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Gender diversity as a CSR tool and financial performance in China

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Abstract: We utilize stakeholder, critical mass, and upper-echelon theories to investigate the effect of female representation on boards as corporate social responsibility (CSR) practices and firm performance of A-share listed companies in China. The indicators used were the proportion of female board members, the average age of female board members, the educational background of female directors, TOBIN Q, asset size, and leverage. We used fixed effects estimates and stationarity, stability, cointegration, and Hausman tests to analyze the data. We find that the proportion of female directors, the average age of female directors, and average educational level of female directors have a significant impact on CSR performance and financial performance, while CSR performance has a significant impact on financial performance. Given that emerging societies and their environments are usually the most susceptible to unethical corporate practices, our findings that female directors have a strategic role in enabling firms to manage their social responsibilities ethically and sustainable practices have important policy implications for regulators and stakeholders.

Subjects: Environmental Economics; Finance; Business, Management and Accounting

Keywords: Board diversity; CSR; stakeholder; upper-echelon theory; critical mass theory; gender socialisation theory

1. Introduction

The gradually increasing representation of female directors in Chinese listed companies over the past decade has unlocked the potential channels for CSR. The proliferation of listed private enterprises at approximately the same time may further promote this trend. Dutta and Bose (2007) believe that there are three reasons women serve on boards. First, women have a better sensitivity and understanding of the market than men, which will help the board of directors make more effective decisions. Second, an increase in board gender diversity enhances a company's social reputation. Organizational theory and signalling offer an additional foundation for our discussion of the relationship between board gender composition and corporate reputation. Broome and Krawiec (2008) suggest that the signalling rationale for board diversity is strongest under the conditions of a firm's reputation. Third, female directors have a better understanding of the business environment, and can provide companies with better decisions. Adams and Funk (2012) believe that women often pay more attention to quality, suggesting that an increase in the proportion of female directors may promote opportunities for companies to participate in CSR-

related activities. Therefore, a company with more senior female directors is in a more competitive position and achieves better social and financial performance. The gender diversity of the board of directors is seen as what stakeholders expect and has been used to manage stakeholder expectations (Hillman, 2007).

Several studies have shown that the impact of the expected behavior of the board of directors on an enterprise is related to its characteristics (Harjoto et al., 2015; Weisbach & Hermalin, 2003). They showed that different board compositions and characteristics have a positive impact on corporate social responsibility-related behavior. They further opined that the characteristics of the board of directors will have an impact on corporate decision-making, while further impacting corporate social responsibility, and financial performance, because these behaviors will ultimately affect costs or revenue. However, some studies show that there may be a negative correlation between women on the board of directors and corporate financial performance (Adams & Ferreira, 2009; Ahern & Dittmar, 2012b; Hambrick, 2007). Most finance literature has examined female directors' involvement in the board as a business case (Adams & Ferreira, 2009; Adams & Mehran, 2012; C. Liu, 2018; Cumming et al., 2015; Post & Byron, 2015; Rose, 2007). Some studies have proposed that gender-diverse boards often outperform non-diverse boards (Carter et al., 2003; Erhardt et al., 2003; Joecks et al., 2013; Y. Liu et al., 2014), have better governance (Adams & Ferreira, 2009), increase market valuation (K. Campbell & Minguez-Vera, 2007) and reduce agency problems (Ain et al., 2020). Gender socialization theory suggests that females are more caring, socially concerned, and expressive (A. H. Eagly & Crowley, 1986; Carlson, 1972; Gilligan, 1977). McGuinness et al. (2017) explained that these qualities help female directors and executives manage their relationships with stakeholders. On the other hand, female directors provide diverse opinions in the boardroom, and due to diversity in discussions, the dynamics of the board are enhanced, which improves decision-making (Erhardt et al., 2003; Gul et al., 2011; Miller & Triana, 2009; Zahra & Pearce, 1989). These studies suggest that board gender diversity helps in making reasonable decisions and increases shareholders' propensity to promote their interests by considering agency challenges.

The Chinese Corporate Governance Code seldom refers to diversity, generally, or gender diversity in boardrooms. Despite rising legislation on gender worldwide to increase female participation on corporate boards and research revealing positive business cases for female directors, China still lacks any gender quotas in place (Nadeem, 2019). This may be the reason China in comparison with many Asian-Pacific countries is lagging in terms of female representation on corporate boards (Nadeem et al., 2017). Additionally, in the study conducted by Khaw et al. (2016), it was revealed that 39.17% of the sampled Chinese firms did not have a single female director. They termed this an outright case of male dominance in boardroom. This may be a consequence of the lack of reference to diversity as a desirable quality in the corporate governance code issued by the China Securities Regulatory Commission (Farag & Mallin, 2016). Nonetheless, contemporary empirical studies in China have reported positive business implications for board gender diversity (Farag & Mallin, 2016; Khaw et al., 2016; Y. Liu et al., 2014). The positive impact of the inclusion of female members on companies' boards of directors is not generally recognized in management literature (Adams & Ferreira, 2009; Gregory-Smith et al., 2014). Some studies argue that the appointment of female directors in response to government supervision and social pressure is implausible (Adams & Ferreira, 2009). Moreover, the relationship between CSR and financial performance remains inconsistent.

This study examines whether board gender diversity as a CSR practice affects the performance of listed Chinese firms. To address this question, we integrate stakeholder, critical mass, and upper echelons theories to develop a model that identifies the social and organizational factors that impact CSR practices. The concepts of feminist ethics of care, stakeholder dialogue, and stakeholder partnership have become mainstream concepts in the field of CSR (Yang & Rivers, 2009) and We contribute to the literature by integrating stakeholder, critical mass, and upper-echelon perspectives into CSR strategy adoption for Chinese listed firms.

We utilize fixed- and random-effect panel estimates to investigate the relationships between female directors and their qualifications, CSR performance, and financial performance of A-share listed companies in China.

The subsequent sections of this study are structured as follows. Section 2 discusses the conceptual underpinnings of the research. This includes the definitions of CSR, women on the board, female directors, CSR, financial performance, female directors, and financial performance. Section 3 discusses the methods and the context of this study. The statistical estimates employed are presented in Section 4. Section 5 presents a summary of the empirical findings, while Section 2 summarizes the research and highlights the key findings and contributions.

2. Conceptual development

2.1. CSR

For the purposes of this research, we define CSR as a strategy that places a premium on a company's efforts to make a profit, while also promoting positive social impacts through its policies and practices. Bowen (1953) published the landmark "social responsibility of business" and defined social responsibility for businessmen in the book: "Businesspeople should fulfill their obligations to society. Their implementation of policies, decisions, and actions should promote the values and goals." As a result, he is known as "the father of CSR." There has been an increase in concepts and literature related to corporate social responsibility. Garriga and Melé (2004) suggested that defining corporate social responsibility is always a difficult task. Thus far, CSR has gone beyond the scope of law, and scholars state that it is a comprehensive responsibility rather than an obligation. Frederick (1987) believes that the basic idea of CSR is that enterprises regard social improvement as a responsibility, which is also correct and ethical. In 1991, Carroll proposed the "Corporate Social Responsibility pyramid theory, which conceptualizes the management of organizational stakeholders based on moral reasons. She suggested that corporate social responsibility is a pyramid, and the company abides by the law based on economic profitability, engages in ethical behavior and charitable behavior, and becomes a good corporate citizen (Carroll, 2016). Regardless of whether it is for individuals or enterprises, the law can be seen as the bottom line, and if the company wants to develop a higher position and become more competitive, it must take a long-term perspective, supplemented by moral responsibility (Kuźbik, 2016). In addition to the corporate social responsibility pyramid theory proposed by Carroll, stakeholder theory also provides a clear explanation that managers need to meet the needs of members affected by the company's results because CSR is a multi-actor concept with inherent stakeholder-driven benefits. Stakeholder theory has been widely used in CSR (Bilan, 2014; Donaldson & Preston, 1995; Freeman, 1984, 1984; Garriga & Melé, 2004; Hah & Freeman, 2014; Jamali, 2008). When a company can meet the social expectations of stakeholders, they will be considered to have socially responsible behaviors, and they will also be able to continue to make profits in the future. Therefore, a company's activities in the local community, including investments, environmental practices, employee relations, maintaining employment levels, and economic capabilities, can be considered socially responsible.

Recently, CSR studies have focused on gender perspectives mainly in the direction of corporate philanthropy (Testa, 2012), including corporate social responsibility reports (Grosser & Moon, 2005), and under certain conditions, have studied the relationship with stakeholders (Grosser, 2009). Existing studies have mostly used traditional corporate governance theories (agency theory and resource dependence theory) and human capital theory to explain the influence of female directors on companies. However, the influence of these theories on the recognition of female directors is limited (Huse et al., 2010). Therefore, this study draws on stakeholder, critical mass, and upper echelons theories to conduct gender mainstreaming research on CSR.

2.2. Women on boards

The board of directors plays an important role in corporate strategy, including participation in CSR (Bernardi et al., 2009, 2009; Liao et al., 2016, 2016; N. A. Ibrahim & Angelidis, 1995). Specifically,

the quality and effectiveness of the report are the basis for demonstrating whether the board of directors is well represented.

Studies on female directors' representation are replete with international literature (Terjesen et al., 2016), but few studies have explored the impact of female directors on CSR and CSR reports (Rao & Tilt, 2016). Therefore, the presence of women on the board of directors is important, because it affects the level of information disclosure (Gul et al., 2011; Velte, 2019). The relationship between gender and business ethics has attracted considerable research attention. Several empirical studies have shown that women exhibit relatively higher levels of moral consciousness than men (Ahern & Dittmar, 2012b; Jamali, 2008; N. Ibrahim et al., 2009). Gender socialization theory suggests that many divisions of labor in society are based on gender. Gender socialization ethics opines that all types of male and female social behavior can be constructed in two extreme frames: males are personal, whereas females are public (A. Eagly & Johnson, 1990; Leckart et al., 1966). The upper echelons theory, as proposed by Freeman (1984), posits that the strategic choices of enterprises reflect the characteristics of decision-makers to a considerable extent. Upper echelons theory clearly points out the important role of the senior management team in the company's strategic management and emphasizes the use of observable managerial characteristics, including gender, age, and educational background, as important indicators for measuring and judging management preferences (Harrigan, 1981). The theory is not without criticism, as explained by Dubey et al. (2017), that it provides generalized qualities and traits of the top management team and fails to apply an individualized approach. Signalling theory is a theoretical underpinning worth noting for the expected relationship between board diversity and corporate reputation. The theory proposes information asymmetry and suggests that parties may relay, deliberately, pertinent but not readily obvious information through obvious signals that are meaningful to the other party. Therefore, the number of women on the board of a firm may serve as a signal to observers, signalling that the firm devotes attention to women and minorities and is, therefore, socially responsible. To address this point, an analysis of the annual reports of Fortune 500 companies revealed that companies with a higher proportion of female directors are more likely to exhibit pictures of them in their annual reports (Bear et al., 2010; Bernardi et al., 2009).

2.3. Female directors and CSR

Over the past few years, research has been conducted on the impact of women on CSR as a whole and on certain aspects of CSR (Bear et al., 2010; Bernardi et al., 2009; Harjoto et al., 2015; ; Williams & O'Reilly, 1998).

The critical mass theory attempts to explain the proportion of female directors on boards as a means of achieving corporate environmental responsibility and has been studied by a number of scholars (Bear et al., 2010; Boulouta, 2013; Meng et al., 2012; Post et al., 2011; Yan, 2014). Yan (2014), Hafsi and Turgut (2013), Zhang et al. (2013) Conversely, other studies have revealed that female directors have no significant or negative influence on CSR performance (Post et al., 2011; Pérez & Rodríguez Del Bosque, 2013; Zhang et al., 2013)

2.4. CSR and financial performance

Research on the relationship between CSR and corporate financial performance has been replete with inconclusiveness (Katmon et al., 2019; Tang et al., 2012). Some researchers have found that CSR enhances enterprises' financial performance of the enterprise (Bear et al., 2010; Gul et al., 2011; Joecks et al., 2013; Ode Ichakpa et al., 2020; Preston & O'Bannon, 1997; Weisbach & Hermalin, 2003). Weisbach and Hermalin (2003) found that companies that disclose CSR accounting information within a certain range can increase corporate profits, whereas the passive performance of social responsibilities can have a negative effect on corporate financial performance. Pérez and Rodríguez Del Bosque (2013) used data from 162 banks worldwide from 2003 to 2009 and found that CSR and corporate financial performance are positively correlated. Gul et al. (2011) selected data from 138 manufacturing companies in Beijing from 2005 to 2009 as samples and divided financial performance into market performance and accounting performance from

shareholders, creditors, and the government to measure its impact on accounting performance and market performance. They concluded that CSR has a positive impact on financial performance. Bear et al. (2010) selected A-share listed companies in Shanghai and Shenzhen as samples, collected relevant data from 2006 to 2008, empirically studied the relationship between CSR and financial performance, and concluded that the two influence each other.

Other studies argue that CSR does not enhance firm performance (Friedman, 2007; (Yin, 2017) they believe that stakeholders have no justifiable business case to support CSR (Yin, 2017). Therefore, the government will intervene in state-owned enterprises (SOEs), leading to an increase in their CSR and a decrease in their financial performance.

2.5. Female directors and financial performance

Several studies reveal that gender diversity in boards can provide more diverse information, richer views, and solutions and enable more comprehensive and in-depth analysis of complex information, thereby improving the quality of decision-making (Carpenter, 2002). Qayyum et al. (2021) examined the role of board gender diversity in influencing stock price crash risk at the firm level in the Asia-Pacific markets. They found that the economic significance of this relationship is higher for firms with three or more female directors on the board than for firms with fewer than three female directors on the corporate board. Jebran et al. (2020) show how board diversity influences stock price crash risks. By classifying board diversity into relation-oriented diversity (gender and age) and task-oriented diversity (tenure and education), they find that greater diversity on the board can lower the risk of future stock crashes. Simons et al. (1999) found that the educational background of female directors has a significant positive effect on corporate financial performance. However, Keck (1997) shows that in some traditional industries, such as the concrete industry, corporate performance improves as the proportion of female board members decreases. Furthermore, in some emerging industries, such as the electronics technology industry, an increase in the proportion of female directors could drive corporate financial performance. Hu (2008) believes that the gender diversity of the board of directors can provide more information channels and information identification capabilities and that the diversity of individual team perceptions will promote the improvement of corporate financial performance by improving the quality of decision-making. It is worth emphasizing that there is an argument that the positive linearity between gender diversity and CSR is further strengthened by the educational qualifications of female directors (Smith et al., 2006). Hence, educational qualifications were one of the variables used in this study.

Boone et al. (2004) concluded that the proportion of female directors in a company is negatively correlated with company performance. Ahern and Dittmar (2012b) also concluded that the constraint imposed by the quota of having female representation on boards caused a significant drop in the stock price at the announcement of the law and a large decline in Gul's et al. (2011) found an inverted U-shaped relationship between female directors and corporate performance; that is, when the proportion of female directors exceeded 20%, this positive influence disappeared. We adopt the critical mass theory of proportionate increase in women on companies' boards, already mentioned in several studies, as having a positive effect on corporate performance to formulate Hypothesis H1a. McGuinness et al. (2017) focused on carbon issues and the critical mass theory. The authors state that the representation of at least two female directors on the board increases participation in carbon disclosure projects. Based on critical mass theory and previous empirical studies, it is assumed that board gender diversity must form a critical mass that has a positive impact on CSR practices, such as carbon disclosure (Jebran et al., 2020).

Furthermore, we use upper echelon theory to reflect characteristics such as age and educational qualifications to formulate H1b and H1c. We intend to verify whether female directors' qualifications and their educational qualifications have a positive impact on CSR performance. Therefore, we propose the following hypothesis:

H1a. The proportion of female directors in a company positively affects its CSR.

H1b. The age of female directors in a company positively affects CSR.

H1c. The educational qualifications of female directors have a positive impact on CSR.

However, the extent to which companies understand how CSR can affect financial performance remains unclear. According to stakeholder theory, internal social capital formed by promoting CSR could enhance the trust of different stakeholders, thus increasing working efficiency and value creation (Jia, 2009). We propose H2 to test the stakeholder theory of corporate social responsibility. In this hypothesis, we use Tobin's Q as a proxy for firm performance because this measure reflects firm value rather than accounting profit. Therefore, we propose the following hypothesis:

H 2. CSR has a positive impact on the company's financial performance.

We combine the stakeholder and upper echelons theories to verify whether female directors' age and qualifications have a positive impact on corporate financial performance. Therefore, we propose the following hypotheses:

H3a. The proportion of female directors has a positive effect on a company's financial performance.

H3b. The age of female directors has a positive impact on a company's financial performance.

H3c. Female directors' educational background has a positive impact on a company's financial performance.

2.6. Research method

This study utilizes fixed effects and a random-effects estimate model to analyze the panel data. This model addresses the issue of unobserved heterogeneity in the Ordinary least square panel estimate. Additionally, the selected model allows for individual effects, which makes the estimation of the regression coefficients more accurate. To determine which estimate was appropriate, Hausman's specification test was adopted.

2.7. Model estimation

This study adopts three regression models to study the relationship between female directors, corporate financial performance, and corporate social responsibility based on the hypotheses formulated. The researcher assumed that the cross-sectional fixed effect was constant and developed the following regression models for the analysis:

$$\mathrm{CSR}_{i,t} = \alpha_0 + \alpha_1 FemaPro_{i,t} + \alpha_2 FemaAge_{i,t} + \alpha_3 FemaEdu_{i,t} + \alpha_4 \mathrm{Scale}_{i,t} + \alpha_5 \mathrm{BSize}_{i,t} + \alpha_6 \mathrm{Lev}_{i,t} + \alpha_7 \mathrm{STOCK}_{i,t} + \varepsilon \quad (1)$$

$$\mathrm{TOBINQ}_{i,t} = \beta_0 + \beta_1 CSR_{i,t} + \beta_2 \mathrm{Scale}_{i,t} + \beta_3 \mathrm{BSize}_{i,t} + \beta_4 \mathrm{Lev}_{i,t} + \beta_5 \mathrm{STOCK}_{i,t} + \varepsilon \quad (2)$$

$$\mathrm{TOBINQ}_{i,t} = \gamma_0 + \gamma_1 FemaPro_{i,t} + \gamma_2 FemaAge_{i,t} + \gamma_3 FemaEdu_{i,t} + \gamma_4 \mathrm{Scale}_{i,t} + \gamma_5 \mathrm{BSize}_{i,t} + \gamma_6 \mathrm{Lev}_{i,t} + \gamma_7 \mathrm{STOCK}_{i,t} + \varepsilon \quad (3)$$

CSR$_t$represents the CSR performance rating and is used as the dependent variable in Model 1 and independent variable in Model 2.

TOBINQ$_t$ can be regarded as the dependent variable and proxy variable for an enterprise's financial performance. This is expressed as the market value of a firm divided by the replacement value of its assets. Tobin's Q has been widely used in economics, finance, and strategy as

a performance measure (Morck et al., 1988; Waddock & GRAVES, 1997). This captures the value that the firm creates with its asset base. It captures the long-term value of a firm versus accounting metrics that are more short-term.

$FemaPro_t$ is a virtual value representing the proportion of female board members at time t.

$FemaAge_{i,t}$ represents the average age of female board members; and

$FemaEdu_{i,t}$ represents the average education level of female board members.

Scale$_t$ represents company size, calculated by the natural logarithm of the total assets of the enterprise at the end of year t, and the range of year t is from 2009 to 2018.

Based on prior studies, a wide range of firm characteristics deemed to affect CSR needs to be controlled for in this study (e.g., C. Liu, 2018; Harjoto et al., 2015; Katmon et al., 2019). The inclusion of these controls aims to assess the impact of board diversity on CSR. This study used BOARDSIZE and LEV as the control variables.

BSize$_t$ is the size of the board of directors that represents the company. This represents the number of directors on the board. Board size is a critical factor affecting CSR disclosure (Issa & Fang, 2019). The larger the board size of the firm, the more voluntary the information firms disclose (Esa & Ghazali, 2012). A board with more directors is expected to influence disclosure-related issues (Rahman & Bukair, 2013). Board size significantly influences companies' CSR information disclosure. Therefore, *BOARD SIZE* was positively associated with CSR.

Lev$_t$ is the financial leverage of the enterprise, that is, the debt-to-asset ratio, calculated by dividing total liabilities at the end of year t by total assets. The year, t, ranged from 2009 to 2018. can be represented as firm risk, defined as the ratio of total debt to assets. *LEV* is closely linked to a firm's *ROA*. Companies with a high gearing ratio can even affect the interests of their shareholders, thus causing the company to fail to meet its corporate social responsibility obligations or even act in a socially irresponsible manner for the sake of profit (J. L. Campbell, 2007). *LEV* has also become an obstacle for firms' CSR activities. Thus, *LEV* is associated with CSR.

ε is a random interference term (error term) that describes the model specification error.

2.8. The sample

The sample comprises all Chinese A-shares (these stocks are subscribed and traded in renminbi, which distinguishes them from B-shares subscribed and traded in foreign currencies) listed companies that disclosed social responsibility reports from 2009 to 2018. There are 570 companies observed in the study, and data were obtained from Rakins CSR Ratings (RKS), an authoritative third-party rating agency in China, the CSMAR database, and companies' official websites. Researchers commonly use CSR indices such as KLD scores (Harjoto et al., 2015). Data were obtained from the China Security Market and Accounting Research (CSMAR) database and evaluation reports published by the Rankins CSR Ratings (RKS) agency. CSMAR and RKS have different focuses but have common points in the basic information on CSR reporting. In this study, we used both data sources because of the accuracy of the data. As one of the earliest professional CSR rating agencies in China, RKS began to evaluate all CSR reports disclosed by listed Chinese companies in 2008, whereas CSMAR started collecting information related to CSR reports relatively late and its early CSR data were collected retrospectively. Another reason is the availability of data compared with other sources (Wu and Habek).

2.9. Descriptive analysis

The descriptive results of dependent variables and independent variables are as follows:

Table 1 shows that the mean, median, and maximum of Tobin's Q are 1.753795, 1.38149, and 9.614131, respectively, which are greater than 1. This means that some companies may issue less stock and purchase more goods, thereby increasing the investment cost. While the minimum Tobin's Q is 0.191545, some companies need to purchase other old capital goods to obtain capital so that investment expenditure will be reduced. The standard deviation of Tobin's Q is 1.109582, which is low, meaning that most companies have similar scores for Tobin's Q. Additionally, the mean, median, maximum, and minimum of CSR at 39.71992, 37.73241, 79.13311, and 16.62, respectively, indicating that some companies have achieved good CSR performance, while others have scored low. The mean, median, maximum, minimum, and standard deviations of the proportion of female directors are 0.175654, 0.125, 0.666667, 0, and 0.145325, respectively, indicating that the proportion of female directors on the board is not high and may be dominated by male directors for most companies. For the age of female directors, the mean number, median, maximum, minimum, and standard deviation were 42.45294, 49.2, 70, 30, and 20.24035, respectively, showing an existing gap between these companies and that most female directors were mature. For female directors' education level, most are well-educated, and there is no significant gap between them, as the mean and standard deviation are 3.057668 and 1.627156, respectively. The scale has mean, median, maximum, minimum, and standard deviation values of 23.60201, 23.51572, 28.09821, 20.2482, and 1.510415, respectively, indicating that the selected companies have similar scales, which could increase the reliability of the results. A similar situation exists for board size, with mean and standard deviations of 2.277895 and 0.250211, respectively. The leverage ratio, maximum, minimum, and standard deviation are 0.87189, 0.060306, and 0.203407, respectively, indicating a significant gap between the selected companies. The higher the leverage ratio, the greater the company's assets through debt financing, and the greater the risk. For most Chinese companies, this ratio should be maintained at 40%–60%. Stock has mean, maximum, and minimum values of 0.36659, 0.7584, and 0.068, respectively, which means that companies with higher shareholding ratios tend to have a level of dominance and are prone to infringement of the rights and interests of other stakeholders. However, there are other companies with low shareholding ratios, which may be due to control dispersion and may be greatly increased by operating costs.

2.10. Correlation matrix

To determine whether there was a correlation between the variables and to verify that the three models were feasible, a correlation test was conducted. Variables that could not meet the relevant requirements were eliminated. The correlation between variables was ascertained using the correlation coefficient shown below:

Table 1. Descriptive result of all variables

	N	Mean	Median	Max	Min	Sd
TOBIN Q	*5700*	*1.753795*	*1.38149*	*9.614131*	*0.191545*	*1.109582*
CSR	*5700*	*39.71992*	*37.73241*	*79.13311*	*16.62*	*12.11144*
FEMAPRO	*5700*	*0.175654*	*0.125*	*0.666667*	*0*	*0.145325*
FEMAAGE	*5700*	*42.45294*	*49.2*	*70*	*30*	*20.24035*
FEMAEDU	*5700*	*3.057668*	*3.333333*	*5*	*1*	*1.627156*
SCALE	*5700*	*23.60201*	*23.51572*	*28.09821*	*20.2482*	*1.510415*
BSIZE	*5700*	*2.277895*	*2.197225*	*2.890372*	*1.609438*	*0.250211*
LEV	*5700*	*0.512371*	*0.549214*	*0.87189*	*0.060306*	*0.203407*
STOCK	*5700*	*0.36659*	*0.33765*	*0.7584*	*0.068*	*0.158023*

The results of Table 2, show that the correlation coefficients between TOBINQ and CSR, FEMAPRO, FEMAAGE, FEMAEDU, SCALE, BSIZE, LEV and STOCK show fairly strong and positive associations. The correlation coefficients between CSR and FEMAPRO, FEMAAGE, FEMAEDU, SCALE, BSIZE, LEV, STOCK all show results strong positive results, indicating the proportion of female directors and the mean age of female directors, female directors' education, company size, board size, leverage ratio, shareholding ratio of the largest shareholder, and corporate social responsibility are related. It can be determined that Model 1 is feasible. We applied Variance Inflation Factor (VIF), to test for multicollinearity. The results were less than 10 which show that the correlation results do not have multicollinearity issues.

2.11. Stability test

Stationarity tests can be divided into two forms: broad and strict. The division of the two forms of stationarity is realized according to the requirements of statistics. Determining whether the sequence is stable or otherwise requires the use of wide stationarity is based on an analysis of the stationarity of the low-order moments of the sequence. If the analysis result is stable, the second order must be selected. In this case, wide stationarity is deemed stable based on the balance of the sequence. From the perspective of strict stability, to determine if all statistics are stable, the key point is to observe whether all statistics are consistent at different times. If they are consistent, they are stable, and if they are inconsistent, they are unstable.

To achieve accuracy in the test, the stability of panel data was tested using the Lagrange Multiplier (LM), Pesaran, Augmented Dickey-Fulley (ADF), and Phillips Phillips–PP (Phillips-Perron) tests (Ringlerova, 2019). In this study, the EViews statistical software was used to perform accurate tests. The specific results of the stationarity test for all variables are presented in the following table.

From the above results, the absolute values of TobinQ, CSR, FEMAAGE, Scale, and LEV under LM, Pesaran test, ADF test, and PP test are all greater than the critical value at the 95% confidence level, and the *P* values are all less than 0.05, which indicates that TobinQ, CSR, FEMAAGE, Scale, Lev original sequences all pass through IM, Pesaran test, ADF test, and PP test, that is, TobinQ, CSR, FEMAAGE, Scale, and LEV, were all stable. The absolute values of FEMAEDU's statistics under the LM, Pesaran test, and ADF test were all greater than the critical value at a confidence level of 95%, and the p-values were all less than 0.05, indicating that the original FEMAEDU sequence passed the IM, Pesaran test, and ADF test. However, the absolute value of the statistics of FEMAEDU under the PP test was less than the critical value at a confidence level of 95%, the p-value was greater than 0.05, and the original FEMAEDU sequence failed to pass the PP test. Overall, we still consider the original FEMAEDU sequence to be stationary.

The absolute values of the statistics of FEMAPRO, BSIZE, and Stock under IM, Pesaran test, ADF test, and PP test are all less than the critical value under a confidence level of 95%, and the p-values are greater than 0.05, which indicates that the original sequences of FEMAPRO, BSIZE, and Stock fail to pass the IM, Pesaran test, ADF test, and PP test; that is, FEMAPRO, BSIZE, and Stock original sequences are not stable. The absolute values of the statistics of FEMAPRO, BSIZE, and Stock under IM, Pesaran test, ADF test, and PP test are greater than the critical value at the 95% confidence level, and the P-values are less than 0.05, which indicates that FEMAPRO, BSIZE, and Stock sequences pass IM, Pesaran test, ADF test, and PP test, that is, FEMAPRO, BSIZE, Stock sequence is stable, and FEMAPRO, BSIZE, and Stock are first-order integers.

2.12. Cointegration test

Co-integration implies a common random trend. This is used to determine whether the linear combination of a group of nonstationary series has a stable equilibrium relationship. A special case of pseudo-regression is that the two-time series exhibit the same components. In this case, common trend correction regression was used to ensure reliability. Cointegration conveys a long-

Table 2. Correlation matrix

	TOBINQ	CSR	FEMAPRO	FEMAAGE	FEMAEDU	SCALE	BSIZE	LEV	STOCK
TOBINQ	1.0000								
CSR	0.8707	1.0000							
FEMAPRO	0.7601	0.9766	1.0000						
FEMAAGE	0.8603	0.9635	0.4035	1.0000					
FEMAEDU	0.7227	0.8932	0.3777	0.1437	1.0000				
SCALE	0.7614	0.9611	0.3622	0.0906	0.09878	1.0000			
BSIZE	0.6937	0.9204	0.1851	0.3332	0.28599	0.3231	1.0000		
LEV	0.6527	0.7915	0.2713	0.5178	0.3848	0.6187	0.2989	1.0000	
STOCK	0.7096	0.9629	0.1645	0.4740	0.4014	0.4742	0.2126	0.5258	1.0000

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Table 3. Stationarity test

Variable	Im, Pesaran test		ADF test		PP test	
	t-stat	p-value	t-stat	p-value	t-stat	p-value
TOBIN Q	-7.94326***	0.0000	271.141***	0.0000	246.593***	0.0000
CSR	-7.61054***	0.0000	258.745***	0.0000	252.546***	0.0000
FEMAPRO	-0.35404	0.3617	122.969	0.1539	104.711	0.5716
FEMAPRO (−1)	-9.90967***	0.0000	298.862***	0.0000	380.185***	0.0000
FEMAAGE	-7.36358***	0.0000	165.132***	0.0001	140.608***	0.0068
FEMAEDU	-11.9034***	0.0000	124.852***	0.0089	99.1696	0.1953
SCALE	-1.96198**	0.0249	190.023***	0.0000	322.743***	0.0000
BSIZE	2.32443	0.9899	50.3681	0.8548	61.5447	0.4924
BSIZE (−1)	-10.5339***	0.0000	222.564***	0.0000	181.407***	0.0000
LEV	-4.19438***	0.0000	194.343***	0.0000	211.681***	0.0000
STOCK	2.06207	0.9804	103.666	0.5460	114.824	0.2626
STOCK (−1)	-11.8692***	0.0000	279.741***	0.0000	302.444***	0.0000

*, ** and *** represent significance levels in statistics of 10%, 5% and 1% respectively

Notes: In table 4 above, FEMAPRO (−1), BSIZE (−1), and STOCK (−1) represent first-order variables with a 95% confidence delay.

term equilibrium relationship if a reliable link is found between several variables that appear to exhibit a single random trend.

From the above stationarity results, it can be determined that Tobin's Q, CSR, FEMAAGE, FEMAEDU, SCALE, and LEV are single integers of the same order. Therefore, it can be ascertained whether there is a cointegration relationship between Tobin's Q, CSR, FEMAAGE, FEMAEDU, SCALE, and LEV.

From Table 3, the model rejects the hypothesis that there is at most one cointegration relationship between CSR, FEMAAGE, FEMAEDU, SCALE, and LEV and that there is no cointegration relationship between CSR, FEMAAGE, FEMAEDU, Scale, and LEV. In other words, FEMAAGE, FEMAEDU, SCALE, and LEV have long-term equilibrium effects on CSR.

From Table 5, the model rejects the hypothesis that there is at most one cointegration relationship between Tobin's Q, CSR, SCALE, and LEV, and that there is no cointegration relationship between Tobin's Q, CSR, SCALE, and LEV. In other words, CSR, SCALE, and LEV have long-term equilibrium effects on Tobin's Q.

From Table 6, the model rejects the hypothesis that there is at most one cointegration relationship between Tobin's Q, FEMAAGE, FEMAEDU, SCALE, and LEV, and that there is no cointegration relationship between Tobin's Q, FEMAAGE, FEMAEDU, Scale, and LEV. In other words, FEMAAGE, FEMAEDU, SCALE, and LEV all have long-term equilibrium effects on Tobin's Q.

2.13. Hausman test

The Hausman test was used to determine whether the fixed-effects or random-effects model was selected. The original assumption is that the internal estimator (least squares dummy variable method) and generalized least squares (GLS) method are consistent, but the internal estimator is not effective. The Hausman test statistic obeys a chi-square distribution with K degrees of freedom.

Table 7 shows a Hausman test statistic of 17.981853 and an ad joint probability of 0.0121. We reject the original hypothesis that there are systematic differences between the fixed effects model and the random effects model, that is, Model 1 should establish a fixed effects model.

Table 8 shows a Hausman test statistic of 11.286618 and an adjoint probability of 0.0460. Therefore, we reject the original hypothesis that there is a systematic difference between the fixed effects model and the random effects model, that is, Model 2 should establish a fixed effects model.

It can be seen from Table 9 that the Hausman test statistic is 20.156076 and the adjoint probability is 0.0052. Therefore, we reject the original hypothesis that there is a systematic difference between the fixed-effects model and the random-effects model, which should also be established in Model 3.

In all three cases, the Hausman test suggests a fixed effect as the appropriate regression model. We use fixed effects to claim that gender diversity is an important component of corporate social responsibility (CSR) and has been related to a variety of positive outcomes for organizations, including higher innovation, better decision-making, and improved financial performance. We also propose that a fixed effects model be used to investigate the impact of the proportion of women on corporate boards on company financial performance while controlling for other time-invariant firm variables such as industry, size, and age. The model evaluates the influence of gender diversity changes on firm performance within each firm, while controlling for all other time-invariant factors that potentially affect the outcome variable.

2.14. Analysis of the influence of female directors, financial performance and CSR performance based on fixed effect model

2.14.1. The impact of female directors and qualification on corporate social responsibility performance

From table 10 above, the null hypothesis is rejected, which shows that FEMAPRO, FEMAAGE, FEMAEDU, SCALE, BSIZE, LEV, and STOCK significantly influence CSR. This is consistent with

Table 4. Cointegration test of model 1

Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	*(from trace test)*	*Prob.*	*(from max-eigen test)*	*Prob.*
None	*566.7*	*0.0000*	*542.1*	*0.0000*
At most 1	*199.5*	*0.0000*	*199.5*	*0.0000*

Table 5. Cointegration test of model 2

Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	*(from trace test)*	*Prob.*	*(from max-eigen test)*	*Prob.*
None	*627.4*	*0.0000*	*550.4*	*0.0000*
At most 1	*292.6*	*0.0000*	*292.6*	*0.0000*

Table 6. Cointegration test of model 3

Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	*(from trace test)*	*Prob.*	*(from max-eigen test)*	*Prob.*
None	*533.3*	*0.0000*	*460.2*	*0.0000*
At most 1	*283.2*	*0.0000*	*283.2*	*0.0000*

Table 7. Hausman test for model 1

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	*17.981853*	*7*	*0.0121*

Table 8. Hausman test for model 2

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	*11.286618*	*5*	*0.0460*

Hypotheses 1a, 1b, and 1c, and it could also verify the upper echelons theory that female directors and their qualifications impact CSR. A possible reason could be that the proportion of female directors is sufficiently high in the selected sample. However, if relevant CSR policies are introduced, female directors of different ages or educational levels may have different attitudes toward CSR performance.

2.14.2. Analysis of the influence of corporate social responsibility on corporate financial performance

From table 11 above, the null hypothesis is rejected based on Prob (F-statistic), which means that CSR, SCALE, BSIZE, LEV, and STOCK have significant effects on financial performance. The results largely support Hypothesis 2 and are consistent with the stakeholder theory. The coefficient of LEV was 0.113888, indicating that TOBIN Q increased by 0.113888 units for each LEV increase of one unit. The significance levels of the leverage ratio and Tobin's Q are not significantly high, which may be a result of companies having high debt-to-asset ratios becoming more likely to invest in activities related to social responsibility. From an accounting perspective, borrowed funds could have tax shield advantages (Kemsley & Nissim, 2002). Therefore, some companies in this study may be willing to invest in CSR activities to reduce tax liabilities.

2.14.3. Analysis on the influence of female directors on corporate financial performance

From table 12 above, the null hypothesis is rejected based on the Prob (F-statistic) above, which shows that FEMAPRO, FEMAAGE, FEMAEDU, SCALE, BSIZE, LEV, and STOCK are significant; in other words, FEMAPRO, FEMAAGE, and FEMAEDU have significant influences on corporate financial performance, which could largely support hypotheses 3a, 3b, and 3c. The significance level of FEMAAGE is very low, which means that the higher the mean age of female directors, the better is the company's financial performance. This may be because older directors have more stable and experienced personalities and can deal with emergencies quicker than younger directors.

3. Summary of empirical findings

From the analysis in the previous section, we find that the proportion of female directors, average age of female directors, and average educational level of female directors have a significant impact on CSR performance and financial performance, while CSR performance has a significant impact on financial performance.

Table 9. Hausman test for model 3

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	*20.156076*	*7*	*0.0052*

Table 10. Regression results of model 1

Dependent variable		CSR	
Independent variable	***Coefficient***	***t-stat***	***P-value***
C	*-133.8867****	*-9.247834*	*0.0000*
FEMAPRO	*0.346332***	*3.096645*	*0.0230*
FEMAAGE	*0.000773***	*3.024707*	*0.0303*
FEMAEDU	*0.223324***	*3.614533*	*0.0391*
SCALE	*8.333035****	*15.33218*	*0.0000*
BSIZE	*7.603490****	*3.013172*	*0.0027*
LEV	*11.52326****	*3.355121*	*0.0009*
STOCK	*1.186148***	*3.233443*	*0.0155*
R-squared	*0.792347*		
Adjusted R-squared	*0.766078*		
F-statistic	*30.16248*		
Prob(F-statistic)	*0.000000*		
Durbin-Watson stat	*2.018336*		

*, ** and *** represent significance levels in statistics of 10%, 5% and 1% respectively

Table 11. Regression results of model 2

Dependent variable		Tobin Q	
Independent variable	***Coefficient***	***t-stat***	***P-value***
C	*8.716344****	*4.865732*	*0.0000*
CSR	*0.001007***	*2.195703*	*0.0449*
SCALE	*0.361655****	*4.843032*	*0.0000*
BSIZE	*0.673533***	*2.391936*	*0.0171*
LEV	*0.113888***	*2.285350*	*0.0155*
STOCK	*0.161897***	*2.278845*	*0. 0105*
R-squared	*0.671639*		
Adjusted R-squared	*0.631579*		
F-statistic	*16.76581*		
Prob(F-statistic)	*0.000000*		
Durbin-Watson stat	*1.998522*		

*, ** and *** represent significance levels in statistics of 10%, 5% and 1% respectively

We also find that the proportion of female directors, average age of female directors, and average educational level of female directors have positive effects on corporate social responsibility performance and corporate financial performance. Additionally, the percentage of female directors in CSR performance is the largest, followed by the average education level of female directors, and finally the average age of female directors. The high proportion of female board members may indicate companies' commitments toward meeting the expectations of society, which improves corporate social responsibility by extension.

We also find that the percentage of female directors relative to corporate financial performance is the largest, followed by the education of female directors, and finally, the average age of female directors. This may mean that companies with female board members can expand their sources of information and provide a more comprehensive analysis of information to make better quality decisions. This result agrees with Singh and Vinnicombe (2004), who opined that having more women on the board may be

Table 12. Regression results of model 3

Dependent variable		**Tobin Q**	
Independent variable	***Coefficient***	***t-stat***	***P-value***
C	*8.662006****	*7.4232*	*0.0000*
FEMAPRO	*0.624029***	*3.1223*	*0.0223*
FEMAAGE	*0.000875****	*3.8061*	*0.0061*
FEMAEDU	*0.003191***	*3.9387*	*0.0387*
SCALE	*0.370609****	*3.0000*	*0.0000*
BSIZE	*0.755587****	*2.0084*	*0.0084*
LEV	*0.138189***	*5.7222*	*0.0222*
STOCK	*0.108782***	*2.8502*	*0.0102*
R-squared	*0.674141*		
Adjusted R-squared	*0.633570*		
F-statistic	*16.61619*		
Prob(F-statistic)	*0.000000*		
Durbin-Watson stat	*1.995662*		

*, ** and *** represent significance levels in statistics of 10%, 5% and 1% respectively

a consequence of having an innovative, current, and transparent enterprise in which all functions of the firm perform well. Female board members with higher degrees may provide unique insights.

The proportion of female directors, average age of female directors, and average degree of female directors affect corporate financial performance more than they affect corporate social responsibility performance. Simultaneously, female directors and their qualifications affect their financial performance relative to CSR.

4. Conclusion

This study investigated the relationship and influence between female directors and their qualifications, corporate financial performance, and corporate social responsibility. Gray (2006) believes that good corporate social responsibility performance does not mean that the organization is well managed. Some managers may focus on CSR performance and neglect corporate financial performance and vice versa. Therefore, stakeholders must use filters to evaluate the overall performance of a company and the credibility of its information. A strict corporate governance structure is an important condition for stakeholders in determining a company's performance. Therefore, the agency theory reflects the importance of the board of directors. Jo and Harjoto (2012) proposed that effective governance mechanisms affect CSR participation and whether they will have a positive impact on a company's financial performance. At the same time, having a diversified board of directors means the company's commitment to social responsibility and meeting the needs of stakeholders (Miller & Triana, 2009; Bear et al., 2010; Hafsi & Turgut, 2013; Liao et al., 2016).

We used panel data composed of 570 Chinese listed A-share companies, selected the performance data indicators of these companies from 2009 to 2018 as samples, established three models, and used the Hausman test and fixed effects to test the hypotheses.

Our empirical results show that the proportion of female directors has a positive impact on the improvement of corporate social responsibility performance, which supports critical mass theory. Our results also show that age and education level have positive impacts on the improvement of corporate social responsibility performance and financial performance, which supports the stakeholder and upper echelons theories. The role of female directors in promoting corporate social

responsibility has been discussed and confirmed by several scholars; that is, companies with more female directors are more socially responsible and willing to undertake corresponding behaviors. Fernandez-Feijoo et al., (2014) proved that gender diversity of the board of directors has a positive impact on CSR. Some scholars also believe that the interpretation of female board members and their qualifications that promote corporate social responsibility is a traditional concept that women are more sensitive and compassionate in moral terms.

Stakeholder, critical mass, and upper-echelon theories conceptually support this link (Freeman, 1984). Firms and stakeholders who maintain a positive connection can secure the resources needed for corporate financing. This study adds to the existing neopluralist research by providing empirical data on the favorable relationship between gender diversity as a CSR strategy and company success. This lends credence to the argument that corporations might use CSR disclosures to legitimize their activities and lessen stakeholder pressure. This study shows complementarities and substitutes between CEO's management skills and selected social traits in the promotion of social performance by female senior executives by investigating the impact of female leaders on firm performance. Furthermore, this study fills a gap in the literature on how board gender diversity affects social performance. While it is commonly assumed that women are more inclined to engage in socially responsible activities, this study's sensitive findings shed light on the brighter side of female CEOs when they gain high-level board positions.

5. Policy implications

In practice, the study emphasizes the need to build a critical mass of female leaders, as well as the combination of CEO managerial abilities and educational/professional backgrounds, to increase firm performance. These findings have significant ramifications for investors and regulators. If investors want to boost their performance, they demand more gender-diverse boards. Furthermore, by providing empirical evidence of superior social outcomes under leader gender diversity, this study helps regulators in their efforts to enhance senior women's quotas. The evidence from this study can also help organizations develop criteria for identifying CEOs who can support their strategic objectives. Although this study only focuses on data from the Chinese market, future research may also look at emerging and developed nations. There are also some real-life applications.

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No potential conflict of interest was reported by the authors.

Data availability statement
The data supporting the findings of this study are available from the corresponding author, I. O. I., upon reasonable request. Data were obtained from Rakins CSR Ratings (RKS), an authoritative third-party rating agency in China, the CSMAR database, and companies' official websites. The manuscript contains no associated data http://www.rksratings.cn/.

Correction
This article has been corrected with minor changes. These changes do not impact the academic content of the article.

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