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Green Banking Strategy and Bank Stability: Evidence from Vietnamese Commercial Banks

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ABSTRACT

This study examines whether green banking strategy enhances the stability of Vietnamese commercial banks. Using annual panel data for 29 banks over 2014–2024, the study applies the System GMM estimator to address persistence in bank stability and potential endogeneity. Bank stability is measured by the Z-score, while green banking strategy is proxied by a text-based index constructed from banks' annual reports. The empirical results reveal a positive and statistically significant relationship between green banking strategy and bank stability, indicating that banks with stronger green banking orientation exhibit greater resilience and lower insolvency risk. The heterogeneity analysis further shows that this stabilizing effect is significant for small banks but not for large banks, implying that the prudential benefits of green banking depend on bank size. The findings highlight the relevance of green banking strategy not only as a sustainability practice but also as a prudential mechanism that can support financial stability in emerging economies where commercial banks play a central role in capital allocation.

Keywords: Bank stability, Green banking strategy, Emerging economy, System GMM.

Introduction

Climate change has increasingly become a material source of financial risk rather than merely an environmental or social concern. Physical risks, such as extreme weather events, flooding, droughts, and sea-level rise, may impair asset values and reduce borrowers' repayment capacity, while transition risks arising from carbon pricing, environmental regulation, technological change, and shifts in market preferences may alter the creditworthiness of firms and sectors financed by banks. The Network for Greening the Financial System (2019) argues that climate-related risks are a source of financial risk and therefore fall within the mandates of central banks and supervisors to ensure the resilience of the financial system. In a similar vein, the Basel Committee on Banking Supervision (BCBS) has released guidelines for the efficient management and oversight of financial risks associated with climate change, highlighting the necessity for banks to integrate climate-related factors into internal controls, risk management, corporate governance, and supervisory procedures (BCBS, 2022).

The banking sector plays a central role in the climate-finance nexus because banks influence how financial resources are allocated across sectors, firms, and investment projects. In bank-based financial systems, this role becomes even more important because commercial banks remain the primary source of external finance for enterprises. Against this background, green banking strategy has emerged as an important strategic orientation through which banks communicate and operationalize their commitment to integrating environmental and social considerations into lending, investment, risk management, product development, internal operations, and disclosure practices. The Principles for Responsible Banking also frame sustainability integration as a process through which banks align their strategies with society's goals and manage their impacts on people and the environment at the strategic, portfolio, and transaction levels (United Nations Environment Programme, 2019).

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However, the implications of the green banking strategy for bank stability remain theoretically ambiguous. On the one hand, a well-articulated and effectively implemented green banking strategy may enhance bank stability by improving screening and monitoring practices, reducing exposure to environmentally vulnerable borrowers, strengthening reputational capital, and encouraging more prudent risk management. By integrating environmental and social criteria into credit appraisal, banks may be able to identify transition-related vulnerabilities earlier and avoid lending to firms with weak environmental compliance or high carbon-transition exposure. From this perspective, green banking strategy can operate as a risk-mitigation mechanism that contributes to stronger asset quality, lower credit losses, and higher resilience. On the other hand, the strategic adoption of green banking may also involve transition costs and implementation frictions, particularly in emerging markets. The adoption of a green banking strategy requires banks to develop new internal capabilities, including environmental and social risk assessment tools, sector-specific expertise, data infrastructure, monitoring systems, staff training, and sustainability reporting mechanisms. These investments may increase operating costs before their benefits are fully reflected in profitability or risk reduction. Moreover, in markets where green taxonomies, climate data, and environmental-risk pricing remain underdeveloped, banks may face uncertainty in identifying genuinely green projects and assessing their creditworthiness. Consequently, the short-run effect of green banking strategy on stability may be weak, delayed, or even adverse if banks expand green-oriented activities without adequate risk-assessment capacity.

Vietnam provides a relevant context for this investigation for several reasons. First, Vietnam is highly exposed to climate-related risks. World Bank (2022) notes that climate change already imposes significant economic costs on Vietnam and that the country's long coastline and concentration of economic activity in climate-vulnerable areas increase its exposure to sea-level rise and extreme weather events. Second, Vietnam has committed to a low-carbon development pathway and has gradually strengthened its policy framework for green growth, sustainable finance, and environmental-risk management in the banking sector. Third, Vietnam's financial system remains strongly bank-based, meaning that commercial banks are central to the allocation of capital for both conventional and green investment. These features make Vietnam a suitable setting for examining whether green banking contributes to bank stability in an emerging-market banking system.

Existing empirical research has mainly examined the financial consequences of green banking, ESG disclosure, and green credit by focusing on accounting-based performance indicators such as return on assets, return on equity, or net interest margin. While this literature provides important evidence on whether sustainability-oriented banking improves profitability, it leaves the prudential dimension less fully explored. In particular, it remains unclear whether a green banking strategy contributes to bank stability. This distinction is important because profitability and stability do not necessarily move in the same direction. Banks may improve short-term profitability while accumulating financial risk, or they may incur implementation costs in the short run while strengthening resilience over time. Therefore, a narrow focus on profitability may overlook the extent to which green banking enhances banks' capacity to absorb shocks and reduce insolvency risk.

This study makes several extensions to the existing literature. First, it shifts the analytical focus from bank profitability to bank stability, measured by the Z-score. Second, it constructs a text-based green banking strategy index from banks' annual reports using the TF-IDF method, allowing the analysis to capture bank-level and time-varying differences in disclosed green banking orientation. Third, it examines whether the effect of a green banking strategy differs by bank size. This heterogeneity analysis is important because small and large banks differ in resources, risk-management capacity, regulatory visibility, and ability to implement green banking practices. By doing so, the study provides new evidence on whether green banking strategy can support prudential resilience in a bank-based emerging economy where the green finance framework is still developing.

Literature Review

Theoretical Background

Green banking has increasingly become an important strategic issue for commercial banks, especially in emerging economies where banks remain the dominant source of external financing for firms. In such economies, banks do not only perform traditional financial intermediation functions but also influence the direction of capital allocation across

sectors. As a result, green banking strategy can affect not only environmental outcomes but also banks' long-term risk profile and financial resilience (Dobrzynski *et al*., 2024a, 2024b; Narayana *et al*., 2024; Begam & Padma, 2025; Fritea *et al*., 2025; Rysbayeva *et al*., 2025).

This study draws on three related theoretical perspectives: stakeholder theory, legitimacy theory, and the risk-management view of banking. Stakeholder theory suggests that firms are expected to respond to the interests of multiple stakeholders, including regulators, investors, customers, communities, and society at large (Freeman, 1984). From this perspective, banks that adopt green banking strategies may strengthen stakeholder trust, improve transparency, and enhance their long-term strategic positioning.

Legitimacy theory provides a complementary explanation. According to Suchman (1995), organizations seek to align their activities with the values, norms, and expectations of the broader institutional environment. This perspective is particularly relevant to the banking sector because banks operate in a highly regulated environment and rely heavily on public trust. Green banking disclosure and strategy may therefore help banks demonstrate institutional compliance and social responsibility, thereby reducing reputational and regulatory risks.

From a prudential risk-management standpoint, adopting a green banking strategy can bolster institutional stability via an effective risk-control mechanism. Climate-related hazards are increasingly acknowledged as core financial vulnerabilities, given that physical and transition risks directly impair borrowers' debt-servicing capabilities, asset values, operational continuity, and broader sectoral exposures (BCBS, 2022). Consequently, financial institutions are urged to embed environmental and climatic factors into their corporate governance, credit evaluations, portfolio oversight, internal controls, and risk frameworks (International Finance Corporation, 2012; BCBS, 2022). Viewed through this lens, institutions prioritizing green banking are better equipped to detect, evaluate, and mitigate environmental and social exposures across their credit portfolios. This rationale is further reinforced by empirical findings demonstrating that sustainable lending frameworks and green credit policies can effectively lower credit risk under specific institutional and bank-level conditions (Zhou *et al*., 2022; Feng *et al*., 2024). Ultimately, the risk-management paradigm offers a robust theoretical foundation for anticipating a positive correlation between green banking strategies and overall bank stability.

Green Banking Strategy and Bank Stability

Existing studies have examined green banking and sustainability-related practices using different concepts, including green banking disclosure, ESG disclosure, green credit, and sustainable finance. Although these measures are not identical, they share a common underlying idea: banks increasingly incorporate environmental and social considerations into their strategies, operations, lending activities, and public disclosure.

One strand of literature focuses on disclosure and strategic communication. Bose *et al*. (2018), for example, examine green banking disclosure in Bangladeshi commercial banks and show that regulatory guidance can significantly influence banks' green disclosure practices. Their study suggests that green banking disclosure is shaped by institutional pressure and may gradually become embedded in banking practice. This is relevant to emerging economies, where regulatory direction often plays an important role in shaping green finance development.

Another related strand examines ESG activities and bank performance. Azmi *et al*. (2021) provide international evidence from emerging market banks and find that ESG activities are associated with bank value, although the relationship may be nonlinear. Their findings suggest that sustainability-related activities can create value, but their benefits may depend on the level of implementation and the bank's ability to manage the associated costs. In the Vietnamese context, Bui *et al*. (2024) show that ESG disclosure improves the financial performance of commercial banks, particularly through the environmental and governance dimensions.

Although existing literature primarily emphasizes financial performance, an emerging body of work indicates that green banking also influences bank stability via the risk channel. Specifically, Zhou *et al*. (2022) investigate China's Green Credit Policy, revealing that the impact of green lending on credit risk is contingent upon bank size and state ownership. Their findings suggest that sustainable financing can lower credit risk, particularly in institutions equipped with robust capabilities for evaluating and managing green initiatives. Similarly, Feng *et al*. (2024) demonstrate that green credit regulations help mitigate credit risk within Chinese commercial banks. Together, these insights suggest

that green banking enhances institutional resilience by refining credit-risk screening and minimizing exposure to environmentally fragile borrowers.

However, the empirical evidence is not fully consistent. Sutrisno *et al*. (2024), using Indonesian banking data, find that green credit improves bank profitability but does not significantly affect bank stability. This suggests that the effect of green banking on stability may depend on how green banking is measured, the maturity of the green finance market, the institutional context, and banks' implementation capacity. It also implies that green banking may first affect profitability, disclosure, or risk management before its effect becomes visible in stability indicators.

Based on the above theoretical arguments and empirical evidence, this study expects a green banking strategy to improve bank stability. Unlike studies that focus only on green credit, this study measures green banking strategy using a text-based index constructed from annual reports. This approach captures a broader strategic orientation, including green products, environmental commitments, green-sector financing, and environmental and social risk-management disclosure. Therefore, the first hypothesis is proposed as follows:

H1. Green banking strategy has a positive effect on bank stability.

Bank size and Heterogeneous Effects of Green Banking Strategy

The relationship between green banking strategy and bank stability may not be identical across banks. Bank size is one of the most important sources of heterogeneity because it affects resources, governance capacity, market access, regulatory attention, and risk-management infrastructure.

Large banks may have advantages in implementing green banking strategies. They usually possess stronger financial resources, better technology infrastructure, broader customer bases, and more developed risk-management systems. These advantages may allow them to assess environmental and social risks more effectively and integrate green banking into lending and investment decisions. In addition, large banks are often more visible to regulators and investors, which may increase their incentives to disclose and implement green banking initiatives.

However, the impact of green banking strategy on large banks may be less visible in empirical models. Large banks often already have diversified operations, stronger capital buffers, and established risk-control systems. As a result, the marginal contribution of green banking strategy to stability may be smaller. Moreover, large banks may face greater internal coordination costs when implementing green banking across multiple business lines, branches, and customer segments.

Small banks may face different conditions. On the one hand, they often have more limited financial resources, weaker technical capacity, and less sophisticated environmental risk-assessment systems. These constraints may make green banking implementation more difficult. On the other hand, green banking strategy may generate a stronger signaling effect for small banks. By adopting and disclosing green banking orientation, smaller banks can demonstrate regulatory responsiveness, improve stakeholder confidence, and strengthen their competitive position. Green banking strategy may also reflect an effort by small banks to upgrade their governance and risk-management practices.

Previous studies provide mixed evidence on the role of bank size. Zhou *et al*. (2022) find that the risk effect of green lending depends critically on bank size and state ownership in China, suggesting that bank characteristics condition the financial consequences of green banking. Sutrisno *et al*. (2024) also indicate that green credit does not uniformly translate into stability benefits across banks, reinforcing the need to consider heterogeneity.

In the context of Vietnam, this issue is especially relevant because the banking system includes both large state-related banks and smaller joint-stock commercial banks with different resource endowments, market positions, and strategic capacities. Therefore, the effect of a green banking strategy on stability may vary across bank-size groups. Accordingly, the second hypothesis is proposed:

H2. The effect of green banking strategy on bank stability differs between small and large banks.

Materials and Methods

This study investigates how green banking strategy influences the financial stability of Vietnamese commercial banks. The empirical analysis is conducted using an annual panel dataset of 29 Vietnamese commercial banks over the period 2014–2024. The sample period is appropriate because it covers the period in which green banking and sustainable finance gradually became more visible in Vietnam's banking sector, following regulatory guidance, growing

sustainability disclosure practices, and banks' increasing attention to environmental and social risk management. The dataset combines bank-level financial data from audited financial statements, annual reports, and macroeconomic indicators published by regulatory institutions.

To empirically assess the relationships between green banking strategy and bank stability, the baseline model is specified in Eq. 1:

$$STB_{i,t} = \beta_0 + \beta_1 STB_{i,t-1} + \beta_2 GREEN_{i,t-1} + \beta_3 X_{i,t-1} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

where subscripts i indexes banks, t denotes years; β represents slope; $\varepsilon_{i,t}$ is the error term; δ_t and μ_i captures time and bank fixed effects, respectively.

The dependent variable is bank stability, denoted by STB. Following the banking literature, this study measures bank stability using the Z-score. The Z-score captures the distance of a bank from insolvency by combining profitability, capitalization and earnings volatility. It is computed in Eq. 2:

$$Zscore_{it} = \frac{ROA_{it} + ETA_{it}}{sd(ROA_i)} \quad (2)$$

Where ROA_{it} is return on assets of bank i in year t, ETA_{it} is the capital ratio, and $\mathrm{sd}(ROA_i)$ is the bank-specific standard deviation of ROA over the sample period. A higher Z-score indicates that the bank has a larger buffer against earnings shocks and, therefore, a lower probability of insolvency. The Z-score is preferred because it reflects stability more comprehensively than profitability indicators alone. A bank may report high profitability while taking excessive risk, whereas the Z-score incorporates both earnings capacity and capital buffers relative to earnings volatility.

The key explanatory variable is green banking strategy, denoted as GREEN. This study conceptualizes green banking strategy as the extent to which a bank publicly communicates its green-oriented strategic priorities, environmental commitments, green products and services, green-sector financing, and environmental and social risk-management practices. Because internal strategic decisions are not directly observable, this study constructs a text-based proxy from annual reports.

The construction of GREEN follows a content analysis procedure. First, annual reports are converted into machine-readable text. Second, the text is cleaned by standardizing encoding, converting words into lowercase, removing punctuation, numbers, repeated page information, non-informative words, and irrelevant reporting expressions. Third, the cleaned text is matched with a green banking keyword dictionary.

The keyword dictionary is organized into seven thematic dimensions of green banking strategy: (i) green products and services; (ii) green strategy, policy, and legal orientation; (iii) environmental and climate-related issues; (iv) energy-related initiatives; (v) green sectors and green projects; (vi) environmental and social risk management; (vii) sustainability-related social impacts.

To avoid relying on raw keyword counts, this study applies the term frequency-inverse document frequency (TF-IDF) method. The TF-IDF approach gives greater weight to words that are important within a specific bank-year report but are not overly common across all reports. This helps reduce the possibility that the green banking index is driven simply by report length or generic sustainability wording.

For each keyword k, bank i, and year t, the TF-IDF score is calculated in Eq. 3:

$$TFIDF_{kit} = TF_i * IDF_i \quad (3)$$

The TF-IDF score is the product of two components: term frequency and inverse document frequency. The term-frequency component is calculated in Eq. 4:

$$TF_i = \frac{n_{kit}}{N_{kit}} \quad (4)$$

and the inverse-document-frequency component is calculated in Eq. 5:

$$IDF_i = ln(\frac{D}{d_k}) \quad (5)$$

In Eqs. 3–5, n_{kit} is the number of times keyword k appears in the annual report of bank i in year t, N_{kit} is the total number of words in that annual report, D is the total number of annual reports in the corpus, and d_k is the number of annual reports containing keyword k.

The total green banking strategy score for each bank-year is obtained by summing the TF-IDF scores of all green banking-related keywords. The aggregation procedure is defined in Eq. 6:

$$GREEN_{it} = \sum_{k=1}^{K} TFIDF_{kit} \quad (6)$$

where K is the total number of keywords in the dictionary. The final variable used in the regression is the natural logarithm of one plus the green banking score.

The empirical models include several bank-specific and macroeconomic control variables that may affect bank stability. At the bank level, SIZE, measured as the natural logarithm of total assets, controls for differences in bank scale. Larger banks may benefit from diversification, stronger market access, and better risk-management capacity, although they may also be exposed to more complex operations. ETA, measured as the equity-to-assets ratio, reflects the capital buffer available to absorb potential losses. LLP, measured by loan loss provisions relative to loans, captures provisioning behavior and expected credit losses. LDR, the loan-to-deposit ratio, is included to control for liquidity and lending intensity, as a higher ratio suggests that a larger proportion of deposits is used for lending. At the macroeconomic level, GDP is included to account for business-cycle conditions, since stronger economic growth may improve borrowers' repayment capacity and support bank stability. To mitigate potential simultaneity and reverse-causality concerns, all independent and control variables are included in the empirical models with a one-year lag.

To test the primary empirical models, we apply the System Generalized Method of Moments (GMM) framework established by Arellano and Bover (1995) and Blundell and Bond (1998). This methodological approach is well-suited for our analysis due to two key considerations. Initially, there is a risk of endogeneity between a bank's financial stability and its adoption of green banking initiatives. Although sustainability strategies can influence stability, institutions that are already financially robust often possess the capital, institutional governance, and motivation necessary to pursue and report green practices. Such reverse causality can lead to biased results in standard fixed-effects models. Furthermore, omitted bank-specific factors, including risk tolerance, management expertise, corporate governance, and strategic vision, can simultaneously impact both stability and environmental strategies. The System GMM estimator effectively mitigates these concerns through the utilization of internal instruments derived from lagged regressors.

Before estimating the regression models, **Table 1** reports the correlation matrix among the main explanatory and control variables. The correlation matrix shows that all pairwise correlation coefficients are below the conventional threshold of 0.80. Therefore, multicollinearity is unlikely to be a serious concern in the empirical models.

Table 1. Correlation matrix

	GREEN	SIZE	ETA	LLP	LDR	GDP
GREEN	1.000					
SIZE	0.349*	1.000				
ETA	-0.067	-0.415	1.000			
LLP	0.279*	0.504*	-0.154	1.000		
LDR	0.137*	0.147*	-0.084	0.124*	1.000	
GDP	-0.053*	-0.067	0.137*	-0.071	-0.054	1.000

Results and Discussion

Descriptive Statistics

Table 2 presents the descriptive statistics of the variables used in the study. The dependent variable, Z-score, has a mean value of 32.932 and a standard deviation of 28.890. This indicates considerable variation in bank stability across banks and over time. The main independent variable, GREEN, has an average value of 2.342, with a standard deviation of 0.777, showing that the degree of green banking strategy disclosure differs substantially among Vietnamese commercial banks. Regarding bank-specific control variables, SIZE has a mean value of 19.025, with values ranging from 12.784 to 21.719. This reflects substantial differences in asset scale across banks in the sample. ETA, which measures the capital ratio, has an average value of 0.122, indicating that banks generally maintain a certain capital buffer, although the range from 0.082 to 0.245 suggests notable heterogeneity in capitalization. LLP has a mean value of 0.110 and ranges from 0.007 to 0.455, implying considerable differences in provisioning behavior and credit risk exposure. The average LDR is 0.247, with a minimum of 0.067 and a maximum of 0.611. This indicates variation in banks' lending intensity and liquidity positions. At the macroeconomic level, GDP growth has an average value of 0.061, ranging from 0.025 to 0.080. This suggests that Vietnam maintained relatively strong economic growth during the sample period, although growth conditions varied across years, particularly during periods affected by external shocks such as the COVID-19 pandemic.

Table 2. Descriptive statistics

Variables	Obs	Mean	Std. dev	Min	Max
Dependent variable					
Z-Score	319	32.932	28.890	6.356	228.718
Main independent variable					
GREEN	319	2.342	0.777	0	3.998
Control variables					
SIZE	319	19.025	1.227	12.784	21.719
ETA	319	0.122	0.029	0.082	0.245
LLP	319	0.110	0.062	0.007	0.455
LDR	319	0.247	0.104	0.067	0.611
GDP	319	0.061	0.017	0.025	0.080

Table 3 presents the baseline regression results on the relationship between green banking strategy and bank stability. The coefficient of the main independent variable, GREEN, is positive and statistically significant at the 1% level. This result provides strong empirical evidence that green banking strategy is positively associated with bank stability. In other words, banks with greater green banking strategic orientation tend to exhibit higher Z-scores, implying stronger resilience and lower insolvency risk.

Regarding the control variables, SIZE has a negative and statistically significant coefficient, suggesting that larger banks in the sample do not necessarily exhibit higher stability. This may reflect the fact that larger banks often engage in more complex operations and may face greater exposure to systemic and credit risks. ETA is positively associated with bank stability, suggesting that stronger capitalization enhances banks' capacity to absorb losses and reduces insolvency risk. The positive and significant coefficient of LLP suggests that loan loss provisioning is associated with higher stability, possibly reflecting a more prudent risk-management approach among banks that recognize expected credit losses more actively. LDR has a negative coefficient, indicating that higher lending intensity may reduce bank stability, although the reported result is not statistically significant. At the macroeconomic level, GDP is negatively associated with bank stability, suggesting that stronger economic growth may be accompanied by more aggressive lending behavior or higher risk-taking in the banking sector.

Table 3. Baseline regression results

Variables	Dependent variable: Z-Score
Z-Score (-1)	0.949*** (0.004)
GREEN (-1)	1.151*** (0.181)
SIZE (-1)	-0.367** (0.148)
ETA (-1)	0.983*** (0.053)
LLP (-1)	0.326*** (0.067)
LDR(-1)	-0.034 (0.150)
GDP(-1)	-0.380** (0.185)
cons	0.779*** (0.088)
N	319
S-test	0.112
AR(1)	0.070
AR(2)	0.176

The numbers in parentheses represent the standard errors. ***,**,* indicate statistical significance at the 1% level, 5% level, 10% level, respectively.

To investigate whether the impact of green banking initiatives varies according to bank size, we segment the dataset into small and large financial institutions using the mean of average total assets from 2014 to 2024 as the threshold. Specifically, institutions with average assets falling below the sample mean are designated as small banks, whereas those meeting or exceeding this average are categorized as large banks. We subsequently re-run the baseline system GMM estimation for each group independently, with the findings detailed in **Table 4**. The empirical output reveals a positive and statistically significant coefficient for the GREEN variable among smaller institutions, implying a robust stabilizing role for green strategies in this cohort. Conversely, while the coefficient for large banks is also positive, it lacks statistical significance, pointing to a less pronounced or negligible stabilizing influence of green banking practices within larger financial institutions.

Table 4. Heterogeneity analysis by bank size

Variables	Dependent variable: Z-Score	
	Group 1: Small Banks	Group 2: Large Banks
Z-Score (-1)	0.948*** (0.004)	1.128*** (0.296)
GREEN (-1)	0.528*** (0.140)	0.498 (0.529)
SIZE (-1)	-1.481* (0.782)	-0.393 (0.301)
ETA (-1)	-0.539*** (0.091)	0.132*** (0.023)
LLP (-1)	0.633** (0.181)	0.105** (0.022)
LDR(-1)	-0.547 (0.330)	0.210 (0.155)
GDP(-1)	0.653***	-0.358

	(0.096)	(0.270)
cons	0.376***	-0.685***
	(0.014)	(0.167)
N	209	110
S-test	0.103	0.435
AR (1)	0.069	0.053
AR (2)	0.184	0.327

The numbers in parentheses represent the standard errors. ***,**,* indicate statistical significance at the 1% level, 5% level, 10% level, respectively.

The empirical findings show that green banking strategy has a positive and statistically significant effect on the stability of Vietnamese commercial banks. This result suggests that banks with stronger green banking orientation tend to exhibit higher Z-scores, indicating lower insolvency risk and greater financial resilience. The finding supports the argument that a green banking strategy may have prudential value, not only reputational or symbolic value. This result is consistent with the stakeholder and legitimacy perspectives, which suggest that banks can benefit from aligning their strategies with environmental and social expectations. By disclosing and developing green banking activities, banks may strengthen stakeholder confidence, improve transparency, and enhance their long-term strategic position. In a highly regulated industry such as banking, this alignment may help banks reduce reputational risk and improve institutional legitimacy.

The finding is broadly consistent with previous empirical studies showing positive effects of sustainability-related banking practices. Azmi *et al*. (2021), for example, find that ESG activities are associated with better bank performance in emerging economies, with the environmental dimension playing an important role. Similarly, Bui *et al*. (2024) provide evidence that ESG disclosure improves financial performance among Vietnamese commercial banks. While these studies focus mainly on profitability and performance, the present study extends the literature by showing that green banking strategy is also relevant to bank stability.

The positive effect of green banking strategy also supports the risk-management channel emphasized in prior research. Zhou *et al*. (2022) show that green lending can reduce credit risk for major state-controlled banks in China, while Feng *et al*. (2024) find that green credit policy helps reduce credit risk among Chinese commercial banks. These findings suggest that green banking may improve banks' risk profiles by encouraging more careful project screening, stronger environmental and social risk assessment, and better monitoring of credit portfolios. The evidence from Vietnam in this study is consistent with this line of argument.

However, the result differs from studies that report weak or insignificant effects of green banking on stability. For example, Sutrisno *et al*. (2024) find that green credit improves profitability but does not significantly affect bank stability in Indonesia. One possible explanation is the difference in measurement. While green credit focuses mainly on the lending side, the GREEN variable in this study captures a broader strategic orientation, including green products, environmental commitments, green-sector financing, and environmental and social risk-management disclosure. Therefore, the text-based index may better reflect the strategic and governance dimensions of green banking.

The heterogeneity analysis provides further insight. The positive effect of green banking strategy is statistically significant for small banks but insignificant for large banks. This suggests that the stability benefits of a green banking strategy are not uniform across bank groups. For smaller banks, green banking strategy may serve as a stronger signaling mechanism, helping them enhance credibility, demonstrate regulatory responsiveness, and strengthen their market position. It may also reflect improvements in governance and risk-management capacity. For large banks, the positive but insignificant coefficient indicates that green banking strategy may not generate a clearly observable additional stability effect in the short run. Large banks usually already have broader operations, stronger capital buffers, diversified portfolios, and more established risk-management systems. As a result, the marginal contribution of green banking strategy to stability may be less pronounced. In addition, larger banks may face higher coordination costs and more complex implementation challenges when integrating green banking across business units.

Conclusion

This study examines the effect of green banking strategy on the stability of Vietnamese commercial banks. Using a panel dataset of 29 banks over the period 2014–2024 and applying the System GMM estimator, the results show that green banking strategy has a positive and statistically significant impact on bank stability. This suggests that banks with a stronger green banking orientation tend to be more resilient and less exposed to insolvency risk. The subsample analysis further indicates that this stabilizing effect is more evident among small banks, while the effect is positive but statistically insignificant for large banks.

These findings have important implications for emerging economies such as Vietnam, where the financial system remains heavily bank-based and commercial banks play a central role in allocating capital to the real economy. In such economies, green banking should not be viewed only as an environmental or reputational initiative. Instead, it should be recognized as part of a broader prudential framework that can support financial stability, improve risk screening, and redirect credit toward more sustainable sectors.

For policymakers and regulators, the results highlight the need to strengthen the institutional foundation for green banking. This includes developing clearer green taxonomies, standardizing green banking disclosure, and providing more detailed guidance on environmental and social risk assessment in credit activities. In bank-dependent emerging economies, weak or inconsistent green banking standards may limit the ability of banks to identify climate-related and transition-related risks. Therefore, a more consistent regulatory framework can help banks integrate green considerations into lending, monitoring, and risk-management processes more effectively.

The stronger effect observed among small banks also suggests that policy support should be differentiated by bank size. Smaller banks may benefit more from green banking strategy, but they often face greater limitations in data, technical expertise, human resources, and environmental risk-assessment capacity. Regulators may therefore consider targeted support mechanisms, such as training programs, shared green project databases, technical guidelines, and capacity-building initiatives for smaller commercial banks. Such support would help reduce implementation gaps across the banking sector.

For commercial banks, the findings imply that green banking strategy should be embedded into core banking operations rather than treated as a separate corporate social responsibility activity. Banks need to integrate environmental and social risk criteria into credit appraisal, portfolio management, internal governance, product development, and sustainability reporting. A credible green banking strategy requires not only disclosure but also operational alignment between strategy, risk management, and lending decisions.

For emerging economies, the broader implication is that banking-sector stability and green transition are closely connected. Since firms rely heavily on bank credit, banks can influence the speed and quality of the green transition through their lending decisions. If green banking is implemented effectively, it can help reduce long-term credit risk, improve capital allocation, and support a more resilient financial system. Conversely, if green banking remains symbolic or disclosure-driven, its contribution to financial stability may be limited.

Limitations and Dimensions for Future Research

This study also has limitations. The green banking strategy variable is constructed from annual-report disclosures, which may not fully capture the actual implementation of green banking practices. Future research could combine text-based measures with direct indicators such as green credit ratios, green bond issuance, environmental risk exposure, or project-level green financing data. Further studies may also examine whether ownership structure, governance quality, or regulatory pressure shape the relationship between green banking and bank stability.

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Ethics Statement: This study uses secondary bank-level data collected from annual reports, audited financial statements, and publicly available macroeconomic sources. No human participants, personal data, or animal subjects were involved; therefore, ethical approval was not required.

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