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The Impact of Female Directors and ESG on Bank Risk: Evidence from the Asian Banks

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ABSTRACT

This study aims to investigate the impact of female directors and environmental, social, and governance (ESG) practices on bank risk. The empirical quantitative study covers a sample of 64 Asia banks for the period of 2016 to 2022 and analyzes using the System Generalized Method of Moments (GMM), we find that the presence of female directors significantly lowers risk. Their diverse perspectives foster richer board deliberations and less-overconfident decision-making, leading to more prudent risk assessments and greater resilience. By contrast, ESG practices alone do not appear to reduce risk. An interaction analysis shows, however, that when female directors and robust ESG engagement coexist, bank risk declines in emerging economies-an effect not observed in developed markets. These findings suggest that expanding female representation on bank boards can curb risk exposure and that empowering these directors to drive ESG initiatives further strengthens risk management, especially in less-developed countries. Regulators might therefore consider incentives that encourage banks to increase female board participation and deepen directors' sustainability expertise.

Keywords: ESG, Women Directors, Bank Risk, GMM
JEL classification: G20, G28

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1. Introduction

Sustainable development, along with the environmental (E), social (S), and governance (G) dimensions of ESG, plays a crucial role in mitigating the damage to human life and property caused by increasingly frequent global extreme weather events. This is especially true for the financial industry, where compliance with growing ESG-related regulations and the integration of ESG principles into investment and lending strategies have become essential for long-term profitability and sustainability. Within the ESG framework, gender equality is not only a core component of international human rights law but also a critical management issue. While gender equality has been extensively discussed, key challenges remain, such as overcoming traditional cultural constraints on gender roles, narrowing the gender gap across various sectors, and encouraging women to actively participate in society, assume leadership positions, and fully realize their potential and influence. Appointing women to corporate boards, in particular, represents a concrete expression of the values of gender equality and social equity.

In recent years, numerous studies have analyzed the impact of appointing women as outside directors in the financial sector. Female directors introduce diverse perspectives that strengthen board governance and mitigate agency conflicts (Chatjuthamard, Jiraporn, and Lee, 2021), while their presence also signals lower risk exposure during financial crises (Mohsni, Otchere, and Shahriar, 2021). Banks led by women tend to exhibit higher capital adequacy and equity-to-asset ratios, alongside lower relative risk (Menicucci and Paolucci, 2022a). They likewise benefit from stronger oversight and more rigorous risk management (Gulamhussen and Santa, 2015; Birindelli, Chiappini, and Savioli, 2020). Emphasizing gender diversity, therefore, not only reduces operational risk but also enhances a bank's image and credibility with investors and other stakeholders (Olsen, Awuah-Offei, and Bumblauskas, 2021).

Rising awareness of gender equality has further heightened interest in women's roles within corporate leadership. Empirical evidence shows that female leaders contribute broader strategic perspectives (Glass and Cook, 2018), help curb corporate risk (Nadeem, Suleman, and Ahmed, 2019), and typically devote greater attention and resources to ESG initiatives (Zhang, 2023).

This paper focuses on Asian banks because corporate-governance reforms were introduced in Asia later than in Europe and the United States, and their effectiveness remains underexplored. Although ESG reporting has become widespread in advanced Western economies, three of the world's four largest economies- Japan, China, and India are in Asia (Abdul Rahman and Alsayegh, 2021). Consequently, ESG implementation and disclosure have become increasingly important across the region (Alsayegh, Abdul Rahman, and Homayoun, 2020). Against this backdrop, the study investigates how the interaction between female board participation and ESG practices influences risk in the Asian banking industry.

Overall, this study makes three contributions. First, it advances the literature on the role of female directors in risk oversight within banks in emerging markets. Corporate success fundamentally hinges on the board of directors, which is charged with monitoring the execution of strategic objectives, upholding sound governance structures, and shaping organizational culture. Effective directors also prioritise business ethics and corporate responsibility (Birindelli, Dell'Atti, Iannuzzi, and Savioli, 2018). Prior research indicates that female directors enhance board governance through more rigorous monitoring (Atif, Hossain, Alam, and Goergen, 2021; Gull, Saeed, Suleman, and Mushtaq, 2022) and greater independence (Adams and Ferreira, 2009). A higher proportion of women on the board increases organisational sensitivity to social and environmental considerations, thereby fostering sustainable development (Hafsi and Turgut, 2013; Yasser, Al Mamun, and Ahmed, 2017; Veltri, Mazzotta, and Rubino, 2021). Consistent with these findings, the study shows that the presence of female directors is associated with reduced bank risk. By contributing diverse perspectives and experiences, they facilitate more comprehensive deliberations and prudent decision-making, which temper managerial overconfidence and enhance institutional resilience. Second, this study deepens the understanding of how ESG implementation influences risk in the banking sector. As the linchpin of the global financial system, banks' risk-management practices are critical to economic stability. By directing capital flows, financial institutions also possess the leverage to propel a worldwide

transition toward sustainability and a low-carbon economy. Prior research attributes the banking sector's vulnerability during the 2008 crisis to the excessive accumulation of risk (Brunnermeier, 2009; DeYoung, Peng, and Yan, 2013). In the post-crisis landscape, leading banks have increasingly acknowledged that ESG-related exposures embedded in their financing portfolios can translate into substantial long-run financial losses. Simultaneously, the emergence of green finance and related instruments has enabled banks to incorporate sustainability considerations into their core operations, thereby promoting sustainable development and mitigating risk. Empirically, this study finds that the environmental pillar (E) is negatively associated with bank risk, whereas the social (S) and governance (G) pillars are positively associated. These divergent effects suggest that ESG dimensions do not uniformly influence risk; rather, each pillar exerts a distinct risk-modulating impact. Finally, this paper contributes to the literature by examining the interaction between female board representation and ESG practices and their influence on bank risk. Gender diversity has been associated with enhanced corporate innovation, improved performance, and reduced risk exposure. However, the interaction between female directors and ESG does not exhibit a significant risk-reducing effect in banks operating in developed countries, whereas a statistically significant association is observed in banks from developing countries. This suggests the presence of entrenched gender biases and cultural stereotypes in certain Asian countries, which may constrain the ability of female directors to fully exercise their professional and managerial influence. As a result, the effectiveness of ESG-related policy implementation in mitigating bank risk appears limited in such contexts.

The rest of the paper is organized as follows: Section 2 reviews the relevant literature and outlines the research hypotheses. Section 3 describes the data, variables, and research methodology. Section 4 presents the empirical findings, including the main regression results. Section 5 concludes the study and offers policy implications.

2. Literature Review and Hypotheses Development

2.1 The relationship between female directors and bank risks

Women's participation in corporate leadership has received increasing scholarly and practitioner attention. Empirical evidence shows that, relative to their male counterparts, female directors display heightened sensitivity to environmental issues (Nadeem et al., 2020), adhere to more stringent ethical standards (Moreno-Ureba, Bravo-Urquiza, and Reguera-Alvarado, 2022), and actively advance environmental strategies and investments (Atif et al., 2021; Gull et al., 2022; Issa and Bensalem, 2023). Because board composition is a cornerstone of the governance mechanism, greater female representation enriches decision-making, shapes corporate strategy and performance (Bennouri et al., 2018; Nielsen and Huse, 2010a), and mitigates intra-board conflict through superior interpersonal skills (Nielsen and Huse, 2010b). It also enhances discussion quality and reporting effectiveness (Gul, Srinidhi, and Ng, 2011), is associated with higher meeting attendance and stronger oversight (Adams and Ferreira, 2009), and improves the company's reputation (Bear, Rahman, and Post, 2010). Collectively, these outcomes signal a commitment to diversity and legitimacy, thereby strengthening support from key stakeholders, particularly customers, suppliers, and investors (Hillman, Shropshire, and Cannella, 2007).

From an agency theory perspective, female directors are regarded as effective monitors of management and contribute a wide range of ideas, perspectives, skills, and experiences to the company's board of directors (McGuinness, Vieito, and Wang, 2017). Their presence also serves as a balancing influence within male-dominated boards. Faccio, Marchica, and Mura (2016) demonstrate that women generally exhibit greater risk aversion than men, rendering them less susceptible to financial distress (Mittal and Lavina, 2018) and contributing to lower levels of risk in the banking sector (Menicucci and Paolucci, 2022a). Furthermore, Belaounia, Tao, and Zhao (2020) suggest that female directors enhance corporate value in at least three ways: by improving overall firm performance, mitigating earnings management, and curbing excessive risk-taking behavior. Based on the aforementioned literature, the following hypothesis is proposed:

H1: There is a negative relationship between female directors and bank risks.

2.2 The relationship between ESG and bank risks

The banking sector is inherently exposed to high levels of moral hazard and therefore demands more stringent regulatory oversight (Wu and Shen, 2013). The 2008 global financial crisis, in particular, highlighted the dangers of institutional complacency among banks and regulators, severely undermining public confidence in financial institutions (Larosière et al., 2009). In response, increased attention has been directed toward corporate social responsibility investment and business philosophy and the integration of environmental, social, and governance (ESG) principles, which are believed to enhance operational resilience and restore stakeholder trust. Empirical evidence suggests that firms engaging in ESG strategies tend to outperform those that neglect their social responsibilities (Flammer and Kacperczyk, 2019).

However, the benefits of ESG implementation remain subject to debate. Critics argue that CSR activities fall outside the core objectives of firms, which should primarily focus on maximizing shareholder value (Friedman, 1970). Some studies further suggest that while ESG engagement positively affects cash flow and operational efficiency, it may simultaneously exert a negative influence on the cost of equity (Azmi, Hassan, Houston, and Karim, 2021). Among ESG components, environmental initiatives are found to have the most pronounced impact on bank valuation. Nevertheless, ESG practices not only help mitigate environmental and social risks but also contribute to improved corporate governance and long-term firm value. Based on the foregoing discussion, this study posits the following hypothesis:

H2: There is a negative relationship between ESG performance and bank risk.

With respect to the influence of female directors, prior research suggests that a higher proportion of women on corporate boards is associated with increased attention to sustainability and social responsibility, thereby enhancing firms' ESG performance (Menicucci and Paolucci, 2022b). Moreover, firms with greater female board representation tend to disclose more environmental information, as female directors are generally more attuned to environmental concerns. The presence of women on boards also contributes to a broader range of perspectives and decision-making styles, which can enhance the overall quality of governance and strategic innovation, further reinforcing ESG outcomes. In summary, the inclusion of female directors may mitigate corporate risk through diversified viewpoints and heightened social accountability. Based on this rationale, the following research hypothesis is proposed:

H3: Female directors and ESG performance are negatively associated with bank risk.

3. Research methods

3.1. Source and sample screening

This chapter outlines the research methodology employed in this study and is organized into three sections. The first section describes the data sources and the selection criteria for the research sample. The second section defines the variables used in the analysis, including both key independent and dependent variables, as well as control variables. The third section presents the regression model specification, detailing the empirical strategy and model formulation adopted for hypothesis testing.

The study investigates the impact of female board representation and environmental, social, and governance (ESG) practices on bank risk. The data are obtained from Datastream, BankFocus, and the World Bank database. Given the improved availability and consistency of ESG-related data in recent years, the study period spans from 2016 to 2022, covering a total of seven years.

In accordance with the International Monetary Fund (IMF) classification, Asian banks in the sample are divided into those from developed and developing countries. The developed economies include China, Hong Kong, Japan, South Korea, and Taiwan, while the developing economies comprise India, Indonesia, Malaysia, Pakistan, the Philippines, and Thailand. After excluding observations with missing or incomplete data, the final sample consists of 64 banks.

3.2 Research methods and models

To address potential endogeneity concerns, this study employs the System Generalized Method of Moments (System GMM) estimator, which effectively mitigates endogeneity bias and accounts for unobserved heterogeneity by incorporating lagged dependent variables and controlling for fixed effects. In the bank risk regression model, the Z-score is utilized as a proxy for overall bank risk. A higher Z-score indicates greater financial stability and a lower probability of insolvency (Laeven and Levine, 2009).

The Z-score is widely adopted in the banking literature as a standard measure of risk exposure (e.g., Delis, Hasan, and Tsionas, 2014; Houston, Lin, Lin, and Ma, 2010) and is computed using the following equation:

$$Zscore = \frac{Return\ on\ Asset + \left(\frac{Equity}{Asset}\right)}{Standard\ Deviation\ of\ Return\ on\ Asset}$$

Where Return on Assets (ROA) represents the bank's profitability relative to its total assets, Equity-to-Asset Ratio denotes the proportion of equity capital to total assets, and Standard Deviation of ROA captures the volatility of the bank's return on assets, serving as a measure of income variability.

To empirically examine the effects of ESG performance and the interaction between female board representation and ESG on bank risk, this study specifies the following regression model:

$$\begin{aligned} Zscore_{it} = {} & \alpha_0 + \alpha_1 WOB_{it-1} + \alpha_2 ESG_{it-1} + \alpha_3 (WOB_{it-1} \times ESG_{it-1}) + \alpha_4 CAR_{it} + \alpha_5 NPL_{it} \\ & + \alpha_6 CURR_{it} + \alpha_7 DBR_{it} + \alpha_8 SIZE_{it} + \alpha_9 GDP_t + \alpha_{10} IRS_t + \alpha_{11} INF_t \\ & + \alpha_{12} Covid19_t + \eta_t + \varepsilon_{it} \end{aligned}$$

where WOB_{it-1}denotes the laggard of female directors, ESG_{it-1}represents the laggard of total ESG score. The interaction term $(WOB_{it-1} \times ESG_{it-1})$ captures the moderating effect of female board representation on ESG performance in relation to bank risk. The model also includes a set of control variables. Specifically, CAR_{it} represents the capital adequacy ratio, NPL_{it} represents the delinquency ratio, $CURR_{it}$ represents the liquidity ratio, DBR_{it} is debt ratio, $SIZE_{it}$ is bank size, GDP_t represents the economic growth rate, IRS_t is deposit spread, INF_t represents for inflation rate and $Covid19_t$ is for the dummy variable of epidemic. η_t is the time effect, and ε_{it} is the residual.

WOB_{it-1} is calculated as the number of females as a proportion of the total number of board members. The ESG score is based on definitions provided by the Datastream database, where it represents a composite score calculated as a weighted average of environmental, social, and governance indicators disclosed by each bank, along with corresponding category-specific scores (Shakil, Mahmood, Tasnia, and Munim, 2019). CAR_{it} is defined as the ratio of a bank's capital to its risk-weighted assets. NPL_{it} is measured as the total non-performing loan divided by total loan. $CURR_{it}$ is defined as the liquid assets divided by deposits and short-term funding. DBR_{it} is calculated as total liabilities divided by total assets. $SIZE_{it}$ is measured by taking the natural log of total assets. The macroeconomic control variables include Gross Domestic Product (GDP), Inflation (INF), Interest Rate Spread (IRS), and a dummy variable for the COVID-19 pandemic (COVID-19), representing systemic shocks during the sample period.

4. Empirical Results

This chapter presents the empirical analysis based on the data and research methodology outlined in the preceding sections. Section 1 provides the descriptive statistics of the variables, while Section 2 reports and interprets the empirical findings derived from the regression model.

4.1 Descriptive Statistics

As shown in Table 1, the average proportion of women on boards of directors (WOB) is 15.05%,

indicating that, on average, less than 16% of board members are female. The WOB variable ranges from a minimum of 0 to a maximum of 69.23%, suggesting that the appointment of female directors is not uniformly mandated across Asian countries. The average ESG score is 52.27, reflecting a moderate level of environmental, social, and governance performance among the sampled banks.

The average capital adequacy ratio (CAR) is 15.91%, which exceeds the Basel III regulatory minimum of 10.5%, implying a relatively strong capital position and lower risk exposure. The average non-performing loan (NPL) ratio is 2.67%, significantly below the commonly accepted threshold, indicating good loan portfolio quality. The average debt-to-asset ratio (DBR) is 0.1005, suggesting low reliance on debt financing and, consequently, lower financial risk. The average bank size (SIZE), measured as the natural logarithm of total assets, is 11.23.

With regard to macroeconomic indicators, the average GDP growth rate is 3.06%, the average interest rate spread (IRS) is 2.13%, and the average inflation rate (INF) is 2.38%. The variable Covid19 is a dummy variable representing the presence of the COVID-19 pandemic, where a value of 0 is assigned to observations prior to 2019 and a value of 1 to those from 2019 onward.

To mitigate the potential bias caused by multicollinearity, this study examines the correlation coefficients among the independent variables. As presented in Table 2, the correlation coefficients range from -0.26 to 0.63, suggesting that no serious multicollinearity issues are present within the model.

Table 1. Descriptive Statistics

Variables	Mean	Median	Std.	Min.	Max.	Obs.
WOB	15.0471	13.8095	11.3439	0	69.2308	448
ESG	52.2696	54.1800	19.4142	9.5400	89.4300	448
CAR	15.9083	14.9850	5.7825	8.4300	56.2100	448
NPL	2.6747	1.4996	3.0344	0.1408	18.4581	448
CURR	26.5716	21.2417	18.1761	4.5014	122.5728	448
DBR	0.1005	0.0741	0.0872	0.0041	0.5091	448
SIZE	11.2269	11.2526	1.2697	8.8306	15.5023	448
GDP	3.0555	3.2286	3.8277	-9.5183	9.0503	448
IRS	2.1312	1.9917	1.1434	0.6733	5.3100	448
INF	2.3843	1.9680	2.6555	-1.1387	19.8739	448
Covid19	0.5714	1	0.4954	0	1	448

Note: WOB refers to the variable for female directors; ESG represents the total score comprising Environmental (E), Social (S), and Governance (G) dimensions; CAR denotes the capital adequacy ratio; NPL is the non-performing loan ratio; CURR represents the liquidity ratio; DBR is the debt-to-asset ratio; SIZE indicates bank size; GDP refers to the economic growth rate; IRS denotes the deposit interest rate spread; INF represents the inflation rate; and Covid19 is a dummy variable indicating the presence of the COVID-19 pandemic.

Table 2. Pearson Correlation

	WOB	ESG	CAR	NPL	CURR	DBR	SIZE	GDP	IRS	INF	Covid19
WOB	1										
ESG	0.3752	1									
CAR	0.0546	0.1723	1								
NPL	-0.0378	-0.1373	0.0084	1							
CURR	-0.0345	0.1019	0.6250	0.0161	1						
DBR	-0.2000	-0.1234	-0.0167	0.0219	0.0727	1					
SIZE	-0.0120	0.1019	-0.2308	-0.1072	-0.1127	0.0397	1				
GDP	0.0722	0.1137	-0.0669	0.1082	-0.1555	-0.0314	0.0520	1			
IRS	0.1561	0.2183	0.0669	0.3607	0.0042	-0.1465	-0.1952	0.2474	1		
INF	0.0102	0.0659	0.0748	0.4772	0.0285	0.0677	-0.1517	0.2809	0.4184	1	
Covid19	0.1153	0.2056	0.0766	-0.0091	0.0580	-0.0488	0.0763	-0.2638	0.0051	0.1459	1

Note: WOB refers to the variable for female directors; ESG represents the total score comprising Environmental (E), Social (S), and Governance (G) dimensions; CAR denotes the capital adequacy ratio; NPL is the non-performing loan ratio; CURR represents the liquidity ratio; DBR is the debt-to-asset ratio; SIZE indicates bank size; GDP refers to the economic growth rate; IRS denotes the deposit interest rate spread; INF represents the inflation rate; and Covid19 is a dummy variable indicating the presence of the COVID-19 pandemic.

4.2 Regression analysis results of bank risk

This study employs the System Generalized Method of Moments (System GMM) to examine the impact of female board representation and ESG performance on bank risk, incorporating an interaction term to explore the joint effect of the two factors. The empirical results are presented below.

Column I of Table 3 reports the baseline System-GMM estimates for the effect of female board representation (WOB) on bank risk. The coefficient on WOB is 0.0051 and is statistically significant at the 10 percent level, thereby lending empirical support to Hypothesis 1, which posits that greater female participation on the board is associated with lower bank risk. In practical terms, a higher proportion of female directors corresponds to enhanced stability and reduced risk-taking at the bank level. This finding aligns with Arayssi, Dah, and Jizi (2016), who demonstrate that female board representation mitigates firms' equity risk. Moreover, it supports the conclusions of Ingersoll, Cook, and Glass (2023), who find that female directors tend to exhibit greater prudence and reduced overconfidence in risk assessment decisions.

The empirical results regarding the relationship between ESG performance and bank risk are presented in Column II of Table 3. The estimated coefficient for ESG is negative and statistically significant at the 5% level (coefficient = -0.0040, $p < 0.05$). However, contrary to the expectations of this study, the result does not support the proposed hypothesis that ESG performance is negatively associated with bank risk. In other words, increased ESG engagement does not appear to significantly reduce bank risk within the sample. One possible explanation for this finding is that the implementation of ESG initiatives entails substantial costs. While the integration of Environmental, Social, and Governance (ESG) principles, particularly through CSR investments and sustainability-driven business strategies, has gained considerable attention in recent years and may enhance investor confidence, the cost-effectiveness of such efforts remains uncertain and warrants further investigation.

4.3 The Impact of the Interaction between Female Directors and ESG on Bank Risks

The empirical results regarding the interaction between female board representation (WOB) and ESG performance on bank risk are presented in Column III of Table 3. The interaction term is statistically insignificant, indicating that the joint effect of WOB and ESG does not exhibit a meaningful association with bank risk. Consequently, this finding fails to support Hypothesis 3, which posits a negative relationship between the interaction of female directors and ESG engagement on bank risk. A plausible explanation for this result is that the effectiveness of female directors and ESG practices may be contingent upon the broader institutional and cultural context. In environments where structural or cultural resistance to gender diversity and sustainability practices exists, the implementation of ESG strategies and the influence of female board members may be constrained. Such resistance may result in misalignment, internal conflict, or inefficiencies in governance and decision-making, potentially exacerbating operational risks within banks (Peng and Chandarasupsang, 2023).

In light of this, the study proceeds to conduct a sub-sample analysis by separating the data into developed and emerging market countries to further investigate contextual differences.

The sample includes 34 banks from developed countries and 30 banks from developing countries. The empirical results for developed countries are presented in Table 4. Column I shows that the coefficient for female board representation is positive and statistically significant at the 10% level (coefficient = 0.0063, $p < 0.1$), indicating that the presence of female directors is associated with lower bank risk. This finding supports the argument that female directors contribute to more effective board governance and reduced agency conflicts by introducing diverse perspectives (Chatjuthamard et al., 2021) and is consistent with the main empirical findings of this study.

Table 3. Regression Analysis of Female Directors and ESG on Bank Risk (Z-score)

Zscore	I	II	III
WOB	0.0051*		0.0115
	(1.84)		(0.99)
ESG		-0.0040**	-0.0049
		(-1.98)	(-1.50)
WOB×ESG			-0.0001
			(-0.30)
CAR	-0.0218***	-0.0187**	-0.0197**
	(-2.82)	(-2.32)	(-2.35)
NPL	-0.1420***	-0.1500***	-0.1510***
	(-11.99)	(-12.89)	(-12.93)
CURR	0.0001	0.0001	0.0005
	(0.06)	(0.03)	(0.20)
DBR	-2.0780***	-2.2440***	-2.1070***
	(-4.23)	(-4.54)	(-4.35)
SIZE	-0.0220	-0.0122	-0.0105
	(-0.77)	(-0.41)	(-0.34)
GDP	-0.0070	-0.0032	-0.0045
	(-0.76)	(-0.34)	(-0.48)
IRS	-0.1830***	-0.1560***	-0.1620***
	(-6.09)	(-4.70)	(-4.89)
INF	-0.0148	-0.0156	-0.0133
	(-0.90)	(-0.94)	(-0.81)
Covid19	-0.0424	0.0051	-0.0081
	(-0.61)	(0.07)	(-0.12)
_cons	5.7440***	5.8180***	5.7280***
	(14.90)	(15.24)	(15.27)
N	448	448	448
Wald chi^2	337.23	366.28	402.11
R-squared	0.4482	0.4497	0.4577
Root MSE	0.6748	0.6738	0.6689

Note: 1. *,**,***represent significance at the 10%,5%, and 1% levels (2-tailed), respectively.
2.WOB refers to the variable for female directors; ESG denotes the total ESG score; WOB × ESG represents the interaction term between female directors and the ESG score; CAR is the capital adequacy ratio; NPL is the non-performing loan ratio; CURR is the liquidity ratio; DBR is the debt-to-asset ratio; SIZE indicates bank size; GDP refers to the economic growth rate; IRS is the deposit interest rate spread; INF denotes the inflation rate; and Covid19 is a dummy variable indicating the presence of the COVID-19 pandemic.
3.The study uses the Z-score as a proxy for bank risk. A higher Z-score indicates greater bank stability and lower risk, while a lower Z-score reflects weaker stability and higher risk exposure.

As shown in Column II of Table 4, the coefficient for ESG is negative but not statistically significant, suggesting that ESG practices alone do not have a meaningful impact on bank risk in developed countries. However, Column III reports a statistically significant negative coefficient for the interaction term between female directors and ESG (coefficient = -0.0004, $p < 0.05$), implying that the joint effect of gender diversity and ESG engagement contributes to risk reduction.

This result suggests that, while ESG implementation or female board presence alone may have a limited effect, their interaction is more effective in mitigating bank risk. Nonetheless, the effectiveness of such governance mechanisms may vary across institutional and cultural contexts. In settings where resistance to ESG practices or gender diversity persists, implementation challenges

may arise, leading to internal conflicts, inefficiencies, and, ultimately, elevated operational risk (Peng and Chandarasupsang, 2023).

Table 4. The Impact of Female Directors and ESG on Bank Risk (Z-score) in Developed Countries

Zscore	I	II	III
WOB	0.0063*		0.0315**
	(1.76)		(2.47)
ESG		-0.0003	0.0038
		(-0.13)	(1.20)
WOB×ESG			-0.0004**
			(-2.16)
CAR	0.0171**	0.0169**	0.0142*
	(2.31)	(2.29)	(1.88)
NPL	0.0198	-0.0094	-0.00167
	(0.20)	(-0.11)	(-0.02)
CURR	-0.0202***	-0.0201***	-0.0199***
	(-5.85)	(-5.52)	(-5.37)
DBR	0.1900	0.0269	0.0931
	(0.58)	(0.07)	(0.26)
SIZE	-0.0100	-0.0100	-0.0176
	(-0.38)	(-0.34)	(-0.59)
GDP	0.0311*	0.0310*	0.0258
	(1.92)	(1.88)	(1.52)
IRS	-0.1250***	-0.1110***	-0.1190***
	(-3.14)	(-2.86)	(-3.00)
INF	-0.0164	-0.0054	-0.0260
	(-0.37)	(-0.12)	(-0.58)
Covid19	-0.0430	-0.0217	-0.0542
	(-0.54)	(-0.27)	(-0.68)
_cons	5.0240***	5.1270***	4.9720***
	(11.56)	(12.73)	(12.44)
N	238	238	238
Wald chi^2	339.87	319.86	352.98
R-squared	0.2811	0.2742	0.2975
Root MSE	0.6056	0.6085	0.5987

Note: 1. *,**,***represent significance at the 10%,5%, and 1% levels (2-tailed), respectively.
2. WOB refers to the variable for female directors; ESG denotes the total ESG score; WOB × ESG represents the interaction term between female directors and the ESG score; CAR is the capital adequacy ratio; NPL is the non-performing loan ratio; CURR is the liquidity ratio; DBR is the debt-to-asset ratio; SIZE indicates bank size; GDP refers to the economic growth rate; IRS is the deposit interest rate spread; INF denotes the inflation rate; and Covid19 is a dummy variable indicating the presence of the COVID-19 pandemic.
3. The study uses the Z-score as a proxy for bank risk. A higher Z-score indicates greater bank stability and lower risk, while a lower Z-score reflects weaker stability and higher risk exposure.

Table 5. The Impact of Female Directors and ESG on Bank Risk (Z-score) in Developing Countries

Zscore	(1)	(2)	(3)
WOB	0.0186***		-0.0378*
	(4.18)		(-1.67)
ESG		0.0045	-0.0183**
		(1.26)	(-2.07)
WOB×ESG			0.0009**
			(2.35)
CAR	0.0566***	0.0444**	0.0659***
	(4.16)	(3.04)	(4.41)
NPL	-0.1350***	-0.1360***	-0.1290***
	(-14.06)	(-13.17)	(-12.29)
CURR	0.0130***	0.0133***	0.0091***
	(4.41)	(4.33)	(2.92)
DBR	-4.0900***	-4.2900***	-4.1200***
	(-7.46)	(-6.95)	(-7.39)
SIZE	-0.0589	-0.0625	-0.0570
	(-1.25)	(-1.30)	(-1.26)
GDP	-0.0036	-0.0032	-0.0040
	(-0.39)	(-0.34)	(-0.42)
IRS	-0.1400**	-0.2160***	-0.1060*
	(-2.51)	(-4.05)	(-1.74)
INF	0.0026	-0.0084	0.0013
	(0.19)	(-0.56)	(0.10)
Covid19	-0.2130***	-0.1710	-0.2090**
	(-2.37)	(-1.80)	(-2.27)
_cons	4.2850***	4.8480***	5.1230***
	(6.42)	(7.02)	(7.96)
N	210	210	210
Wald chi^2	1132.15	981.33	1172.38
R-squared	0.6593	0.6355	0.6705
Root MSE	0.5341	0.5525	0.5253

Note: 1. *,**,***represent significance at the 10%,5%, and 1% levels (2-tailed), respectively.
2. WOB refers to the variable for female directors; ESG denotes the total ESG score; WOB × ESG represents the interaction term between female directors and the ESG score; CAR is the capital adequacy ratio; NPL is the non-performing loan ratio; CURR is the liquidity ratio; DBR is the debt-to-asset ratio; SIZE indicates bank size; GDP refers to the economic growth rate; IRS is the deposit interest rate spread; INF denotes the inflation rate; and Covid19 is a dummy variable indicating the presence of the COVID-19 pandemic.
3. The study uses the Z-score as a proxy for bank risk. A higher Z-score indicates greater bank stability and lower risk, while a lower Z-score reflects weaker stability and higher risk exposure.

With respect to the impact of female directors and ESG on bank risk in developing countries, the empirical results are presented in Table 5. Column I indicates a positive and statistically significant relationship between female board representation and bank risk (coefficient = 0.0186, $p < 0.01$). This suggests that the presence of female directors contributes to reduced risk, likely due to the introduction of diverse perspectives, enhanced board effectiveness, and diminished agency conflicts (Chatjuthamard et al., 2021). This finding is consistent with the main empirical conclusions of the study.

Column II shows that the coefficient for ESG is positive but not statistically significant, although the direction of the effect aligns with the theoretical expectations of this paper. Notably, the interaction term between female directors and ESG, reported in Column III, is positive and

statistically significant (coefficient = 0.0009, $p < 0.05$). This result implies that in developing countries, female board members play a moderating role in strengthening the relationship between ESG engagement and reduced bank risk. The significant interaction supports Hypothesis 3 of this study, which posits that the combined effect of female directorship and ESG practices contributes to risk mitigation in the banking sector.

5. Conclusion

This study investigates the extent to which female board representation, ESG performance, and their interaction influence bank risk in Asian countries. Prior literature has suggested that women contribute diverse perspectives and insights to corporate boards and that female leadership is often more attentive to ESG-related concerns, allocating greater resources to sustainability initiatives. However, the extent to which female directors directly contribute to risk reduction remains an open empirical question.

Drawing on the existing literature, this study formulates three hypotheses: (1) female board representation is negatively associated with bank risk; (2) ESG performance is negatively associated with bank risk; and (3) the interaction between female board representation and ESG performance is negatively associated with bank risk.

The empirical findings reveal that, in the context of Asian banks, female directors are associated with lower levels of risk and enhanced bank stability. This supports the notion that women tend to exhibit greater prudence and lower overconfidence in risk assessment (Ingersoll et al., 2023). However, the independent effects of ESG performance and its interaction with female board representation are not consistently significant across all country contexts. Specifically, in developed Asian countries, the interaction between female directors and ESG performance does not significantly reduce bank risk. In contrast, in developing Asian countries, the interaction term is both negative and statistically significant, suggesting that the joint influence of female directors and ESG initiatives is more effective in risk mitigation.

These findings underscore the importance of institutional and developmental contexts in shaping the effectiveness of gender diversity and ESG strategies. From a managerial perspective, the results suggest that banks should consider increasing female representation on their boards and actively promote ESG-related policies to enhance stability. Furthermore, banks are encouraged to support female directors in pursuing ESG-related training to strengthen board-level expertise in sustainability. Regulatory authorities may also consider introducing incentive mechanisms to promote sustainable governance and professional development among bank directors.

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