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Unveiling the Role of Women Directors in Shaping Corporate ESG Performance: Evidence from China

Keru Li

Weiyang College, Tsinghua University, Beijing, China
likr22@mails.tsinghua.edu.cn

Abstract. This paper explores how female directors on board affect the environmental, social, and governance (ESG) performance of companies in China. Using stakeholder, gender socialization, and resource dependence theories, the study examines the relationship between women's board representation and overall ESG scores, as well as individual ESG pillars. Utilizing a sample of 1,520 Chinese listed companies from 2006 to 2023 and a panel data regression model with fixed effects, the results reveal a negative relationship. The study further explores the moderating effects of female directors' age and financial background, finding that older directors and those with more financial expertise have a less adverse impact on ESG scores. The findings offer nuanced insights into the complexities of boardroom gender composition and ESG, with implications for corporate governance and sustainability conducts in China. This study also contributes to the ongoing discussion about the role of women in shaping corporate social responsibility and environmental stewardship.

Keywords: ESG performance, board gender diversity, sustainability

1. Introduction

Environmental, social, and governance (ESG) factors are essential to assess the sustainability of organizations [1]. It focuses on companies' performances in non-financial facets, including its environmental impact, employees' treatment and communities' welfare, and governance within the corporation [2]. Besides, prior studies show that integrating ESG can improve risk management, enhance brand reputation, and stimulate solid employee satisfaction [1,3]. On this point, ESG has become an important consideration for investors, policymakers, and corporate leaders.

Directors play a critical role in corporate decision-making by overseeing management and guiding strategic direction [4]. In 2021, women held 22.6% of directorships in Fortune 500 companies, up from 17.2% in 2015 [5]. Although women's representation on boards in China remains low, studies found a notable increase in their representation [6]. This upward trend has spurred research into the influence of female executives on corporate ESG initiatives. The academic debate has yielded counteractive results. While some studies suggest that female directors are more socially conscious and environmentally aware, leading to stronger ESG initiatives, others indicate a more complex relationship.

Research highlights a gap in understanding how female directors impact individual ESG pillars and how personal traits, such as age and education, moderate this relationship [7]. Our study aims to

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bridge these gaps by addressing key questions: How does the inclusion of female directors affect corporate ESG performance and each pillar? Additionally, do their financial background and age moderate this relationship?

To find empirical support, we include 1520 listed companies on China's A-share market that issued ESG ratings from 2006 to 2023. We employed multiple regression models with control variables. To address endogeneity concerns, we use time and industry fixed-effect panel methods and lag regressors by one year. Various validation experiments, including placebo tests, changing our independent variable into a dummy variable, and instrumental variable analysis, confirm the robustness of our findings.

Our study makes several contributions that are stated as follows. Drawing on stakeholder [8], gender socialization [9], and resource dependence theory [10], this study builds upon the existing evidence of the relevance between female directors and ESG score and each of its pillars. However, our study identifies a negative relationship, contradicting the common notion that female directors promote ESG initiatives. Second, we reveal that older female directors with financial backgrounds have a less adverse effect on ESG scores. Lastly, conducted in the context of China over an 18-year time scope, our study provides regional and long-term insights.

The paper is organized to first review relevant literature, then present our conceptual framework and hypotheses, followed by data description, empirical modeling, and key findings. We conclude with robustness tests, along with suggestions for future research.

2. Literature review

2.1. The development of ESG and sustainability in the Chinese market

Integrating ESG in firms' strategy has become increasingly vital in the global business landscape [11], serving as key indicators of sustainability and risk preference. While ESG disclosure is linked to non-financial performance, growing evidence suggests that ESG performance can also enhance financial performance [12].

As the world's second-largest economy, China is increasingly adopting ESG practices due to regulatory pressure, heightened investor interest, and growing public awareness of sustainability [13]. The concept of sustainability in the Chinese market is an abstract jargon that emphasizes balancing financial and non-financial pursuits for stable development. Firms have begun to restructure business models to promote growth by incorporating ESG targets [14].

Corporate ESG is highly interconnected with sustainability in the Chinese market. Studies have found a direct correlation between ESG metrics and sustainability practices [15]. Strong ESG performance represents better environmental stewardship, social responsibility, and governance, promoting overall sustainability. Besides, a higher ESG score is linked to improved financial returns, leading top executives to rethink the interrelation between financial and non-financial profits [14].

2.2. Women's representation on Chinese corporate boards and ESG performance

Despite the burgeoning ESG market in China and the rising power of female leadership, female board membership remains low, at around 10% in 2018, compared to a global average of 15% [16]. Low female representation on Chinese boards stems from cultural and institutional factors. First, a male-dominated business culture suppresses female's voice in decision-making. Also, there is a lack of gender balance policies to ensure a minimum number of females. Recent efforts by the China Securities Regulatory Commission have issued guidelines encouraging female presence [16].

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Previous literature on board compositions and firm ESG employs various theoretical lenses. The Agency theory [17] proposes the misalignment of interests between managers and shareholders may lead to a supply-demand mismatch. The Stakeholder theory [8] expands the definition of stakeholders beyond employees, suppliers, local communities, and the environment. These theories support the idea that a diverse board can enhance firm performance.

Research on the relationship between female board representation and ESG manifestation in China has drawn a motley picture. Some studies indicate a positive relation, showing that increased female representation correlates with improved corporate social responsibility [18]. Conversely, others have reported contradicting results [19]. Moreover, female directors may face barriers in male-dominated boardrooms, leading to their roles being more symbolic than substantive, which reflects tokenism rather than genuine leadership [20].

2.3. Research gaps of existing literature

While existing literature has delivered substantial insights into ESG practices within the Chinese market, several areas need further exploration.

Firstly, most research relies on cross-sectional data, limiting the capture of the market's dynamic nature. Few employ longitudinal approaches to track changes in ESG performance over time, resulting in inconclusive long-term findings. Second, the focus has predominantly been on the overall ESG score, with limited examination of pillar-specific differences. Moreover, contextual factors, such as personal backgrounds and cultural norms, may shape and moderate this relationship. Lastly, endogeneity complicates the analysis, as the relationship is bidirectional—while women influence corporate ESG, varying levels of ESG performance may also attract female directors, complicating cause-and-effect conclusions.

3. Conceptual framework and hypothesis development

We explain women's behavior and ESG performance through various theories. Gender socialization theory and resource-dependent theory (RDT) indicate that women's collaborative and empathetic traits foster a more conducive working environment [9]. The stakeholder theory posits that female directors, attuned to diverse stakeholder needs, consider stakeholder interests more thoroughly when making strategic decisions, thereby enhancing firms' ESG practices [21].

However, the critical mass theory suggests that the benefits may not materialize unless there are at least three women on board, risking tokenism [22]. Also, the institutional theory suggests that the institutional environment, including formal and informal rules and cultural norms, may hinder females from effectively influencing corporate decision-making. In China, the patriarchal business culture can pose barriers for women to exercise their authority and impact [6].

In accordance to the theoretical foundation and limitations of prior research, our study does not presume that women directors will necessarily promote or hinder a company's ESG performance. Instead, we aim to empirically test how female board representation affects corporate ESG and its pillars. Consequently, we propose our hypothesis:

H1. The number of female directors has an impact on corporate ESG performance.

H1a. The impact is mainly through Environmental disclosure.

H1b. The impact is mainly through Social disclosure.

H1c. The impact is mainly through Governance disclosure.

To further explore this relationship, we consider female directors' demographics. The upper echelons theory posits that the demographic features of top executives, such as age, education, and

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overseas experience, influence their cognitive frames, which subsequently shape organizational outcomes [23]. Older female directors tend to exhibit a long-term orientation to societal and environmental issues, having witnessed the impacts of business decisions over time. In contrast, younger female directors may prioritize short-term gains and lack experience in complex ESG situations [24]. Thus:

H2a. The relationship between the number of female directors and corporate ESG performance is positively moderated by their age.

Besides age, we consider female directors' financial backgrounds as a potential moderator. The resource-based view (RBV) contends that a firm's human capital can provide a competitive advantage [25]. Female directors with financial expertise (e.g., in risk management, investment analysis, and financial reporting) are valuable resources that can help firms make well-rounded decisions [26]. This unique background aids in developing robust ESG measurement, enhancing the firm's ability to track and communicate its ESG performance to stakeholders. Therefore:

H2b. The relationship between the number of female directors and corporate ESG performance is positively moderated by their financial background.

Fig.1 is presented below to offer a clear logical flow of our study.

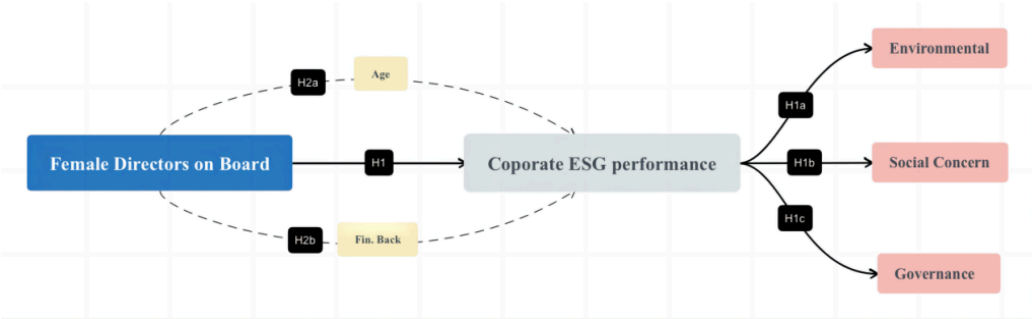

Figure 1. Conceptual framework

4. Data and sample specification

4.1. Sample selection and data source

To uncover the linkages between gender diversification, executive traits, and ESG performance, we source data from multiple databases. ESG scores are retrieved from Bloomberg, and the sample selection begins with identifying accessible ESG scores in its latest data. Specifically, we collect all listed A-share companies in China that disclose their ESG scores, either mandatorily or voluntarily. Data on board gender composition, accounting variables, and top executives' information is sourced from the CSMAR database.

We use winsorization to tackle outliers, trimming values at the 1st and 99th percentiles. The final sample includes 16,123 firm-year observations across 1,520 firms from 2006 to 2023.

4.2. Measures

4.2.1. Dependent variable

The ESG disclosure score is the focal dependent variable in examining H1 and H2, representing a firm’s sustainability performance, in line with other studies [27]. ESG data is extracted from Bloomberg, which assigns scores from 0 to 100 based on annual disclosures across 120 indicators in

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three main dimensions. Environment (ENV): resource utilization, emissions, waste, and environmental impact. Social (SOC): human rights, occupational health and safety, and community relations. Governance (GOV): corporate governance, business ethics, and human capital [28].

To address the right-skew distribution of ESG score, we apply a natural logarithmic transformation (logESG, logENV, logSOC, logGOV) for more reliable inferences.

4.2.2. Independent variable

The number of women on board measures female board representation, paralleling with prior research [29]. To address its right-skewed distribution, we add 1 to all the data points and apply a natural logarithmic transformation (logFDNum).

4.2.3. Control variable

To assess the impact of ESG disclosure, we include various control variables. We control firm attributes. Size: fixed assets (FASSET). Leverage: debt-to-asset ratio (LEV). Profitability: return on equity (ROE). Market value: market-to-book ratio (MTB). Additionally, in accordance to prior literature [30], we control for board attributes. Board size: natural log of the number of directors (logDN). Board independence: the ratio of independent directors to total directors (IDP).

4.2.4. Moderator

To test H2, we introduce two moderators: age (AGE) and financial background (FINBACK). Following previous studies [31], we average these data at the firm level. AGE: the average age of female directors. FINBACK: average score of financial background, coded as a binary variable (1 for experience in financial departments, 0 otherwise). For interaction effects (logFDNum × AGE and logFDNum × FINBACK), we mean-center the moderator variables (AGE_center and FIN_center) to reduce multicollinearity. Table 1 outlines the definitions of each of the variables.

Table 1. Definitions of variables

Acronym	Description
Independent variable	(Source: CSMAR)
logFDNum	The natural log of the number of female directors on board.
Dependent variable	(Source:Bloomberg)
ESG	A firm's environmental, social, and governance (ESG) disclosure.
logESG	The natural log of a firm's ESG disclosure.
ENV	A firm's environmental disclosure.
logENV	The natural log of a firm's environmental disclosure.
SOC	A firm's social disclosure.

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Table 1. (continued)

logSOC	The natural log of a firm's social disclosure.
GOV	A firm's governance disclosure.
logGOV	The natural log of a firm's governance disclosure.
Control variable	(Source: CSMAR)
FASSET	The fixed asset of a firm.
LEV	Leverage, the ratio of long-term debt to total assets of a firm.
ROE	Return on equity, the net income divided by shareholders' equity.
MTB	Market to book ratio.
DirNum	A firm's director numbers on board.
logDN	The natural log of a firm's director numbers on board.
IDP	Independence of the board of directors.
Moderator	(Source: CSMAR)
AGE	The average age of a firm's total female directors.
AGE_center	The mean-centered average age of total female directors.
FINBACK	The average financial background of total female directors.
FIN_center	The mean-centered average financial background of female directors.

5. Empirical specification

5.1. Descriptive statistics and correlation

Table 2 showcases the descriptive statistics of the variables after winsorization, based on 16,123 firm-year observations from 1,520 companies over the 2006 to 2023 period.

The mean ESG disclosure is 28.03 (SD = 10.24), with a maximum of 71.18. The E pillar averages 8.80 (±12.87 SD), while the G pillar is highest at 62.89 (±15.07 SD), and the S pillar is 13.08 (±8.44 SD). All scores exhibit a left-skewed distribution, necessitating a natural log transformation. Firms average 1.35 (±1.21) female directors and a board size of 10.85 (±3.03), with 0.38 (±0.07) being independent. The average leverage ratio is 0.50 (±0.21). The average ROE is 0.05 (±0.08). For the moderator variables, female directors possess a mean age of 47.17 (±5.70), and an average financial background rating of 1.12 (±0.25). Other control variables are in conformity with prior research [32].

Table 2. Descriptive statistics

Variables	Mean	SD	Median	Min.	Max
ESG	28.03	10.24	27.42	6.20	71.18
ENV	8.80	12.87	1.60	0.00	76.71
SOC	13.08	8.44	11.82	0.00	55.44
GOV	62.89	15.07	1.00	0.00	5.00
FDNum	1.35	1.21	1.00	0.00	5.00
FASSET (%)	0.16	0.15	0.13	0.00	0.66
LEV	0.50	0.21	0.51	0.07	0.94
ROE (%)	0.05	0.08	0.05	-0.31	0.26

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Table 2. (continued)

MTB (%)	0.67	0.26	0.67	0.13	1.20
DirNum	10.85	3.03	10.00	4.00	27.00
IDP (%)	0.38	0.07	0.36	0.25	0.60
AGE	47.17	5.70	47.17	24.00	73.00
FINBACK	1.12	0.25	1.00	1.00	2.00

Correlation analysis is also conducted before modeling. Notably, correlations exceeds 0.70 in absolute terms may indicate multicollinearity [33]. High correlations that exceed this threshold are only found between:

- BENV (environmental pillar) and BESG (overall ESG score): 0.841 ($p < 0.001$)
- BSOC (social pillar) and BESG: 0.784 ($p < 0.001$)
- BGOV (governance pillar) and BESG: 0.839 ($p < 0.001$)

However, this high correlation are expected, as BENV, BSOC, and BGOV are components of BESG. Consistent with prior literature, board size, board independence, leverage, and market-to-book ratio positively correlate with ESG performance [34], while fixed assets and ROE show negative correlations. The varying correlations by ESG pillar underscore the importance of separate analyses.

5.2. Empirical models

To examine the influence of female directors on the board of firm ESG (H1), a fixed-effects panel data regression containing independent and control variables is employed (Model 1).

$$\log ESG_{it} = \beta_1 \log FDNum_{it-1} + \beta_2 Controls_{it-1} + \mu_k + \gamma_t + \varepsilon_{it} \quad (1)$$

Besides the overall ESG model, we develop separate models for each ESG pillar to test H1a, b, and c, replacing the dependent variables with the natural logarithm of each pillar's score: logENVit (Model 2), logSOCit (Model 3), and log (Model 4).

To study how the age and financial background of women directors impact this direct association between board gender composition and corporate ESG score (H2a & H2b), we develop two models that add interaction terms to Model 1 (Model 5 & Model 9).

$$logESG_{it} = \beta_1 logFDNUM_{it-1} + \beta_2 Controls_{it-1} + \beta_3 logFDNUM_{it-1} * AGE\_center_{it-1} + \mu_k + \gamma_t + \varepsilon_{it} \quad (2)$$

$$logESG_{it} = \beta_1 logFDNUM_{it-1} + \beta_2 Controls_{it-1} + \beta_3 logFDNUM_{it-1} * Fin\_center_{it-1} + \mu_k + \gamma_t + \varepsilon_{it} \quad (3)$$

Models 6 to 8 further investigate the impact of female directors' age on individual ESG pillars (logENVit, logSOCit, logGOVit) while including the interaction term with age. Models 10 to 12 adopt similar structures, only substituting age with financial background.

Among all the twelve models, i, k, and t denote the 'firm', 'industry', and 'year', respectively. The dependent variables are the natural log of combined ESG score and the decomposed ESG pillar scores for firm i at time t. Control variables (FASSETit-1, LEVit-1, ROEit-1, MTBit-1, and logDNit-

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1) are lagged by one year to tackle potential reverse causality. μ_k and γ_t are specifications for industry and year fixed effects separately. ε_{it} represents the disturbance error term in the models.

6. Results and discussion

6.1. Female directors on board and ESG disclosure

Table 3 showcases the panel data regression results for Hypothesis H1 on ESG disclosure. The analysis shows no multicollinearity issues, with a maximum VIF value of 1.407, well below the limit of 10 [33]. Models 1 to 4 regress the ESG score (logESG) and its components on the female director numbers (logFDNum) and control variables, adding fixed effects.

Model 1 reveals a significant negative coefficient for logFDNum ($b = -0.017$, $p < 0.01$), indicating that a 1-unit increment in logFDNum in year t-1 leads to a 0.017-unit drop in logESG in year t, reflecting an adverse impact on corporate ESG ratings.

Models 2 to 4 reveal that a 1-unit rise in logFDNum in year t-1 corresponds to a 0.138-unit decrease ($p < 0.005$) in the environmental pillar (logENV) and a 0.067-unit decrease ($p < 0.01$) in the social pillar (logSOC), while governance disclosure shows no significant relationship. These results indicate a negative influence of female directors on ESG disclosure, primarily in the environmental and social pillars.

Control variables such as board size (logDN), profitability (ROE), and board independence positively correlate with ESG disclosure. Financial leverage and fixed assets negatively affect ESG but are not significant.

These outcomes substantiate Hypotheses H1, H1a, and H1b. Female directors negatively impact the corporate ESG disclosure, primarily affecting E and S pillars, but not on G pillar.

Table 3. Number of female directors on board and ESG disclosure

Regression results	Model 1	Model 2	Model 3	Model 4	VIF
Dependent variable	logESGt	logENVt	logSOCt	logGOVt	
$logFDNum_{t-1}$	-0.017* (-2.089)	-0.138*** (-3.502)	-0.067* (-2.545)	0.006 (0.955)	1.077
$logDN_{t-1}$	0.173*** (9.222)	0.852*** (9.246)	0.046*** (7.512)	0.065*** (4.279)	1.136
LEV_{t-1}	-0.016 (-0.627)	0.266* (2.191)	-0.118 (-1.467)	-0.053** (-2.652)	1.307
$FASSET_{t-1}$	-0.034 (-0.799)	0.292 (1.406)	-0.099 (-0.717)	-0.044 (-1.298)	1.407
ROE_{t-1}	0.587*** (10.809)	2.387*** (8.977)	1.508*** (8.564)	0.192*** (4.411)	1.061
MTB_{t-1}	0.112*** (5.287)	0.352*** (3.384)	0.235*** (3.420)	0.052** (3.061)	1.384
IDP_{t-1}	0.164** (3.003)	0.117 (0.436)	0.015 (0.086)	0.203*** (4.616)	1.033
Intercept	Included	Included	Included	Included	
Double fixed effects	Yes	Yes	Yes	Yes	
Adjusted R-squared	0.048	0.034	0.018	-0.006	

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Notes: t statistics are in parenthesis, with ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. Model 1- 4 examine the relationships between logFDNum, and the dependent variables (logESG, logENV, logSOC, logGOV).

6.2. Female directors on board, age, and ESG disclosure

Table 4 displays the panel data regression analysis on ESG disclosure, testing Hypothesis H2a with age as a moderator. The interaction term in Model 5 is negative and significant (b = -0.09, $p < 0.001$), indicating that age weakens the negative relationship between female directors and ESG performance. The coefficient for logFDNum in Model 5 is -0.013 ($p > 0.01$), down from -0.017 ($p < 0.01$) in Model 1, confirming the moderating effect of age.

In the sub-models, Model 6 shows a smaller coefficient for logFDNum (b = -0.117) compared to Model 2 (b = -0.138), with an interaction term of -0.019 ($p < 0.01$). Model 7's interaction term is insignificant, while Model 8 shows a negative moderation (b = -0.004, $p < 0.001$) Due to space limits, we do not present the coefficients of control variables in Table 4.

VIF values are blow the critical threshold, indicating no multicollinearity concerns.

In summary, the findings confirm H2a: older female directors have a less pronounced negative impact on company ESG performance.

Table 4. Number of female directors and ESG disclosure adding the age moderator

Regression results	Model 5	Model 6	Model 7	Model 8	VIF
Dependent variable	logESGt	logENVt	logSOCt	logGOVt	
$logFDNum_{t-1}$	-0.011 (-1.273)	-0.117** (-2.754)	-0.068* (-2.481)	0.012 (1.746)	1.090
Age_center_{t-1} (moderator)	0.005*** (3.358)	0.020** (2.880)	0.008 (1.809)	0.002 (1.742)	3.167
$Interaction_{t-1}$	-0.007*** (-4.437)	-0.019* (-2.371)	-0.007 (-1.382)	-0.004*** (-3.471)	3.205
Intercept	Included	Included	Included	Included	
Double fixed effects	Yes	Yes	Yes	Yes	
Adjusted R-squared	0.049	0.035	0.011	-0.007	

Notes: t statistics are in parenthesis, with ***, **, and * denoting significance at the 1%, 5%, and 10% levels, respectively. Model 5 - 8 examines the relationships between the independent variable (logFDNum) and the dependent variables (logESG, logENV, logSOC, logGOV).

6.3. Female directors, financial background, and ESG disclosure

Table 5 presents the regression results on ESG score with financial background as the moderator to test Hypothesis H2b. Multicollinearity is not an issue (maximum VIF = 3.271).

Comparing Model 9 to Model 1, the coefficient of logFDNum changes from -0.017 ($p < 0.01$) to -0.011 ($p > 0.01$), a decrease of 0.006. The interaction term exhibits a significant negative moderation effect (b = -0.007, $p < 0.001$), implying that as the financial background of female directors increases, their negative impact on ESG performance weakens.

For ESG pillars, all interaction terms are negative: logENV (b = -0.019, $p < 0.01$), logSOC (b = -0.007, $p > 0.01$), logGOV (b = -0.004, $p < 0.001$. However, logFDNum coefficients in Models 4 and 12 are both insignificant.

Comparing Model 10 to Model 2, logFDNum changes from -0.138 ($p < 0.001$) to -0.117 ($p < 0.005$), a decrease of 0.021 and a reduction in significance.

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Thus, we confirm Hypothesis H2b: financial background moderates the relationship between female board members and ESG score. The negative relationship identified in H1 weakens when a company has female directors with more financial experience.

Table 5. Number of female directors and ESG disclosure adding the FinBack moderator

Regression results	Model 9	Model 10	Model 11	Model 12	VIF
Dependent variable	logESGt	logENVt	logSOCt	logGOVt	
$logFDNum_{t-1}$	-0.013 (-1.431)	-0.110* (-2.486)	-0.065* (-2.406)	0.011 (1.566)	1.081
Fin_center_{t-1} (moderator)	0.093*** (3.325)	0.462** (2.880)	-0.029 (-0.330)	0.062** (2.829)	3.271
Interaction	-0.098*** (-3.299)	-0.585*** (-3.927)	0.044 (0.476)	-0.070** (-3.011)	3.269
Intercept	Included	Included	Included	Included	
Double fixed effects	Yes	Yes	Yes	Yes	
Adjusted R-squared	0.047	0.042	0.011	-0.010	

Notes: t statistics are in parenthesis, with ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. Model 9 - 12 examine the relationships between the independent variable (logFDNum), and the dependent variables (logESG, logENV, logSOC, logGOV).

7. Robustness checks

7.1. Placebo test

To assess the reliability and validity of findings for Hypotheses H1, 2a, and 2b, we perform placebo tests on models (1), (5), and (9). Specifically, we randomly assign the number of female directors across firms a thousand times, creating a coefficient distribution expected to follow a normal distribution if the original findings were due to chance.

Fig.2 shows the results, with the blue distribution representing randomized outcomes and vertical lines indicating the tested coefficients. The coefficients on the variables of interest in our original models are never significantly different from zero in these randomized tests. This suggests that our models are robust and not due to chance.

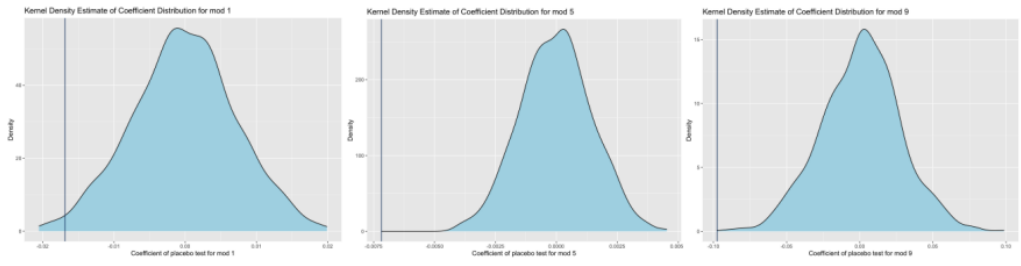

Figure 2. Placebo tests for Model 1, Model 5, and Model 9 from left to right

7.2. Evaluating the quantity of female directors as a dummy variable

To strengthen the validity of our findings, we used a dummy variable approach for female board directors, assigning 1 to firms with female directors above the median and 0 otherwise.

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This alternative test supports our main findings, as shown in Table 6. The test models follow the same form as the original Models 1, 5, and 9, replacing the variable of interest with a dummy variable (FDNum_dummy). The critical coefficients remain significant and exhibit the same directional influence on the firms' ESG disclosure.

In test Model 1, Hypothesis 1 is confirmed with b = -0.026 ($p < 0.005$). In the test Models 5 and 9, all interaction term coefficients are negative and significant. This reinforces that age and financial experience moderate the relationship in Hypothesis 1 (H1).

Additionally, VIF results are included to rule out multicollinearity issues in our analysis.

Table 6. Robustness checks by replacing the log of FDNum to a dummy variable

Variables	Test Model 1	Test Model 5	Test Model 9	VIF
FDNum_dummy	-0.026** (-2.885)	-0.026** (-2.598)	-0.025* (-2.467)	1.044
Moderator		0.007*** (4.351)	0.097** (2.934)	4.250
Interaction		-0.009*** (-5.201)	-0.092** (-2.539)	4.498
Intercept	Included	Included	Included	
Fixed effects	Yes	Yes	Yes	
Adjusted R-squared	0.059	0.053	0.047	

Notes: t statistics are in parenthesis. ***, **, and * denote significance at the 1, 5 and 10%.

7.3. Using instrument variable

To tackle endogeneity and omitted variables, we perform a two-stage regression using the log of average female directors in an industry (Ave_logFDNum) as our instrumental variable.

In the first step, we regress logFDNum on the Ave_FDNum and control variables. The coefficient of Ave_FDNum is 0.101 ($p < 0.001$), with other controls consistent with Model 1.

In the second step, logBESG is regressed on logFDNum, resulting in a coefficient of -0.429 ($p < 0.005$), larger than in Model 1 (b = -0.017), indicating greater robustness.

This two-stage analysis supports our key findings: the increased representation of the presence of females on board is negatively correlated with corporate ESG performance.

8. Discussion

The empirical findings uphold both of our hypotheses (H1 & H2). In summary: Our main findings yield that women on board exerts a slight negative influence on overall ESG scores, primarily in the E and S pillars. Our secondary findings indicate that personal attributes and experience moderate this relationship; the age and financial background of female directors can mitigate the negative influence on ESG performance. Thus, companies with older directors or more financial expertise may experience improved ESG outcomes.

These findings contradict broader research suggesting that women on board enhance ESG disclosure. One explanation is based on critical mass theory [21], which posits that minority groups need to reach a critical point to make an effective change. The underrepresentation of women may render them "tokens" status rather than influence.

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Our data, spanning from 2006 to 2023, shows an escalating trend in female directors, but the average remains below 2. Only 17% of our observations meet the critical mass requirement, potentially limiting the positive impact of women's participation on ESG.

The negative impact on the environmental and social pillars, but not the Governance, arises from the less-defined nature of the E and S pillars compared to the G pillar [35]. In China's patriarchal business culture, female directors may face greater resistance in corporate decision-making. Contrary, the G pillar is more regulated, allowing female directors to exert greater influence.

Our secondary findings resonate with prior literature. We find that age and financial background can mitigate the negative link between female directors and ESG ratings. Older female directors tend to be more risk-averse and familiar with ESG policies, enabling them to integrate ESG considerations thoroughly. Additionally, those with relevant financial experiences are better equipped to effectively implement and report on ESG.

9. Conclusion

Spurred by increasing investor demands for sustainability, many firms now publicly share their ESG initiatives [14], coinciding with a rise in female directors on board. Our research unveils the role that women directors play in shaping corporate ESG performance.

Based on a sample of 1,520 firms listed in the A-share market in China from 2006 to 2023, we document a significant but slightly negative relationship between the number of women directors on the board and corporate ESG score, raising concerns about tokenism.

Also, we study the relationship between women directors on board and each ESG pillar. The negative impact is evident in the E and S pillars but not in the G pillar. This could be explained by the ambiguity in assessing E and S compared to the relatively structured assessment of G, along with the patriarchal business culture in China.

To further understand how personal factors moderate this relationship, we choose age and financial background as moderators. The results show that as these factors increase, the negative association between the women on boards and ESG weakens, consistent across all pillars. In this research, we utilize a panel data regression with control variables and fixed effect for H1 and interaction terms for H2. we address endogeneity with multiple validation tests (placebo test, variable type changes, instrument variable), and our model passes all tests.

Our study has crucial implications. From the managerial perspective, it enriches the dialogue around women's inclusion on boards regarding ESG initiatives. The slightly negative relation observed in the Chinese market suggests regulators should reevaluate the ESG rating system. It emphasizes valuing female directors as integral members instead of tokens. Thus, it raises questions about the structural changes needed to improve the treatment and perception of female directors in China. Organizations should prioritize gender composition in the boardroom while addressing power balance in decision-making.

From an individual perspective, our research underscores the importance of personal growth and experience. As directors age and gain financial expertise, they develop a deeper understanding of market conditions. These seasoned individuals excel in integrating ESG principles into daily management, thereby elevating overall ESG performance. This offers valuable insights for companies when selecting board candidates and nurturing future leaders.

However, the study has several limitations. First, we could not fully eliminate endogeneity bias. Future research could explore alternative models and extend the analysis to a cross-country setting. Finally, incorporating ESG scores from other providers can also enhance robustness.

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Looking ahead, studies could employ in-depth interviews with board members to uncover mechanisms and power dynamics in sustainability integration. Also, expanding moderating factors to include educational background and personality traits may offer additional insights.

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