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ESG and bank cost efficiency in Vietnam: The moderating roles of economic conditions and income diversification

Thi Lam Anh Nguyen[1+]
Minh Ha Luong[2]
Van Tam Nguyen[3]

[1,2,3]*Banking Academy of Vietnam, 12 Chua Boc, Hanoi, Vietnam.*
[1]*Email: nguyenlamanh@hvnh.edu.vn*
[2]*Email: halm@hvnh.edu.vn*
[3]*Email: tamnv@hvnh.edu.vn*

(+ Corresponding author)

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ABSTRACT

This study examines how environmental, social, and governance (ESG) factors influence the cost efficiency of banks, utilizing a dataset of 27 Vietnamese commercial banks over the period from 2014 to 2023. Employing a two-way fixed-effects estimation method, the findings reveal that social factors exert a significant adverse effect on bank cost efficiency, while governance practices contribute positively to improvements in bank efficiency. Additionally, further analysis indicates that favorable economic conditions can lessen the positive beneficial impact of governance practices on the cost efficiency of banks. The study also shows that income diversification strategies help reduce the detrimental effects associated with social practices, implying that banks with more diversified incomes can mitigate the negative influence of social activities on their efficiency. Interestingly, the study reveals significantly positive impacts of combined ESG and economic factors for banks with low levels of government and foreign ownership, respectively. These results emphasize the dynamic and complex role of ESG practices in shaping bank performance. They also suggest that ownership structure can critically influence the extent to which banks can leverage ESG activities to enhance their operational outcomes. This study offers valuable insights for banks, investors, and policymakers seeking to enhance efficiency by strategically implementing ESG, taking into account the moderating effects of economic environments and ownership characteristics.

Contribution/ Originality: This study contributes to the literature by examining how ESG factors affect bank cost efficiency, considering the moderating roles of economic development and income diversification. It offers insights into how banks can strategically leverage ESG to improve efficiency in developing markets such as Vietnam.

1. INTRODUCTION

ESG practices play an important role in bank operations and outcomes (Yuen, Ngo, Le, & Ho, 2022). Banks' environmental practices may influence their lending activities due to increased scrutiny on the environmental risks of their loan portfolios, leading to improved risk management and restricted lending to certain industries (Weber, 2012). Social factors, such as employee welfare or community engagement, may help enhance banks' reputations, potentially boosting their performance (Yan, Espinosa-Cristia, Kumari, & Cioca, 2022). Governance practices, such as ethical leadership and transparency, can contribute to minimizing compliance-related risks and fostering improvements in banks' operational efficiency (Efunniyi et al., 2024).

The effects of ESG on bank performance in developing countries may be more pronounced due to unique opportunities and challenges. Opportunities include social considerations, such as financial inclusion initiatives and

urgent environmental practices to reduce climate-related risks faced by developing countries, which can positively expand customer bases, enhance bank image, and boost bank performance (Chang, Liang, & Liu, 2021). However, challenges include less-developed regulatory frameworks and infrastructure, which could adversely affect banks' ability to effectively implement ESG strategies and maintain strong performance (Buallay, Fadel, Alajmi, & Saudagaran, 2021).

Previous research examining the relationship between ESG and bank efficiency has yielded inconsistent results, mostly due to the sample selection and method employed. The majority of studies focused on examining commercial banks in developed economies, including Europe and North America, such as Chiaramonte, Dreassi, Girardone, and Piserà (2022) and Citterio and King (2023), or on a global scale, including Di Tommaso and Thornton (2020), Yuen et al. (2022) and Li, Trinh, and Elnahass (2023). In contrast, few authors have investigated the banking sector in developing countries, with notable studies by Azmi, Hassan, Houston, and Karim (2021) and Gutiérrez-Ponce and Wibowo (2024). Although empirical evidence generally supports the notion that ESG positively influences bank financial outcomes, its positive role appears to be less than that of banks in developing economies. The methods employed also show variations, including panel regression (Chiaramonte et al., 2022; Yuen et al., 2022), fixed effects model (Li et al., 2023), GMM (Di Tommaso & Thornton, 2020), and difference-in-difference (DiD) methods (Azmi et al., 2021). Generally, existing literature highlights the need to control for endogeneity issues when estimating the impact.

By surveying the previous literature, we identified that empirical studies exploring how ESG factors influence bank efficiency in Vietnam remain scarce, especially those investigating overall ESG scores and individual components. One constraint leading to this research gap is the lack of ESG data for Vietnamese banks due to their recent adoption of ESG reporting practices. Additionally, because Vietnamese banks are currently in the early stages of incorporating ESG principles—driven by a developing regulatory framework, international commitments, and ESG's potential to improve performance—they provide a unique socioeconomic setting for research. Accordingly, this study aims to evaluate how ESG reporting practices among Vietnamese banks influence their efficiency. To achieve this, we apply a two-way fixed effects model using panel data from 27 commercial banks in Vietnam from 2014 to 2023. The findings suggest that, while the overall ESG score does not have a statistically significant impact on bank cost efficiency, the social aspect shows a notable negative relationship, while the governance component shows a positive impact. Additionally, we find that diversification of income helps lessen the negative influence of the social aspect on efficiency, while economic conditions reduce the positive impact of the governance factor. We also found a positive significant impact of ESG for banks with low degrees of government ownership, and a similar impact of the environmental factor for banks with low degrees of foreign ownership.

Our study offers several key contributions to existing research. First, it expands the scarce empirical evidence on how ESG implementation affects bank efficiency in emerging economies, particularly by addressing the gap caused by the recent emergence of ESG reporting among Vietnamese banks. Second, it provides an in-depth analysis of how ESG interacts with economic conditions and income diversification to shape efficiency outcomes. Third, the study analyzes the impacts using a heterogeneity analysis based on bank ownership and the financial disruption linked to the COVID-19 pandemic. Fourth, it suggests valuable recommendations for financial institutions and regulators to improve ESG practices and efficiency within Vietnamese banks.

The paper is structured as follows: Section 2 reviews theoretical frameworks and empirical findings; Section 3 describes the data, modeling framework, and estimation approaches; Section 4 presents and interprets the empirical findings along with further analysis; and Section 5 offers concluding remarks.

2. LITERATURE REVIEW

ESG significantly influences bank operational efficiency, affecting costs, revenue, profitability, stability, and sustainability (Yuen et al., 2022). However, the impact varies based on context and moderating factors. ESG and bank

performance relationships are complex, with theories offering diverse perspectives on both positive and negative effects. Stakeholder theory argues that when banks perform well on ESG, they meet stakeholders' expectations regarding social and environmental responsibility, which can enhance their reputation, build trust, mitigate risks, and improve operational efficiency (Freeman, 1984). Signaling theory adds that banks' ESG practices send market signals about their quality, value, and prospects, which can create unique resources and improve competitive capabilities and efficiency (Spence, 1973).

In contrast, Friedman (2007) argues that increased compliance costs, reduced short-term profits, and the phenomenon of "greenwashing" when facing trade-offs between different objectives may account for the adverse effects of ESG initiatives on bank financial outcomes. Similarly, Transaction Cost Economics explains how ESG implementation may increase a bank's transaction costs, adversely impacting its efficiency (Williamson, 1981). Additionally, Agency Theory argues that managers may prioritize their personal interests over those of shareholders, suggesting that ESG implementation can cause conflicts of interest due to excessive ESG spending or the targets of shareholder groups regarding short-term profit and sustainable growth (Jensen & Meckling, 1976).

Previous literature reveals that despite growing academic interest in ESG, empirical findings have yet to reach a unified conclusion regarding its effects on banking sector performance (Chiaramonte et al., 2022; Citterio & King, 2023; Yuen et al., 2022). Notably, the majority of existing studies have focused on commercial banks in developed countries or on a global scale (Di Tommaso & Thornton, 2020; Li et al., 2023) while empirical evidence from developing countries remains relatively limited (Azmi et al., 2021; Gutiérrez-Ponce & Wibowo, 2024). Differences in economic, cultural, and institutional contexts in developing economies, such as Vietnam, may lead to markedly different empirical results compared to developed countries, a point that has not yet been adequately clarified in prior studies.

Azmi et al. (2021) shed evidence that ESG might help banks and businesses in lowering their cost of capital while promoting long-term value creation. However, Di Tommaso and Thornton (2020) and Yuen et al. (2022) show that ESG does not necessarily always produce a positive effect, and there are instances where a trade-off emerges between ESG spending and short-term profitability in banks. Citterio and King (2023) identified that ESG significantly influences bankruptcy risk as a whole without exploring individual components of ESG. Many studies have attempted to analyze the impact of each factor (E, S, G) on various aspects of banks (Chiaramonte et al., 2022; Gutiérrez-Ponce & Wibowo, 2024; Li et al., 2023; Yuen et al., 2022).

Specifically, the environmental factor (E) has positive effects, but is inconsistent across studies. Some studies concluded that E increases the reputation of banks (Chiaramonte et al., 2022) and reduces long-term risk (Li et al., 2023) but may reduce short-term returns if overinvested (Di Tommaso & Thornton, 2020). The influence of the social factor (S) remains unclear in most studies. It is considered a supplementary factor rather than a key factor in risk management and improving operational efficiency. In contrast, the governance factor (G) is concluded to be the most crucial factor in reducing NPLs, risk management, and bank costs, especially during the COVID-19 outbreak (Chiaramonte et al., 2022; Li et al., 2023). Gutiérrez-Ponce and Wibowo (2024) employed a Fixed Effects Model (FEM) for a sample of 19 banks from five countries in the ASEAN region. However, this study had several limitations. The authors did not comprehensively address endogeneity issues, which may have led to biased conclusions. Bank size was considered without separately evaluating banks in different groups. They also did not consider the impact of banks' ownership structures, which could significantly alter ESG's effect on bank performance.

Azmi et al. (2021) investigated banks from 44 developing nation i during the period 2011–2017, focusing on the influence of ESG practices on the weighted average cost of capital (WACC). Their findings imply that, although overall ESG performance did not produce a statistically significant effect on WACC, ESG activities were observed to strongly influence the cost of equity. Specifically, the environmental factor (E) did not influence banks' costs of debt but significantly reduced their cost of equity. Meanwhile, the social (S) and governance (G) factors show no significant effects on either debt or equity costs. One shortcoming of this study is its exclusive focus on banks within a specific

subset of developing economies, which potentially limits the applicability of the findings across other groups of developing economies.

Moreover, although recent studies have employed diverse analytical methods, including panel regression, fixed effects models, difference-in-differences (DiD), and machine learning approaches (Chiaramonte et al., 2022; Citterio & King, 2023; Li et al., 2023) few have comprehensively addressed endogeneity issues, particularly when focusing on banking institutions in developing economies such as Vietnam. Importantly, the recent context of the COVID-19 pandemic raises the question of whether ESG practices can function as an efficient defensive strategy for banks to navigate unexpected economic shocks an assertion previously supported by studies such as Chiaramonte et al. (2022) in the context of the 2008 global financial crisis but has not yet been clearly examined in the COVID-19 crisis.

Therefore, the authors aim to provide evidence to address the research gaps regarding how ESG practices influence the performance of Vietnamese commercial banks, utilizing a two-way fixed-effects estimation technique with control for endogeneity. In particular, the study emphasizes clarifying the role of ESG within the unique context of a developing country such as Vietnam, underlining the critical role of ESG amid the COVID-19 pandemic.

3. DATA AND METHODOLOGY

3.1. Data

To assess the influence of ESG factors on the cost efficiency of banks, we used a sample of 27 commercial banks in Vietnam from 2014 to 2023. The 27 banks were selected based on data availability, including 5 government-owned banks and 22 private banks. There are no foreign-owned banks in the sample because only 30% of foreign ownership is permitted for commercial banks in Vietnam. ESG score data were collected from banks' annual reports, while additional financial data were obtained from the FiinPro database.

3.2. Models

3.2.1. Dependent Variable

The dependent variable is bank cost efficiency (COSTEFF), computed using the stochastic frontier approach (SFA). This approach constructs a cost-efficiency frontier that accounts for bank input prices, output levels, and other external control factors. The inefficiency term is then extracted from the error term, allowing an accurate measure of bank efficiency (Berger, Hasan, & Zhou, 2010).

We construct the stochastic cost frontier using the translog functional form (Berger et al., 2010).

$$\ln\left(\frac{TC}{P_L}\right) = \beta_0 + \sum_{i=1}^{2}\alpha_i \ln\frac{P_i}{P_L} + 0.5\sum_{i=1}^{2}\sum_{j=1}^{2}\alpha_{ij}\ln\frac{P_i}{P_L}\ln\frac{P_j}{P_L} + \sum_{k=1}^{3}\gamma_k lnQ_K + 0.5\sum_{k=1}^{3}\sum_{m=1}^{3}\gamma_{km} lnQ_K lnQ_M +$$

$$0.5\sum_{i=1}^{2}\sum_{m=1}^{3}\delta_{im}\ln\frac{P_i}{P_L} lnQ_M + \lambda_n controls + v_{it} + u_{it} \quad \text{(A.1)}$$

In which i and t represent the individual bank and the time period, respectively. TC represents the bank total costs. Q captures the output quantity, comprising loans to customers (Q_1), interbank loans (Q_2), and other earning assets (Q_3). P is the set of input prices, which includes labor price (P_L), capital price (P_K), and fund price (P_D). P_L is the ratio of personnel expenses to total assets, P_K is the ratio of depreciation expenses to total assets, and P_D is the ratio of interest expenses to deposits. We standardize the dependent and input price variables by dividing by P_L to impose linear homogeneity on the above model (Berger et al., 2010). *Controls* are the bank equity ratio, productivity (increases in GDP per person employed), inflation rate, industry concentration (share of the three largest banks in the sector), and year dummy. u_{it} represents the inefficiency term and v_{it} denotes the random error.

Cost efficiency scores (*COSTEFF*) are then estimated using the method of Battese and Coelli (1995). *COSTEFF* values range between 0 and 1, with higher scores implying higher bank cost efficiency.

3.2.2. Independent Variables

The explanatory variables consist of the overall ESG composite score as well as the individual scores for the environmental (E), social (S), and governance (G) dimensions. We construct ESG scores because popular ESG databases such as Refinitiv and Bloomberg provide limited data for commercial banks in Vietnam.

We score each bank against the standards set by the Global Reporting Initiative (GRI), which forms the foundation adopted by the State Bank of Vietnam to establish ESG disclosure guidelines within the banking sector (Global Reporting Initiative (GRI), 2021).

We followed the approach of Akhter, Hossain, Elrehail, Rehman, and Almansour (2023) to construct scores. In each indicator of GRI, banks receive a score of "1" if they meet the criteria and "0" if they do not. The score for each aspect (E, S, and G) is the average of all indicators in that theme, multiplied by 10. The ESG combined scores are the averages of the E, S, and G scores. Higher scores indicate stronger ESG disclosure compliance among banks.

3.2.3. Controls

Drawing from the literature Gawęda (2025) and Shen, Wu, Li, and Chen (2025) we use control variables that represent bank characteristics, including ownership structure (GOVT, FOREIGN), size, age, profitability, revenue growth, and financial structure (Table 1). We then construct static panel time-individual two-way fixed-effect models to examine the influence of ESG factors on bank cost efficiency:

$$COSTEFF_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 GOVT_{it} + \beta_3 FOREIGN_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 ROA_{it} + \beta_7 GROWTH_{it} + \beta_8 ESG_{it} + \beta_9 DEBT_{it} + \sum bankdum + \sum yeardum + \varepsilon_{it} \quad (1)$$

$$COSTEFF_{it} = \beta_0 + \beta_{11} E_{it} + \beta_{12} S_{it} + \beta_{13} G_{it} + \beta_2 GOVT_{it} + \beta_3 FOREIGN_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + \beta_6 ROA_{it} + \beta_7 GROWTH_{it} + \beta_8 ESG_{it} + \beta_9 DEBT_{it} + \sum bankdum + \sum yeardum + \varepsilon_{it} \quad (2)$$

In which $\sum bankdum$ and $\sum yeardum$ represent individual and time fixed effects, respectively. ε_{it} is the random error.

Table 1. Variable description.

Variables	Definitions	Calculation methods
COSTEFF	Cost efficiency scores	SFA method
ESG	ESG performance of banks	Using GRI standards
E	Environmental dimension of ESG	Using GRI standards
S	Social dimension of ESG	Using GRI standards
G	Governance dimension of ESG	Using GRI standards
GOVT	Government ownership	% of government ownership
FOREIGN	Foreign ownership	% of foreign ownership
SIZE	Bank size	Natural logarithm of total assets at the fiscal year-end
AGE	Bank age	Natural logarithm of the number of years since establishment
ROA	Bank profitability	Profit after tax/ Total asset at the end of the year
GROWTH	Bank growth	Changes in bank turnover
DEBT	Financial structure of banks	Total debt/Total asset
ECON	Economic conditions	Dummy variable, assigned 1 if GDP growth exceeds the sample median, and 0 otherwise
INCOME_DIV	Income diversification	HHI index (Appendix A)

4. EMPIRICAL RESULTS

4.1. Baseline Results

Table 2 displays the descriptive statistics of the variables used in the analysis. Table 3 summarizes the results of the baseline regressions. Column (1) reports the regression results based on the aggregated ESG scores, while Column (2) presents the results for the separate environmental, social, and governance components. We controlled

for individual and time fixed effects in both columns. The results in Column (1) indicate that ESG has no overall significant effect on the cost efficiency of Vietnamese commercial banks. However, when analyzing individual components, the results in Column (2) show a significant negative impact of the social dimension but a significant positive influence of the governance dimension on cost efficiency.

The insignificant influence of ESG on bank efficiency in Vietnam may stem from a lack of immediate cost-saving benefits. The higher costs of ESG implementation (e.g., compliance costs, reporting expenses, investment in green technology) may not be offset by corresponding benefits (e.g., increased revenue, risk reduction), potentially leaving a bank's cost efficiency unchanged (Freeman, 1984; Jensen & Meckling, 1976; Williamson, 1981). Additionally, the current adoption of ESG by Vietnamese banks is primarily driven by regulatory compliance or image enhancement, giving rise to "greenwashing" concerns rather than operational efficiency, which limits the direct impact on bank cost reduction.

Consistent with the findings for the aggregated ESG scores, environmental scores (E) showed no significant impact on bank cost efficiency. This can be explained by the weak and unclear legal and institutional requirements for banks to enforce environmental practices, which may decrease Vietnamese banks' investment in environmental activities.

The significant negative influence of the social score (S) on bank cost efficiency suggests that the costs related to implementing social initiatives currently exceed the benefits, aligning with the findings of Gawęda (2025). For Vietnamese banks, the largest institutions are either state-owned or have significant state ownership. In addition to pursuing business objectives, these banks also implement the social policies of the Vietnamese government. These banks may accept a lower level of cost efficiency to achieve social goals, such as maintaining branches in rural or remote areas, even if unprofitable, to serve the community, and investing in social initiatives.

Table 2. Descriptive statistics.

Variables	Obs.	Mean	Std. dev.	Min.	Max.
COSTEFF	254	0.878	0.107	0.507	0.985
ESG	270	1.446	1.03	0	5.503
E	270	0.646	1.018	0	5.15
S	270	1.881	1.433	0	7.2
G	270	1.822	1.189	0	8.24
GOVT	270	0.152	0.281	0	1
FOREIGN	270	0.11	0.117	0	0.3
SIZE	269	32.765	1.134	30.393	35.372
AGE	270	3.114	0.524	0	4.19
ROA	269	0.008	0.007	-0.007	0.032
GROWTH	270	0.176	0.243	-1	2.9
DEBT	269	0.915	0.032	0.78	0.959
ECON	270	0.7	0.459	0	1
INCOME_DIV	270	0.2	0.401	0	1

Finally, governance positively affects bank cost efficiency through various channels, including mitigating conflicts of interest among stakeholders and between owners and managers, reducing transaction costs, improving decision-making quality, lowering the cost of capital, and building core competencies. State Bank of Vietnam (2023) also indicates that Vietnamese banks have made significant improvements in complying with governance regulations, particularly those related to board structure, internal oversight, and risk management, which play a crucial role in achieving cost efficiency. Gawęda (2025) shows that firms with strong governance tend to have a lower cost of capital.

Table 3. Baseline results.

Variables	COSTEFF	COSTEFF
	(1)	(2)
ESG	-0.000557	
	(-0.10)	
E		0.00527
		(0.54)
S		-0.0154*
		(-1.90)
G		0.0145*
		(1.96)
GOVT	0.182**	0.223***
	(2.23)	(2.61)
FOREIGN	-0.0266	-0.049
	(-0.35)	(-0.62)
SIZE	0.125***	0.129***
	(3.77)	(4.07)
AGE	-0.0946	-0.0977
	(-1.10)	(-1.17)
ROA	2.037	1.984
	(1.33)	(1.24)
GROWTH	-0.214***	-0.211***
	(-5.81)	(-5.95)
DEBT	0.555*	0.597**
	(1.96)	(2.16)
Bank FE	Yes	Yes
Year FE	Yes	Yes
N	254	254
Adj. R^2	0.747	0.758

Note: This table reports the impact of ESG and its components on banks' cost efficiency in Vietnam. The sample period is 2014 - 2023. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively. t-statistics are in parentheses.

4.2. Moderating Effects of Economic Conditions and Income Diversification

Table 4 presents the findings that illustrate how economic conditions diminish the role of governance in enhancing bank efficiency. This is because strong governance is more important for banks during economic downturns, helping them navigate challenges and maintain operational efficiency (Akerlof & Shiller, 2009). Our results support the findings of Gawęda (2025), which show that in developed economies, investing in ESG (including G) yields lower financial benefits than in developing economies.

Additionally, we find that bank income diversification helps reduce the negative impact of social aspects on bank efficiency, aligning with the conclusions of Gawęda (2025).

When a bank is not overly reliant on a single business area or customer group, the impact of a negative social event on the bank's overall operations is reduced. Income from diverse sources can compensate for mitigating financial damage and remediation costs. Simultaneously, the diversification process compels banks to develop a comprehensive social risk management capability that is applicable across various sectors, thereby minimizing the negative impact of social practices.

Table 4. Moderating effects of economic conditions and income diversification.

Variables	COSTEFF			
	Moderator: ECON		Moderator: INCOME_DIV	
	(1)	(2)	(3)	(4)
ESG	0.002		0.006	
	(0.16)		(0.027)	
ESG x Moderator	-0.003		-0.014	
	(-0.24)		(-0.25)	
E		0.007		0.041
		(0.55)		(1.03)
E x Moderator		0.0008		-0.089
		(0.05)		(-1.01)
S		-0.028***		-0.050**
		(-2.80)		(-2.47)
S x Moderator		0.014		0.096**
		(1.47)		(2.12)
G		0.028***		0.040**
		(2.83)		(2.14)
G x Moderator		-0.020**		-0.073
		(-2.30)		(-1.59)
Controls	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	254	254	254	254
Adj. R^2	0.694	0.711	0.700	0.718

Note: This table reports the moderating role of economic conditions (ECON) and bank income diversification (INCOME_DIV) on the impact of ESG on bank cost efficiency in Vietnam, by adding interactive variables to the baseline model. The sample period is from 2014–2023. ***, ** denote statistical significance at 1% and 5%, levels, respectively. t-statistic is in parentheses.

4.3. Heterogeneity Analysis

This section presents the varied effects of ESG on bank cost efficiency.

The results in Table 5 show that, while ESG practices do not exhibit a statistically significant influence on bank cost efficiency across the full sample, they demonstrate a significant positive influence on banks with less than 5% state ownership. One possible explanation is that banks with greater government involvement may implement ESG measures mainly for social objectives, thereby overlooking their economic advantages.

Similarly, the environmental component shows a significant positive influence on efficiency for banks with less than 5% foreign ownership, despite an overall insignificant influence for the entire sample. This is due to the consequences of asymmetric information and unclear benefits of ESG investment in emerging economies. Vietnamese banks with significant foreign ownership benefit less from ESG. Moreover, institutional investors might not be interested in ESG in the context of emerging countries (Mohamed Buallay et al., 2023).

Table 5. Heterogeneity analysis based on ownership.

Variables	COSTEFF							
	GOVT ≥ 5%		GOVT <5%		FOREIGN≥ 5%		FOREIGN <5%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG	-0.010		0.015*		0.002		-0.010	
	(-1.46)		(1.83)		(0.36)		(-0.97)	
E		-0.005		0.010		-0.005		0.053**
		(-1.02)		(0.56)		(-0.58)		(2.38)
S		-0.008*		-0.011		-0.005		-0.055***
		(-1.83)		(-0.92)		(-0.78)		(-3.34)
G		0.010		0.017		0.013		0.006
		(1.37)		(1.50)		(1.07)		(0.45)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	95	95	157	157	137	137	105	105
Adj. R^2	0.823	0.826	0.689	0.694	0.746	0.746	0.757	0.811

Note: This table reports the heterogeneity analysis based on bank ownership. GOVT and FOREIGN represent proportion of government and foreign ownership, respectively. The sample period is from 2014–2023. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively. t-statistic is in parentheses.

We extend our investigation to examine the impact of the COVID-19 pandemic. Table 6 highlights that in the COVID-19 outbreak, ESG scores, particularly the environmental (E) and governance (G) factors, positively impact COSTEFF, aligning with the results reported by Broadstock, Chan, Cheng, and Wang (2021) and Yuen et al. (2022). Kim, Kang, and Hyun (2024) argue that firms with strong ESG performance, particularly in environmental and governance dimensions, are in a better position to manage risk and maintain their efficiency during crises.

Table 6. Heterogeneity analysis based on economic crises.

Variables	COSTEFF			
	COVID-19 pandemic		No COVID-19 pandemic	
	(1)	(2)	(3)	(4)
ESG	0.54***		-0.001	
	(3.28)		(-0.25)	
E		0.052**		0.003
		(2.15)		(0.33)
S		-0.056		-0.014*
		(-1.34)		(-1.78)
G		0.013*		0.017*
		(1.85)		(1.69)
Controls	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	52	52	193	193
Adj. R^2	0.940	0.947	0.657	0.694

Note: This table reports the heterogeneity analysis based on the presence of COVID-19 pandemic. The sample period is from 2014-2023. ***, **, * denote statistical significance at 1%, 5%, and 10% levels, respectively. t-statistic is in parentheses.

4.4. Mitigating Endogeneity Issues

To address potential endogeneity issues, we use the propensity score matching (PSM) method to re-estimate the models. First, we separate banks into two groups: (i) the treated group, comprising banks with ESG adoption levels above the median (i.e., banks with higher ESG scores), and (ii) the untreated group, consisting of banks with ESG adoption levels below the median (i.e., banks with lower ESG scores).

Subsequently, we use logit models to measure the propensity of banks to undergo treatment; the dependent variable in the logit models takes the value of 1 if a bank has a higher ESG score and 0 otherwise. We matched each treated bank with one, two, and three untreated banks with the closest propensity scores. Table 7 reports the estimation outcomes of the baseline model using PSM. The results of all regressions confirm our baseline findings, indicating that our results are not significantly biased by endogeneity.

Table 7. Mitigating endogeneity issues: propensity score matching estimates.

Variables	COSTEFF					
	N=1		N=2		N=3	
	(1)	(2)	(3)	(4)	(5)	(6)
ESG	-0.001		-0.003		-0.002	
	(-0.15)		(-0.52)		(-0.43)	
E		0.005		0.006		0.006
		(0.56)		(0.65)		(0.74)
S		-0.018**		-0.019**		-0.019**
		(-2.11)		(-2.38)		(-2.40)
G		0.019**		0.019**		0.018**
		(2.06)		(2.15)		(2.14)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	179	179	204	157	220	220
Adj. R^2	0.691	0.708	0.694	0.714	0.685	0.705

Note: This table reports the impact of ESG on bank cost efficiency using propensity score matching (PSM) method. The sample period is from 2014-2023. ** denote statistical significance at 5% levels, respectively. t-statistic is in parentheses.

5. CONCLUSION

This study examines how ESG factors influence bank cost efficiency in Vietnam. We found strong evidence that the social dimension exerts a significant negative effect, whereas the governance dimension has a significant positive influence on bank cost efficiency. Additionally, economic conditions reduce the positive impacts of the governance component, while income diversification helps reduce the negative influence of the social component on bank efficiency. Finally, a positive effect of the combined ESG scores was found for banks with low levels of government ownership, and the environmental aspect showed positive effects for banks with low levels of foreign ownership.

The findings suggest that banks should strengthen governance practices to enhance efficiency while mitigating the negative social impacts through income diversification. Measures that banks can adopt to improve governance include enhancing board oversight, increasing transparency in decision-making processes, and implementing robust risk management frameworks. To counteract the adverse social effects of ESG, banks are advised to diversify their income streams, potentially by expanding into new product lines or markets. Policymakers should refine ESG regulations to promote sustainable banking practices. Specifically, reducing government ownership may help amplify ESG benefits, while encouraging foreign-owned banks to integrate environmental strategies could improve their efficiency.

While this study provides interesting insights regarding ESG and bank efficiency in Vietnam, we focus only on commercial banks in our sample because of data constraints. We suggest that future research extend to other bank types in Vietnam (i.e., 100% foreign-owned banks) or banks in the ASEAN region.

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REFERENCES

Akerlof, G. A., & Shiller, R. J. (2009). *Animal spirits: How human psychology drives the economy, and why it matters for global capitalism.* United States: Princeton University Press.

Akhter, F., Hossain, M. R., Elrehail, H., Rehman, S. U., & Almansour, B. (2023). Environmental disclosures and corporate attributes, from the lens of legitimacy theory: A longitudinal analysis on a developing country. *European Journal of Management and Business Economics*, 32(3), 342-369. https://doi.org/10.1108/EJMBE-01-2021-0008

Azmi, W., Hassan, M. K., Houston, R., & Karim, M. S. (2021). ESG activities and banking performance: International evidence from emerging economies. *Journal of International Financial Markets, Institutions and Money*, 70, 101277. https://doi.org/10.1016/j.intfin.2020.101277

Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics*, 20, 325-332. https://doi.org/10.1007/BF01205442

Berger, A. N., Hasan, I., & Zhou, M. (2010). The effects of focus versus diversification on bank performance: Evidence from Chinese banks. *Journal of Banking & Finance*, 34(7), 1417-1435. https://doi.org/10.1016/j.jbankfin.2010.01.010

Broadstock, D. C., Chan, K., Cheng, L. T., & Wang, X. (2021). The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China. *Finance Research Letters*, 38, 101716. https://doi.org/10.1016/j.frl.2020.101716

Buallay, A., Fadel, S. M., Alajmi, J., & Saudagaran, S. (2021). Sustainability reporting and bank performance after financial crisis: Evidence from developed and developing countries. *Competitiveness Review: An International Business Journal*, 31(4), 747-770. https://doi.org/10.1108/CR-04-2019-0040

Chang, H.-Y., Liang, L.-W., & Liu, Y.-L. (2021). Using environmental, social, governance (ESG) and financial indicators to measure bank cost efficiency in Asia. *Sustainability*, 13(20), 11139. https://doi.org/10.3390/su132011139

Chiaramonte, L., Dreassi, A., Girardone, C., & Piserà, S. (2022). Do ESG strategies enhance bank stability during financial turmoil? Evidence from Europe. *The European Journal of Finance*, 28(12), 1173-1211. https://doi.org/10.1080/1351847X.2021.1964556

Citterio, A., & King, T. (2023). The role of environmental, social, and governance (ESG) in predicting bank financial distress. *Finance Research Letters*, 51, 103411. https://doi.org/10.1016/j.frl.2022.103411

Di Tommaso, C., & Thornton, J. (2020). Do ESG scores effect bank risk taking and value? Evidence from European banks. *Corporate Social Responsibility and Environmental Management*, 27(5), 2286-2298. https://doi.org/10.1002/csr.1964

Efunniyi, C. P., Abhulimen, A. O., Obiki-Osafiele, A. N., Osundare, O. S., Agu, E. E., & Adeniran, I. A. (2024). Strengthening corporate governance and financial compliance: Enhancing accountability and transparency. *Finance & Accounting Research Journal*, 6(8), 1597-1616. https://doi.org/10.51594/farj.v6i8.1509

Freeman, R. E. (1984). Strategic management: A stakeholder approach.

Friedman, M. (2007). The social responsibility of business is to increase its profits. In. Berlin Heidelberg: Springer (Ed.), Corporate Ethics and Corporate Governance.

Gawęda, A. (2025). Does environmental, social, and governance performance elevate firm value? International evidence. *Finance research letters*, 73, 106639. https://doi.org/10.1016/j.frl.2024.106639

Global Reporting Initiative (GRI). (2021). *GRI standard*. USA: GRI.

Gutiérrez-Ponce, H., & Wibowo, S. A. (2024). Do sustainability practices contribute to the financial performance of banks? An analysis of banks in Southeast Asia. *Corporate Social Responsibility and Environmental Management*, 31(2), 1418-1432. https://doi.org/10.1002/csr.2641

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X

Kim, J., Kang, J., & Hyun, S. (2024). Environmental, social, and governance (ESG) and idiosyncratic volatility: The COVID-19 pandemic and its impact on ESG-sensitive industries. *Business Ethics, the Environment & Responsibility*, 33(4), 730-745. https://doi.org/10.1111/beer.12636

Li, T., Trinh, V. Q., & Elnahass, M. (2023). Drivers of global banking stability in times of crisis: The role of corporate social responsibility. *British Journal of Management*, 34(2), 595-622. https://doi.org/10.1111/1467-8551.12631

Mohamed Buallay, A., Al Marri, M., Nasrallah, N., Hamdan, A., Barone, E., & Zureigat, Q. (2023). Sustainability reporting in banking and financial services sector: A regional analysis. *Journal of Sustainable Finance & Investment*, 13(1), 776-801. https://doi.org/10.1080/20430795.2021.1978919

Shen, C., Wu, J., Li, Y., & Chen, Q. (2025). Does digital transformation improve the cost efficiency of commercial banks? Evidence from China. *Finance Research Letters*, 73, 106619. https://doi.org/10.1016/j.frl.2024.106619

Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, 87(3), 355–374. https://doi.org/10.2307/1882010

State Bank of Vietnam. (2023). *Annual report 2023*. Vietnam: State Bank of Vietnam.

Weber, O. (2012). Environmental credit risk management in banks and financial service institutions. *Business Strategy and the Environment*, 21(4), 248-263. https://doi.org/10.1002/bse.737

Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American Journal of Sociology*, 87(3), 548-577. https://doi.org/10.1086/227496

Yan, X., Espinosa-Cristia, J. F., Kumari, K., & Cioca, L. I. (2022). Relationship between corporate social responsibility, organizational trust, and corporate reputation for sustainable performance. *Sustainability*, 14(14), 8737. https://doi.org/10.3390/su14148737

Yuen, M. K., Ngo, T., Le, T. D., & Ho, T. H. (2022). The environment, social and governance (ESG) activities and profitability under COVID-19: Evidence from the global banking sector. *Journal of Economics and Development*, 24(4), 345-364. https://doi.org/10.1108/JED-08-2022-0136

Appendix A. Bank income diversification measurement.

We measure bank income diversification using an adjusted Herfindahl-Hirschman index (HHI). The diversification index is formulated by taking one minus the HHI value. The higher the index value, the higher degree of bank income diversification. Income diversification (INCOME_DIV) includes the key sources of bank revenue: interest income (II), income from commissions (CI), net profit from other operations (NPFO), and other income (OI). TI represents banks' total incomes:

$$INCOME\_DIV_{i,t} = 1 - \left(\left(\frac{II_{i,t}}{TI_{i,t}}\right)^2 + \left(\frac{CI_{i,t}}{TI_{i,t}}\right)^2 + \left(\frac{NPFO_{i,t}}{TI_{i,t}}\right)^2 + \left(\frac{OI_{i,t}}{TI_{i,t}}\right)^2\right), \quad (A.1)$$