female CFOs are more conservative in reporting financial information than male CFOs. Faccio *et al.* (2016) find that firms led by female CEOs report lower leverage ratios and have lower earnings volatility than those led by male CEOs, suggesting that female CEOs are more risk-averse than their male counterparts.

A female-friendly corporate culture can be cultivated by female leaders present in the management teams. It has been documented that firms with higher female representation in leadership positions are less

likely to use tournament compensation for female employees and are more likely to reduce the wage disparity between female and male employees (Price 2012; Tate & Yang 2015). Bugeja *et al.* (2012) examine the gender difference in CEO compensation and find that female CEOs are compensated at similar levels to male CEOs.

A large literature has studied the relation between executive gender and firm performance. The field experiment conducted by Hoogendoorn *et al.* (2013) shows that gender-diverse business teams bring higher sales and profits to firms than male-dominated business teams. In a similar vein, Apesteguia *et al.* (2012) examine the optimal gender composition of business groups. Their study shows that three women teams are outperformed by any other gender combinations. Moreover, Weber and Zulehner (2010) find that start-up firms with women among the first hires appoint more women over the following years and have a higher likelihood to survive in the markets. Dezsö and Ross (2012) find that the presence of female executives improves firm performance only when the firms adopt innovation-intensive business strategies. More recently, Strøm *et al.* (2014) show that female CEOs significantly improve the performance of microfinance institutions across 73 countries. This cross-country study also shows that the presence of female CEOs is associated with larger boards, younger firms and more female clients.

2.2. Board gender diversity

Since the quota of 40% female representation on board was first introduced in Norway in 2003, the issue of board gender diversity has attracted growing interests in academia. Ahern and Dittmar (2012) find that Norwegian firms experienced a large decline in stock price when the gender quota was publicly announced and that firms' performance in subsequent years further deteriorated as most of them had to alter their optimal board structure. Matsa and Miller (2013) further show that Norwegian firms affected by the gender quota have fewer employee layoffs and lower short-term profitability, which reflects that the newly appointed female directors hoard labor to achieve their long-run strategies. Bøhren and Staubo (2014) suggest that this gender quota is costly because half of the firms choose to change their optimal organizational forms to avoid board restructuring.

For other countries, there is mixed evidence on the effect of board gender diversity on firm performance. For example, Adams and Ferreira (2009) find that, in U.S. firms, female directors have better attendance records and allocates more effort to monitoring than male directors; they further show that higher female representation on board adversely affects firm profitability due to female directors' over-monitoring. However, Levi *et al.* (2014) find that the presence of female directors in U.S. firms adds to shareholder value by reducing acquisition bids and acquisition premiums. For Chinese firms, Liu *et al.* (2014) document a positive relation between board gender diversity and firm performance. They further reveal that female independent directors play a less influential role in improving firm performance than female executive directors. In an international setting, García-Meca *et al.* (2015) show that board gender diversity improves bank performance and that this relation becomes more pronounced in countries with stronger investor protection.

3. Institutional background and hypotheses development

3.1. Institutional background

In Chinese firms, the most senior executive officer in charge of business was usually entitled Chief Manager (CM). More recently, some firms have begun to entitle this person Chief Executive Officer (CEO). CMs or CEOs are appointed by the board of directors as the head manager and report directly to the board. They make investments to maximise shareholder value. More specifically, they implement corporate policies set by the board, run day-to-day business, disclose corporate information to outside investors and government agencies and so forth. In addition, they can nominate qualified candidates to comprise the management team. In some firms, CMs or CEOs may sit on the board; in such cases, they have much higher status within the firm, which strengthens their managerial power in decision making. In our paper, if a firm has a CM but no CEO, we take the person with the CM title to be the CEO. If a firm has both CM and CEO, we only retain the person with the CEO title. The responsibilities of the CFOs in Chinese firms are similar to those in U.S. firms. The *Company Law of China* prescribes that CFOs are responsible for the firms'

financial planning, reporting and risk management. CFOs should be involved in corporate decision making process along with CEOs. More importantly, the performance of CFOs has a direct impact on the quality of reported earnings, which in turn influences accounting returns. In light of the influential role of CEOs and CFOs, we define both of them as *leaders* of management.

The board of directors in China has similar functions to the board in U.S. Both of them aim to alleviate agency conflicts between inside managers and outside investors. According to the *Code of Corporate Governance for Listed Companies in China*, published by China Securities Regulatory Commission in 2002, the board of directors should represent the best interests of shareholders to oversee the daily operation and policy making of firms. Directors are elected during shareholder meetings, and the decisions regarding their appointment and dismissal are subject to the approval of shareholders. Directors should have adequate knowledge of corporation laws and regulations related to business operation and management. The directors can be divided into two groups. Executive directors hold managerial positions in the firm and take part in daily operations on behalf of shareholders. Independent directors are selected from outside the firm and not allowed to have any affiliation with majority shareholders. They are usually required to have professional expertise, such as being certified public accountants or lawyers, to serve their independent monitoring role. The *Company Law of China* requires that the board of directors contains 5−19 members, among whom at least one-third should be independent directors.

It is worth noting that there are two separate boards in China and some European countries. One is the commonly discussed board of directors, which is responsible for monitoring and disciplining management. The other one is the supervisory board, which is elected by shareholders and employees to supervise both the board of directors and the top management team. The board of directors and the supervisory board are established in parallel to serve shareholders' best interests but constructed in different ways. The supervisory board cannot consist of any members of the board or management; it must be a separate, independent agency inside the firm. In contrast, the board of directors is more directly and frequently involved in firms' operational governance. The board of directors is composed of both executive

directors and independent directors with similar duties to their counterparts in U.S. firms. To make our findings comparable to those of other countries, we focus our analysis on the board of directors rather than on the supervisory board.

3.2. The hypotheses

In top management, CEOs and CFOs are the senior executives who are most likely to make an impact on firm performance. As has been discussed, CEOs and CFOs are defined in our paper as *leaders* of management. A large array of literature has documented the association of firm performance with various characteristics and activities of the leaders, such as their abilities (Kaplan *et al.* 2012), personality (Nadkarni & Herrmann 2010), power (Adams *et al.* 2005), compensation (Core *et al.* 1999), managerial ownership (Coles *et al.* 2012) and succession (Huson *et al.* 2004). The leaders have pervasive interactions with other members of the firm and consequently affect corporate decisions. For instance, Graffin *et al.* (2008) find that star CEOs tend to improve the remuneration of other senior executives. Borokhovich *et al.* (1996) show that firms are more likely to appoint CEOs from outside the firm when there is a higher percentage of outside directors on the board. Gulati and Westphal (1999) reveal that the better cooperation between CEOs and boards of directors promotes alliance formation by enhancing trust. In view of these dynamic relationships within the firm, we expect that gender similarity could facilitate the interaction between leaders and directors.

The literature has shown that women cooperate more with women than with men. Eckel and Grossman (2001) conduct experiments and find that the agreement among women is more easily attainable and that women are more likely to accept the offer of other women. Greig and Bohnet (2009) find that women in Kenya contribute more to the provision of public goods in all-female groups than in mixed-sex groups, suggestive of better cooperation among women in daily life. For U.S. firms, Matsa and Miller (2011) find that firms with higher female representation on the board tend to appoint more women to the top management team. Tate and Yang (2015) find that women in leadership positions help reduce wage disparity between female and male employees. Overall, it is plausible to expect that, at the top of corporate

hierarchy, female leaders are more cooperative with female directors than with male directors.

One the one hand, the cooperation between female leaders and female directors could improve firms' operational efficiency. In firms with more women sitting on the board, female leaders are likely to have more efficient information exchange with the board of directors, due to their better cooperation. Moreover, female directors may provide extra expert support for female leaders to make corporate decisions. The increased efficiency in decision making will lead to better firm performance. With more women on the board, a female-friendly corporate culture can arise (Matsa & Miller 2011; Tate & Yang 2015), which creates a more equal and vibrant environment for women to perform and motivates women to enhance firm profitability. As a result, we expect that the interaction between female leaders and female directors can improve firm performance. We thus formulate the first hypothesis as follows,

H1: The interaction between female leaders and female directors improves firm performance.

On the other hand, the cooperation between female leaders and female directors could reduce firms' operational efficiency. The board of directors, as a monitoring facility essential to mitigating agency conflicts between managers and shareholders, should have a certain degree of independence from managers in order to detect and discipline managerial misconducts. However, the close interaction or cooperation between directors and managers could undermine the effectiveness of the board monitoring, as the cooperation connects directors to managers to some extent. Tate and Yang (2015) have argued that, in the workplace, women tend to help each other; intuitively, if female leaders engage in earnings manipulation, it is possible that female directors would be inclined to hide or intentionally disregard the value-diminishing behaviour of female leaders, which in turn results in inferior firm performance. Consequently, the better cooperation between female leaders and female directors could be detrimental to board monitoring as well as to firm performance. We thus formulate the alternative hypothesis as follows,

H2: The interaction between female leaders and female directors impairs firm performance.

4. Sample and research design

4.1. Sample construction

Our sample consists of all Chinese firms listed on the Shanghai and Shenzhen Stock Exchanges. We obtain data for these firms from several sources. We extract board- and management-level data and firm-level accounting balance data from the China Stock Market and Accounting Research (CSMAR) database. We obtain the provincial marketization index for 31 provinces in China from the NERI INDEX of Marketization of China's Provinces Report (2011). After excluding financial and utility firms, we are left with a sample of 19,022 firm-years from 2,328 firms for the period of 2000−2014.

4.2. Model specification

To examine the interaction effect of female leaders and female directors on firm performance, we estimate the following regression model:

$$
\begin{aligned}
(1)\quad \text{Firm } performance_{i,t} &= \alpha_0 + \alpha_1 \text{Female leadership}_{i,t} + \alpha_2 \%\text{Female directors}_{i,t} + \alpha_3 \text{Female leadership}_{i,t} \\
&\times \%\text{Female directors}_{i,t} + \alpha_4 \ln(\text{Board size})_{i,t-1} + \alpha_5 \%\text{Independent directors}_{i,t-1} \\
&+ \alpha_6 \ln(\text{Management size})_{i,t-1} + \alpha_7 \text{Leverage}_{i,t-1} + \alpha_8 \ln(1 + \text{Sales growth})_{i,t-1} \\
&+ \alpha_9 \ln(\text{Assets})_{i,t-1} + \alpha_{10} \ln(\text{Firm age})_{i,t-1} + \sum Industry\ dummy \\
&+ \sum Year\ dummy + \varepsilon_{it}
\end{aligned}
$$

where firm performance is measured by *ROA* and *Tobin's q*, and *Female leadership* is a dummy variable which is equal to 1 if a firm has a female CEO or CFO, and 0 otherwise. *%Female directors* is the percentage of female directors on the board. The interaction term, *Female leadership* × *%Female directors*, is the key variable of interest.

Following the gender diversity literature, such as Adams and Ferreira (2009), Dezsö and Ross (2012) and Liu *et al.* (2014), the regression model controls for several board and management characteristics that have been identified as explanatory factors of firm performance. As shown by Yermack (1996), firms with smaller boards have less satisfactory performance. Core *et al.* (1999) and Rosenstein and Wyatt (1990) find that board independence influences corporate governance, which in turn affects firm performance.

Haleblian and Finkelstein (1993) show that firms with larger management teams perform better. Accordingly, the control variables in the model include the natural logarithm of the number of directors on the board (*ln(Board size)*), the proportion of independent directors on the board *(%Independent directors*) and the natural logarithm of the number of executives in the top management (*ln(Management size)*).[5]

We also include a variety of firm characteristics as controls. Fama and French (1998) document an inverse relation between leverage and firm value. Brush *et al.* (2000) show that sales growth is positively related to firm performance. Moreover, Yermack (1996) finds a positive association between firm size and firm performance. Peng (2004) shows that younger firms have better performance. Our model thus controls for leverage ratio (*Leverage*), sales growth (*ln(1+Sales growth)*), firm size (*ln(Assets)*) and firm age (*ln(Firm age)*). Industry dummies and year dummies are included to account for industry-wide and yearly economic fluctuations. Firm-level control variables are lagged by one year relative to the dependent variable to mitigate potential reverse causality. We estimate the model using ordinary least squares (OLS) regressions with robust standard errors adjusted for clustering at the firm level. Table A1 summarises variable definitions.

4.3. Descriptive statistics

Table 1, Panel A, presents summary statistics of gender-related variables for public firms in China and the U.S. The average probability of presence of female leadership in Chinese firms is 0.289, which is significantly higher in magnitude than the corresponding ratio of 0.042 in U.S. firms. The likelihood of a Chinese firm having a female CEO (0.049) is more than twice the likelihood of a U.S. firm having a female CEO (0.022). The likelihood of a CFO in a Chinese firm to be female (0.256) is nearly thrice that in a U.S. firm (0.088). Firms in China and U.S. have similar proportions of female directors on the board, but in China the female directors are more likely to be executive directors, whereas in U.S they are more likely to

[5] Consistent with Dezsö and Ross (2012), we consider all executives reported in the top executive file of CSMAR database to be top management.

be independent directors. The comparisons of female leadership and board gender diversity between China and U.S. indicate that women have more managerial power in Chinese firms, which strengthens our rationale for focusing on Chinese firms to test our hypotheses. Table 1, Panel B, presents summary statistics of firm performance and control variables for Chinese listed firms. We observe that independent directors comprise 32% of total board seats and that a large proportion of shares in public firms are held by Chinese governments.

[Insert Table 1 about here]

Table 2 reports the correlations between variables. ROA (Tobin's q) is significantly and positively (negatively) correlated with the presence of female leadership. The correlation between ROA and the proportion of female directors on board (*%Female directors*) is insignificant, but the correlation is significantly negative for Tobin's q. The results suggest that the existence of female leadership and female directors is correlated with unfavourable firm performance in stock markets as reflected by Tobin's q, while it is unclear about their correlation with firms' accounting performance such as ROA. Moreover, *Female leadership* is significantly and positively correlated with *%Female directors*, *%Female executive directors* and *%Female independent directors*. This indicates that the presence of female leadership is associated with higher female representation on the board, consistent with the argument of Matsa and Miller (2011) that women tend to help women. The firm performance variables are also significantly correlated with most control variables with expected signs.

[Insert Table 2 about here]

To decide upon the best methodology to carry out our hypotheses tests, we first assess whether there is time-variation in our variables of interest. In Table 3, we present the proportion of sample firms that experience a change in *Female leadership*, *Female CEO*, *Female CFO*, *%Female directors*, *%Female executive directors* or *%Female independent directors* over a one-year period. Although firm-fixed effect models can account for time-invariant unobserved heterogeneity and mitigate some endogeneity concerns, we find limited within-firm variations in the key variables. On average, the presence of female leaders

(*Female leadership*) changes in 6.30 % of sample firms on a yearly basis. Specifically, only 1.72% of firms experience a transition between female CEO and male CEO, while the percentage is 5.50% for a transition between female CFO and male CFO. Over the whole sample period, 6.25% of firm-years undergo a change in *Female leadership*, and 33.25% of firms alter the CEO or CFO gender at least once. With regard to the percentage of female directors on the board, the within-firm variations are also not large. We report a change in *%Female directors* in 20.68% of firm-years. Overall, the analysis suggests that firm-fixed effects regressions can largely undermine the statistical significance of the key variables due to their small time-series variations within firms. Therefore, we do not employ firm-level fixed effects to alleviate endogeneity concerns regarding the female interaction effect in equation (1).

[Insert Table 3 about here]

5. Results

5.1. Female interaction within Chinese firms

Women helping women is a key assumption behind the rationale for arguing the significant impact of female interaction on firm performance. We must examine whether this female cooperation phenomenon exists in Chinese firms. In Table 4, we explore whether female directors help other women progress to top executive positions, such as CEOs and CFOs. The dependent variable in the model is *Female leadership*; and the key independent variables are *%Female directors* as of different time periods, which can be employed by us to analyse the timing of the relation. The regression is estimated with a linear probability model with firm-level fixed effects to isolate from the confounding effect of time-invariant firm heterogeneity (e.g., women-friendly corporate culture). We are interested in assessing the relation between the current presence of female leadership in top management and the past ratio of female representation on the board. Model 1 shows that a firm with a more gender-diverse corporate board as of the previous year is more likely to have a female CEO or a female CFO in the current year. In model 2, we control for board gender diversity of current year and find that the relation between female leadership and female board

representation remains positively significant. In model 3, we additionally include two lead values of *%Female directors* in the model to determine whether high female board representation leads to female leadership or vice versa. The coefficient estimates on the two forward terms of *%Female directors* are shown to be statistically insignificant, which suggests that changes in female board representation precede changes in female leadership but not the reverse. Overall, the results demonstrate that women help women at the highest level of corporate hierarchy in China.

[Insert Table 4 about here]

5.2. Determinants of gender in appointments

The interaction effect of female leaders and female directors on firm performance could be subject to reverse causality. That is, the performance of firms could decide on the gender of the newly appointed leader or director. We thus follow Farrell and Hersch (2005) to examine the determinants of gender in appointments of CEOs, CFOs and directors in Table 5. The dependent variable in models 1 and 2 is a binary variable which is equal to 1 if a female CEO (CFO) is appointed in a given firm-year, and 0 otherwise. In models 3−5, the number of female (executive/independent) directors newly added to the board is as the dependent variable. The model controls for board size (*Ln(Board size)*), board gender diversity (*%Female directors*), management size (*Ln(Management size)*), female representation in top management (*%Female executives*), total compensation paid to top executives and corporate directors (*Ln(1+Compensation)*), institutional ownership (*Institutional ownership*), standard deviation of monthly stock returns (*Stock return volatility*) and firm size (*Ln(Assets)*). These controls are lagged by one year relative to the dependent variable. We also control for the departures of female leaders or female directors as of the current year because it is plausible that a woman is appointed to replace a departing female leader or female director if achieving gender diversity is a corporate goal. The results in Table 5 show that a firm with lower ROA is less likely to hire a female CEO and a female director, while a firm with higher Tobin's q is more likely to appoint a female CEO and a female CFO. These results point to a reverse causation of firm performance leading to appointments of women. We also find that female departures are positively and significantly

associated with female appointments, which means that firms tend to hire a woman to maintain the preferred gender diversity level when a female leader or a female director departs from the position.

[Insert Table 5 about here]

5.3. Female leadership and female directors

5.3.1. Baseline OLS regression results

Table 6, Panel A, presents OLS regression results for the effect of female interaction on ROA. In model 1, we observe that the coefficient on *Female leadership* is positively significant, suggesting that the presence of female leaders in top management improves accounting profitability. By contrast, *%Female directors* has an insignificant impact on ROA. The effect of female leadership on firm performance is also economically relevant. The ROA of women-led firms is 0.004 higher than that of men-led firms, holding other controls constant. Given that ROA has a mean of 0.048, an increase of 0.004 in ROA corresponds to a percentage change of 8.3% (=0.004/0.048). For the control variables, *Leverage* is negatively related to ROA, as high leverage reflects potential problems in profitability (Fama & French 1998). *ln(1+Sales growth)* has a significantly positive association with ROA, consistent with the argument of Brush *et al.* (2000) that growth in sales enables firms to fully employ existing capacity and thereby improves operational efficiency and firm profits. *ln(Assets)* is positively associated with ROA, suggesting that larger firms generally perform better (Yermack 1996). *ln(Firm age)* is negatively related to ROA. This relation provides support for Peng (2004), who argues that younger Chinese firms have better governance mechanisms and thus better accounting performance.

Panel A, model 2, tests our hypotheses by multiplying *Female leadership* by *%Female directors*.[6] The insignificant coefficient on *Female leadership* suggests that when none of the directors are women, the presence of female leaders in top management has no impact on ROA. The coefficient on *Female leadership*

6 To rule out the possibility that multicollinearity would confound our results, we compute the variance inflation factors (VIF) for each explanatory variable and find all the VIFs below 10.

× *%Female directors* is positive and significant at the 5% level, indicating that a higher percentage of female directors on the board enhances the positive effect of female leadership on firms' accounting returns. Figure 1 illustrates the marginal effect of female leadership on ROA for different proportions of female directors on the board. The effect of female leadership becomes positive and significant for a board with 14% of female director membership. This effect monotonically increases as the proportion of female directors increases. Specifically, at the 25th percentile of *%Female directors* (=0.000), the difference in ROA between firms with female leadership and firms without is negligible; at the 50th percentile of *%Female directors* (=0.111), the difference in ROA between these two groups of firms is 0.003, which is not statistically significant; and at the 75th percentile of *%Female directors* (=0.167), the difference in ROA is 0.005, which is statistically significant at the 5% level.

To mitigate the effect of potentially omitted variables, we control for additional firm- and market-level factors. In model 3, we consider financial policies that have been previously documented to influence firm performance. We control for *Cash holding*, *R&D* and *Capital expenditure*. *Cash holding* is positively and significantly related to ROA as firms that have large cash reserves benefit from lower internal financing costs (Mikkelson & Partch 2003). *Capital expenditure* has a positive and significant association with ROA, consistent with the finding of McConnell and Muscarella (1985) that firms are more likely to make capital investment that improves firm profitability. In model 4, we control for ownership structure, including *Government ownership*, *Institutional ownership* and *Managerial ownership*. We find that *Institutional ownership* significantly increases *ROA*, supporting the notion that institutional investors monitor and discipline managerial behaviours and improve accounting performance (McConnell & Servaes 1990). We also document a significant impact of *Managerial ownership* on *ROA*, consistent with the evidence in Coles *et al.* (2012). In model 5, we control for *Regional development* which is a comprehensive index as a proxy for the regional market development level across 31 provinces in China. We assign the index to each firm based on the firm's headquarter location. We find that firms headquartered in provinces with more developed markets perform better. Model 6 includes all additional control variables, and model 7 further

includes industry-year fixed effects to capture all time-variant industry characteristics. Overall, the empirical results suggest that the interaction between female leaders and female directors has a significantly positive effect on ROA.

Panel B presents OLS regression results for the effect of female interaction on Tobin's q. In model 1, we show that the presence of female leaders in top management significantly decreases Tobin's q, while the percentage of female directors on the board significantly increases Tobin's q. The results indicate that the stock markets respond negatively to female leadership but positively to board gender diversity. After including the interaction term in model 2, we observe that the interaction between female leadership and percentage of female directors has a significantly negative effect on Tobin's q, consistent with the argument that the cooperation between women is perceived negatively by investors. Figure 2 illustrates the marginal effect of female leadership on Tobin's q for different proportions of female directors on the board. The effect of female leadership becomes negative and significant for a board with 13% of female director representation. This effect monotonically increases as the proportion of female directors increases. Specifically, at the 25th percentile of *%Female directors* (=0.000), the difference in Tobin's q between firms with female leadership and firms without is negligible; at the 50th percentile of *%Female directors* (=0.111), the difference in Tobin's q between these two groups of firms is −0.004, but not statistically significant; and at the 75th percentile of *%Female directors* (=0.167), the difference in Tobin's q is −0.008, which is statistically significant at the 5% level. The relation between female interaction and Tobin's q continues to hold if additional controls and industry-year dummies are included in the model.

[Insert Table 6 about here]

5.3.2. Endogeneity

Endogeneity is a major concern in our study. Establishing a causal relation between gender diversity and performance is especially challenging. Board characteristics are not exogenous variables as they are endogenously chosen by firms to suit their operating and contracting environments (Adams & Ferreira 2009). The small time variations in our key variables make the use of firm fixed effects and dynamic panel

GMM estimator, both of which remove unobserved between-firm heterogeneity, inappropriate. Table 5 has confirmed the existence of reverse causality in our main equation, which adds to the need of employing a technique, such as instrumental variables, to alleviate the endogeneity concern. We note that there are three gender-related endogenous variables in our model specification.[7] Thus, at a minimum, we require three instruments, where the multiplication of two instrumental variables can constitute the other instrument. Knyazeva *et al.* (2013) argue that firms' decisions on appointments of top executives and corporate directors are affected by the local supply of qualified candidates. We thus define the three instrumental variables as (1) *%Local female directors* which is the industry average percentage of female directors in the province where the firm is headquartered, (2) *%Local female executives* which is the industry average percentage of female executives in the province where the firm is headquartered, and (3) the interaction between *%Local female directors* and *%Local female executives*.

Table 7, Panel A, reports the two-stage least squares (2SLS) regression results for the effect of female interaction on firm performance. The first-stage results show that *Female leadership* is significantly and positively related to *%Local female directors* and *%Local female executives* and that *%Female directors* is significantly and positively related to *%Local female directors*, both consistent with our expectations. In the second-stage, the interaction term significantly increases ROA but decreases Tobin's q. We compute the F-statistic of excluded instruments for each first-stage regression, and the results show that the instruments are not weak. We calculate the Cragg-Donald statistic to examine the identification of the equation as a whole. The Cragg-Donald statistic is 169.17, which is higher than all critical values reported in Table 5.1 of Stock and Yogo (2005).[8] This means that the relative bias of the 2SLS regression with respect to the OLS regression does not exceed 5%, at the 5% significance level. The two tests confirm that we do not have a weak instrument problem.

[Insert Table 7 about here]

One drawback of having an exactly identified model (three endogenous variables and three

[7] The endogenous variables are Female leadership, %Female directors and Female leadership × %Female directors.
[8] The highest critical value reported in Table 5.1 of Stock and Yogo (2005) is 21.42.

instruments) is that the exogeneity assumption cannot be formally tested through the Sargan-test for over-identification. Thus, we follow Adams and Ferreira (2009) and add a fourth instrumental variable, the proportion of male directors with external board connections to female directors, as firms in which male directors are more closely connected to female directors in other firms are more likely to add women to their boards. We make sure to control for *Director connectedness*, which is defined as the total number of external board seats held by all directors in the firm, to alleviate concerns that the connection instrument is a proxy for the connectedness of the board. The overly identified 2SLS regression results are presented in Panel B of Table 7. It shows that *Female leadership* is significantly and positively related to the connection instrument. The coefficient on the interaction term in the second-stage is significantly positive in ROA regression but negative in Tobin's q regression. The F statistics and the Cragg-Donald statistic suggest that the model is not weakly identified. The Hansen J statistic for the over-identification test fails to reject the null hypothesis that the excluded instruments are uncorrelated with the residuals in the model. Thus our instruments are exogenous.

5.4. Female leadership and female executive/independent directors

The interaction effect of female leaders and female directors on firm performance could rely on whether the female directors are endowed with managerial power. Executive directors have managerial power to support the execution of corporate decisions made by female leaders. By comparison, independent directors do not hold any executive positions in firms. They sit on boards by providing external monitoring and professional expertise and thus are less likely to add to the managerial power of female leaders. We expect that the effect of female leadership on firm performance demands the managerial power of female executive directors to enhance women's status in management. To test for this prediction, in Table 8, we examine the interactions of *Female leadership* with *%Female executive directors* and *%Female independent directors* on firm performance. [9]

[9] We use OLS regressions to assess this managerial power argument because there are at least 2 additional endogenous variables that need to be instrumented and we do not have more instruments to carry out 2SLS regressions.

[Insert Table 8 about here]

In Panel A, model 1, the coefficient on *Female leadership* is positive and significant at the 5% level. *%Female executive directors* and *%Female independent directors* show statistically insignificant relations with ROA, indicating that the cooperation within either category of female directors has no effect on ROA. In model 2, we add the interaction terms, *Female leadership* × *%Female executive directors* and *Female leadership* × *%Female independent directors*, to the model.[10] The insignificant coefficient on *Female leadership* suggests that when all executive and independent directors are male, the presence of female leaders in top management has no significant impact on ROA. The coefficient on *Female leadership* × *%Female executive directors* is positive and significant at the 5% level, indicating that as the proportion of female executive directors on the board increases, female leadership raises ROA.

Figure 3 illustrates the marginal effect of female leadership on ROA for different proportions of female executive directors on the board. When *%Female executive directors* is above 0.08, the difference in ROA between firms with female leadership and firms without is statistically significant at the 5% level. The difference in ROA between the two groups increases with *%Female executive directors*. Specifically, at the 50th percentile of *%Female executive directors* (=0.000), the difference in ROA is negligible; at the 75th percentile of *%Female executive directors* (=0.111), the difference in ROA is 0.005, which is statistically significant at the 5% level. By contrast, we find that *Female leadership* × *%Female independent directors* has no significant impact on ROA, consistent with our argument that female independent directors, due to their outsider status, lack managerial roles to reinforce the power of female leaders. We control for additional firm characteristics, market conditions and industry-year fixed effects in models 3−7 and find consistent results. Altogether, we show that the increasing impact of female leadership on ROA is associated with the managerial power provided by female executive directors.

Table 8, Panel B, reports OLS regression results for the effect of the interaction terms on Tobin's q.

[10] The VIFs of all independent variables are below 10. Thus the collinearity is not a significant issue.

In model 1, *Female leadership* significantly reduces Tobin's q, while *%Female executive directors* significantly increases Tobin's q. Thus the documented effect of *%Female directors* on Tobin's q reported in Table 6 arises from the effect of female executive directors. When we include the interaction terms in model 2, we see that the interaction between *Female leadership* and *%Female executive directors* has a significant, negative impact on Tobin's q, while the interaction with *%Female independent directors* has no significant effect. Figure 4 illustrates the marginal effect of female leadership on Tobin's q for different proportions of female executive directors on the board. When *%Female executive directors* is above 0.09, the difference in Tobin's q between firms with female leadership and firms without is statistically significant at the 5% level. The difference in Tobin's q between the two groups increases with *%Female executive directors*. Specifically, at the 50th percentile of *%Female executive directors* (=0.000), the difference in Tobin's q is negligible; at the 75th percentile of *%Female executive directors* (=0.111), the difference in Tobin's q is −0.009, which is statistically significant at the 5% level. The results suggest that female interaction has a decreasing effect on firms' stock market returns only when the female directors possess managerial power; as a result, investors will respond negatively to these powerful directors' interaction with female leaders.

5.5. Robustness checks

5.5.1. Critical mass versus cooperation

Our results have shown that the gender interaction effect increases with female representation on the board. One may be concerned that our results capture the critical mass effect of board gender diversity rather than the collaboration effect between female leaders and female directors. The critical mass theory (Kramer *et al.* 2006) posits that 'although two women are generally more powerful than one, it takes three or more women to achieve the "critical mass" that can cause a fundamental change in the boardroom…' We explicitly test this contention by using different dummy variables that reflect the different number (1, 2 or 3) of female directors in the boardroom. Panel A of Table 9 shows that women's representation on the board has a significantly positive effect on Tobin's q even in firms where there is only one female director.

In Panel B, we differentiate between female executive and independent directors. We report significantly higher Tobin's q in firms with one female executive director. Together, the results demonstrate that the critical mass evidence does not apply to our sample. Thus our analyses reveal a female cooperation effect and not a critical mass effect.

[Insert Table 9 about here]

5.5.2. Possibility of a quadratic term in the interaction

As reported in Table 2, female leadership is significantly correlated with female board representation. It is further shown in Table 4 that female leadership is determined by female board representation. Given the strong link between female leadership and female board representation, someone may argue that the interaction between female leadership and female directors captures the effect of a quadratic term of female board representation. In Table 10, we test this possibility and square the percentage of female directors on the board. Panel A shows that the interaction between female leadership and female directors remains to increase ROA but decrease Tobin's q and that the squared female board representation is statistically insignificant in determining firm performance. Panel B distinguishes between female executive directors and female independent directors and find results consistent with our main conclusions.

[Insert Table 10 about here]

5.5.3. Female interaction versus male interaction

Is the gender interaction effect specific to women? To answer this question, in Table 11, we test whether male leaders cooperate with male directors and which gender interaction effect influences firm performance. We define *Male Leadership* as a dummy variable, which is equal to 1 if both CEO and CFO in the firm are men, and 0 otherwise. Since male leadership is collinear with female leadership, if we include both female leadership and male leadership in the model, one will be omitted. We thus use only *Female leadership* as a proxy for the gender in leadership. To make sure that female interaction and male interaction can be simultaneously examined through one model, we do not use *%Female directors* or *%Male directors*

as the multiplier because *Female leadership* × *%Female directors* and *Male leadership* × *%Male directors* will be perfectly collinear. We construct new variables to represent board gender diversity. *High female representation on board* is a dummy variable equal to 1 if the percentage of female directors on a firm's board is no less than the 75th percentile of the sample, and 0 otherwise. *High male representation on board* is constructed analogously for male directors. In Table 11, female interaction is positively related to ROA in model 1 and negatively related to Tobin's q in model 4, at the 1% significance level. This result provides further support for our main findings. Models 2 and 5 show that male interaction has no significant impact on ROA or Tobin's q. When both female interaction and male interaction are included in models 3 and 6, only the female interaction effect is statistically significant. Thus, the gender interaction effect at the top hierarchy of Chinese firms only exists among women, and there is no evidence of a significant interaction effect between male leaders and male directors.

[Insert Table 11 about here]

5.6. Stock market reactions to appointments of female CEOs

Although we have documented that the interaction between female leadership and female directors exerts a positive impact on the firm's return on assets, the female interaction is also shown to reduce Tobin's q. That means stock investors perceive female interaction as an unfavourable practice and respond negatively as a result even though the female interaction improves the firm's accounting rate of return. To verify the negative perception of investors about female interaction, we exploit an event study methodology to examine stock price changes around appointments of female CEOs to firms with different proportions of female directors on the boards. To be included in the event study, the appointments must involve a transition in the gender of CEO – namely, either a female CEO is appointed to replace a departing male CEO or a male CEO is appointed to replace a departing female CEO.[11]

[11] For a sample including only the observations where a male CEO to replace a male CEO and a female CEO to replace a female CEO, we do not find a significant impact of *Female CEO appointment* × *%Female directors* on CAR. That means the gender effect

We create a binary variable, *Female CEO appointment*, which is equal to 1 if the newly appointed CEO is female, and 0 otherwise. *Female CEO appointment* is multiplied by *%Female directors* to capture the female interaction effect. We focus our analysis on CAR in two different event windows from day 0 to 1 and –1 to 1, where day 0 is the CEO appointment announcement date. The expected return used to compute the CAR comes from a market model with equal-weighted index return as the market return over an estimation window (–149,–23) (in trading days) prior to the appointment announcement date.

In Panel A of Table 12, the coefficient estimates on *%Female directors* are positive and significant. This indicates a positive effect of female board representation on CAR when *Female CEO appointment* is equal to 0 – the CEO changes from a woman to a man. The coefficient estimates on the interaction between *Female CEO appointment* and *%Female directors* are significantly negative, suggesting that the appointments of female CEOs cause more negative CARs in firms with higher female representation on the boards. In Panel B, we find that the CARs surrounding female CEO appointments are significantly related to female membership as executive directors and not as independent directors. Thus, only the interaction with female executive directors leads to significant stock market reactions to female CEO appointments, consistent with our argument that the significant female interaction effect requires female directors' managerial power to support.

[Insert Table 12 about here]

5.7. Why does female interaction increase ROA but decrease Tobin's q?

We have shown that the gender interaction among women has a positive impact on the firms' accounting performance but a negative impact on their stock price performance. Since Tobin's q accounts for the expected value of future cash flows, the negative effect of female interaction on Tobin's q conveys investors' negative expectations about the firms' future performance. But, why do investors interpret the

---

has no significant impact on the firm's stock performance, while only the gender transition effect has a significant impact.

interaction among women as an unfavourable practice when there is a noticeable improvement in the accounting returns? This could be explained by the possibility that the accounting rates of returns had been distorted by managers through earnings management. Investors could believe that female leaders can more easily manipulate reported earnings when they can closely interact and cooperate with female directors. As we have argued, the interaction with female directors, especially with female executive directors, strengthens the managerial power of female leaders, through which they could engage more in earnings manipulation given the mounting pressure on women to perform. In addition, the cooperation between female leaders and female directors connects board to management, which diminishes the effectiveness of board monitoring and poses less restraint on managerial earnings manipulation. Since in our sample the presence of female leaders is largely driven by the gender of CFOs, the earnings management argument is plausible.

In Table 13, we include earnings management as an additional control. *Earnings management* is the sum of the absolute value of discretionary accruals over the previous three years, where discretionary accruals are calculated based on the modified Jones model (Dechow et al., 1995). The results show that *Earnings management* significantly increases ROA but decreases Tobin's q.

[Insert Table 13 about here]

In Table 14, we examine the effect of female interaction on earnings management. In Panel A, the coefficient on *%Female directors* represents the effect of female board representation on earnings management when the firm is led only by men. This coefficient is negative and statistically significant at the 5% level, which suggests that board gender diversity curbs earnings manipulation in male-led firms. However, the coefficient on *Female leadership* × *%Female directors* is significantly positive, consistent with our expectation that female leaders are more likely to manipulate reported earnings when they can interact more closely with directors. Figure 5 illustrates the marginal effect of female leadership on the magnitude of earnings management for different levels of female representation on the board. The effect of female leadership becomes positive and significant at the 75th percentile of *%Female directors* (=0.167),

where the difference in the magnitude of earnings management between firms with female leadership and firms without is 0.018.

Panel B of Table 14 shows that it is the interaction between female leaders and female executive directors leading to a significant effect on earnings management. The interaction between female independent directors and female leaders has no such significant effect. This is consistent with our previous finding that, only when female directors have managerial power, their interaction with female leaders is associated with increased ROA but decreased Tobin's q, because the strengthened managerial cooperation facilitates earnings management. Figure 6 illustrates the marginal effect of female leadership on the magnitude of earnings management for different percentages of female executive directors on the board. The effect of female leadership becomes positive and significant at the 75th percentile of *%Female executive directors* (=0.111), where the difference in the magnitude of earnings management between firms with female leadership and firms without is 0.016.

[Insert Table 14 about here]

5.8. Female interaction and the pressure on women to perform

We check whether the pressure on women to perform leads to the documented female cooperation effect. Ragins *et al.* (1998) surveyed female top executives in Fortune 1000 companies, and the female executives reported a perception of higher pressure to perform relative to their male peers. 99% of the surveyed women stated that they had to consistently over-perform to demonstrate their ability and counter negative stereotypes in the workplace against women. This gender pressure could induce female leaders to cooperate with female directors in earnings management, which corresponds to improved earnings numbers but unfavourable stock market responses. If women in top corporate positions face such pressure, female leaders with longer tenure who are more entrenched in firms should experience less of this pressure and engage less in this 'female cooperation'.

To carry out testing, *Female leadership* is decomposed to *Female leadership_New* and *Female leadership_Old* by the tenure of female leaders. *Female leadership_New* is equal to 1 if a female CEO/CFO is newly appointed to the firm in a given year, and 0 otherwise. *Female leadership_Old* is equal to 1 if female leadership is equal to 1 but there are no appointments of female leaders in the year, and 0 otherwise. The two dummy variables are multiplied by *%Female directors*. In Table 15, we find that *Female leadership_New* × *%Female directors* is significantly related to ROA, Tobin's q and earnings management with expected signs on the coefficients, while the coefficients on *Female leadership_Old* × *%Female directors* are statistically insignificant. The results suggest that only the newly appointed female leaders cooperate with female directors to affect firm performance via earnings manipulation as they experience greater pressure to perform when initially taking up their leadership roles.

[Insert Table 15 about here]

6. Conclusion

This paper investigates whether and how female leaders (including both female CEOs and female CFOs) interact with female directors to influence firm performance. Given the minority status of women in senior management and the growing pressure on women to perform, we argue that this cooperation effect can be exacerbated and potentially lead to firm outcomes. The effect of cooperation on performance is, however, difficult to predict. One the one hand, the cooperation between female leaders and female directors could improve firm performance due to the efficient information exchange in decision-making. On the other hand, it could impair firm performance due to the detrimental effect of female cooperation on board monitoring. We test these hypotheses and find that the presence of female leaders in top management is more likely to increase ROA but decrease Tobin's q in a firm with a higher percentage of women on the board. Moreover, we find that only the interaction between female leaders and female *executive* directors has a significant effect on firm performance, while the interaction with female *independent* directors has no such effect. Importantly, we show that the opposite results on ROA and Tobin's q are related to earnings

management. Specifically, female leaders cooperate with female directors to engage in earnings management, leading to overstated accounting profits and unfavourable stock market perceptions. Finally, we demonstrate that the pressure on women to perform leads to this female cooperation effect as the significant cooperation among women vanishes when women hold their leadership roles for longer than one year, under lower pressure because of more entrenchment in firms.

Previous literature has largely explored the independent impacts of female leadership and board gender diversity on firm performance. Our paper complements the existing literature by showing that female executives and female directors can interact with each other and make an impact at the firm level. The significant interaction effect stems from female leaders' enhanced managerial power due to their better cooperation with female executive directors. Powerful women tend to collaborate, and this collaboration is detrimental to investors as we find evidence of higher manipulation in earnings in firms with stronger cooperation between female leadership and female executive directors. This paper thus presents a new direction of research that investigates the dynamic relationships among women within the firms. By doing so, we align two strands of gender diversity literature with respect to female leadership and board gender diversity. Our results do not suggest that firms should avoid that female CEOs/CFOs work alongside with other women directors. If boards were more gender-balanced or there were not so many unrealistic expectations on women at the top of the ladder, then cooperation might not be necessary.

References

Adams, R.B., Almeida, H., Ferreira, D., 2005. Powerful CEOs and their impact on corporate performance. Review of Financial Studies 18, 1403-1432.

Adams, R.B., Ferreira, D., 2009. Women in the boardroom and their impact on governance and performance. Journal of Financial Economics 94, 291-309.

Adams, R.B., Funk, P., 2012. Beyond the glass ceiling: does gender matter? Management Science 58, 219-235.

Ahern, K.R., Dittmar, A.K., 2012. The changing of the boards: The impact on firm valuation of mandated female board representation. Quarterly Journal of Economics 127, 137-197.

Amore, M.D., Garofalo, O., Minichilli, A., 2014. Gender interactions within the family firm. Management Science 60, 1083-1097.

Apesteguia, J., Azmat, G., Iriberri, N., 2012. The impact of gender composition on team performance and decision making: Evidence from the field. Management Science 58, 78-93.

Beck, T., Behr, P., Guettler, A., 2013. Gender and banking: Are women better loan officers? Review of Finance 17, 1279-1321.

Bøhren, Ø., Staubo, S., 2014. Does mandatory gender balance work? Changing organizational form to avoid board upheaval. Journal of Corporate Finance 28, 152-168.

Borokhovich, K.A., Parrino, R., Trapani, T., 1996. Outside directors and CEO selection. Journal of Financial and Quantitative Analysis 31, 337-355.

Brush, T.H., Bromiley, P., Hendrickx, M., 2000. The free cash flow hypothesis for sales growth and firm performance. Strategic Management Journal 21, 455-472.

Bugeja, M., Matolcsy, Z.P., Spiropoulos, H., 2012. Is there a gender gap in CEO compensation? Journal of Corporate Finance 18, 849-859.

Carpenter, M.A., 2002. The implications of strategy and social context for the relationship between top management team heterogeneity and firm performance. Strategic Management Journal 23, 275-284.

Coles, J.L., Lemmon, M.L., Meschke, J.F., 2012. Structural models and endogeneity in corporate finance: The link between managerial ownership and corporate performance. Journal of Financial Economics 103, 149-168.

Core, J.E., Holthausen, R.W., Larcker, D.F., 1999. Corporate governance, chief executive officer compensation, and firm performance. Journal of Financial Economics 51, 371-406.

Croson, R., Buchan, N., 1999. Gender and culture: International experimental evidence from trust games. The American Economic Review 89, 386-391.

Dezsö, C.L., Ross, D.G., 2012. Does female representation in top management improve firm performance? A panel data investigation. Strategic Management Journal 33, 1072-1089.

Eckel, C.C., Grossman, P.J., 2001. Chivalry and solidarity in ultimatum games. Economic Inquiry 39, 171-188.

Faccio, M., Marchica, M.-T., Mura, R., 2016. CEO gender, corporate risk-taking, and the efficiency of capital allocation. Journal of Corporate Finance 39, 193-209.

Fama, E.F., French, K.R., 1998. Taxes, financing decisions, and firm value. The Journal of Finance 53, 819-843.

Farrell, K.A., Hersch, P.L., 2005. Additions to corporate boards: the effect of gender. Journal of Corporate Finance 11, 85-106.

Francis, B., Hasan, I., Park, J.C., Wu, Q., 2015. Gender differences in financial reporting decision making: Evidence from accounting conservatism. Contemporary Accounting Research 32, 1285-1318.

García-Meca, E., García-Sánchez, I.-M., Martínez-Ferrero, J., 2015. Board diversity and its effects on bank performance: An international analysis. Journal of Banking & Finance 53, 202-214.

Graffin, S.D., Wade, J.B., Porac, J.F., McNamee, R.C., 2008. The impact of CEO status diffusion on the economic outcomes of other senior managers. Organization Science 19, 457-474.

Greig, F., Bohnet, I., 2009. Exploring gendered behavior in the field with experiments: Why public goods are provided by women in a Nairobi slum. Journal of Economic Behavior & Organization 70, 1-9.

Gul, F.A., Srinidhi, B., Ng, A.C., 2011. Does board gender diversity improve the informativeness of stock prices? Journal of Accounting and Economics 51, 314-338.

Gulati, R., Westphal, J.D., 1999. Cooperative or controlling? The effects of CEO-board relations and the content of interlocks on the formation of joint ventures. Administrative Science Quarterly 44, 473-506.

Haleblian, J., Finkelstein, S., 1993. Top management team size, CEO dominance, and firm performance: The moderating roles of environmental turbulence and discretion. Academy of Management Journal 36, 844-863.

Hoogendoorn, S., Oosterbeek, H., Van Praag, M., 2013. The impact of gender diversity on the performance of business teams: Evidence from a field experiment. Management Science 59, 1514-1528.

Huang, J., Kisgen, D.J., 2013. Gender and corporate finance: Are male executives overconfident relative to female executives? Journal of Financial Economics 108, 822-839.

Huson, M.R., Malatesta, P.H., Parrino, R., 2004. Managerial succession and firm performance. Journal of Financial Economics 74, 237-275.

Kaplan, S.N., Klebanov, M.M., Sorensen, M., 2012. Which CEO characteristics and abilities matter? The Journal of Finance 67, 973-1007.

Kilduff, M., Angelmar, R., Mehra, A., 2000. Top management-team diversity and firm performance: Examining the role of cognitions. Organization science 11, 21-34.

Knyazeva, A., Knyazeva, D., Masulis, R.W., 2013. The supply of corporate directors and board independence. Review of Financial Studies 26, 1561-1605.

Kramer, V.W., Konrad, A.M., Erkut, S., Hooper, M.J., 2006. Critical mass on corporate boards: Why three or more women enhance governance. Wellesley Centers for Women Boston.

Levi, M., Li, K., Zhang, F., 2014. Director gender and mergers and acquisitions. Journal of Corporate Finance 28, 185-200.

Liu, Y., Wei, Z., Xie, F., 2014. Do women directors improve firm performance in China? Journal of Corporate Finance 28, 169-184.

Matsa, D.A., Miller, A.R., 2011. Chipping away at the glass ceiling: Gender spillovers in corporate leadership. The American Economic Review 101, 635-639.

Matsa, D.A., Miller, A.R., 2013. A female style in corporate leadership? Evidence from quotas. American Economic Journal: Applied Economics 5, 136-169.

McConnell, J.J., Muscarella, C.J., 1985. Corporate capital expenditure decisions and the market value of the firm. Journal of Financial Economics 14, 399-422.

McConnell, J.J., Servaes, H., 1990. Additional evidence on equity ownership and corporate value. Journal of Financial Economics 27, 595-612.

Mikkelson, W.H., Partch, M.M., 2003. Do persistent large cash reserves hinder performance? Journal of Financial and Quantitative Analysis 38, 275-294.

Nadkarni, S., Herrmann, P., 2010. CEO personality, strategic flexibility, and firm performance: The case of the Indian business process outsourcing industry. Academy of Management Journal 53, 1050-1073.

Pegels, C.C., Song, Y.I., Yang, B., 2000. Management heterogeneity, competitive interaction groups, and firm performance. Strategic Management Journal 21, 911-923.

Peng, M.W., 2004. Outside directors and firm performance during institutional transitions. Strategic Management Journal 25, 453-471.

Price, C.R., 2012. Gender, competition, and managerial decisions. Management Science 58, 114-122.

Ragins, B.R., Townsend, B., Mattis, M., 1998. Gender gap in the executive suite: CEOs and female executives report on breaking the glass ceiling. The Academy of Management Executive 12, 28-42.

Richard, O.C., 2000. Racial diversity, business strategy, and firm performance: A resource-based view. Academy of Management Journal 43, 164-177.

Richard, O.C., Barnett, T., Dwyer, S., Chadwick, K., 2004. Cultural diversity in management, firm performance, and the moderating role of entrepreneurial orientation dimensions. Academy of Management Journal 47, 255-266.

Rosenstein, S., Wyatt, J.G., 1990. Outside directors, board independence, and shareholder wealth. Journal of Financial Economics 26, 175-191.

Sapienza, P., Zingales, L., Maestripieri, D., 2009. Gender differences in financial risk aversion and career choices are affected by testosterone. Proceedings of the National Academy of Sciences 106, 15268-15273.

Sila, V., Gonzalez, A., Hagendorff, J., 2016. Women on board: Does boardroom gender diversity affect firm risk? Journal of Corporate Finance 36, 26-53.

Srinidhi, B., Gul, F.A., Tsui, J., 2011. Female directors and earnings quality. Contemporary Accounting Research 28, 1610-1644.

Stock, J.H., Yogo, M., 2005. Testing for weak instruments in linear IV regression. Identification and inference for econometric models: Essays in honor of Thomas Rothenberg.

Strøm, R.Ø., D'Espallier, B., Mersland, R., 2014. Female leadership, performance, and governance in microfinance institutions. Journal of Banking & Finance 42, 60-75.

Sunden, A.E., Surette, B.J., 1998. Gender differences in the allocation of assets in retirement savings plans. The American Economic Review 88, 207-211.

Tate, G., Yang, L., 2015. Female leadership and gender equity: Evidence from plant closure. Journal of Financial Economics 117, 77-97.

Weber, A., Zulehner, C., 2010. Female hires and the success of start-up firms. The American Economic Review 100, 358-361.

Yermack, D., 1996. Higher market valuation of companies with a small board of directors. Journal of Financial Economics 40, 185-211.

Table 1: Summary Statistics

Panel A: Female leadership and female directors							
	Mean	SD	Min	p25	Median	p75	Max
China							
Female leadership	0.289	0.453	0.000	0.000	0.000	1.000	1.000
Female CEO	0.049	0.216	0.000	0.000	0.000	0.000	1.000
Female CFO	0.256	0.437	0.000	0.000	0.000	1.000	1.000
%Female directors	0.110	0.110	0.000	0.000	0.111	0.167	0.833
%Female executive directors	0.064	0.084	0.000	0.000	0.000	0.111	0.636
%Female independent directors	0.047	0.068	0.000	0.000	0.000	0.100	0.571
US							
Female leadership	0.042	0.201	0.000	0.000	0.000	0.000	1.000
Female CEO	0.022	0.147	0.000	0.000	0.000	0.000	1.000
Female CFO	0.088	0.283	0.000	0.000	0.000	0.000	1.000
%Female directors	0.100	0.096	0.000	0.000	0.100	0.167	0.429
%Female executive directors	0.006	0.026	0.000	0.000	0.000	0.000	0.167
%Female independent directors	0.088	0.090	0.000	0.000	0.091	0.143	0.375

Panel B: Descriptive statistics of firm performance and controls (China)							
	Mean	SD	Min	p25	Median	p75	Max
ROA	0.048	0.087	-0.562	0.026	0.050	0.080	0.355
Tobin's q	0.490	0.237	0.063	0.328	0.484	0.628	1.558
Ln(Board size)	2.255	0.232	1.386	2.197	2.197	2.398	3.219
%Independent directors	0.320	0.133	0.000	0.316	0.333	0.375	1.000
Ln(Management size)	1.796	0.383	0.000	1.609	1.792	2.079	3.761
Leverage	0.490	0.314	0.040	0.315	0.472	0.618	3.208
Ln(1+Sales growth)	0.131	0.468	-9.212	-0.013	0.127	0.270	11.810
Ln(Assets)	21.430	1.207	10.840	20.660	21.290	22.060	28.480
Ln(Firm age)	1.830	0.766	-1.710	1.280	1.984	2.449	3.138
Cash holding	0.179	0.139	0.000	0.083	0.142	0.235	1.000
R&D	0.001	0.005	0.000	0.000	0.000	0.000	0.216
Capital expenditure	0.058	0.067	-0.702	0.016	0.042	0.084	0.453
Government ownership	0.183	0.243	-0.006	0.000	0.000	0.383	0.971
Institutional ownership	0.169	0.188	0.000	0.022	0.096	0.261	0.939
Managerial ownership	0.013	0.060	0.000	0.000	0.000	0.000	0.647
Regional development	6.703	1.617	1.482	5.588	6.925	8.084	8.867

For U.S. firms, the data on CEO and CFO gender are from Execucomp, and the data on board gender diversity are from RiskMestrics.

Table 2: Correlations

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1)	ROA	1.000																			
(2)	Tobin's q	**-0.345**	1.000																		
(3)	Female leadership	**0.026**	**-0.050**	1.000																	
(4)	%Female directors	-0.003	**-0.028**	**0.233**	1.000																
(5)	%Female executive directors	-0.018	**-0.025**	**0.246**	**0.784**	1.000															
(6)	%Female independent directors	0.018	-0.015	**0.072**	**0.645**	**0.031**	1.000														
(7)	Ln(Board size)	0.012	**0.051**	**-0.031**	**-0.034**	-0.008	**-0.044**	1.000													
(8)	%Independent directors	**0.056**	0.018	**0.055**	**0.062**	**-0.085**	**0.204**	0.004	1.000												
(9)	Ln(Management size)	**0.032**	**0.027**	0.007	**-0.045**	**-0.060**	0.002	**0.230**	**0.137**	1.000											
(10)	Leverage	**-0.095**	**0.821**	**-0.028**	-0.011	-0.016	0.002	0.016	**0.038**	**-0.032**	1.000										
(11)	Ln(1+Sales growth)	**0.157**	**-0.057**	0.007	**-0.025**	**-0.021**	-0.015	**0.026**	0.008	**0.056**	**-0.104**	1.000									
(12)	Ln(Assets)	**0.104**	**0.126**	**-0.057**	**-0.104**	**-0.130**	-0.008	**0.231**	**0.239**	**0.309**	-0.002	**0.112**	1.000								
(13)	Ln(Firm age)	**-0.061**	**0.286**	**-0.025**	-0.008	**-0.054**	**0.054**	**0.056**	**0.191**	-0.009	**0.290**	**-0.048**	**0.180**	1.000							
(14)	Cash holding	**0.148**	**-0.383**	**0.062**	**0.044**	**0.045**	0.014	**-0.030**	**0.099**	**0.041**	**-0.315**	**0.055**	**-0.080**	**-0.298**	1.000						
(15)	R&D	0.017	**-0.074**	0.012	0.003	-0.005	0.011	-0.010	**0.082**	**0.062**	**-0.067**	0.012	0.001	**-0.039**	**0.109**	1.000					
(16)	Capital expenditure	**0.110**	**-0.120**	0.006	-0.018	**-0.036**	0.015	**0.022**	0.013	**0.089**	**-0.172**	**0.122**	**0.157**	**-0.264**	**-0.039**	**0.028**	1.000				
(17)	Government ownership	-0.011	**0.046**	**-0.096**	**-0.140**	**-0.076**	**-0.132**	**0.049**	**-0.262**	**-0.031**	0.015	**0.031**	**0.038**	**-0.092**	**-0.121**	**-0.084**	0.009	1.000			
(18)	Institutional ownership	**0.073**	0.001	0.001	0.002	0.006	-0.004	**0.043**	**0.076**	**0.047**	0.016	**0.031**	**0.048**	**0.024**	**0.027**	**0.032**	**0.020**	**-0.021**	1.000		
(19)	Managerial ownership	**0.040**	**-0.132**	**0.045**	**0.081**	**0.044**	**0.075**	**-0.027**	**0.121**	**0.041**	**-0.112**	0.013	**-0.042**	**-0.152**	**0.099**	**0.094**	**0.042**	**-0.160**	**-0.055**	1.000	
(20)	Regional development	**0.077**	**-0.095**	0.014	**0.029**	**0.055**	**-0.020**	**-0.037**	**0.061**	**-0.043**	**-0.077**	0.001	**0.066**	**-0.064**	**0.135**	-0.002	-0.010	**-0.129**	0.001	**0.121**	1.000

Bold values indicate that the correlation is significant at the 1% level.

Table 3: Change in Female Leadership and Female Directors over Time

This table presents the fraction of sample firms that experience a change in *Female leadership*, *Female CEO*, *Female CFO, %Female directors, %Female executive directors, and %Female independent directors*, over a one-year period between 2000 and 2014. The results are based on a sample of 19,022 firm-year observations from 2,328 firms in China.

	Change in						
year	Female leadership	Female CEO	Female CFO	%Female directors	%Female executive directors	%Female independent directors	#Firms (#Firm-years)
2000	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	671
2001	8.92%	2.36%	7.09%	20.21%	19.29%	3.28%	762
2002	8.17%	1.90%	7.05%	29.68%	18.70%	16.91%	893
2003	7.11%	2.12%	5.84%	24.63%	17.41%	13.27%	942
2004	6.89%	2.10%	6.29%	16.77%	13.27%	5.29%	1,002
2005	7.89%	1.50%	6.95%	17.48%	13.35%	6.11%	1,064
2006	7.25%	1.68%	6.54%	17.33%	12.20%	7.34%	1,131
2007	7.94%	2.29%	6.27%	20.39%	13.06%	11.39%	1,133
2008	5.81%	1.24%	4.81%	22.24%	10.79%	14.94%	1,205
2009	6.68%	1.31%	6.30%	20.89%	12.52%	12.90%	1,302
2010	5.65%	2.01%	4.61%	20.28%	12.26%	11.00%	1,346
2011	5.30%	1.61%	5.44%	18.59%	11.34%	10.47%	1,490
2012	5.17%	1.79%	4.40%	17.56%	9.30%	10.98%	1,839
2013	5.64%	1.45%	5.50%	21.61%	11.77%	13.51%	2,073
2014	6.09%	2.44%	5.35%	29.55%	14.66%	20.79%	2,169
Mean	6.30%	1.72%	5.50%	19.81%	12.66%	10.54%	1,268
2000-2014							
Percent of firms	33.25%	9.66%	30.54%	68.00%	48.93%	52.79%	2,328
Percent of firm-years	6.25%	1.77%	5.51%	20.68%	12.61%	11.65%	(19,022)

Table 4: Female Interaction within Chinese Firms

This table presents regression results examining the interaction among women within Chinese firms. The dependent variable, *Female Leadership*, is a dummy variable which is equal to 1 if a firm has a female CEO or CFO, and 0 otherwise. All control variables are lagged by one year relative to the dependent variable. The regressions are estimated using a linear probability model with firm-level fixed effects. See Table A1 for variable definitions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable =	Female leadership		
	(1)	(2)	(3)
<u>%Female directors:</u>			
Previous year	0.389***	0.121**	0.126**
	[5.44]	[2.02]	[2.00]
Current year		0.399***	0.329***
		[5.68]	[4.80]
Forward 1 year			0.095
			[1.53]
Forward 2 years			0.066
			[0.99]
<u>Control variables:</u>			
Ln(Board size)	-0.021	-0.021	-0.044
	[-0.84]	[-0.82]	[-1.57]
%Independent director	0.048	0.058	0.045
	[0.74]	[0.90]	[0.66]
Ln(Management size)	0.020	0.020	0.015
	[1.28]	[1.25]	[0.84]
Leverage	-0.008	-0.009	-0.015
	[-0.34]	[-0.35]	[-0.54]
Ln(1+Sales growth)	0.009	0.009	0.005
	[1.38]	[1.43]	[0.60]
Ln(Assets)	-0.022*	-0.021*	-0.012
	[-1.90]	[-1.85]	[-0.90]
Ln(Firm age)	-0.013	-0.011	-0.019
	[-0.42]	[-0.35]	[-0.52]
Constant	0.680***	0.652***	0.521*
	[2.81]	[2.71]	[1.87]
Year FE	Y	Y	Y
Firm FE	Y	Y	Y
R^2	0.053	0.061	0.057
N	16666	16666	12493

Table 5: Determinants of Gender in Appointments

This table presents regression results for the determinants of female leader and female director appointments. The dependent variable, *Female CEO* (*CFO*), is a dummy variable equal to 1 if a female CEO (CFO) is appointed in a given year, and 0 otherwise. The dependent variable, *#Female directors* (*#Female executive/independent directors*), is the total number of female directors (female executive/independent directors) appointed to the board in a given year. All independent variables are lagged by one year, except the departure variables. *Female CEO departure* (*Female CFO departure*) is a dummy variable equal to 1 if a female CEO (CFO) is being replaced, and 0 otherwise. *# Female director departures* (*# Male director departures*) is the number of female (male) directors departing from the board. Other departure variables are constructed analogously. Columns 1 and 2 are estimated using a probit model. Columns 3-5 are estimated using a poisson model. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	Female CEO	Female CFO	# Female directors	# Female executive directors	# Female independent directors
ROA (lag)	-0.577*	-0.162	-0.763***	-1.094***	-0.451
	[-1.89]	[-0.73]	[-3.56]	[-3.93]	[-1.50]
Tobin's q (lag)	0.141*	0.144***	0.098	0.126	0.078
	[1.73]	[2.75]	[1.56]	[1.62]	[1.06]
Ln(Board size) (lag)	-0.221	0.164**	-0.897***	-0.721***	-0.870***
	[-1.48]	[2.07]	[-10.02]	[-5.46]	[-8.10]
%Female directors (lag)	1.032***	0.270	0.475***	0.362	0.504**
	[4.12]	[1.64]	[2.64]	[1.42]	[2.16]
Ln(Management size) (lag)	0.054	0.060	-0.079	-0.070	-0.063
	[0.55]	[1.06]	[-1.36]	[-0.82]	[-0.91]
%Female executives (lag)	0.669***	0.635***	0.781***	1.523***	0.021
	[3.74]	[5.55]	[6.81]	[9.69]	[0.13]
Ln(1+Compensation) (lag)	0.024	-0.064***	0.025	0.053	-0.018
	[0.48]	[-3.27]	[0.95]	[1.25]	[-0.62]
Institutional ownership (lag)	-0.103	-0.074	0.025	0.112	-0.038
	[-0.63]	[-0.73]	[0.26]	[0.80]	[-0.32]
Stock return volatility (lag)	1.077	0.595	-0.214	-0.050	-0.287
	[1.48]	[1.42]	[-0.48]	[-0.08]	[-0.52]
Ln(Assets) (lag)	-0.118***	-0.051***	-0.065***	-0.110***	-0.039*
	[-3.35]	[-2.94]	[-3.37]	[-3.80]	[-1.74]
Female CEO departure	0.898***				
	[6.63]				
Female CFO departure		1.311***			
		[20.73]			
# Female director departures			0.256***		
			[6.88]		
# Male director departures			0.200***		
			[19.26]		
# Female executive director departures				0.471***	
				[8.26]	
# Male executive director departures				0.299***	
				[17.85]	
# Female independent director departures					0.380***
					[4.73]
# Male independent director departures					0.377***
					[13.68]
Constant	-0.654	-0.569	1.303***	-0.305	1.534***
	[-0.75]	[-1.41]	[2.86]	[-0.45]	[2.78]
Industry FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
N	17291	17336	17336	17336	17336

Table 6: Female Leadership and Female Directors (OLS)

This table presents OLS regression results for the impact of female interaction on firm performance. The dependent variable is *ROA* in Panel A and *Tobin's q* in Panel B. See Table A1 for variable definitions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Dependent Variable = ROA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female leadership	0.004*	-0.001	-0.001	-0.001	-0.001	-0.001	-0.000
	[1.81]	[-0.26]	[-0.33]	[-0.51]	[-0.20]	[-0.48]	[-0.09]
%Female directors	-0.004	-0.017	-0.014	-0.019*	-0.015	-0.014	-0.014
	[-0.51]	[-1.58]	[-1.37]	[-1.69]	[-1.39]	[-1.24]	[-1.21]
Female leadership × %Female directors		0.033**	0.030*	0.038**	0.035**	0.037**	0.032*
		[1.99]	[1.86]	[2.20]	[2.04]	[2.13]	[1.83]
Control variables:							
Ln(Board size)	-0.002	-0.002	-0.002	-0.003	-0.002	-0.002	-0.001
	[-0.54]	[-0.54]	[-0.43]	[-0.65]	[-0.62]	[-0.55]	[-0.32]
%Independent directors	-0.000	-0.001	0.003	0.003	-0.005	0.002	0.000
	[-0.03]	[-0.05]	[0.24]	[0.29]	[-0.42]	[0.18]	[0.04]
Ln(Management size)	-0.004	-0.004	-0.005**	-0.005*	-0.003	-0.005*	-0.004
	[-1.61]	[-1.62]	[-1.97]	[-1.90]	[-1.28]	[-1.73]	[-1.63]
Leverage	-0.016***	-0.016***	-0.006	-0.015***	-0.017***	-0.004	-0.004
	[-3.16]	[-3.15]	[-1.10]	[-2.73]	[-3.03]	[-0.70]	[-0.65]
Ln(1+Sales growth)	0.027***	0.027***	0.025***	0.025***	0.028***	0.024***	0.024***
	[9.10]	[9.11]	[8.73]	[8.18]	[9.04]	[7.85]	[7.78]
Ln(Assets)	0.007***	0.007***	0.006***	0.007***	0.006***	0.006***	0.006***
	[6.64]	[6.57]	[6.30]	[6.47]	[5.78]	[5.20]	[5.65]
Ln(Firm age)	-0.009***	-0.009***	-0.002	-0.008***	-0.008***	-0.001	-0.001
	[-7.47]	[-7.47]	[-1.62]	[-6.63]	[-6.70]	[-0.44]	[-0.75]
Additional controls:							
Cash holding			0.090***			0.094***	0.091***
			[9.93]			[9.51]	[9.25]
R&D			-0.087			-0.027	-0.099
			[-0.80]			[-0.24]	[-0.89]
Capital expenditure			0.110***			0.113***	0.110***
			[8.40]			[8.34]	[8.26]
Government ownership				0.007		0.010**	0.008*
				[1.48]		[2.24]	[1.74]
Institutional ownership				0.026***		0.026***	0.025***
				[5.19]		[5.15]	[4.98]
Managerial ownership				0.039***		0.031***	0.031***
				[3.62]		[2.66]	[2.59]
Regional development					0.004***	0.003***	0.003***
					[6.09]	[5.72]	[5.74]
Constant	-0.042*	-0.040*	-0.061***	-0.068***	-0.050**	-0.106***	-0.119***
	[-1.95]	[-1.84]	[-2.85]	[-3.00]	[-2.21]	[-4.49]	[-4.69]
Industry FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Industry-year FE	N	N	N	N	N	N	Y
R^2	0.072	0.073	0.073	0.092	0.074	0.080	0.101
N	19022	19022	19022	17585	17910	16563	16563

Panel B: Dependent Variable = Tobin's q							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female leadership	-0.006*	0.002	0.002	0.002	0.002	0.002	0.001
	[-1.81]	[0.41]	[0.54]	[0.33]	[0.41]	[0.46]	[0.24]
%Female directors	0.034**	0.057***	0.053***	0.060***	0.051***	0.048**	0.047**
	[2.25]	[2.92]	[2.80]	[2.88]	[2.61]	[2.42]	[2.36]
Female leadership × %Female directors		-0.060**	-0.058**	-0.061**	-0.061**	-0.061**	-0.055**
		[-2.23]	[-2.19]	[-2.13]	[-2.32]	[-2.22]	[-2.03]
Control variables:							
Ln(Board size)	0.000	0.000	0.000	0.001	-0.001	-0.000	-0.001
	[0.03]	[0.03]	[0.01]	[0.08]	[-0.10]	[-0.05]	[-0.20]
%Independent director	-0.029*	-0.029*	-0.033*	-0.034**	-0.024	-0.032*	-0.032*
	[-1.84]	[-1.82]	[-1.94]	[-2.11]	[-1.50]	[-1.84]	[-1.85]
Ln(Management size)	0.016***	0.016***	0.017***	0.016***	0.016***	0.016***	0.016***
	[3.90]	[3.91]	[4.21]	[3.61]	[3.58]	[3.46]	[3.42]
Leverage	0.628***	0.628***	0.609***	0.623***	0.644***	0.621***	0.623***
	[24.38]	[24.38]	[23.42]	[23.62]	[24.35]	[22.50]	[23.12]
Ln(1+Sales growth)	0.002	0.002	0.004	0.004	0.003	0.007	0.006
	[0.44]	[0.44]	[0.92]	[0.76]	[0.54]	[1.22]	[1.18]
Ln(Assets)	0.021***	0.021***	0.020***	0.023***	0.021***	0.022***	0.022***
	[9.30]	[9.34]	[9.25]	[9.67]	[9.00]	[8.93]	[8.89]
Ln(Firm age)	0.014***	0.014***	0.004	0.012***	0.011***	0.001	0.002
	[5.22]	[5.21]	[1.58]	[4.82]	[4.41]	[0.64]	[0.71]
Additional controls:							
Cash holding			-0.181***			-0.165***	-0.163***
			[-9.01]			[-8.48]	[-8.41]
R&D			0.111			0.117	0.158
			[0.80]			[0.74]	[0.99]
Capital expenditure			-0.058**			-0.052*	-0.049*
			[-2.32]			[-1.90]	[-1.90]
Government ownership				-0.025***		-0.028***	-0.027***
				[-3.19]		[-3.51]	[-3.43]
Institutional ownership				-0.011		-0.007	-0.007
				[-1.44]		[-0.95]	[-0.93]
Managerial ownership				-0.031**		-0.029*	-0.030*
				[-2.05]		[-1.85]	[-1.90]
Regional development					-0.004***	-0.004***	-0.004***
					[-3.62]	[-3.15]	[-3.11]
Constant	-0.328***	-0.333***	-0.274***	-0.348***	-0.303***	-0.257***	-0.263***
	[-7.61]	[-7.68]	[-6.81]	[-7.71]	[-6.91]	[-5.95]	[-5.71]
Industry FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Industry-year FE	N	N	N	N	N	N	Y
R^2	0.697	0.697	0.705	0.702	0.701	0.711	0.715
N	18936	18936	18936	17499	17827	16480	16480

Table 7: Female Leadership and Female Directors (IV/2SLS)

This table presents 2SLS regression results for the impact of female interaction on firm performance. The IVs include (1) *%Local female directors* which is the industry average percentage of female directors in the province where the firm is headquartered, (2) *%Local female executives* which is the industry average percentage of female executives in the province where the firm is headquartered, (3) *%Local female directors×%Local female executives*, and (4) *Proportion of male directors with board connections to female directors* which is the number of male directors who sit on other boards on which there are female directors, divided by the total number of male directors. (1)–(3) are used as instruments in Panel A, and (1)–(4) are used as instruments in Panel B. *Director connectedness* which is the total number of external board seats held by all directors in a firm is controlled for in Panel B. See Table A1 for variable definitions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Exactly identified model

1st stage			***2nd stage***		
	Female leadership	%Female directors		ROA	Tobin's q
%Local female directors	0.350*	0.989***	$\widehat{Female\ leadership}$	-0.053***	0.110***
	[1.70]	[17.30]		[-3.20]	[3.72]
%Local female executives	1.694***	-0.016	$\widehat{\%Female\ directors}$	-0.100**	0.286***
	[10.01]	[-0.41]		[-2.40]	[3.31]
%Local female directors × %Local female executives	-0.699	0.030	$\widehat{Female\ leadership} \times \widehat{\%Female\ directors}$	0.265***	-0.487***
	[-0.77]	[0.09]		[3.34]	[-2.76]
Ln(Board size)	-0.036	-0.006	Ln(Board size)	-0.003	0.002
	[-1.22]	[-1.00]		[-0.70]	[0.23]
%Independent director	0.004	-0.001	%Independent director	0.002	-0.028
	[0.05]	[-0.06]		[0.16]	[-1.44]
Ln(Management size)	0.026	-0.006	Ln(Management size)	-0.004	0.015***
	[1.29]	[-1.59]		[-1.51]	[3.27]
Leverage	-0.009	-0.002	Leverage	-0.013**	0.622***
	[-0.35]	[-0.29]		[-2.28]	[22.83]
Ln(1+Sales growth)	0.001	-0.004**	Ln(1+Sales growth)	0.028***	0.006
	[0.13]	[-2.05]		[9.01]	[1.19]
Ln(Assets)	-0.020***	-0.007***	Ln(Assets)	0.005***	0.025***
	[-2.81]	[-4.68]		[4.13]	[9.13]
Ln(Firm age)	-0.024**	-0.004*	Ln(Firm age)	-0.000	0.003
	[-2.27]	[-1.83]		[-0.30]	[1.21]
Cash holding	0.045	-0.002	Cash holding	0.091***	-0.166***
	[0.79]	[-0.13]		[9.04]	[-8.25]
R&D	-0.985	-0.380*	R&D	-0.031	0.184
	[-0.86]	[-1.69]		[-0.25]	[0.98]
Capital expenditure	0.074	0.008	Capital expenditure	0.118***	-0.046*
	[0.87]	[0.42]		[8.58]	[-1.68]
Government ownership	-0.083***	-0.030***	Government ownership	0.008*	-0.022***
	[-2.72]	[-4.60]		[1.89]	[-2.62]
Institutional ownership	-0.011	-0.001	Institutional ownership	0.027***	-0.009
	[-0.32]	[-0.19]		[5.35]	[-1.11]
Managerial ownership	-0.020	0.038	Managerial ownership	0.027**	-0.027
	[-0.21]	[1.39]		[2.12]	[-1.54]
Regional development	-0.002	-0.000	Regional development	0.003***	-0.004***
	[-0.34]	[-0.28]		[5.49]	[-3.14]
Constant	0.702***	0.211***	Constant	-0.058**	-0.407***
	[4.22]	[6.12]		[-2.01]	[-7.03]
Industry FE	Yes	Yes	Industry FE	Yes	Yes
Year FE	Yes	Yes	Year FE	Yes	Yes
N	16480	16480	N	16480	16480
F test of excluded instruments	83.22	249.45			
Cragg-Donald Wald F-statistic	169.17				

Panel B: Over-identified model					
1st stage			***2nd stage***		
	Female leadership	%Female directors		ROA	Tobin's q
%Local female directors	0.347*	0.987***	$\widehat{Female\ leadership}$	-0.053***	0.110***
	[1.68]	[17.36]		[-3.22]	[3.72]
%Local female executives	1.696***	-0.014	$\%\widehat{Female\ directors}$	-0.103**	0.287***
	[10.00]	[-0.35]		[-2.50]	[3.33]
%Local female directors × %Local female executives	-0.714	0.023	$\widehat{Female\ leadership}$ ×$\%\widehat{Female\ directors}$	0.275***	-0.490***
	[-0.79]	[0.07]		[3.49]	[-2.79]
Proportion of male directors with external board connections to female directors	0.157**	0.023			
	[2.33]	[1.26]			
Director connectedness	-0.011***	-0.004***	Director connectedness	0.002***	-0.001
	[-2.66]	[-4.48]		[4.11]	[-0.84]
Ln(Board size)	-0.024	-0.002	Ln(Board size)	-0.005	0.002
	[-0.82]	[-0.30]		[-1.13]	[0.32]
%Independent director	-0.002	-0.002	%Independent director	0.002	-0.028
	[-0.02]	[-0.13]		[0.18]	[-1.45]
Ln(Management size)	0.026	-0.006	Ln(Management size)	-0.004	0.015***
	[1.28]	[-1.59]		[-1.53]	[3.27]
Leverage	-0.009	-0.002	Leverage	-0.013**	0.622***
	[-0.35]	[-0.32]		[-2.26]	[22.83]
Ln(1+Sales growth)	0.001	-0.004**	Ln(1+Sales growth)	0.027***	0.006
	[0.15]	[-2.02]		[9.03]	[1.19]
Ln(Assets)	-0.019***	-0.006***	Ln(Assets)	0.005***	0.025***
	[-2.58]	[-4.09]		[3.75]	[9.20]
Ln(Firm age)	-0.023**	-0.003	Ln(Firm age)	-0.001	0.003
	[-2.22]	[-1.56]		[-0.52]	[1.26]
Cash holding	0.046	-0.000	Cash holding	0.090***	-0.166***
	[0.81]	[-0.02]		[8.96]	[-8.23]
R&D	-0.936	-0.352	R&D	-0.042	0.188
	[-0.82]	[-1.57]		[-0.34]	[0.99]
Capital expenditure	0.077	0.010	Capital expenditure	0.117***	-0.046*
	[0.91]	[0.50]		[8.53]	[-1.67]
Government ownership	-0.082***	-0.029***	Government ownership	0.008*	-0.022***
	[-2.70]	[-4.53]		[1.86]	[-2.62]
Institutional ownership	-0.011	0.000	Institutional ownership	0.026***	-0.009
	[-0.30]	[0.03]		[5.14]	[-1.06]
Managerial ownership	-0.025	0.037	Managerial ownership	0.026**	-0.027
	[-0.25]	[1.37]		[2.07]	[-1.53]
Regional development	-0.002	0.000	Regional development	0.003***	-0.004***
	[-0.29]	[0.00]		[5.20]	[-3.07]
Constant	0.651***	0.185***	Constant	-0.047	-0.411***
	[3.88]	[5.31]		[-1.60]	[-7.14]
Industry FE	Yes	Yes	Industry FE	Yes	Yes
Year FE	Yes	Yes	Year FE	Yes	Yes
N	16480	16480	N	16480	16480
F test of excluded instruments	64.61	187.93	Hansen J statistic	1.75	0.07
Cragg-Donald Wald F-statistic	127.33		(p-value)	(0.19)	(0.79)

Table 8: Female Leadership and Female Executive/Independent Directors (OLS)

This table presents OLS regression results for the impact of female interaction on firm performance. The dependent variable is *ROA* in Panel A and *Tobin's q* in Panel B. See Table A1 for variable definitions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Dependent Variable = ROA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female leadership	0.004**	-0.001	-0.001	-0.001	-0.000	-0.001	-0.000
	[2.01]	[-0.18]	[-0.25]	[-0.45]	[-0.11]	[-0.40]	[-0.02]
%Female executive directors	-0.016	-0.035***	-0.032**	-0.042***	-0.038***	-0.041***	-0.039***
	[-1.63]	[-2.62]	[-2.44]	[-2.81]	[-2.82]	[-2.80]	[-2.64]
%Female independent directors	0.013	0.007	0.009	0.006	0.015	0.017	0.015
	[1.07]	[0.42]	[0.57]	[0.38]	[0.93]	[1.06]	[0.94]
Female leadership × %Female executive directors		0.045**	0.039**	0.055**	0.051**	0.054**	0.049**
		[2.23]	[2.00]	[2.51]	[2.44]	[2.43]	[2.22]
Female leadership × %Female independent directors		0.018	0.020	0.020	0.016	0.022	0.015
		[0.74]	[0.84]	[0.79]	[0.64]	[0.89]	[0.63]
Control variables:							
Ln(Board size)	-0.002	-0.002	-0.001	-0.002	-0.002	-0.002	-0.001
	[-0.45]	[-0.44]	[-0.32]	[-0.53]	[-0.49]	[-0.40]	[-0.18]
%Independent directors	-0.002	-0.002	0.001	0.002	-0.007	-0.000	-0.002
	[-0.17]	[-0.19]	[0.08]	[0.14]	[-0.60]	[-0.03]	[-0.15]
Ln(Management size)	-0.004	-0.004	-0.005**	-0.005*	-0.003	-0.005*	-0.004
	[-1.62]	[-1.64]	[-2.00]	[-1.94]	[-1.29]	[-1.75]	[-1.64]
Leverage	-0.016***	-0.016***	-0.006	-0.015***	-0.017***	-0.004	-0.004
	[-3.16]	[-3.15]	[-1.09]	[-2.73]	[-3.02]	[-0.68]	[-0.63]
Ln(1+Sales growth)	0.027***	0.027***	0.025***	0.025***	0.028***	0.024***	0.024***
	[9.12]	[9.13]	[8.75]	[8.20]	[9.07]	[7.89]	[7.82]
Ln(Assets)	0.007***	0.007***	0.006***	0.007***	0.006***	0.006***	0.006***
	[6.65]	[6.57]	[6.32]	[6.48]	[5.77]	[5.19]	[5.64]
Ln(Firm age)	-0.009***	-0.009***	-0.002*	-0.008***	-0.009***	-0.001	-0.001
	[-7.51]	[-7.50]	[-1.67]	[-6.68]	[-6.75]	[-0.52]	[-0.81]
Additional controls:							
Cash holding			0.090***			0.094***	0.092***
			[9.96]			[9.54]	[9.28]
R&D			-0.085			-0.030	-0.100
			[-0.79]			[-0.26]	[-0.89]
Capital expenditure			0.109***			0.111***	0.109***
			[8.30]			[8.23]	[8.16]
Government ownership				0.007		0.010**	0.008*
				[1.45]		[2.24]	[1.75]
Institutional ownership				0.027***		0.026***	0.025***
				[5.21]		[5.19]	[5.01]
Managerial ownership				0.039***		0.031***	0.031***
				[3.61]		[2.66]	[2.59]
Regional development					0.004***	0.004***	0.004***
					[6.24]	[5.88]	[5.89]
Constant	-0.042*	-0.040*	-0.061***	-0.068***	-0.050**	-0.107***	-0.120***
	[-1.95]	[-1.83]	[-2.85]	[-3.02]	[-2.20]	[-4.53]	[-4.73]
Industry FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Industry-year FE	N	N	N	N	N	N	Y
R^2	0.073	0.074	0.092	0.075	0.080	0.102	0.118
N	19022	19022	19022	17585	17910	16563	16563

Panel B: Dependent Variable = Tobin's q							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female leadership	-0.006*	0.002	0.002	0.001	0.002	0.002	0.001
	[-1.92]	[0.36]	[0.47]	[0.29]	[0.36]	[0.40]	[0.18]
%Female executive directors	0.049***	0.079***	0.077***	0.085***	0.077***	0.080***	0.079***
	[2.63]	[3.33]	[3.30]	[3.22]	[3.24]	[3.09]	[3.05]
%Female independent directors	0.012	0.028	0.021	0.031	0.016	0.013	0.011
	[0.55]	[1.06]	[0.80]	[1.15]	[0.62]	[0.49]	[0.43]
Female leadership × %Female executive directors		-0.075**	-0.069**	-0.078**	-0.084***	-0.080**	-0.075**
		[-2.32]	[-2.15]	[-2.18]	[-2.65]	[-2.34]	[-2.19]
Female leadership × %Female independent directors		-0.042	-0.048	-0.046	-0.031	-0.044	-0.037
		[-0.96]	[-1.12]	[-1.02]	[-0.71]	[-1.00]	[-0.84]
Control variables:							
Ln(Board size)	-0.000	-0.000	-0.001	0.000	-0.001	-0.001	-0.002
	[-0.03]	[-0.05]	[-0.08]	[0.00]	[-0.19]	[-0.16]	[-0.30]
%Independent director	-0.027*	-0.027*	-0.030*	-0.032**	-0.022	-0.029*	-0.029*
	[-1.73]	[-1.69]	[-1.80]	[-1.97]	[-1.36]	[-1.68]	[-1.69]
Ln(Management size)	0.016***	0.016***	0.018***	0.016***	0.016***	0.016***	0.016***
	[3.92]	[3.93]	[4.22]	[3.63]	[3.59]	[3.47]	[3.43]
Leverage	0.628***	0.628***	0.609***	0.623***	0.644***	0.621***	0.623***
	[24.38]	[24.38]	[23.43]	[23.63]	[24.36]	[22.50]	[23.11]
Ln(1+Sales growth)	0.002	0.002	0.004	0.004	0.003	0.007	0.006
	[0.44]	[0.44]	[0.93]	[0.76]	[0.55]	[1.22]	[1.18]
Ln(Assets)	0.021***	0.021***	0.020***	0.023***	0.021***	0.022***	0.022***
	[9.31]	[9.35]	[9.26]	[9.67]	[9.01]	[8.96]	[8.92]
Ln(Firm age)	0.014***	0.014***	0.004	0.013***	0.012***	0.002	0.002
	[5.23]	[5.22]	[1.62]	[4.84]	[4.42]	[0.70]	[0.76]
Additional controls:							
Cash holding			-0.181***			-0.166***	-0.164***
			[-9.03]			[-8.51]	[-8.43]
R&D			0.108			0.120	0.159
			[0.79]			[0.76]	[1.00]
Capital expenditure			-0.057**			-0.050*	-0.048*
			[-2.27]			[-1.84]	[-1.85]
Government ownership				-0.025***		-0.028***	-0.027***
				[-3.17]		[-3.51]	[-3.44]
Institutional ownership				-0.011		-0.008	-0.007
				[-1.46]		[-0.98]	[-0.97]
Managerial ownership				-0.031**		-0.029*	-0.030*
				[-2.04]		[-1.85]	[-1.91]
Regional development					-0.004***	-0.004***	-0.004***
					[-3.69]	[-3.24]	[-3.20]
Constant	-0.329***	-0.333***	-0.274***	-0.348***	-0.303***	-0.256***	-0.262***
	[-7.61]	[-7.68]	[-6.81]	[-7.70]	[-6.91]	[-5.93]	[-5.69]
Industry FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y
Industry-year FE	N	N	N	N	N	N	Y
R^2	0.697	0.697	0.705	0.702	0.701	0.711	0.715
N	18936	18936	18936	17499	17827	16480	16480

Table 9: Critical Mass versus Cooperation

This table presents regression results examining the critical mass argument. A set of dummy variables are created to indicate that the number of female (executive/independent) directors on board is 1, 2 or 3. For example, *Dummy_1 female director* is a dummy variable equal to 1 if there is one female director on the board, and 0 otherwise. The control variables in model 6 of Panel A of Table 6 are included in all regressions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Female directors

	ROA	Tobin's q
Female leadership	0.003*	-0.005*
	[1.75]	[-1.67]
Dummy_1 female director	0.003	0.007**
	[1.39]	[2.48]
Dummy_2 female directors	-0.001	0.008**
	[-0.45]	[2.06]
Dummy_3 female directors	0.002	0.009
	[0.60]	[1.61]
Controls	Y	Y
Industry FE	Y	Y
Year FE	Y	Y
R^2	0.101	0.711
N	16563	16480

Panel B: Female executive/independent directors

	ROA	Tobin's q
Female leadership	0.004**	-0.006*
	[2.05]	[-1.84]
Dummy_1 female executive director	-0.002	0.007**
	[-1.06]	[2.12]
Dummy_2 female executive directors	-0.005	0.010**
	[-1.64]	[1.99]
Dummy_3 female executive directors	-0.010*	0.013*
	[-1.87]	[1.68]
Dummy_1 female independent director	0.003	0.003
	[1.42]	[0.80]
Dummy_2 female independent directors	0.010***	-0.003
	[3.05]	[-0.59]
Dummy_3 female independent directors	-0.000	-0.022*
	[-0.04]	[-1.87]
Controls	Y	Y
Industry FE	Y	Y
Year FE	Y	Y
R^2	0.102	0.711
N	16563	16480

Table 10: Possibility of a Quadratic Term in the Interaction

This table presents regression results examining whether the interaction term between female leadership and female directors captures the effect of a quadratic term of percentage of female directors. We control for (%Female directors)^2 in Panel A and both (%Female executive directors)^2 and (%Female independent directors)^2 in Panel B. The control variables in model 6 of Panel A of Table 6 are included in all regressions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Female directors

	ROA	Tobin's q
Female leadership	-0.002	0.000
	[-0.63]	[0.10]
%Female directors	-0.003	0.018
	[-0.19]	[0.79]
Female leadership × %Female directors	0.041**	-0.052**
	[2.18]	[-2.05]
(%Female directors)^2	-0.036	0.043
	[-0.71]	[0.63]
Controls	Y	Y
Industry FE	Y	Y
Year FE	Y	Y
R^2	0.101	0.743
N	16563	16480

Panel B: Female executive/independent directors

	ROA	Tobin's q
Female leadership	-0.001	-0.001
	[-0.38]	[-0.15]
%Female executive directors	-0.046*	0.054*
	[-1.94]	[1.67]
%Female independent directors	0.040	0.013
	[1.47]	[0.33]
Female leadership × %Female executive directors	0.052**	-0.051*
	[2.32]	[-1.72]
Female leadership × %Female independent directors	0.024	-0.044
	[0.98]	[-1.11]
(%Female executive directors)^2	0.024	-0.022
	[0.28]	[-0.19]
(%Female independent directors)^2	-0.127	-0.024
	[-1.13]	[-0.14]
Controls	Y	Y
Industry FE	Y	Y
Year FE	Y	Y
R^2	0.102	0.743
N	16563	16480

Table 11: Female Interaction versus Male Interaction

This table presents regression results for the impact of female interaction on firm performance while controlling for male interaction. *Female Leadership* is a dummy variable which is equal to 1 if a firm has a female CEO or CFO, and 0 otherwise. *Male Leadership* is a dummy variable which is equal to 1 if both CEO and CFO in the firm are male, and 0 otherwise. *High female representation on board* is a dummy variable which is equal to 1 if the percentage of female directors in a firm is no less than the 75th percentile of the sample, and 0 otherwise. *High male representation on board* is a dummy variable which is equal to 1 if the percentage of male directors in a firm is no less than the 75th percentile of the sample, and 0 otherwise. The control variables in model 6 of Panel A of Table 6 are included in all regressions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable =	ROA			Tobin's q		
	(1)	(2)	(3)	(4)	(5)	(6)
Female leadership	-0.000	0.004	-0.002	0.000	-0.008**	0.001
	[-0.06]	[1.64]	[-0.66]	[0.06]	[-2.42]	[0.24]
High female representation on board	-0.005**		-0.007***	0.009***		0.010**
	[-2.07]		[-2.64]	[2.61]		[2.54]
Female leadership × High female representation on board	0.011***		0.013***	-0.018***		-0.019***
	[2.74]		[2.94]	[-3.36]		[-3.06]
High male representation on board		-0.003	0.000		0.004	-0.002
		[-0.87]	[0.01]		[0.75]	[-0.28]
Male leadership × High male representation on board		0.002	-0.004		-0.007	0.002
		[0.50]	[-0.80]		[-1.18]	[0.33]
Controls	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
R^2	0.101	0.100	0.101	0.743	0.743	0.743
N	16563	16563	16563	16480	16480	16480

Table 12: Stock Market Reactions to Appointments of Female CEOs

This table presents stock market reactions to the announcements of female CEO appointments, conditional on the percentage of female directors on the board. The sample includes all appointments with gender transition. The dependent variable is CAR in a two- or three-day event window (day 0 is the appointment announcement date). The expected return used to compute the CAR comes from a market model with equal-weighted index return as the market return over an estimation window (–149,–23) (in trading days) prior to the appointment announcement date. *Female CEO appointment* is a dummy variable which is equal to 1 if the newly appointed CEO is female, and 0 otherwise. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Female directors	(1)	(2)	(3)	(4)
	CAR(0,1)	CAR(0,1)	CAR(-1,1)	CAR(-1,1)
Female CEO appointment	0.027*	0.027	0.009	0.011
	[1.69]	[1.59]	[1.19]	[1.30]
%Female directors	0.125**	0.135**	0.051**	0.052*
	[2.37]	[2.29]	[1.99]	[1.93]
Female CEO appointment × %Female directors	-0.173**	-0.167**	-0.062*	-0.066*
	[-2.22]	[-1.99]	[-1.72]	[-1.66]
Ln(Board size)	-0.023*	-0.025	-0.014**	-0.011
	[-1.82]	[-1.62]	[-2.05]	[-1.26]
%Independent director	-0.068	-0.087*	-0.039	-0.056*
	[-1.64]	[-1.77]	[-1.47]	[-1.80]
Ln(Management size)	0.018**	0.019**	0.006	0.004
	[2.51]	[2.09]	[1.40]	[0.66]
Leverage	0.015	0.018	-0.004	-0.003
	[1.24]	[1.30]	[-0.64]	[-0.42]
Ln(1+Sales growth)	-0.003	0.007	-0.002	0.003
	[-0.55]	[0.61]	[-0.70]	[0.37]
Ln(Assets)	0.002	0.001	0.002	0.003
	[0.64]	[0.38]	[1.38]	[1.25]
Ln(Firm age)	-0.005	-0.005	-0.002	-0.000
	[-1.08]	[-0.86]	[-0.72]	[-0.17]
Cash holding		0.003		0.011
		[0.12]		[0.71]
R&D		0.107		-1.223
		[0.03]		[-0.99]
Capital expenditure		0.041		0.013
		[0.59]		[0.41]
Government ownership		0.027		0.005
		[1.35]		[0.46]
Institutional ownership		-0.013		-0.006
		[-0.53]		[-0.42]
Managerial ownership		0.016		0.028
		[0.35]		[1.18]
Regional development		-0.000		-0.000
		[-0.06]		[-0.06]
Constant	-0.055	-0.049	-0.038	-0.052
	[-0.82]	[-0.68]	[-0.92]	[-1.21]
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
R^2	0.141	0.178	0.127	0.163
N	248	207	248	207

Panel B: Female executive/independent directors	(1) CAR(0,1)	(2) CAR(0,1)	(3) CAR(-1,1)	(4) CAR(-1,1)
Female CEO appointment	0.027*	0.030*	0.010	0.013
	[1.74]	[1.77]	[1.24]	[1.52]
%Female executive directors	0.125**	0.139**	0.053*	0.057*
	[2.48]	[2.48]	[1.84]	[1.86]
%Female independent directors	0.125	0.119	0.046	0.036
	[1.26]	[1.04]	[1.09]	[0.80]
Female CEO appointment × %Female executive directors	-0.175**	-0.206**	-0.071*	-0.097**
	[-2.31]	[-2.37]	[-1.73]	[-2.13]
Female CEO appointment × %Female independent directors	-0.171	-0.110	-0.047	-0.019
	[-1.24]	[-0.71]	[-0.76]	[-0.27]
Ln(Board size)	-0.023*	-0.026	-0.014**	-0.012
	[-1.81]	[-1.65]	[-2.06]	[-1.34]
%Independent director	-0.068	-0.084	-0.038	-0.054*
	[-1.56]	[-1.65]	[-1.40]	[-1.72]
Ln(Management size)	0.018**	0.019**	0.006	0.004
	[2.51]	[2.10]	[1.39]	[0.70]
Leverage	0.015	0.018	-0.004	-0.003
	[1.20]	[1.33]	[-0.60]	[-0.35]
Ln(1+Sales growth)	-0.003	0.008	-0.002	0.003
	[-0.55]	[0.70]	[-0.68]	[0.48]
Ln(Assets)	0.002	0.002	0.002	0.003
	[0.64]	[0.48]	[1.40]	[1.35]
Ln(Firm age)	-0.005	-0.005	-0.002	-0.000
	[-1.10]	[-0.85]	[-0.70]	[-0.14]
Cash holding		0.001		0.009
		[0.05]		[0.60]
R&D		0.262		-1.133
		[0.06]		[-0.89]
Capital expenditure		0.038		0.011
		[0.56]		[0.35]
Government ownership		0.027		0.005
		[1.33]		[0.44]
Institutional ownership		-0.011		-0.005
		[-0.46]		[-0.33]
Managerial ownership		0.020		0.031
		[0.42]		[1.30]
Regional development		0.000		0.000
		[0.09]		[0.12]
Constant	-0.056	-0.055	-0.040	-0.057
	[-0.82]	[-0.78]	[-0.97]	[-1.31]
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
R^2	0.141	0.182	0.128	0.170
N	248	207	248	207

Table 13: Controlling for Earnings Management

This table presents regression results for the impact of female interaction on firm performance while controlling for earnings management. *Earnings management* is the sum of the absolute value of discretionary accruals over the previous three years, where discretionary accruals are calculated based on the modified Jones model (Dechow et al., 1995). See Table A1 for variable definitions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Female directors

	ROA	Tobin's q
Earnings management	0.018***	-0.049***
	[6.96]	[-4.41]
Female leadership	0.000	-0.001
	[0.08]	[-0.38]
%Female directors	-0.007	0.034**
	[-0.65]	[2.15]
Female leadership × %Female directors	0.022	-0.040*
	[1.35]	[-1.83]
Ln(Board size)	-0.002	0.002
	[-0.47]	[0.29]
%Independent director	0.001	-0.016
	[0.05]	[-1.21]
Ln(Management size)	-0.005*	0.008**
	[-1.81]	[2.18]
Leverage	-0.007	0.834***
	[-1.16]	[59.08]
Ln(1+Sales growth)	0.023***	-0.010
	[7.42]	[-1.16]
Ln(Assets)	0.006***	0.008***
	[5.03]	[4.69]
Ln(Firm age)	-0.001	-0.008***
	[-0.37]	[-4.62]
Cash holding	0.088***	-0.100***
	[8.81]	[-4.93]
R&D	0.005	0.054
	[0.05]	[0.47]
Capital expenditure	0.104***	0.010
	[7.69]	[0.45]
Government ownership	0.010**	-0.021***
	[2.22]	[-3.27]
Institutional ownership	0.030***	0.001
	[6.09]	[0.19]
Managerial ownership	0.032***	-0.017
	[2.71]	[-1.41]
Regional development	0.003***	-0.002***
	[5.61]	[-3.14]
Constant	-0.101***	-0.048
	[-4.18]	[-1.61]
Industry FE	Y	Y
Year FE	Y	Y
R^2	0.112	0.748
N	15691	15620

Panel B: Female executive/independent directors

	ROA	Tobin's q
Earnings management	0.018***	-0.049***
	[6.95]	[-4.41]
Female leadership	0.000	-0.002
	[0.15]	[-0.43]
%Female executive directors	-0.031**	0.051***
	[-2.13]	[2.58]
%Female independent directors	0.020	0.014
	[1.27]	[0.60]
Female leadership × %Female executive directors	0.038*	-0.045
	[1.75]	[-1.64]
Female leadership × %Female independent directors	0.007	-0.039
	[0.30]	[-1.00]
Ln(Board size)	-0.001	0.002
	[-0.34]	[0.23]
%Independent director	-0.002	-0.015
	[-0.13]	[-1.08]
Ln(Management size)	-0.005*	0.008**
	[-1.82]	[2.19]
Leverage	-0.007	0.834***
	[-1.14]	[59.15]
Ln(1+Sales growth)	0.023***	-0.010
	[7.45]	[-1.16]
Ln(Assets)	0.006***	0.008***
	[5.02]	[4.71]
Ln(Firm age)	-0.001	-0.008***
	[-0.44]	[-4.53]
Cash holding	0.088***	-0.100***
	[8.84]	[-4.95]
R&D	0.002	0.057
	[0.02]	[0.49]
Capital expenditure	0.103***	0.011
	[7.60]	[0.48]
Government ownership	0.010**	-0.021***
	[2.23]	[-3.28]
Institutional ownership	0.030***	0.001
	[6.12]	[0.17]
Managerial ownership	0.032***	-0.017
	[2.70]	[-1.41]
Regional development	0.003***	-0.002***
	[5.76]	[-3.23]
Constant	-0.102***	-0.048
	[-4.22]	[-1.59]
Industry FE	Y	Y
Year FE	Y	Y
R^2	0.113	0.748
N	15691	15620

Table 14: Female Interaction and Earnings Management

This table presents regression results for the impact of female interaction on earnings management. *Earnings management* is the sum of the absolute value of discretionary accruals over the previous three years, where discretionary accruals are calculated based on the modified Jones model (Dechow et al., 1995). See Table A1 for variable definitions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Female directors	
	Earnings management
Female leadership	-0.017
	[-1.05]
%Female directors	-0.095**
	[-2.27]
Female leadership × %Female directors	0.206*
	[1.73]
Ln(Board size)	0.001
	[0.07]
%Independent director	0.051
	[0.94]
Ln(Management size)	-0.031
	[-1.48]
Leverage	0.360***
	[2.99]
Ln(1+Sales growth)	-0.022
	[-1.40]
Ln(Assets)	-0.060***
	[-5.10]
Ln(Firm age)	0.005
	[0.88]
Cash holding	0.099**
	[2.21]
R&D	-0.297
	[-0.40]
Capital expenditure	0.251***
	[2.95]
Government ownership	0.036***
	[2.88]
Institutional ownership	-0.005
	[-0.23]
Managerial ownership	-0.066**
	[-2.08]
Regional development	0.000
	[0.14]
Constant	1.217***
	[5.10]
Industry FE	Y
Year FE	Y
R^2	0.094
N	15691

Panel B: Female executive/independent directors	
	Earnings management
Female leadership	-0.017
	[-1.05]
%Female executive directors	-0.112*
	[-1.78]
%Female independent directors	-0.075*
	[-1.85]
Female leadership × %Female executive directors	0.212*
	[1.75]
Female leadership × %Female independent directors	0.205
	[1.36]
Ln(Board size)	0.002
	[0.10]
%Independent director	0.049
	[0.92]
Ln(Management size)	-0.031
	[-1.48]
Leverage	0.360***
	[2.99]
Ln(1+Sales growth)	-0.022
	[-1.40]
Ln(Assets)	-0.060***
	[-5.10]
Ln(Firm age)	0.005
	[0.85]
Cash holding	0.099**
	[2.22]
R&D	-0.300
	[-0.41]
Capital expenditure	0.250***
	[2.96]
Government ownership	0.036***
	[2.88]
Institutional ownership	-0.005
	[-0.23]
Managerial ownership	-0.066**
	[-2.07]
Regional development	0.000
	[0.18]
Constant	1.216***
	[5.11]
Industry FE	Y
Year FE	Y
R^2	0.094
N	15691

Table 15: Female Interaction and the Pressure on Women to Perform

This table presents regression results examining whether the pressure on women to perform affects the impact of female interaction on firm performance. *Female leadership* is decomposed into *Female leadership_New* and *Female leadership_Old*. *Female leadership_New* is a dummy variable which is equal to 1 if a female CEO/CFO is newly appointed in a given year, and 0 otherwise. *Female leadership_Old* is a dummy variable which is equal to if female leadership is equal to 1 and there are no appointments of female leaders in the given year, and 0 otherwise. *Earnings management* is the sum of the absolute value of discretionary accruals over the previous three years, where discretionary accruals are calculated based on the modified Jones model (Dechow et al., 1995). See Table A1 for variable definitions. Cluster-robust t statistics are reported in brackets. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) ROA	(2) Tobin's q	(3) Earnings management
Female leadership_*New*	-0.011*	0.011	-0.010
	[-1.91]	[0.78]	[-1.03]
Female leadership_*Old*	0.001	-0.003	-0.003
	[0.19]	[-0.78]	[-0.59]
%Female directors	-0.014	0.030*	-0.014
	[-1.22]	[1.75]	[-0.79]
Female leadership_*New* × %Female directors	0.071**	-0.125*	0.135**
	[2.28]	[-1.75]	[2.55]
Female leadership_*Old* × %Female directors	0.029	-0.028	0.018
	[1.63]	[-1.22]	[0.75]
Ln(Board size)	-0.002	0.003	-0.002
	[-0.58]	[0.42]	[-0.37]
%Independent director	0.002	-0.009	-0.010
	[0.20]	[-0.66]	[-0.67]
Ln(Management size)	-0.005*	0.010**	-0.009**
	[-1.68]	[2.37]	[-2.39]
Leverage	-0.004	0.831***	0.091***
	[-0.74]	[59.60]	[11.74]
Ln(1+Sales growth)	0.026***	-0.013	-0.006
	[8.96]	[-1.54]	[-1.63]
Ln(Assets)	0.006***	0.009***	-0.025***
	[5.12]	[5.13]	[-15.53]
Ln(Firm age)	-0.001	-0.008***	0.000
	[-0.41]	[-4.66]	[0.10]
Cash holding	0.094***	-0.109***	-0.009
	[9.49]	[-5.38]	[-0.67]
R&D	-0.030	0.145	-0.626***
	[-0.26]	[1.16]	[-2.83]
Capital expenditure	0.112***	-0.017	0.061**
	[8.28]	[-0.71]	[2.36]
Government ownership	0.010**	-0.024***	0.006
	[2.21]	[-3.74]	[0.99]
Institutional ownership	0.025***	0.002	0.010
	[5.04]	[0.37]	[1.45]
Managerial ownership	0.031***	-0.018	-0.009
	[2.61]	[-1.45]	[-0.47]
Regional development	0.003***	-0.003***	-0.001
	[5.75]	[-3.15]	[-0.65]
Constant	-0.105***	-0.061**	0.605***
	[-4.41]	[-2.02]	[17.67]
Industry FE	Y	Y	Y
Year FE	Y	Y	Y
R^2	0.103	0.743	0.192
N	16545	16464	15674

Table A1: Variable Definitions

Variable	Definition
Firm performance:	
ROA	EBIT divided by total assets
Tobin's q	the ratio of a firm's market value to its book value of assets, where market value is book assets minus book common equity plus market value of equity
Female leadership:	
Female leadership	1 if a firm has a female CEO or CFO, and 0 otherwise
Board gender diversity:	
%Female directors	the percent of female directors on the board
%Female executive directors	the percent of female executive directors on the board
%Female independent directors	the percent of female independent directors on the board
Controls:	
Ln(Board size)	the natural logarithm of the number of directors on the board
%Independent directors	the percentage of independent directors on the board
Ln(Management size)	the natural logarithm of the number of top executives reported in CSMAR
Leverage	total debt divided by total assets
Ln(1+Sales growth)	the natural logarithm of one plus annual growth in total sales
Ln(Assets)	the natural logarithm of total assets
Ln(Firm age)	the natural logarithm of the number of years of stock listing
Cash holding	total cash divided by total assets
R&D	research and development expenses divided by total assets
Capital expenditure	capital expenditures divided by total assets
Government ownership	the percentage of shares held by government
Institutional ownership	the percentage of shares held by bank trusts, insurance companies, investment companies, independent investment advisors, pension funds, and other institutions
Managerial ownership	the percentage of shares held by top executives
Regional development	the provincial marketization index
Industry dummy	2-digit Global Industry Classification Standard (GICS) code

Figure 1

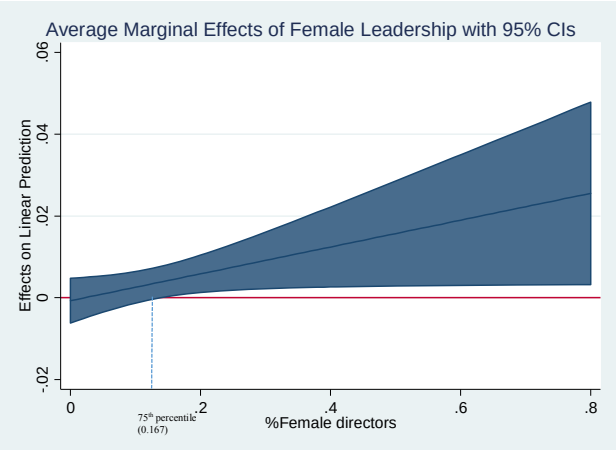

Figure 2

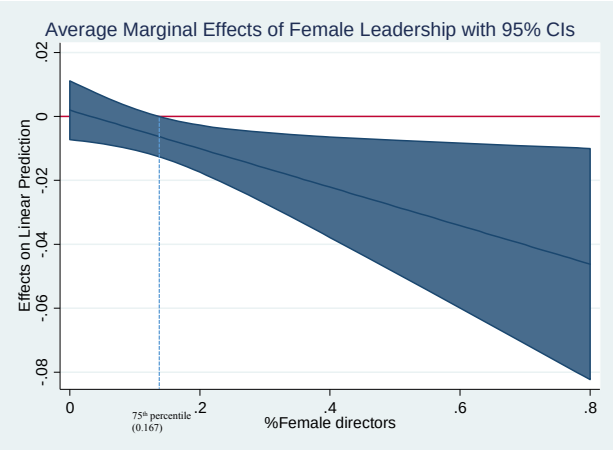

Figure 3

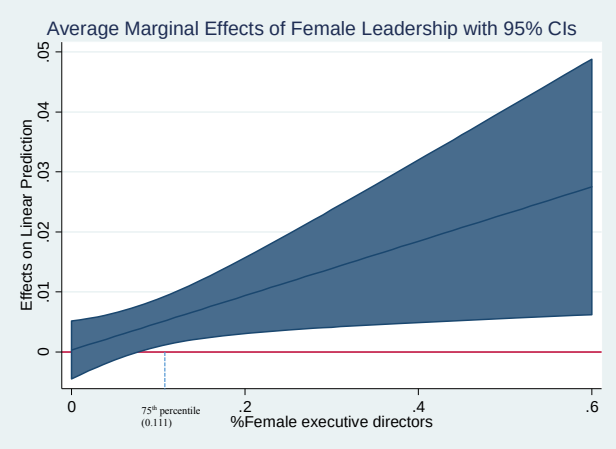

Figure 4

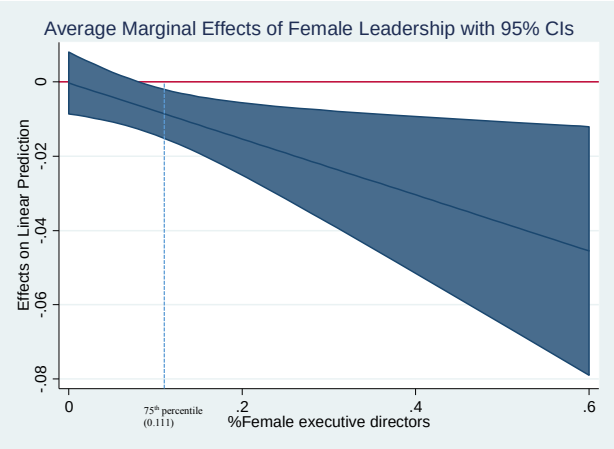

Figure 5

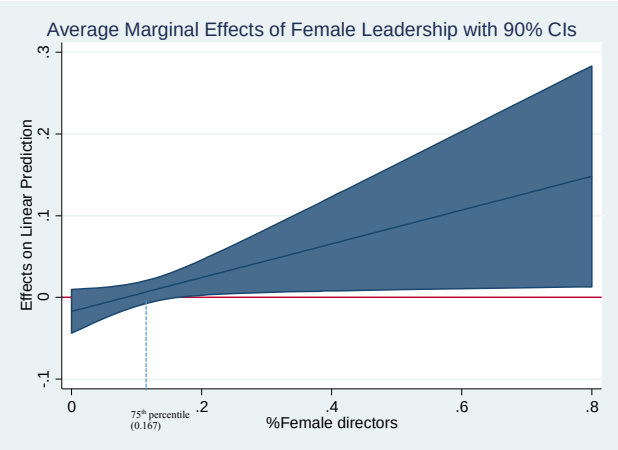
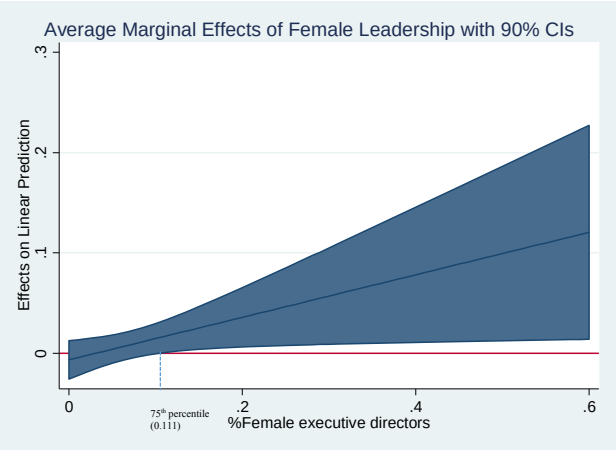
Figure 6