



When Does Sustainability Become Profitable? The Non-linear Impact of ESG Pillars on Vietnamese Commercial Bank's Performance

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ABSTRACT

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This study investigates the nonlinear effects of Environmental, Social, and Governance (ESG) factors on the performance of the 14 largest Vietnamese commercial banks by total assets (TA) during 2017-2024. Using a generalized least squares approach, the study performs diagnostic tests for cross-sectional dependence, slope heterogeneity, multicollinearity, and heteroskedasticity to ensure robust estimation. ESG data are collected from the Bloomberg Terminal. The results show that overall ESG display positive nonlinear effects, indicating a U-shaped relationship with bank performance, measured by return on equity (ROE). At the pillar level, the nonlinear effect of the Environmental and Social pillar are insignificant, the Governance pillars display positive nonlinear effects, indicating a U-shaped relationship. These results suggest that ESG adoption may impose financial costs due to investments in green technology, environmental risk management, and corporate social responsibility. However, such investments competitive benefits that banks obtain from deeper engagement in sustainable practices are may sufficient to offset the costs incurred during ESG implementation. Based on these findings, the study proposes recommendations to strengthen ESG implementation and improve the operational performance of Vietnamese commercial banks.

1. INTRODUCTION

Environmental, Social, and Governance (ESG) practices are increasingly recognized as an important strategic instrument through which firms can strengthen stakeholder trust, mitigate operational risks, and sustain competitive advantage [1, 2]. Nevertheless, empirical evidence on the relationship between ESG and firm performance remains inconclusive [3-5]. From a favorable perspective, a substantial body of research suggests that ESG adoption can enhance corporate reputation, lower the cost of capital, and improve risk management capacity, thereby supporting profitability growth [3]. In contrast, other studies argue that investment in sustainability initiatives may increase compliance costs, impose additional operational burdens, and divert resources away from projects with higher expected returns, thereby adversely affecting bank profitability [4, 5]. This inconsistency raises the question of whether the impact of ESG on performance is more appropriately explained from a nonlinear perspective rather than a purely linear one.

Particularly in Vietnam, an emerging financial market where ESG practices remain at an early stage of development [6], a deeper examination of this relationship is of considerable theoretical and practical importance. The literature review reveals five key research gaps. First, empirical evidence on the

relationship between ESG and bank performance in Vietnam remains fragmented and inconclusive [6, 7]. Second, most existing studies have focused primarily on the direction and magnitude of the ESG effect, while the possibility of a nonlinear relationship has not been adequately examined [8, 9]. Third, most existing studies rely on the overall ESG score without examining the ESG dimensions separately. This approach may obscure the distinct effects of each pillar, as some ESG activities may improve bank performance while others may increase costs and reduce performance. Fourth, although several studies have provided preliminary evidence of a U-shaped relationship between ESG and firm performance [6], this finding has not been sufficiently validated proper calculation to confirm the shape of the relationship within the observed data range [10]. Furthermore, the existing literature has not clearly identified the threshold at which the effect of ESG begins to reverse. Fifth, ESG data and measurement approaches in Vietnam remain inconsistent. Most studies measure ESG by constructing disclosure indices or applying content-based scoring methods to corporate reports, rather than using standardized ESG data from international databases, largely because of high costs and limited accessibility.

Building on these research gaps, this study is expected to make four contributions. First, it provides additional empirical

evidence from the Vietnamese banking sector. Second, it examines the nonlinear relationships between bank performance and both the overall ESG score and the individual ESG dimensions. Third, it identifies the threshold at which the effect of ESG on bank performance changes direction. Fourth, it uses standardized ESG data from Bloomberg, thereby improving the objectivity and comparability of the findings.

2. LITERATURE REVIEW

According to Stakeholder Theory [11], banks' proactive engagement in ESG initiatives helps meet the expectations of customers, investors, regulators, and the broader community, thereby strengthening legitimacy, building trust, and supporting better performance [12, 13]. At the pillar level, environmental practices can reinforce stakeholder confidence and reduce information-related risks by demonstrating that banks actively manage emissions, natural resources, and environmental risks. Social practices, including responsible lending, consumer protection, employee development, and financial inclusion, can strengthen customer relationships, enhance human capital, and reduce conduct and litigation risks [14, 15]. Governance practices, such as independent monitoring, effective risk oversight, audit quality, and transparent disclosure, can strengthen market discipline, improve credit screening, and enhance portfolio allocation [16, 17]. In addition, signaling theory [18, 19] likewise suggests that ESG disclosure enables banks to communicate their commitment to sustainable development and sound governance, thereby enhancing stakeholder confidence, reducing information asymmetry, and improving performance [20, 21]. At the same time, Legitimacy Theory emphasizes that ESG helps banks maintain social acceptance, reduce legal risk, and demonstrate compliance in a highly regulated industry [22, 23]. Evidence from developed economies indicates that ESG can create a "buffering effect", enhance stability, expand strategic opportunities, attract high-quality talent, and improve profitability [20, 24, 25].

In Vietnam, research on ESG in the banking sector has expanded considerably in recent years. However, empirical findings remain inconclusive, particularly as commercial banks face increasing pressure to improve information transparency, strengthen risk management, and promote sustainable finance. Some studies suggest that ESG practices enhance bank performance by improving governance quality and strengthening market reputation. Bui et al. [7] and Nguyen and Le [26] found that ESG has a positive effect on the profitability of commercial banks because its implementation can increase investor confidence, expand access to capital, and improve risk management capabilities. However, in emerging financial markets such as Vietnam, where ESG implementation remains at an early stage and varies considerably across banks, several studies report contrasting findings. Nguyễn et al. [6] found that ESG has a negative effect on bank performance, while Nguyen and Nguyen [27] also reported that corporate social responsibility reduces firm value, as measured by Tobin's Q. This finding is consistent with Trade-off theory, Kraus and Litzenberger [28] suggested that allocating resources to ESG initiatives may undermine financial performance because capital is diverted away from core profit-generating activities [29]. In banking, the integration of ESG standards often entails substantial costs, including compliance expenses, technological upgrading, the

establishment of dedicated risk management structures, and significant opportunity costs when banks are required to reject highly profitable but unsustainable projects [30]. These costs may differ across ESG pillars. Environmental initiatives may require substantial spending on technology, monitoring systems, climate risk assessment, and sustainable financial products [2, 31]. Social initiatives may increase employee welfare, community investment, reporting, and consumer protection costs, while excessive social expenditure may divert resources from core financial intermediation activities or support projects with limited economic benefits [32, 33]. Similarly, additional governance mechanisms may increase administrative complexity, constrain managerial discretion, slow strategic responses, and raise compliance costs, particularly when committee structures and monitoring procedures become excessively rigid [34]. In addition, from the perspective of Agency Theory, ESG investment may also be exploited by managers for private objectives, leading to inefficient resource allocation and negative consequences for shareholder interests [35-40].

The inconsistency in previous empirical findings on Vietnamese commercial banks raises the possibility that the relationship between ESG and bank performance may not be purely linear. In other words, the effect of ESG may vary across different levels of implementation. However, most prior studies have adopted a linear approach, which may not fully explain the differences in their findings. Consequently, recent research has increasingly applied a nonlinear perspective to examine how the effect of ESG changes as the level of ESG implementation increases. Drawing on the Resource-based View [41-43], deeper engagement in sustainable practices enables banks to gradually accumulate strategic resources that are valuable, rare, difficult to imitate, and non-substitutable. In the banking context, such intangible resources may include sustainable risk management capabilities, ESG-based credit assessment systems, brand reputation, market credibility, and the trust of stakeholders. These resources are developed through organizational learning, accumulated managerial experience, and the refinement of operational mechanisms aligned with sustainable development. When effectively integrated into business operations, these factors not only enhance governance quality, optimize capital allocation, and strengthen risk control, but also enable banks to build sustainable advantages in financial markets [44-46]. Each ESG pillar may contribute to the development of different strategic resources. Environmental capabilities can generate valuable intangible assets, including climate risk management systems, cleaner technologies, and expertise in green finance [47]. Social engagement can create relational and reputational assets through stronger customer loyalty, employee commitment, legitimacy, and human capital [47, 48]. Governance mechanisms can strengthen internal control, market discipline, credit assessment, risk oversight, and investor confidence [16, 17]. These benefits may become more substantial as ESG practices are integrated more deeply into bank operations. This raises the question of whether the competitive benefits that banks obtain from deeper engagement in sustainable practices are sufficient to offset the costs incurred during ESG implementation, as argued by Trade-Off Theory [28]?

However, even when extending the analysis to a nonlinear approach, existing studies have yet to reach a consensus on the actual shape of the relationship between ESG and bank performance. Some studies document an inverted U-shaped

relationship, implying that ESG investment may initially enhance firm value, but that marginal benefits decline once the optimal threshold is exceeded [49]. Bouattour et al. [50] argued that if ESG investment continues to rise beyond a certain turning point, compliance costs and operational burdens may exceed the gains achieved, thereby adversely affecting the market value and bank stability trade-off. Similar findings are reported by Salem et al. [2] and El Khoury et al. [49]. This pattern may also occur at the pillar level. Environmental investment may improve climate risk management and market value at moderate levels, but excessive spending on technology, monitoring, and innovation may outweigh its financial benefits [2, 31]. Similarly, excessive social investment may increase reporting costs, divert resources from financial intermediation, and create obligations to stakeholders that are increasingly costly to fulfil [32, 33, 48]. Governance practices may also produce diminishing returns when additional monitoring mechanisms, highly rigid committee structures, or constraints on managerial discretion reduce organizational flexibility and risk-adjusted profitability [34]. By contrast, other empirical studies support a U-shaped relationship between ESG and performance, emphasizing the substantial fixed costs firms face in the implementation [51, 52]. Barnett and Salomon [32] showed the costs of upgrading systems, adjusting internal processes, thereby exert downward pressure on profitability. However, once ESG integration reaches a sufficiently high level, this relationship tends to turn positive. This argument is reinforced by Yuen et al. [9] and Han et al. [53], who suggest that declines in profitability may be interpreted as deeper engagement in sustainable practices enables banks to gradually accumulate strategic resources that are valuable, rare, difficult to imitate. A U-shaped relationship may also arise across the individual ESG pillars. Environmental investment may impose technological and monitoring costs, but a sufficiently developed environmental capability may subsequently strengthen climate risk management and green finance expertise. Social initiatives may require considerable expenditure on employees, customers, and communities, but deeper social engagement may eventually generate stronger trust, customer loyalty, human capital, and reputational value. Governance investment may increase compliance and monitoring costs, but more developed governance capabilities can subsequently reduce agency conflicts, strengthen risk oversight, and increase investor confidence [49, 54].

In Vietnam, the study by Nguyễn et al. [6] was among the few studies to document a U-shaped nonlinear relationship between ESG and bank performance. However, the study primarily relies on the signs and statistical significance of the linear and quadratic regression coefficients. According to Lind and Mehlum [10], this approach is insufficient to establish the existence of a U-shaped relationship within the observed data range. Moreover, it does not clearly identify the ESG threshold at which the effect of ESG on bank performance changes direction. Therefore, the following hypotheses are proposed:

H1: *There is a U-shaped relationship between ESG and bank's performance.*

H2: *There is a U-shaped relationship between environmental pillar and bank's performance.*

H3: *There is a U-shaped relationship between social pillar and bank's performance.*

H4: *There is a U-shaped relationship between governance pillar and bank's performance.*

3. METHODOLOGY

3.1 Data

The sample consists of 14 Vietnamese commercial banks observed annually from 2017 to 2024, producing a balanced panel of 112 bank-year observations. The ESG Disclosures (ESG overall, Environmental pillar, Social Pillar, Governance pillar) data used in this study were collected from Bloomberg Terminal. Bloomberg develops its own ESG assessment framework based on the standards of the Global Reporting Initiative. The framework covers four dimensions, namely Environmental, Social, Governance, and the overall ESG score, with scores ranging from 1 to 100. This dataset was selected because of its standardized measurement approach. ESG Disclosure scores are calculated using publicly disclosed ESG information provided by firms and do not rely on the subjective estimates of individual analysts. In addition, the scoring framework is provided by Bloomberg, a reputable international database that is widely used in academic research [55]. Compared with the approaches adopted in previous studies, which constructed ESG indices or manually assessed the content of corporate reports [6, 56], the Bloomberg measure may reduce subjectivity in the selection of assessment criteria and the interpretation of disclosed information. It may also improve measurement consistency, reliability, and comparability across studies.

The year 2017 was selected because of the limited availability of ESG data in Vietnam, where sustainability reporting requirements were not yet mandatory and the relevant legal framework was still developing. The sample consists of 14 commercial banks selected on the basis of data availability rather than through random sampling from the entire Vietnamese commercial banking system. These banks are generally characterized by relatively large asset sizes, strong financial capacity, advanced governance quality, and high levels of information transparency, which enable them to satisfy the conditions required for ESG scoring by Bloomberg Terminal. The authors acknowledge that the sample size is limited because of constraints related to the availability and continuity of ESG data. This limitation is recognized in the conclusion and provides a basis for future studies to expand the sample as ESG data become more complete. Although the sample does not ensure full representation of the entire banking system, it captures a substantial proportion of total banking assets. The three state-owned commercial banks, BIDV, VietinBank, and Vietcombank, account for approximately 79% of the total assets (TA) of the state-owned commercial banking group. The remaining 11 banks, namely ACB, HDBank, LPBank, MBBank, SHB, SeABank, Sacombank, Techcombank, TPBank, VIB, and VPBank, account for approximately 80% of the TA of the joint stock commercial banking group [57].

3.2 Dependent variable

Operational performance is a multidimensional concept that reflects the outcomes generated by an organization's business activities and is defined according to the objectives of the assessment as well as the specific characteristics of each sector [58]. According to Daft and Marcic [59], performance refers to the ability to utilize input resources efficiently in order to generate profits and sustain competitive advantage. In the banking sector, performance is commonly associated with

profit growth, expansion of deposit mobilization, improvement in service quality, and the maintenance of capital adequacy [32]. Among the available performance indicators, ROE is one of the most frequently employed because they capture profitability and allow comparisons across banks of different sizes and across time periods [60, 61]. Specifically, ROE measures the return generated from shareholders' equity [56, 62]. Accordingly, this study uses ROE as the primary proxy for the performance of Vietnamese commercial banks [9, 51].

3.3 Control variables

The non-performing loan (NPL) ratio represents asset quality and credit risk. An increase in NPL is typically associated with higher provisioning costs and lower

profitability [7, 49]. The loan-to-deposit ratio (LDR) captures liquidity risk; a higher LDR may support credit expansion and profitability, but an excessively high level can place pressure on repayment capacity and adversely affect performance [7, 49]. The equity-to-total-assets ratio (TETA) is employed to control for capital adequacy and resilience to financial shocks; a strong capital base enables banks to withstand adverse conditions, reduce funding costs, and enhance profitability [34]. Bank size, measured by TA, reflects scale advantages that allow banks to diversify risk, optimize marginal costs, and strengthen competitiveness [49]. In addition, GDP growth indicates economic expansion, which stimulates credit demand and positively affects bank profitability [25]. By contrast, high inflation raises funding costs and puts pressure on profit margins across the banking system [63]. Table 1 provides detailed information on all variables.

Table 1. Symbol, measurement, expected result and data source of variables in the model

Variable	Symbol	Measurement	Expected Result	Data Source
Dependent variables				
Return on equity	ROE	Net income Average equity $\times 100\%$		Refinitiv
Independent variables				
ESG score	ESG	ESG score (1-100)	-	Bloomberg Terminal
Squared ESG score	ESG ²	Squared of the ESG score	+	Bloomberg Terminal
Environmental score	ENV	Environmental score (1-100)	-	Bloomberg Terminal
Squared Environmental score	ENV ²	Squared of Environmental score	+	Bloomberg Terminal
Social score	SOC	Social score (1-100)	-	Bloomberg Terminal
Squared Social score	SOC ²	Squared of the Social score	+	Bloomberg Terminal
Governance score	GOV	Governance score (1-100)	-	Bloomberg Terminal
Squared Governance score	GOV ²	Squared of the Governance score	+	Bloomberg Terminal
Macroeconomic control variables				
Inflation rate	INF	Inflation rate	-	Refinitiv
GDP growth	GDPG	GDP growth rate	+	Refinitiv
Bank-specific control variables				
Non – performing loans				
Non-performing loan ratio	NPL	Total loans Total loans	-	Refinitiv
Loan-to-deposit ratio	LDR	Customer deposits Total equity	+	Refinitiv
Equity-to-total-assets ratio	TETA	Total assets	+	Refinitiv
Bank size	TA	Natural logarithm of total assets	+	Refinitiv

Note: Environmental, Social, and Governance (ESG).
Source: Compiled by the authors based on prior studies.

3.4 Model

This study examines the impact of ESG and its pillars on the performance of Vietnamese commercial banks from a nonlinear perspective. To this end, the squared ESG term and its pillar (ESG², E², S², G²) are incorporated into the model to test for the possible existence of a nonlinear relationship. From a theoretical standpoint, establishing nonlinearity requires regressing y on both x and x^2 [64]. In this setting, the effect of x on y is no longer constant, but varies with the level of x , as indicated by the first derivative $\frac{dy}{dx} = b_1 + 2b_2x$ [32]. When $b_1 > 0$ and $b_2 < 0$, the relationship takes an inverted U-shape; conversely, when $b_1 < 0$ and $b_2 > 0$, it follows a U-shaped pattern. This approach has been widely adopted in prior studies to identify nonlinear relationships between ESG and firm performance, particularly U-shaped or inverted U-shaped effects [9, 51]. The empirical model is specified as follows:

Model 1. $ROE_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 (ESG_{it})^2 + \beta_3 LDR_{it} + \beta_4 NPL_{it} + \beta_5 TETA_{it} + \beta_6 TA_{it} + \beta_7 INF_{it} + \beta_8 GDPG_{it} + \varepsilon_{it}$

Model 2. $ROE_{it} = \beta_0 + \beta_1 ENV_{it} + \beta_2 (ENV_{it})^2 + \beta_3 LDR_{it} + \beta_4 NPL_{it} + \beta_5 TETA_{it} + \beta_6 TA_{it} + \beta_7 INF_{it} + \beta_8 GDPG_{it} + \varepsilon_{it}$

Model 3. $ROE_{it} = \beta_0 + \beta_1 SOC_{it} + \beta_2 (SOC_{it})^2 + \beta_3 LDR_{it} + \beta_4 NPL_{it} + \beta_5 TETA_{it} + \beta_6 TA_{it} + \beta_7 INF_{it} + \beta_8 GDPG_{it} + \varepsilon_{it}$

Model 4. $ROE_{it} = \beta_0 + \beta_1 GOV_{it} + \beta_2 (GOV_{it})^2 + \beta_3 LDR_{it} + \beta_4 NPL_{it} + \beta_5 TETA_{it} + \beta_6 TA_{it} + \beta_7 INF_{it} + \beta_8 GDPG_{it} + \varepsilon_{it}$

where, i denotes individual banks and t represents the year of observation.

4. RESULT AND DISCUSSION

4.1 Result

Table 2 reports the descriptive statistics of the variables included in the research model, highlighting a certain degree

of heterogeneity among the 14 Vietnamese commercial banks over the sample period. The mean values of ROE is 18.46% respectively, indicating noticeable variation in profitability across the sampled banks. The ESG variable has a mean of 23.821 and ranges from 11.62 to 47.84, suggesting substantial differences in the extent of ESG engagement across banks. Examining the three ESG pillars separately, ENV records a mean of 9.696 and varies from 1 to 43.01, implying uneven environmental practices; SOC has a mean of 13.802, with values ranging from 2.57 to 34.55; while GOV shows a mean of 48.874, ranging from 25.23 to 74.26, indicating that the governance dimension is generally more stable than the environmental and social components. The NPL ratio is maintained at a relatively low average level of 1.71%; however, the gap between its minimum and maximum values suggests that credit quality remains uneven across the banking system. In addition, lnTA reflects a pronounced disparity in TA size, ranging from smaller banks to large commercial

banks that play a dominant role in the market. Among them, BIDV is the largest bank, with an lnTA value of 18.500, corresponding to approximately VND 2.76 quadrillion by the end of 2024.

To further assess multicollinearity among the explanatory variables, the study employs the Pearson correlation coefficient, with 0.8 used as the threshold indicating serious multicollinearity. The results reported in Table 3 show that the aggregate ESG score is highly correlated with the ESG pillars, with correlation coefficients of 0.8166, 0.8708, and 0.8549, respectively. These high correlations are expected because the aggregate ESG score incorporates information related to the three individual pillars. However, the aggregate ESG score and the individual ESG pillars are estimated in separate regression specifications and are not included simultaneously in the same model. Accordingly, the preliminary evidence suggests that multicollinearity is not a serious concern in the model.

Table 2. Descriptive statistics

Variable	Mean	Std. dev.	Min	Max
ROE	0.1845545	0.0581738	0.0506	0.3064
ESG	23.82107	8.531918	11.62	47.84
ENV	9.696339	11.24219	1	43.01
SOC	13.80214	8.091466	2.57	34.55
GOV	48.87455	10.05449	25.23	74.26
LDR	1.009972	0.1466722	0.6884	1.4282
NPL	0.017083	0.0097265	0.0047	0.0573
TETA	0.0844232	0.0313294	0.0406	0.171
TA	16.87642	0.7593607	15.50644	18.5007
INF	0.0308875	0.0058527	0.017	0.0362
GDPG	0.0598625	0.0210395	0.0255	0.0854

Note: Environmental, Social, and Governance (ESG), non-performing loan (NPL), loan-to-deposit ratio (LDR), equity-to-total-assets ratio (TETA), total assets (TA).

Source: Data processing results derived from Stata 17.

Table 3. Correlation matrix

	ROE	ESG	ENV	SOC	GOV	LDR	NPL	TETA	TA	INF	GDPG
ROE	1.0000										
ESG	0.0883	1.0000									
ENV	0.1299	0.8166	1.0000								
SOC	0.3256	0.8708	0.6929	1.0000							
GOV	0.2532	0.8549	0.4844	0.6258	1.0000						
LDR	0.3847	0.0807	0.2573	0.0864	-0.1115	1.0000					
NPL	0.0312	0.0775	0.2281	0.1121	-0.1410	0.5146	1.0000				
TETA	0.7768	0.3206	0.1888	0.3700	0.2441	0.4745	0.2789	1.0000			
TA	-0.0363	0.3850	0.1963	0.5409	0.2955	-0.0746	-0.1297	-0.0649	1.0000		
INF	-0.1167	0.0634	0.0287	0.1070	0.0019	-0.0803	0.1264	0.0058	-0.0377	1.0000	
GDPG	-0.0346	0.0178	0.0240	0.0212	-0.0122	-0.0086	0.0939	-0.0244	-0.0533	0.6125	1.0000

Note: Environmental, Social, and Governance (ESG), non-performing loan (NPL), loan-to-deposit ratio (LDR), equity-to-total-assets ratio (TETA), total assets (TA).

Source: Data processing results derived from Stata 17.

Table 4 indicates that most variables in the model have VIF values below 5, suggesting that multicollinearity is not a serious concern. The main exceptions are ESG, ENV, SOC, GOV and their squared terms (ESG^2 , ENV^2 , SOC^2 , GOV^2).

This result is expected because the squared terms are deliberately included to test for possible nonlinear relationships between the ESG dimensions and bank performance. Since each squared term is constructed directly from its original variable, the high correlation between them reflects a technical form of structural multicollinearity rather than model misspecification. Therefore, the relatively high VIF values for these variables are not sufficient grounds for excluding the nonlinear specification from the analysis.

However, to mitigate the high structural multicollinearity arising from the inclusion of both the linear and squared ESG terms, the ESG score and each of its individual pillars were mean-centered before constructing their corresponding quadratic terms. The revised VIF results are presented in Table 5. Compared with the original specification, the VIF values of the linear and squared terms declined substantially after mean-centering, indicating that the multicollinearity associated with the polynomial specification was effectively reduced. This transformation does not alter the fitted values, overall explanatory power, or shape of the estimated nonlinear relationship, but improves the numerical stability and interpretability of the regression coefficients.

Table 4. Variance Inflation Factor (VIF) before mean-centered

Variable	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
ESG	284.91	0.003510						
ESG ²	278.82	0.003587						
ENV			18.62	0.053715				
ENV ²			18.39	0.054381				
SOC					37.00	0.027027		
SOC ²					37.50	0.026670		
GOV							712.49	0.001404
GOV ²							708.15	0.001412
LDR	1.82	0.550375	1.72	0.582229	1.77	0.565990	1.77	0.565233
INF	1.68	0.595125	1.67	0.598819	1.72	0.580998	1.67	0.597158
GDPG	1.61	0.619252	1.61	0.619299	1.62	0.618031	1.62	0.619064
TETA	1.54	0.651437	1.32	0.759946	1.72	0.582803	1.51	0.662089
NPL	1.44	0.692548	1.46	0.685157	1.46	0.685401	1.46	0.685860
TA	1.39	0.718477	1.09	0.917226	1.67	0.598008	1.22	0.818666
Mean VIF			5.73		10.56		178.74	

Note: Environmental, Social, and Governance (ESG), non-performing loan (NPL), loan-to-deposit ratio (LDR), equity-to-total-assets ratio (TETA), total assets (TA).

Source: Data processing results derived from Stata 17.

Table 5. Variance Inflation Factor (VIF) after mean-centered

Variable	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF	VIF	1/VIF
ESG	2.27	0.440157						
ESG ²	1.80	0.555143						
ENV			2.73	0.366156				
ENV ²			2.48	0.402906				
SOC					2.40	0.416405		
SOC ²					1.36	0.736552		
GOV							1.46	0.686415
GOV ²							1.24	0.803702
LDR	1.78	0.563013	1.65	0.604723	1.79	0.557114	1.78	0.561602
INF	1.94	0.514693	1.94	0.515861	1.98	0.505746	1.93	0.517030
GDPG	1.86	0.536311	1.86	0.536480	1.86	0.537078	1.86	0.536254
TETA	1.63	0.613620	1.32	0.755543	1.85	0.541338	1.53	0.653184
NPL	1.43	0.699030	1.46	0.685639	1.45	0.690057	1.40	0.712985
TA	1.47	0.678039	1.12	0.891797	1.75	0.571889	1.29	0.777221
Mean VIF	1.77		1.82		1.80		1.56	

Note: Environmental, Social, and Governance (ESG), non-performing loan (NPL), loan-to-deposit ratio (LDR), equity-to-total-assets ratio (TETA), total assets (TA).

Source: Data processing results derived from Stata 17.

After conducting the preliminary diagnostic tests, the pooled OLS model was found to be unsuitable due to the presence of serial correlation and heteroskedasticity. Accordingly, the Hausman test was employed to choose between the fixed-effects model (FEM) and the random-effects model (REM), with the results indicating that FEM was the more appropriate specification. The subsequent Pesaran CD and Pesaran-Yamagata tests revealed no evidence of cross-sectional dependence or slope heterogeneity across banks. Nevertheless, the FEM still violated the assumptions of homoskedasticity and no serial correlation, as indicated by the White and Wooldridge tests. Therefore, both the FEM with Driscoll-Kraay standard errors and the feasible generalized least squares estimator are employed. The former provides robust statistical inference while controlling for unobserved bank-specific heterogeneity, whereas the latter accounts explicitly for heteroskedasticity and serial correlation in the panel error structure. The Feasible Generalized Least Squares (FGLS) specifications include a full set of bank indicator variables, allowing each bank to have a bank specific intercept. The models allow for panel level heteroskedasticity and first order serial correlation within banks. The results obtained from the two estimators are compared to assess the stability and robustness of the estimated linear and nonlinear ESG effects.

The regression results reported in Tables 6 and 7 provide broadly consistent evidence across the fixed effects model with Driscoll Kraay standard errors and the FGLS estimator. For the overall ESG score, the linear coefficient is negative and statistically significant, while the squared term is positive and significant under both estimation methods. Specifically, the ESG coefficient is significant at the 5 percent level and ESG² at the 10 percent level in the fixed effects model, whereas FGLS reports significance at the 1 percent and 5 percent levels, respectively. These results suggest a U shaped association between overall ESG engagement and bank performance. A similar pattern is observed for the Governance pillar. GOV has a negative and statistically significant coefficient, while GOV² is positive and significant in both models. The evidence is particularly strong under FGLS, where both terms are significant at the 1 percent level. This finding suggests a robust U-shaped association between Governance engagement and bank performance. By contrast, neither the Environmental pillar nor the Social terms are statistically significant under either estimator, indicating insufficient evidence of a U-shaped relationship.

Table 8 presents the estimated turning points for the nonlinear relationships between ESG, Governance, and ROE. For the overall ESG score, the turning point estimated by the FEM Driscoll Kraay model is 18.726 on the mean centered

scale, corresponding to 42.547 on the original Bloomberg scale. This threshold lies within the observed range of the ESG variable. However, 109 observations, representing 97.32 percent of the sample, are located below the threshold, while only 3 observations, representing 2.68 percent, are located

above it. The FGLS estimator produces a lower turning point of 13.162 on the centered scale, equivalent to 36.983 on the original scale. Under this specification, 100 observations, or 89.29 percent, fall below the threshold, while 12 observations, or 10.72 percent, lie above it.

Table 6. Fixed-effects model (FEM)-Driscoll-Kraay results for model 1-4

Variable	(1)	(2)	(3)	(4)
ESG	-0.015608** (0.006193)			
ESG ²	0.000417* (0.000197)			
ENV		-0.002290 (0.002186)		
ENV ²		-0.000057 (0.000056)		
SOC			-0.003973 (0.007251)	
SOC ²			-0.000018 (0.000317)	
GOV				-0.01287*** (0.002773)
GOV ²				0.000465* (0.000243)
LDR	1.072*** (0.194)	0.895*** (0.208)	0.910*** (0.201)	0.879** (0.258)
NPL	-0.186** (0.053)	-0.167** (0.066)	-0.159* (0.071)	-0.204*** (0.034)
TA	0.155* (0.077)	0.091* (0.044)	0.093 (0.100)	0.084*** (0.021)
TETA	0.185*** (0.040)	0.158* (0.067)	0.179** (0.068)	0.368*** (0.103)
INF	0.095*** (0.014)	-0.216*** (0.041)	-0.203*** (0.038)	-0.242*** (0.057)
GDPG	-0.196*** (0.034)	0.092*** (0.024)	0.087*** (0.024)	0.097*** (0.013)
_cons	-4.712*** (1.056)	-4.069*** (0.702)	-3.981** (1.439)	-3.705*** (0.284)

Note: Driscoll-Kraay standard errors are shown in parentheses. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. Environmental, Social, and Governance (ESG), non-performing loan (NPL), loan-to-deposit ratio (LDR), equity-to-total-assets ratio (TETA), total assets (TA).

Source: Data processing results derived from Stata 17.

For the Governance pillar, the FEM Driscoll Kraay model identifies a turning point of 13.853 on the centered scale, equivalent to 62.730 on the original scale. The FGLS estimate is 12.002, corresponding to 60.877 on the original scale. Both thresholds fall within the observed Governance range. In the FEM Driscoll Kraay model, 100 observations, representing 89.29 percent of the sample, are below the threshold and 12 observations, representing 10.72 percent, are above it. In the FGLS model, 98 observations, or 87.5 percent, are below the threshold, while 14 observations, or 12.5 percent, are above it.

Overall, the turning points estimated by the two methods are reasonably consistent, particularly for the Governance pillar. All estimated thresholds lie within the observed data ranges, which provides support for the proposed U-shaped relationships. Nevertheless, the distribution of observations is uneven across the two sides of the thresholds suggesting that the increasing segment of this relationship should be interpreted cautiously.

To assess the robustness of the main findings, the study conducts three additional analyses. First, potential endogeneity in the relationship between ESG engagement and bank performance is considered, as larger and more profitable institutions may have greater capacity and incentives to adopt ESG practices more actively [65]. The diagnostic tests in this study do not provide clear statistical evidence of endogeneity.

Specifically, the Durbin and Wu Hausman tests fail to reject the null hypothesis that the ESG variables are exogenous. The first stage results also suggest that the instruments are sufficiently relevant, with minimum eigenvalue statistics of 80.020 for ESG and 76.131 for the Governance pillar. Nevertheless, to address this concern cautiously, the study additionally applies two stage least squares as a robustness test, using the corresponding ESG score and Governance pillar lagged by one period as the instrumental variable. Second, year effects are incorporated alongside bank specific effects to control for common shocks during the 2017 to 2024 period that may have affected all banks simultaneously, including macroeconomic fluctuations, regulatory changes, and pandemic related disruptions. Third, ROA is used as an alternative dependent variable to ROE to examine whether the results remain stable across different measures of bank performance.

The robustness results in Tables 9 and 10 are generally consistent with the main findings. For the overall ESG model, the lagged ESG term is negative and significant, while its squared term is positive and significant in the 2SLS specification. The same coefficient pattern is maintained after including year effects and when ROA is used as an alternative performance measure under both FEM with Driscoll Kraay standard errors and FGLS. Similar evidence is found for the

Governance pillar. Overall, the nonlinear ESG and estimators, year effects, and measures of bank performance. Governance results remain broadly robust across alternative

Table 7. FGLS results for model 1-4

Variable	(1)	(2)	(3)	(4)
ESG	-0.020884*** (0.006649)			
ESG ²	0.000793** (0.000348)			
ENV		-0.004141 (0.005222)		
ENV ²		-0.000029 (0.000185)		
SOC			-0.014954** (0.006853)	
SOC ²			0.000574 (0.000367)	
GOV				-0.013335*** (0.004284)
GOV ²				0.000556*** (0.000212)
LDR	0.376 (0.257)	0.358 (0.272)	0.445 (0.272)	0.201 (0.246)
NPL	-0.105 (0.088)	-0.109 (0.095)	-0.105 (0.093)	-0.105 (0.088)
TA	-0.338 (0.243)	-0.273 (0.249)	-0.179 (0.244)	-0.251 (0.250)
TETA	-0.119 (0.194)	-0.233 (0.198)	-0.186 (0.193)	0.024 (0.203)
INF	-0.261*** (0.090)	-0.229*** (0.091)	-0.203*** (.092)	-0.288*** (0.088)
GDPG	0.144*** (0.045)	0.146*** (0.046)	0.127*** (0.045)	0.147*** (0.045)
_cons	-7.459*** (1.789)	-7.412*** (1.807)	-8.021 (1.741)	-6.561*** (1.739)

Note: Robust standard errors are shown in parentheses. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively, non-performing loan (NPL), loan-to-deposit ratio (LDR), equity-to-total-assets ratio (TETA), total assets (TA); Environmental, Social, and Governance (ESG).

Source: Data processing results derived from Stata 17.

Table 8. Turning point

Model	Estimator	Turning Point	Observed Range	Below Threshold	Above Threshold	Threshold within Range
ESG-ROE	FEM-Driscoll-Kraay	18.726 (42.547)	[-12.201, 24.019]	109 (97.32%)	3 (2.68%)	Yes
ESG-ROE	FGLS	13.162 (36.983)	[-12.201, 24.019]	100 (89.29%)	12 (10.72%)	Yes
GOV-ROE	FEM-Driscoll-Kraay	13.853 (62.730)	[-23.645, 25.385]	100 (89.29%)	12 (10.72%)	Yes
GOV-ROE	FGLS	12.002 (60.877)	[-23.645, 25.385]	98 (87.5%)	14 (12.5%)	Yes

Note: Original-scale variable are shown in parentheses. Environmental, Social, and Governance (ESG); fixed-effects model (FEM); return on equity (ROE); Governance score (GOV); Feasible Generalized Least Squares (FGLS).

Source: Data processing results derived from Stata 17.

Table 9. Robustness test for Environmental, Social, and Governance (ESG) model

Variable	ROE (2SLS)	Year Fixed Effects (FEM-Driscoll-Kraay)	Year Fixed Effects (FGLS)	ROA (FEM-Driscoll-Kraay)	ROA (FGLS)
L.ESG	-0.0296** (0.0153)				
L.ESG ²	0.0011* (0.0006)				
ESG		-0.01529** (0.00606)	-0.0205*** (0.0065)	-0.0115** (0.0039)	-0.0163*** (0.0066)
ESG ²		0.00043* (0.00020)	0.0008** (0.0003)	0.00016** (0.00008)	0.0005** (0.0002)
Control variables	Yes	Yes	Yes	Yes	Yes

Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Durbin test (p-value)	0.2634				
Wu-Hausman test (p-value)	0.3805				
First-stage test	80.020				

Note: Robust standard errors are shown in parentheses. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. Fixed-effects model (FEM)Environmental, Social, and Governance (ESG); Feasible Generalized Least Squares (FGLS); return on equity (ROE).

Source: Data processing results derived from Stata 17.

Table 10. Robustness test for governance pillar model

Variable	ROE (2SLS)	Year Fixed Effects (FEM-Driscoll-Kraay)	Year Fixed Effects (FGLS)	ROA (FEM-Driscoll-Kraay)	ROA (FGLS)
L.GOV	-0.0390** (0.0195)				
L.GOV ²	0.0014** (0.00070)				
GOV		-0.01025** (0.0032)	-0.0133*** (0.0042)	-0.0125*** (0.0026)	-0.0095*** (0.0002)
GOV ²		0.00042* (0.0002)	0.0005*** (0.0002)	0.0004* (0.0002)	0.0005*** (0.0002)
Control variables	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Durbin test (p-value)	0.0623				
Wu-Hausman test (p-value)	0.1300				
First-stage test	76.131				

Note: Robust standard errors are shown in parentheses. Statistical significance is denoted by ***, **, and * at the 1%, 5%, and 10% levels, respectively. Fixed-effects model (FEM).

Source: Data processing results derived from Stata 17.

4.2 Discussion

First, the findings indicate that ESG exerts a negative effect on bank performance. This suggests that Vietnamese commercial banks incur substantial investment and compliance costs when implementing ESG, thereby exerting downward pressure on performance. This result is consistent with the trade-off theory of Kraus and Litzenberger [28], which posits that engagement in social and environmental activities may reduce performance because resources are diverted away from core profit generating operations. In the banking context, this implies that capital, human resources, and managerial capacity are allocated to ESG requirements rather than being concentrated on deposit mobilization, lending, and financial service provision [66]. This finding is also in line with prior empirical evidence reported by Auer et al. [29]. Moreover, the study reveals a positive nonlinear U-shaped effect of ESG on bank performance, thereby supporting hypotheses H1. Specifically, once the ESG scores of Vietnamese commercial banks exceed the thresholds of 36.983 for FGLS estimator and 42.547 for FEM-Driscoll-Kraay estimator, the effect of ESG shifts from negative to positive. This finding accords with the Resource-based View [43], according to which ESG implementation, although costly, enables banks to accumulate strategic intangible resources such as risk management capability, brand reputation, market credibility, and stakeholder trust. Consequently, while ESG may place pressure on performance,

its financial benefits are likely to emerge once ESG commitment reaches a sufficiently high level. This result is also broadly consistent with the empirical evidence documented by Nguyễn et al. [6] and Yuen et al. [9].

Second, the results show that the Environmental pillar and Social pillar have no statistically significant effect on bank performance in either its linear or nonlinear form. Accordingly, hypotheses H2 and H3 are not supported. This finding suggests that, in the context of Vietnamese commercial banks, environmental and social practices have not yet been sufficiently strong to generate a measurable effect. One possible explanation is that environmental and social initiatives in the banking sector remain relatively limited, while their economic benefits may require a longer period to materialize. From a theoretical perspective, although Stakeholder Theory [11] and the Resource-based View [43] suggest that moderate environmental and social engagement can enhance legitimacy, strengthen stakeholder trust, and create valuable intangible assets such as clean technologies and effective risk management systems, these advantages may not yet have been sufficiently developed in the Vietnamese banking context.

Third, the results show that the Governance pillar has a negative effect on bank performance, but simultaneously exhibits a positive nonlinear U-shaped effect, thereby supporting hypothesis H4. More specifically, the effect of governance changes from negative to positive when the governance score exceeds 62.730 for FEM-Driscoll-Kraay

estimator and 60.877 for FGLS estimator. From a theoretical standpoint, this result can be explained by the combination of Agency Theory and the Resource-based View. Governance mechanisms such as independent monitoring, dedicated risk committees, and transparent disclosure enhance market discipline and improve portfolio allocation, but excessive governance intensity may raise compliance costs and constrain flexibility [38]. However, the benefits associated with stronger core capabilities and greater stakeholder confidence begin to dominate; banks gradually benefit from reduced agency conflicts, better decision-making, stronger risk oversight, and enhanced investor confidence, all of which contribute to improved performance making governance a key driver of the observed U-shaped pattern [49, 54]. This result is also consistent with the empirical evidence documented by previous studies [7, 14, 17].

5. CONCLUSION AND IMPLICATIONS

Based on data from Vietnamese commercial banks over the period 2017 to 2024, this study finds that ESG, as well as its governance dimensions, exerts a negative effect on bank performance. However, this effect is not purely linear; rather, it follows a U-shaped pattern. This suggests that the costs associated with ESG implementation may place pressure on bank performance, whereas once ESG engagement reaches a sufficiently high threshold, the associated benefits begin to materialize more clearly. These findings provide further empirical support for both trade-off theory and the Resource-based view in explaining the nonlinear effect of ESG on bank performance. By contrast, the Environmental and Social dimensions do not show a statistically significant effect implying that environmental and social practices among Vietnamese commercial banks have not yet become sufficiently strong to generate a measurable performance impact.

The findings generate several important implications for policymakers and commercial banks:

First, because ESG implementation requires substantial investment and may increase operating costs, banks should adopt a cost effective and phased ESG strategy, prioritizing initiatives that are feasible yet capable of generating visible impacts, such as improving disclosure transparency, strengthening environmental and social risk management in lending activities, enhancing governance quality, and developing green financial products.

Second, although ESG adoption may place downward pressure on profitability, the ESG and Governance pillars in particular can generate benefits by improving institutional reputation, strengthening stakeholder relationships, enhancing customer loyalty, reducing agency conflicts, and increasing investor confidence. ESG should therefore be integrated into banks' development strategies through the incorporation of sustainability objectives into core business activities, the expansion of responsible and green lending, and the improvement of ESG practices in line with international standards. At the same time, banks should make greater use of government support schemes and international sustainability reporting frameworks in order to reduce compliance burdens and improve access to long term capital.

Third, although the environmental and social pillars do not show a statistically significant impact on bank performance in this study, it should not be overlooked in practice. From the

perspective of Stakeholder Theory, a moderate level of environmental engagement can strengthen legitimacy, reinforce stakeholder confidence, and reduce information-related risk. Likewise, the Resource-based View suggests that environmental capability can generate valuable intangible assets, such as cleaner technologies and more effective risk management systems, which may enhance competitive advantage over time. For this reason, commercial banks should continue to pay attention to environmental practices, not only because of potential economic benefits, but also because environmental commitment is increasingly becoming an essential condition sustainable banking development.

Fourth, at the policy level, Vietnam is still in the process of refining its ESG-related legal and institutional framework. The government should therefore establish clear, consistent, and credible ESG regulations. A phased introduction of ESG disclosure requirements, aligned with international standards, would help reduce regulatory uncertainty and compliance costs for commercial banks, while also encouraging a more effective and substantive integration of ESG into the banking system.

The study also acknowledges several limitations:

First, bank performance is measured using only ROE while ROA is employed only as a robustness measure; therefore, the findings may not fully capture all dimensions of bank performance. Incorporating additional indicators, such as NIM and Tobin's Q, could improve the robustness of the analysis and provide a stronger test of the stability of the empirical results.

Second, although the findings confirm the existence of a U-shaped relationship between ESG and bank performance, the magnitude of this effect may differ across banks with different ownership structures, particularly between state-owned and non-state-owned banks. Future research could extend the analysis by explicitly considering ownership characteristics in order to shed further light on heterogeneity in the ESG-performance relationship.

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