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Green Credit and Bank Financial Performance: Exploratory Evidence from Eight Vietnamese Commercial Banks, 2022-2024

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Abstract

This exploratory study examines the association between green credit and the financial performance of eight Vietnamese commercial banks over the 2022-2024 period. The balanced panel comprises 24 bank-year observations compiled from the financial statements, annual reports, sustainability reports, and ESG disclosures of BIDV, Vietcombank, LPBank, MB, SHB, MSB, Techcombank, and VPBank. Financial performance is measured by return on assets (ROA), while green credit is proxied by the ratio of outstanding green loans to total outstanding loans (GCR) and the logarithm of outstanding green loans (LogGCO). The pooled OLS results indicate that GCR has a positive and statistically significant coefficient across all three specifications, whereas LogGCO is not statistically significant. In the parsimonious model, the non-performing loan ratio and financial leverage have negative and statistically significant coefficients in relation to ROA. The VIF test for the parsimonious model does not indicate serious multicollinearity; the White test fails to reject the null hypothesis of homoskedasticity; and the Wooldridge test fails to reject the null hypothesis of no first-order serial correlation at the 5% level, although $p = 0.0501$ is very close to the threshold. The findings should be interpreted as exploratory evidence of statistical associations rather than causal effects. The study suggests that the development of green credit should be accompanied by effective risk control, data standardization, and transparent reporting.

Keywords: green credit, financial performance, ROA, commercial banks, Vietnam, sustainable development

1. Introduction

Climate change, environmental risks, and the transition toward low-carbon growth are reshaping the financial intermediation role of the banking system. In economies where bank lending remains the principal source of finance, banks must allocate capital not only on the basis of profitability and conventional financial risk but also by integrating environmental and social risks into loan appraisal, monitoring, and pricing. Green credit is therefore regarded as an important instrument for directing capital toward energy-efficiency projects, renewable energy, sustainable agriculture, green buildings, waste treatment, and emission-reduction activities.

In Vietnam, Article 149 of the 2020 Law on Environmental Protection introduced the first specific legal provision on green credit, while Articles 154-157 of Decree No. 08/2022/ND-CP further specified the implementation roadmap, incentive mechanisms, and responsibilities for environmental risk management in lending activities (National Assembly of Vietnam, 2020; Government of Vietnam, 2022). Following the study period, Decision No. 21/2025/QD-TTg was issued on July 4, 2025 and took effect on August 22, 2025, prescribing environmental criteria and the certification of investment projects included in the Green Taxonomy (Prime Minister of Vietnam, 2025). The gradual development of this regulatory framework raises an important empirical question: is the expansion of green credit associated with higher profitability, or does it generate additional appraisal and monitoring costs and short-term transition risks?

Theoretically, green credit may be associated with financial performance through three channels. First, integrating environmental criteria into appraisal and monitoring may improve credit-risk identification and loan-portfolio quality (Weber et al., 2010; Weber, 2012). Second, a well-founded and transparently disclosed green strategy may strengthen a bank's reputation among investors, customers, and regulators (Scholtens, 2009). Third, green credit may create new products and customer segments. Nevertheless, its short-term effect may be negative or unclear because of the costs of establishing environmental and social risk management systems, the lack of classification data, long payback periods, and difficulties in quantifying environmental benefits. The direction and magnitude of the association must therefore be tested rather than assumed.

This exploratory study focuses on eight Vietnamese commercial banks as BIDV, Vietcombank, LPBank, MB, SHB, MSB, Techcombank, and VPBank over the 2022-2024 period. Whereas Nguyen and Phan (2025) examined the effect of Vietnam's green credit policy using a difference-in-differences design and found no evidence of increased profitability, the present exploratory study directly measures green credit intensity at the bank level through GCR and LogGCO. It addresses three research questions: (1) how is GCR associated with ROA; (2) does the absolute volume of green credit yield different results from the green share of the loan portfolio; and (3) what roles do non-performing loans, bank size, and leverage play in explaining ROA?

2. Literature Review and Hypothesis Development

2.1 Green Credit and Sustainable Finance in Banking

Green credit refers to lending to projects or customers that meet specified environmental criteria. Within sustainable banking, the concept is associated with internalizing environmental risk in credit decisions and directing capital toward activities that generate environmental benefits. Weber et al. (2010) demonstrate that sustainability criteria can be incorporated into credit scoring and credit-risk management, while Weber (2012) emphasizes the need to identify potential losses arising from environmental liabilities, legal disputes, and declines in collateral value.

At the international level, a substantial body of research focuses on China because the country implemented green credit policies relatively early. Cui et al. (2018) analyze the effect of green lending on credit risk. Zhou et al. (2022) show that the relationship between green lending and credit risk varies with bank characteristics and the policy environment. Lian et al. (2022) report a positive association between the green credit ratio and both ROA and NIM among Chinese banks. By contrast, Song et al. (2019) find that the green credit ratio is negatively associated with the profitability of Chinese banks, whereas the share of project finance provided under the Equator Principles is positively associated with profitability among international banks. These differences suggest that the results depend on the measurement approach, the stage of market development, and the institutional context.

Another strand of research treats green credit as a policy instrument that affects both banks and borrowing firms. Wen et al. (2021) show that green credit policy influences credit-allocation efficiency and the upgrading of energy-intensive enterprises. Luo et al. (2021) use a quasi-experimental design to examine its effect on the core competence of commercial banks. Huang et al. (2023) identify implementation obstacles arising from differences in incentives, information, and compliance capacity between banks and firms. Thus, the financial effect of green credit is not automatically positive; it depends on institutional quality, information transparency, and risk-management capacity.

Recent evidence from Vietnam is also inconsistent with simple profitability expectations. Nguyen and Phan (2025) find no evidence that green credit policy increases bank profitability or reduces the cost-to-income ratio, although they report a reduction in the non-performing loan ratio. This finding underscores the need to distinguish between the effect of adopting a policy and the effect of the actual intensity of green credit at individual banks.

2.2 Bank Financial Performance and Its Determinants

Bank financial performance is commonly measured by ROA, ROE, or NIM. ROA captures the ability to generate profits from total assets and facilitates comparisons among banks with different capital structures. Studies by Demirgüç-Kunt and Huizinga (1999), Athanasoglou et al. (2008), Pasiouras and Kosmidou (2007), and Dietrich and Wanzenried (2011) show that bank profitability is jointly influenced by bank-specific characteristics and macroeconomic conditions. Berger and DeYoung (1997) emphasize the relationship among non-performing loans, cost efficiency, and management quality, while Fiordelisi et al. (2011) show that risk, capital, and operating efficiency are dynamically interrelated.

In this study, NPL, LogSIZE, CAR, LDR, loan-loss provision expenses, operating expenses, GDP, and financial leverage are included as control variables to avoid attributing all variation in ROA to green credit. Non-performing loans generally reduce profitability through higher

provisioning expenses and foregone interest income (Berger & DeYoung, 1997). Bank size may generate economies of scale but can also create bureaucratic costs; leverage may amplify profits under favorable conditions but increases vulnerability when asset quality deteriorates (Dietrich & Wanzenried, 2011).

2.3 Theoretical Foundations

The analytical framework combines three established theories stakeholder theory, signaling theory, and agency theory with an environmental credit-risk management perspective. These four perspectives are complementary: the first three explain incentives, information, and monitoring mechanisms, whereas the fourth explains how environmental factors are translated into risk-management processes and financial outcomes.

Stakeholder theory holds that firms create and sustain value through relationships with parties that have legitimate interests in their activities (Freeman, 1984; Donaldson & Preston, 1995; Clarkson, 1995). For banks, stakeholders include shareholders, depositors, borrowers, regulators, investors, employees, and communities. A green credit portfolio based on clear criteria and verifiable impacts may strengthen legitimacy, reputation, and customer relationships, thereby supporting funding and revenue. However, simultaneously meeting diverse stakeholder expectations may also increase compliance costs; therefore, the association with ROA is conditional rather than deterministic.

Signaling theory proposes that, under information asymmetry, high-quality actors can use observable and sufficiently credible signals to distinguish themselves from lower-quality actors (Spence, 1973; Connelly et al., 2011). Disclosing a green credit strategy, classification criteria, an environmental and social management system (ESMS), portfolio size, and impact outcomes may signal management quality and a long-term orientation. Such signals create value only when they are consistent, verifiable, and linked to substantive practices; disclosures that exceed actual implementation may be perceived as greenwashing and increase reputational risk (Delmas & Burbano, 2011).

Under agency theory, information asymmetry and divergent objectives among owners, depositors, regulators, and managers may generate agency costs (Jensen & Meckling, 1976). In banking, capital structure and monitoring are associated with managerial behavior and operating performance (Berger & Bonaccorsi di Patti, 2006). If green targets are pursued merely for symbolic compliance, managers may allocate capital to maximize image or short-term achievements rather than risk-adjusted value. Independent approval mechanisms, loan covenants, post-disbursement monitoring, and impact indicators can reduce moral hazard, adverse selection, and greenwashing.

The environmental credit-risk management perspective should be understood as a specialized management approach rather than an independent theory. It requires environmental risks to be integrated into customer screening, rating, pricing, loan-condition design, monitoring, and loan resolution (Weber et al., 2008; Weber et al., 2010; Weber, 2012). Comprehensive integration may reduce future losses arising from environmental liabilities, stranded assets, collateral impairment, and transition risks. Nevertheless, appraisal costs and measurement uncertainty may prevent financial benefits from emerging immediately over a short horizon.

Taken together, the four perspectives suggest that GCR captures the strategic priority assigned

to green lending more effectively than the absolute volume of outstanding green loans. Specifically, GCR is linked to stakeholder relationships, signal credibility, and the intensity of risk integration, whereas LogGCO may primarily reflect bank size. At the same time, agency costs, greenwashing, and implementation costs explain why the empirical association may be weak, heterogeneous, or time-varying.

2.4 Research Hypotheses

Drawing on stakeholder theory, signaling theory, and the environmental credit-risk management perspective, a higher share of green credit is expected to be associated with greater profitability when green portfolios are substantively defined and managed. Agency theory, however, cautions that the absolute volume of outstanding green loans may reflect bank size or symbolic targets more than the degree of strategic transformation.

Hypothesis 1 (H1): The ratio of outstanding green loans to total outstanding loans (GCR) is positively associated with the ROA of commercial banks.

Hypothesis 2 (H2): The logarithm of outstanding green loans (LogGCO) is positively associated with ROA, but the association is expected to be weaker than that of GCR because LogGCO does not directly capture the degree to which the loan portfolio has been greened.

For the control variables, NPL and leverage are expected to be negatively associated with ROA, while the effects of bank size and capital adequacy may vary with asset quality, funding structure, and management capacity.

3. Method

3.1 Data and Sample

The sample consists of eight Vietnamese commercial banks observed from 2022 to 2024, forming a balanced 8 × 3 panel with 24 bank-year observations. The data were compiled from consolidated financial statements, annual reports, sustainability reports, ESG reports, and other public disclosures by the banks. Banks were selected according to the availability of relatively consistent green credit time series, rather than through probability sampling. The sample may therefore be biased toward banks with better green disclosure and is not representative of the entire Vietnamese commercial banking system.

The sample size of 24 observations is a major limitation. The full model includes 10 explanatory variables and an intercept, leaving only 13 residual degrees of freedom. The coefficients and p-values may therefore be sensitive to individual observations, and the risk of overfitting is relatively high. Accordingly, pooled OLS is used only to describe conditional associations within the sample; the study does not infer causal relationships or generalize the results to the full population of banks.

3.2 Research Variables

Table 1. Variable Definitions

Symbol	Measurement	Interpretation
ROA	After-tax profit / Average total assets	Dependent variable measuring financial performance
GCR	Outstanding green loans / Total outstanding loans	Main independent variable capturing the green share of the loan portfolio
LogGCO	Logarithm of outstanding green loans	Supplementary independent variable capturing the absolute volume of green credit
NPL	Non-performing loans / Total outstanding loans	Asset quality
LogSIZE	Logarithm of total assets	Bank size
CAR	Regulatory capital / Risk-weighted assets	Capital adequacy
LDR	Outstanding loans / Customer deposits	Liquidity and lending intensity
TLCPDP	Credit-loss provision expenses / Total outstanding loans	Credit-risk cost
TLCPHD	Operating expenses / Total operating income	Cost-control efficiency
GDP	Annual GDP indicator after data transformation	Macroeconomic conditions
LEV	Total liabilities / Total assets	Financial leverage

Source. Compiled by the authors

3.3 Estimation Model

The baseline model is specified as follows:

$$ROA_{it} = \beta 0 + \beta 1.GCR_{it} + \beta 2.LogGCO_{it} + \beta 3.NPL_{it} + \beta 4.LogSIZE_{it} + \beta 5.CAR_{it} + \beta 6.LDR_{it} + \beta 7.TLCPDP_{it} + \beta 8.TLCPHD_{it} + \beta 9.GDP_{t} + \beta 10.LEV_{it} + \varepsilon_{it}$$

Here, i denotes the bank and t denotes the year. The study reports three specifications: the full model; a model excluding LogGCO; and a parsimonious model containing GCR, NPL, LogSIZE, and LEV. The parsimonious model alleviates pressure on the degrees of freedom but does not eliminate omitted-variable bias. Results across the specifications are therefore used as sensitivity checks rather than as a basis for selecting variables solely according to statistical significance.

The diagnostic tests comprise the variance inflation factor (VIF), the White test, and the Wooldridge test. VIF is reported for the parsimonious model and therefore cannot rule out multicollinearity in the full model, particularly given the strong correlation between CAR and LEV. With only 24 observations and eight bank clusters, the White and Wooldridge tests have limited power; conventional OLS p-values are therefore interpreted cautiously. Future research requires longer panels to estimate fixed-effects and random-effects models, cluster-robust standard errors, and appropriate models that address endogeneity.

4. Results

4.1 Descriptive Statistics

Table 2. Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min.	Max.
ROA	24	0.0172	0.0055	0.0085	0.0288
GCR	24	0.0426	0.0273	0.0096	0.0997
LogGCO	24	0.8140	0.0873	0.6331	0.9627
NPL	24	0.0150	0.0065	0.0068	0.0295
LogSIZE	24	0.8884	0.0519	0.7953	0.9756
CAR	24	0.1232	0.0236	0.0800	0.1707
LDR	24	0.8239	0.1057	0.6755	1.0947
TLCPDP	24	0.0135	0.0119	0.0023	0.0468
TLCPHD	24	0.2768	0.1163	0.0003	0.4141
GDP	24	0.1264	0.0266	0.0903	0.1508
LEV	24	0.8907	0.0412	0.8196	0.9509

Source. Authors' calculations using Stata, 2025

The sample banks have a mean ROA of 1.72%, indicating that all observed banks remained profitable during 2022-2024. The mean GCR is 4.26%, ranging from 0.96% to 9.97%, which reflects substantial variation in the greening of loan portfolios. ROA ranges from 0.85% to 2.88%, a difference of 2.03 percentage points between the maximum and minimum values.

4.2 Correlations Among Variables

Table 3. Selected Correlation Coefficients

Variable Pair	Correlation Coefficient	Interpretation
ROA – GCR	0.0423	Very weak positive correlation
ROA – LogGCO	-0.2434	Weak negative correlation
ROA – NPL	-0.2618	Weak negative correlation
ROA – LogSIZE	-0.2150	Weak negative correlation
ROA – GDP	-0.2522	Weak negative correlation
ROA – LEV	-0.6529	Relatively strong negative correlation
GCR – LogGCO	0.5854	Moderate positive correlation
LogGCO – LogSIZE	0.7693	Strong positive correlation
CAR – LEV	-0.8909	Very strong negative correlation

Source. Authors' calculations using Stata, 2025

The selected correlation coefficients in Table 3 indicate that ROA has only a very weak positive correlation with GCR (0.0423) but is negatively correlated with LogGCO, NPL, LogSIZE, GDP, and LEV. The LogGCO-LogSIZE correlation is 0.7693, suggesting that bank size may strongly influence the absolute volume of green credit. The CAR-LEV correlation is -0.8909; consequently, including both variables in the full model with a small sample may produce unstable coefficients, even though VIF is low in the parsimonious model.

The near-zero bivariate correlation between ROA and GCR, combined with a statistically significant GCR regression coefficient after the addition of controls, may reflect a suppression effect or specification sensitivity. With only 24 observations, small changes in the control variables or a few influential observations could alter the results. The GCR coefficient should therefore be treated as exploratory evidence that requires verification using a larger sample.

4.3 Regression Results

Table 4. Pooled OLS Regression Results

Variable	Full Model	Excluding LogGCO	Parsimonious Model
GCR	0.1431** (p=0.024)	0.0897** (p=0.022)	0.0740** (p=0.011)
LogGCO	-0.0351 (p=0.250)	-	-
NPL	-0.4684 (p=0.214)	-0.4973 (p=0.170)	-0.4936*** (p=0.000)
LogSIZE	0.0126 (p=0.727)	-0.0185 (p=0.515)	-0.0284* (p=0.066)
CAR	-0.0255 (p=0.862)	-0.0036 (p=0.979)	-
LDR	0.0100 (p=0.564)	0.0064 (p=0.702)	-
TLCPDP	0.0405 (p=0.833)	0.0896 (p=0.634)	-
TLCPHD	-0.0003 (p=0.974)	-0.0020 (p=0.849)	-
GDP	-0.0288 (p=0.537)	-0.0273 (p=0.565)	-
LEV	-0.1166 (p=0.149)	-0.0860 (p=0.229)	-0.1034*** (p=0.000)
Constant	0.1378* (p=0.082)	0.1112** (p=0.021)	0.1391*** (p=0.000)
Observations	24	24	24
Adjusted R^2	0.6391	0.6274	0.6713

Note. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively; "-" indicates that the variable was not included in the model.

Source. Authors' calculations using Stata, 2025

GCR has a positive coefficient that is statistically significant at the 5% level across all three specifications. In the full model, the coefficient of 0.1431 implies that a 0.01 increase in GCR (i.e., one percentage point) is associated with a predicted increase in ROA of 0.001431, equivalent to 0.1431 percentage points, holding other factors constant. In the parsimonious model, the corresponding increase is 0.0740 percentage points. The result is consistent with H1

within the sample but does not establish that green credit causes an increase in ROA.

LogGCO has a negative but statistically insignificant coefficient; thus, H2 is not supported. This result may arise because the absolute volume of outstanding green loans is strongly associated with bank size: a large bank may have a substantial green loan portfolio while the green share of its total lending remains low. In this sample, GCR provides more comparable information on green lending intensity than LogGCO, although this conclusion should be tested using alternative measures and datasets.

In the parsimonious model, NPL and LEV have negative coefficients that are statistically significant at the 1% level, while LogSIZE has a negative coefficient that is significant at the 10% level. These coefficient signs are consistent with the arguments that non-performing loans increase provisioning expenses and that high leverage increases financial vulnerability. However, the significance of these variables is not stable in the full model; they should therefore not be interpreted as robust findings without verification using a longer panel.

4.4 Diagnostic Tests

Table 5. Model Diagnostic Tests

Test	**Result**	**Interpretation**
Multicollinearity	Mean VIF = 1.24; maximum VIF = 1.32 in the parsimonious model	No serious multicollinearity.
Heteroskedasticity	White: $\chi^2(14) = 17.09$; p = 0.2513	Fail to reject H0 of homoskedasticity at the 5% level.
First-order serial correlation	Wooldridge: F(1,6) = 5.983; p = 0.0501	Fail to reject H0 at the 5% level, but the result is borderline and should be interpreted cautiously.

Source. Authors' calculations using Stata, 2025

At the 5% level, the diagnostic tests do not identify clear defects in the parsimonious model, but they are insufficient to establish that the model is correctly specified. In particular, the Wooldridge test returns p = 0.0501, which is very close to the threshold; with only eight banks, the test has limited power. The results should therefore be interpreted in conjunction with the limitations related to sample size, sample selection, measurement error, and endogeneity.

5. Discussion

The positive GCR coefficient suggests that, among the observed banks, a greater share of green lending in the loan portfolio is associated with ROA after controlling for selected bank characteristics. The result is consistent with Lian et al. (2022), but differs from Song et al. (2019), who report a negative association among Chinese banks, and from Nguyen and Phan (2025), who find no effect of green credit policy on the profitability of Vietnamese banks. These differences may stem from the green credit measure, observation period, bank sample, and identification strategy. The present findings therefore add evidence on portfolio intensity without invalidating earlier results.

LogGCO is not statistically significant and is strongly correlated with LogSIZE. This is consistent with the theoretical argument that absolute volume alone is not a reliable signal of

green commitment: large banks may report substantial outstanding green loans while their green share of total lending remains low. GCR standardizes size differences, although the indicator itself still depends on the consistency of classification and disclosure criteria.

The negative NPL and LEV coefficients emphasize that green credit does not replace conventional bank risk management. This result is consistent with the environmental credit-risk management perspective: environmental criteria create value only when they are integrated into appraisal, pricing, loan conditions, and post-disbursement monitoring (Weber et al., 2008; Weber, 2012). Agency theory also warns that poorly monitored green targets may lead to symbolic capital allocation or greenwashing, weakening the signal received by stakeholders.

The study covers 2022-2024, when green credit disclosure in Vietnam was not yet fully standardized and Decision No. 21/2025/QD-TTg had not taken effect. Consequently, GCR values across banks may not be fully comparable in terms of the activities classified as green. The results should be understood as preliminary evidence of association within a disclosure-availability sample, rather than as causal estimates or evidence representative of the entire banking system.

6. Managerial and Policy Implications

6.1 Implications for Commercial Banks

First, banks should move from merely "offering green products" to actively managing a green credit portfolio. Within the sample, GCR has a clearer association with ROA than LogGCO; banks should therefore monitor the green share by sector, maturity, risk level, NIM, and credit quality, without treating this study's regression coefficients as causal evidence. Second, appraisal should be standardized through ESMS, internal green criteria, and quantitative evidence of energy savings, emission reductions, or resource efficiency. Third, green data should be integrated into credit-risk management systems. Fourth, credit officers should be trained in green classification, climate risk, technology appraisal, and post-disbursement impact monitoring.

For large banks, priorities should include building a database of green projects, fully disclosing outstanding green loans by sector, and applying international standards such as the IFC Performance Standards or the Equator Principles where appropriate. Banks outside the largest group should develop green products focused on segments where risks can be effectively controlled, including rooftop solar energy, sustainable agriculture, energy efficiency for small and medium-sized enterprises, green buildings, and sustainable supply-chain finance.

6.2 Implications for Regulatory Authorities

Regulatory authorities should prioritize three policy areas: updating the Green Taxonomy; specifying minimum disclosure indicators for loan volumes, sectors, maturities, credit quality, and environmental impacts; and developing technical assistance or risk-sharing mechanisms for projects that provide clear environmental benefits but have long payback periods. Incentive policies should not rely solely on the association observed in this small sample. Instead, they should be linked to certification standards, impact verification, and risk-based pricing principles to limit adverse selection and moral hazard.

The quality of sector-level data should also be improved. When banks disclose green credit using different methods, researchers and investors cannot readily compare performance across banks. Unified data standards would enable future research to employ stronger panel models, test causal relationships, and analyze the transmission mechanisms linking green credit to profitability, risk, and the cost of capital.

7. Conclusion, Limitations, and Directions for Future Research

This exploratory study provides exploratory evidence on the association between green credit and the financial performance of eight Vietnamese commercial banks over the 2022-2024 period. GCR has a positive and statistically significant coefficient across three pooled OLS specifications, whereas LogGCO is not statistically significant; NPL and LEV have negative coefficients in the parsimonious model. The results suggest that the green share of the loan portfolio has greater analytical value than the absolute volume of outstanding green loans, but they do not permit the conclusion that increasing green credit causes an increase in ROA.

The exploratory study has five principal limitations. First, 24 observations provide low statistical power and create a risk of overfitting, particularly in the full model. Second, selecting banks according to the availability of green data may introduce selection bias and limit representativeness. Third, green credit criteria and disclosure scope are not uniform across banks, creating measurement error. Fourth, pooled OLS does not fully control for time-invariant bank heterogeneity, year-specific shocks, reverse causality, or omitted variables. Fifth, a three-year period is unlikely to capture the lagged effects of green projects and climate risks.

Future research should extend the sample to all commercial banks, use longer time series, and standardize the data according to the effective Green Taxonomy. With sufficiently large datasets, studies could compare fixed-effects, random-effects, FGLS, and dynamic models; use cluster-robust standard errors; or apply difference-in-differences or event-study designs when a policy shock and credible identification assumptions can be established. Future research should also test mediation mechanisms through NPL, NIM, CIR, and the cost of capital; disaggregate green credit by sector; and conduct sensitivity tests using alternative definitions, lags, and measures of green credit.

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