

Research Article

Do Female Directors Enhance ESG Performance? The Moderating Role of FinTech in Indonesian Banking

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Abstract

This study examines the effect of female representation on the board of directors on environmental, social, and governance (ESG) performance in the banking sector. The rapid growth of financial technology (FinTech) creates a governance phenomenon by potentially reshaping how board diversity influences sustainability outcomes. This study uses panel data from Indonesian listed banks and analyzes 230 firm-year observations from 2019 to 2023. This study applies moderated regression analysis (MRA) to test the proposed relationships. The findings show that female representation on the board of directors improves ESG performance. However, FinTech development weakens the positive effect of female directors on ESG performance, indicating that higher levels of digitalization reduce the effectiveness of board gender diversity in promoting sustainability. This study concludes that digital transformation alters the role of board governance mechanisms in achieving ESG objectives. This study provides managerial and regulatory implications by emphasizing the importance of aligning FinTech strategies with board governance practices to ensure that digitalization supports, rather than undermines, corporate ESG commitments and long-term sustainability.

Keywords: Female Directors, Board Gender Diversity, Financial Technology, ESG Performance

JEL Classification: G21, G34, M14

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1. Introduction

Sustainability issues in the banking sector are no longer appropriate to treat merely as a reputation attribute. Instead, they are increasingly tied to risk perceptions, funding costs, and social legitimacy because banks sit at the center of capital allocation and risk transmission (Andrieş & Sprincean, 2023; Chiaramonte et al., 2022). Through their intermediation function, banks shape who receives financing, under what conditions, and how environmental and social risks are priced and managed in credit decisions. From a stakeholder theory perspective, ESG becomes a response to stakeholder expectations and monitoring: banks are incentivized to align sustainability practices and disclosures with what key stakeholders regulators, investors, customers, and the broader community consider legitimate and decision-useful, particularly in emerging markets where credibility and comparability are still developing (Supriyanto et al., 2025).

Moreover, ESG disclosure appears to be value relevant in emerging-market settings, as it is associated with market reactions, reinforcing incentives for banks to strengthen sustainability reporting quality and credibility (Itan, Sylvia, et al., 2025).

However, ESG is not a single, fully objective, and uniform fact. ESG scores can differ for the same entity due to differences in indicator coverage, weighting methods, and emphasis across the E, S, and G pillars. Berg et al. (2022) show that ESG assessments can diverge and create “aggregate confusion”, meaning stakeholders may receive inconsistent signals about the same bank. For accounting and finance research, this implies that conclusions about ESG determinants should consider measurement characteristics and reporting incentives, because the same underlying practices may be reflected differently in ESG ratings and disclosures (Berg et al., 2022; Tsang et al., 2023).

In this context, governance is frequently positioned as a mechanism that can translate stakeholder demands into strategic priorities and operational control. Board composition, including gender diversity, is often argued to shape a bank’s sustainability orientation. Female directors are commonly associated conceptually with stronger oversight, higher stakeholder sensitivity, and more cautious risk preferences, which can support more consistent sustainability decision-making and ESG-related actions. Consistent with this view, evidence in European banks indicates that the proportion of women on boards is positively associated with ESG disclosure, particularly in the environmental and social dimensions (Gurol & Lagasio, 2022).

At the same time, digital transformation and the development of financial technology (FinTech) reshape how banks create value, manage risk, and produce information for stakeholders. FinTech-based innovation such as digital onboarding, alternative-data credit scoring, compliance automation, real-time transaction monitoring, and platform integration can change internal processes and information flows (Suhardjo et al., 2024). The literature suggests that FinTech and ESG can intersect through process efficiency, reporting standardization, and the use of data analytics for risk monitoring and measurement (Dicuonzo et al., 2024a; Trotta et al., 2024; Wan et al., 2023). Under stakeholder theory, this matters because digital capabilities may strengthen a bank’s capacity to meet stakeholder demands for transparency and accountability yet the effect may depend on whether governance can effectively steer digital resources toward sustainability objectives.

Empirical findings also indicate that FinTech development may be associated with ESG performance in the banking sector. (Dicuonzo et al., 2024a), for example, develop a disclosure-based FinTech index from annual reports and find that higher FinTech levels are associated with better bank ESG performance alongside governance characteristics. These findings raise an important possibility: FinTech may not only matter as a direct driver, but also as a contextual factor that changes how effectively governance such as board gender diversity translates into ESG outcomes.

This contingency argument is supported by practical evidence that ESG implementation is often constrained by organizational reporting capacity and data readiness. Deloitte’s 2024 Sustainability Action Report shows that data quality remains a major barrier in ESG reporting: 57% of executives identify ESG data quality as the top challenge (and 88% place it among the top three challenges), while documentation and sign-off are also widely reported as difficult (81%) (Deloitte, 2024). These constraints are closely aligned with the stakeholder-theory logic that disclosure credibility is a capability problem as much as a willingness problem organizations may face pressure to report, but still struggle to produce consistent, auditable, decision-useful sustainability information (Supriyanto et al., 2025).

Indonesia provides a particularly relevant setting because ESG pressures and digital acceleration occur simultaneously under an evolving governance and disclosure infrastructure. The Financial Services Authority (OJK) has institutionalized sustainable finance through Regulation No.

51/POJK.03/2017 and the Sustainable Finance Roadmap Phase II (2021–2025), which signal rising expectations for sustainability integration within financial institutions' governance and reporting (OJK, 2021). More recently, OJK released the Indonesia Taxonomy for Sustainable Finance (TKBI) Version 2 (2025) to support consistency in sustainability assessment and disclosure (OJK, 2025). In parallel, Bank Indonesia reports rapid growth in the digital ecosystem digital banking and QRIS transactions expanding sharply indicating that Indonesian banks face strong incentives to scale digital services while maintaining control and trust (Bank Indonesia, 2024). These institutional and technological dynamics suggest that findings from mature markets may not transfer mechanically to Indonesian banks and motivate context-specific testing of how governance mechanisms operate under digitalization.

Accordingly, this study fills a gap by examining how board gender diversity and FinTech jointly shape ESG performance in Indonesian listed banks, using stakeholder theory as the explanatory lens. Prior studies often investigate governance to ESG links or FinTech to ESG links separately, leaving limited evidence on when gender-diversity-based governance becomes more (or less) effective under different levels of digital development. Therefore, this study formulates two research questions: (1) does the proportion of female directors affect bank ESG performance in Indonesia; and (2) does FinTech development strengthen or weaken that effect. The purpose of this study is to test the relationship between female directors and ESG and to evaluate FinTech as a moderating variable using bank–year panel data (2019-2023). The study contributes to governance and sustainable banking literature by positioning FinTech as a contingency factor that explains the strengthening or weakening of the influence of female directors on ESG performance in Indonesian banks, amid ESG measurement variation and ESG reporting dynamics (Alkhawaja et al., 2023). Consistent with methodological concerns in ESG research, we further support inference by conducting robustness checks using Coarsened Effect Model (CEM).

2. Literature Review and Hypothesis

Stakeholder Theory

Stakeholder Theory argues that corporate success is not determined only by fulfilling shareholders' interests, but also by the company's ability to manage relationships, demands, and expectations of various stakeholders such as employees, customers, regulators, suppliers, communities, and the environment. In banking, stakeholder expectations often materialize through credit risk, liquidity risk, and reputational risk; therefore, ESG strategy is commonly interpreted as a response to legitimacy and accountability pressure.

Consistent with this, empirical evidence in banking shows that ESG practices are associated with a more prudent risk profile and better stability, especially during periods of uncertainty (Chiaromonte et al., 2022). At the same time, the literature also emphasizes the risk side: ESG controversies can signal strained relationships between banks and stakeholders and can generate reputational costs, making substantive ESG quality crucial (Agnese et al., 2024; Cicchiello et al., 2023). Evidence from Indonesia indicates that corporate governance mechanisms shape CSR engagement and disclosure, consistent with the argument that board level monitoring structures condition sustainability reporting and related ESG outcomes (Itan, Febriana, et al., 2025).

Based on these arguments, the female-director ratio is expected to improve bank ESG performance through two main channels. First, stronger monitoring and accountability make sustainability commitments easier to translate into policies, targets, control procedures, and traceable disclosures (Abdelkader et al., 2024; Menicucci & Paolucci, 2023; Odriozola et al., 2024; Wu et al., 2024). Second, stronger stakeholder orientation encourages decisions that are more sensitive to reputational risk and long-term risk, so ESG strategies tend to be more consistent (Disli et al., 2022; Fan et al., 2024; Huang et al., 2024). Cross-context findings generally point to a positive direction, but the magnitude depends on institutional quality, governance depth, and reporting maturity; therefore, context-based testing in Indonesia remains relevant for enriching evidence in a highly regulated industry with strong information asymmetry such as banking (Karkowska et al., 2025; Wu et al., 2024).

Female directors and bank ESG performance

Growing attention from investors, regulators, and the public to sustainability issues positions ESG as an important indicator of governance quality and long-term corporate strategy, including in banking, which channels risk and incentives to the real sector. At the governance level, board composition helps explain differences in ESG performance because directors shape strategic priorities, policy design, and control systems related to environmental, social, and governance commitments.

A higher female director ratio is expected to improve ESG performance because gender diversity can broaden ethical deliberation, reputational-risk awareness, and stakeholder sensitivity in strategic decision-making (Alkhawaja et al., 2023). Gender diversity is also associated with stronger board monitoring and accountability, enabling ESG commitments to be translated into targets, internal controls, and verifiable disclosure practices (Gurol & Lagasio, 2022). In banking, ESG outcomes are especially sensitive to monitoring quality because ESG controversies can trigger material reputational and performance consequences (Agnese et al., 2024). Moreover, divergence across ESG rating methodologies (“aggregate confusion”) reinforces the importance of governance that can improve reporting credibility and consistency (Berg et al., 2022). This relationship is particularly relevant in banking because ESG outcomes are closely linked to reputational exposure, risk oversight, and disclosure credibility, all of which depend heavily on board-level monitoring quality.

H1: The ratio of female directors has a positive effect on bank ESG performance.

FinTech Moderates Effect of Female Directors on Bank ESG Performance

Digital transformation and FinTech can change how governance translates into ESG outcomes by reshaping information, control, and risk-management processes. One pathway suggests amplification: FinTech improves data availability, analytics, and process traceability (e.g., automated controls and audit trails), which can reduce coordination and monitoring costs for ESG programs and make board oversight more effective (Dicuonzo et al., 2024a). Consistent with this logic, evidence in the banking domain shows that higher FinTech intensity is associated with better bank ESG performance (Dicuonzo et al., 2024a), and bank FinTech can reduce ESG greenwashing by alleviating financial constraints and reducing information asymmetry (Liu & Li, 2024). Under amplification, pro-ESG governance preferences associated with female directors should be easier to operationalize when banks possess mature digital infrastructure for measuring, monitoring, and reporting ESG targets.

A competing pathway suggests displacement (weakening): rapid FinTech expansion can increase operational complexity, cyber/IT risk, and attention competition for governance capacity. In such conditions, boards may prioritize technology execution and risk-control requirements, potentially crowding out sustainability integration even when board composition is more stakeholder-oriented. This trade-off is consistent with evidence that digital transformation effects on ESG are heterogeneous and sensitive to boundary conditions (Guo & Pang, 2025). In addition, FinTech-related competitive pressure can shift strategic focus and profitability dynamics in banking systems (Hodula, 2024), which may further intensify attention and resource constraints. Relatedly, evidence on “ESG decoupling” indicates that FinTech can influence the gap between ESG disclosure and implementation in non-linear ways across time horizons (Wanyan & Zhao, 2025), highlighting that stronger digitalization does not automatically guarantee substantive ESG improvement.

Given these competing mechanisms, the moderating role of FinTech depends on whether technology adoption is accompanied by strong technology governance, mature risk controls, and explicit ESG integration into digital strategy. In the Indonesian banking context where ESG pressures and digital acceleration occur simultaneously and governance capacity may differ across banks FinTech can plausibly strengthen or weaken the influence of female directors on ESG performance. Accordingly, we test FinTech as a contingency factor (moderator) in the female directors to ESG relationship. Given these competing mechanisms, the moderating effect of FinTech is theoretically ambiguous rather than unidirectional. FinTech may strengthen the

effectiveness of female directors by improving information quality and monitoring capacity, but it may also weaken that effectiveness when digital expansion increases complexity, attention competition, and implementation risk.

H2: FinTech moderates the effect of the female director ratio on bank ESG performance.

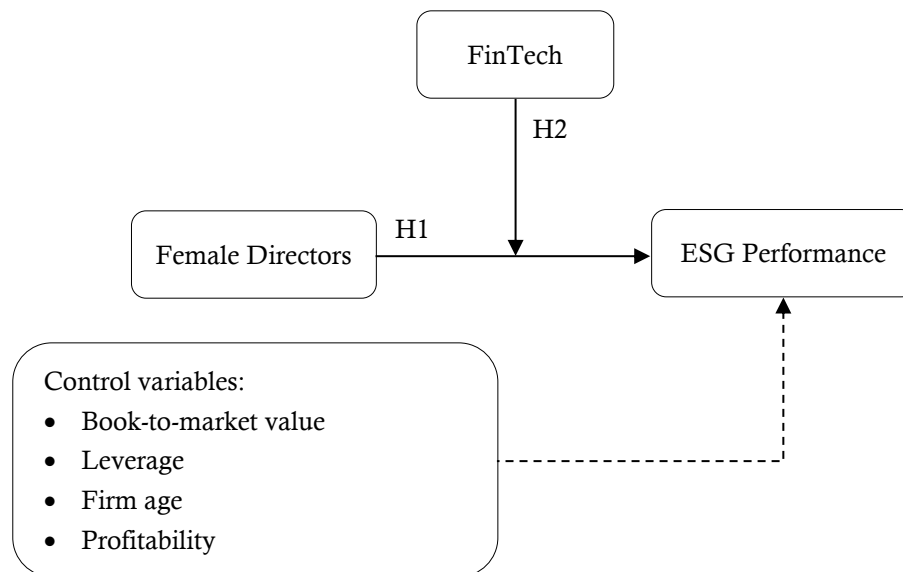


Figure 1. Research Model

3. Data and Method

This study employs a quantitative approach with bank–year panel data for banking firms listed on the Indonesia Stock Exchange (IDX/BEI) over 2019–2023. Data are collected from annual reports and sustainability reports. The population comprises 46 banks; purposive sampling retains banks with available annual/sustainability reports (at minimum for the most recent two years), yielding 230 firm-year observations (Wan et al., 2023). The analysis tests (i) the effect of Female Directors (WOMANRATIO) on ESG Performance (ESG) and (ii) the moderating role of FinTech intensity (FINTECH) via the interaction WOMANRATIO×FINTECH, controlling for Book-to-Market Value (BMV), Leverage (LEV), Firm Age (FIRMAGE), and Profitability (ROA). To ensure valid inference under heteroskedasticity and within-bank serial correlation, we conduct a robustness check using Coarsened Exact Matching (CEM) to improve comparability across observations. Estimation on the matched sample yields qualitatively similar results, including a negative and significant WOMANRATIO×FINTECH interaction.

Dependent variable

ESG performance captures the extent to which a bank discloses environmental, social, and governance information. ESG is measured as a disclosure index: the number of ESG items disclosed divided by the number of applicable items in the checklist (Laskar, 2024). Items coded “not applicable” are excluded from the denominator. To validate the ESG index, a coding protocol is applied and a subset of reports is double-coded; disagreements are reconciled to ensure consistent interpretation. Bank-years with missing reports are treated as missing rather than coded as zero to avoid artificial inflation of “zero ESG”.

Independent and control variables

Female Directors (WOMANRATIO) is the proportion of women on the board of directors (number of female directors divided by total directors). Prior research links strategic-level gender diversity to stronger stakeholder orientation and governance quality that can translate into higher ESG performance (Birindelli et al., 2024; Galletta et al., 2022; Odriozola et al., 2024).

FinTech index (FINTECH) is constructed via dictionary-based content analysis of annual-report narratives. We count occurrences of validated FinTech-related keywords (e.g., fintech, digital banking, mobile banking, artificial intelligence, big data, blockchain) using a Python script, normalize counts by document length to ensure comparability across firms and years, and apply $\ln(1 + \text{normalized count})$ to reduce skewness (Kharrat et al., 2024). To validate the keyword index, the dictionary is reviewed manually and cross-checked against industry glossaries and prior literature; we also conduct a spot-check of reports to confirm that high scores correspond to substantive digital initiatives (El Khoury et al., 2023; Khalil et al., 2023; Suparman et al., 2025).

The model includes control variables such as BMV (book-to-market), LEV (total liabilities/total assets), FIRMAGE (years since establishment/listing), and ROA (net income/total assets) are included to account for differences in growth opportunities, capital structure, maturity, and profitability that may jointly affect ESG and disclosure incentives (Bsoul et al., 2022; Dicuonzo et al., 2024a).

Table 1. Variable Measurement

Variable	Code	Role	Definition	Measurement
ESG Performance	ESG	Dependent	Comparison between disclosure and the index: a score, i.e., disclosed items divided by items that should be disclosed	ESG score (Berg et al., 2022; Dicuonzo et al., 2024a; Laskar, 2024)
Female Directors	WOMANRATIO	Independent	Percentage of women on the board of directors	Number of female directors / total directors (Galletta et al., 2022; Odriozola et al., 2024)
FinTech	FINTECH	Moderating	Intensity of FinTech keyword disclosure in annual reports	Frequency of FinTech keywords (Kharrat et al., 2024)
Firm Age	FIRMAGE	Control	Company age	Years since establishment/listing (Dicuonzo et al., 2024)
Profitability	ROA	Control	Return on assets	Net income / total assets (Dicuonzo et al., 2024)
Book-to-Market Value	BMV	Control	Book-to-market ratio	Book value / market value (Bsoul et al., 2022)
Leverage	LEV	Control	Leverage	Total liabilities / total assets (Bsoul et al., 2022; Dicuonzo et al., 2024)

This study uses panel-data regression to test the effect of the proportion of female directors on ESG performance of Indonesian banks and to test FinTech's role as a moderating variable. A panel approach is selected because the data contain firm and time dimensions, enabling control for unobserved heterogeneity and yearly dynamics. To control for macro conditions, policies, and regulations that affect all banks in the same year, the model includes Year Fixed Effects. The study also includes common control variables to reduce omitted variable bias.

The empirical models consist of two specifications. Model (1) tests the direct effects of female directors and FinTech on ESG, while Model (2) adds the interaction term $\text{womanratio} \times \text{fintech}$ to test FinTech's moderating effect. The data analysis tool used is STATA 17.

Model (1) Direct effect:

$$ESG_{it} = \alpha + \beta_1 WOMANRATIO_{it} + \beta_2 FINTECH_{it} + \beta_3 FIRMAGE_{it} + \beta_4 ROA_{it} + \beta_5 BMV_{it} + \beta_6 LEV_{it} + \gamma_t + \varepsilon_{it} \quad (1)$$

Model (2) Moderation model:

$$ESG_{it} = \alpha + \beta_1 WOMANRATIO_{it} + \beta_2 FINTECH_{it} + \beta_3 (WOMANRATIO_{it} \times FINTECH_{it}) + \beta_4 FIRMAGE_{it} + \beta_5 ROA_{it} + \beta_6 BMV_{it} + \beta_7 LEV_{it} + \gamma_t + \varepsilon_{it} \quad (2)$$

Notes: i denotes the bank and t denotes the year. α is the constant (intercept), $\beta_1, \beta_2, \dots, \beta_7$ are the estimated parameter coefficients, γ_t represents the year fixed effects, and ε_{it} is the error term

4. Results

The empirical analysis was conducted in several stages. First, descriptive statistics and pairwise correlations were used to understand the distribution of the variables and to identify preliminary associations among the study variables. Second, panel-model specification tests were conducted to determine the most appropriate estimation approach, including the Chow test, Breusch-Pagan Lagrange Multiplier (LM) test, and Hausman test. Third, the direct-effect and moderation models were estimated using panel-data regression with year fixed effects. Fourth, robustness analysis was performed using Coarsened Exact Matching (CEM) to improve comparability across observations and reduce imbalance between firm-year observations. Finally, the consistency of the findings was evaluated by comparing the signs, magnitudes, and significance levels of the coefficients across the main and matched-sample estimations.

Table 2. Descriptive Statistics

	N	Mean	Standard Deviation	Minimum	Median	Maximum
ESG	230	0.285	0.328	0.000	0.000	1.000
WOMANRATIO	230	0.174	0.169	0.000	0.000	0.750
FINTECH	230	210.465	156.197	0.000	106.000	1194.000
FIRMAGE	230	48.435	27.611	5.000	30.000	128.000
ROA	230	20.180	152.427	-0.181	0.002	1276.000
BMV	230	5.750	48.377	0.000	0.000	588.930
LEV	230	2.958	11.096	0.000	0.044	87.572

The sample consists of 230 observations. The average ESG score is 0.285 (median 0; maximum 1), indicating that ESG values tend to cluster at low/zero levels. The low median ESG score suggests that ESG disclosure is highly uneven across Indonesian banks, with many bank-year observations exhibiting very limited disclosure. This pattern indicates that ESG adoption in the sample is still heterogeneous and supports the relevance of examining governance and digital factors as potential drivers of variation. The average proportion of female directors (womanratio) is 0.174 (maximum 0.750). The FinTech index based on keyword frequency has a mean of 210.465 with a range of 0–1194, showing heterogeneity in digital narrative/activity intensity across banks.

Table 3. Correlation Table

	ESG	WOMANRATIO	FINTECH	FIRMAGE	ROA	BMV	LEV
ESG	1.000						
WOMANRATIO	0.123* (0.063)	1.000					
FINTECH	0.009 (0.887)	-0.086 (0.193)	1.000				
FIRMAGE	0.145** (0.028)	0.004 (0.952)	-0.054 (0.414)	1.000			
ROA	0.149** (0.024)	0.056 (0.400)	-0.085 (0.198)	-0.149** (0.024)	1.000		
BMV	0.039 (0.556)	0.032 (0.634)	-0.049 (0.457)	0.126* (0.056)	-0.025 (0.703)	1.000	
LEV	-0.008 (0.899)	0.086 (0.192)	-0.022 (0.744)	-0.117* (0.076)	-0.020 (0.767)	-0.050 (0.453)	1.000

p-values in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3 reports pairwise correlations. WOMANRATIO is positively correlated with ESG ($r = 0.123$, $p = 0.063$), providing initial bivariate support for H1. FINTECH is not correlated with ESG ($r = 0.009$, $p = 0.887$), consistent with a moderation view where FinTech may not affect ESG directly but conditions governance effects. Among controls, firm age and ROA are positively related to ESG ($r = 0.145$, $p = 0.028$; $r = 0.149$, $p = 0.024$). Overall, correlations are modest, suggesting no obvious bivariate collinearity concerns.

Table 4. Hausman Test

	Chi2	df	Prob_chi2
FE_vs_RE	4.178811	6	.6524927

Table 4 present although the Hausman test suggests that RE is acceptable ($\chi^2 = 4.1788$; $p = 0.6525$), we primarily use FE to control for unobserved time-invariant bank heterogeneity and to identify within-bank effects over time, which is more aligned with the study's governance mechanism and panel structure. In this context, the fixed-effects approach provides a more conservative estimate of within-bank changes over time, while random-effects estimations are treated as supplementary specification checks.

Hypothesis 1: The Effect of Female Directors on ESG Performance

The regression results evaluate the relationship between female directors and ESG performance, measured using the ESG score. Table 5 reports a positive association between female directors and ESG performance. Specifically, the coefficient of womanratio is 0.252 and is statistically significant at the 10% level ($t = 1.90$). This finding indicates that a higher proportion of female directors is associated with stronger ESG performance. Therefore, the result supports the first hypothesis (H1) and is consistent with prior studies (Alkhwaldi et al., 2024; Berg et al., 2022; Menicucci & Paolucci, 2023), which suggest that gender diversity on the board can strengthen board monitoring and accountability, making ESG commitments easier to translate into concrete policies, targets, control procedures, and verifiable disclosures (Gurol & Lagasio, 2022). An increase in the ESG score also implies that the company is more capable of adopting and implementing ESG-related policies (Peng & Chandarasupsang, 2023). This result aligns with Khan et al. (2024), who argue that firms have incentives to implement ESG initiatives because they attract greater public attention, which can enhance transparency and credibility in sustainability reporting and, in turn, strengthen stakeholder trust. These findings provide empirical support for H1 and are broadly consistent with stakeholder theory.

Model 2 shows that board gender diversity (WOMANRATIO) has a positive association with ESG performance. The coefficient for WOMANRATIO is $B = 0.2528$ with $t = 1.89$ and $p = 0.060$, indicating the effect is marginally significant at the 10% level. This suggests that, holding other variables constant, an increase in the proportion of female directors is associated with a higher ESG score. In contrast, FINTECH is not statistically significant ($B = 0.0000244$, $t = 0.17$, $p = 0.868$), implying that FinTech intensity does not have a detectable direct effect on ESG in this specification. Overall, these results support H1, while they do not support H2 if H2 hypothesizes a direct FINTECH to ESG performance effect.

Table 5. Regression Test

Multiple Linear Regression Analysis Test				
Model	Unstandardized Coefficients			
	B	Std. Error	t	Sig
1 (Constant)	0.0119095	0.0526999	0.23	0.821
WOMANRATIO	0.251529	0.1324735	1.90	0.059*
p < 0.10, **p < 0.05, ***p < 0.01				
T-test				
Model	Unstandardized Coefficients			
	B	Std. Error	t	Sig
3 (Constant)	-0,0391147	0.0665991	-0,59	0.558
WOMANRATIO	0.4641468	0.2012184	2.31	0.022**
FINTECH	0.0001862	0.0001578	1.18	0.239
WOMANRATIOXFINTECH	-0,0006775	0.0003221	-2,1	0.037**
p < 0.10, **p < 0.05, ***p < 0.01				

Hypothesis 2: The Effect of Female Directors on ESG Performance Moderated by FinTech

The regression results assess the relationship between female directors and ESG performance when moderated by FinTech. Table 5 shows that FinTech significantly weakens the relationship between female directors and ESG performance at the 5% significance level, with an interaction coefficient of -0.001 ($t = -2.1$). This indicates that in firms with higher FinTech adoption, the positive contribution of female directors to ESG achievement tends to decline. In other words, financial technology advancement may disrupt or reduce the positive influence of board gender diversity on a firm's sustainability performance.

This negative moderation effect goes with the argument that FinTech implementation can reshape corporate governance processes in ways that make the board's traditional role including oversight contributed by female directors less decisive. Digital innovation may create disruption in decision making mechanisms through automation and algorithm-based processes, potentially reducing the room for directors to influence the ESG agenda. This pattern is important because it signals that digital transformation can generate organizational dynamics where governance benefits from gender diversity do not automatically translate into higher ESG outcomes.

In addition to the main variables, several control variables also significantly affect ESG performance. Firm age (firmage) is positively associated with ESG scores, and profitability (ROA) shows a significant positive relationship. This means that older firms and firms with stronger financial performance tend to achieve higher ESG scores. These results align with prior literature suggesting that older firms often face greater reputational pressure and have accumulated experience that encourages investment in social responsibility (Zhou et al., 2025). Fiorillo et al. (2025) also find that firm age is positively related to ESG performance, indicating that more established firms tend to take sustainability principles more seriously.

Similarly, higher ROA provides slack resources (excess resources) that firms can allocate to ESG initiatives (Li & Pang, 2023). With stronger profits, management has greater financial flexibility to respond to stakeholder demands for responsible business practices.

Table 6. Robustness CEM Table

		Unstandardized Coefficients			
Model		B	Std. Error	t	Sig
1	(Constant)	0.0119043	0.0522336	0.23	0.820
	WOMANRATIO	0.2255374	0.1368355	1.65	0.101
p < 0.10, **p < 0.05, ***p < 0.01					
		Unstandardized Coefficients			
Model		B	Std. Error	t	Sig
2	(Constant)	-0.0382006	0.0660022	-0,58	0.563
	WOMANRATIO	0.4283502	0.2056193	2.08	0.038**
	FINTECH	0.0001916	0.000157	1.22	0.224
	WOMANRATIO×FINTECH	-0.000649	0.0003185	-2,04	0.043**
p < 0.10, **p < 0.05, ***p < 0.01					

Table 6 reports robustness results using Coarsened Exact Matching (CEM) to improve covariate balance and comparability across observations (N = 224 after matching). The results are consistent with the main regression findings. In the interaction specification (Column 3), WOMANRATIO remains positive and statistically significant ($\beta = 0.428$; $t = 2.08$; $p < 0.05$), while WOMANRATIO×FINTECH remains negative and statistically significant ($\beta = -0.001$; $t = -2.04$; $p < 0.05$). This confirms that the negative moderation is not driven solely by imbalance or a small set of extreme observations. Control variables such as firm age and ROA remain positively associated with ESG across matched models, suggesting that more established and profitable banks tend to exhibit higher ESG disclosure even after improving sample comparability.

The results should be interpreted with caution because the distribution of several variables indicates substantial heterogeneity across observations. In particular, the ESG variable is concentrated at low values, while FINTECH and ROA exhibit wide dispersion, suggesting that the sample contains both very low and very high observations. Although the robustness analysis helps support the stability of the findings, the output remains sensitive to the quality of corporate disclosures and to differences in how banks report sustainability and digital initiatives.

5. Discussion

In banks, governance issues and ESG controversies can interact with risk-taking behavior, including operational, compliance, and reputational risks. As banks expand digital innovation, exposure to issues such as data security, system resilience, and technology-based compliance increases. The literature suggests that governance problems and ESG controversies in the banking industry have real consequences, so a “more digital” environment can increase the likelihood that FinTech weakens the effectiveness of board-driven ESG agendas (Agnese et al., 2024; Galletta et al., 2022). At this point, the negative moderation should not be read as a failure of female directors to promote ESG. Rather, it indicates that the benefits of inclusive governance require compatible organizational infrastructure, including well designed digital internal controls, stable strategic priorities, and clear processes to integrate ESG into the technology transformation roadmap.

These findings emphasize the importance of alignment among governance, digital strategy, and sustainability agendas. First, banks should view gender diversity on the board as a valuable governance resource for ESG, but its effectiveness will be higher when ESG is embedded in decision-making systems (for example, through cross-functional Key Performance Indicators,

sustainability committees, and integration into risk management). Evidence from Indonesian banking also shows that board structure is linked to ESG disclosure quality as well as legitimacy and performance (Andrieş & Sprincean, 2023; Gurol & Lagasio, 2022; Supriyanto et al., 2025).

Second, the FinTech roadmap should be designed not only as an innovation program, but also as a governance platform: digitalization that supports reporting, assurance, and internal controls can help ensure ESG is not reduced to narrative only. Third, regulators and bank management can treat the negative moderation as an early warning that rapid digital acceleration without adequate governance design may reduce the board's (including gender diversity's) influence on ESG. Therefore, digital transformation policies should be accompanied by stronger technology-based controls, compliance mechanisms, and risk management.

6. Conclusion

This study investigates whether female director representation is associated with ESG performance in Indonesian listed banks and whether FinTech intensity moderates this relationship using bank-year panel data for 2019-2023. The results indicate that a higher proportion of female directors is linked to stronger ESG performance, supporting the view that inclusive governance remains important as ESG becomes increasingly connected to stakeholder expectations. In contrast, the interaction results show that higher FinTech intensity weakens this positive association. This suggests that rapid digitalisation does not automatically translate into stronger sustainability outcomes when technology expansion increases operational complexity and stretches monitoring capacity, governance-based influence on ESG can become less effective.

These findings contribute to a stakeholder-oriented governance perspective by showing that the sustainability benefits of gender-diverse boards are conditional on the digital environment. Practically, banks should treat inclusive governance and digital transformation as complementary systems by strengthening technology governance, embedding ESG objectives into digital decision processes, and improving the reliability of sustainability data and internal sign-off so disclosure is verifiable rather than purely narrative. From a policy standpoint, the results are relevant for OJK, Bank Indonesia, and IDX: sustainable finance expectations and ESG reporting infrastructure should be aligned with technology-risk supervision, operational resilience requirements, and clearer disclosure guidance on digital governance so that innovation and sustainability reinforce each other rather than create trade-offs.

Limitations and avenue for future research

This study has several limitations. First, ESG performance is measured using ESG scores that may differ across rating providers, so variation in assessment methodology can influence interpretation. Second, the FinTech index is built from the intensity of keyword disclosure in annual reports; this disclosure-based measure may not fully capture implementation quality, depth of system integration, or the effectiveness of each bank's digital risk controls. Third, the sample is limited to the banking sector and a specific observation period, so generalization to other sectors or longer periods should be made with caution.

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