



Green Loan, Sustainability-Linked Loan, and Profitability of Conventional Banks in Indonesia

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Abstract

This study aims to examine the association between green loans, Sustainability-Linked Loans (SLL), and the profitability (measured by Return on Assets) of conventional commercial banks in Indonesia. Using a balanced panel of eight banks from 2021 to 2025, the research employed a Fixed Effect Model to analyze data from audited financial and sustainability reports, measuring sustainable loan exposure as a percentage of total assets while controlling for bank size and capital adequacy. The results reveal that neither green loans nor SLLs significantly impact profitability once bank fixed effects are controlled. While an initial negative association between SLLs and profitability appeared during pooled estimation, further analysis demonstrated this was merely a bank-size artifact: smaller, inherently less profitable banks simply held proportionally larger sustainable-lending portfolios. Ultimately, bank size and capital adequacy were the actual drivers of profitability, and mechanism tests found no evidence that SLLs reduce credit risk. Methodologically and theoretically, this study provides the first scale-adjusted measurement of SLL exposure in Indonesian banking and issues a strong caution: studies reporting significant profitability effects from sustainable lending without adequate size controls may simply be measuring bank scale rather than the true impact of the financial instruments.

Keywords: *green loan, sustainability-linked loan, bank profitability, return on assets, Indonesian banking.*

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1. INTRODUCTION

Global climate change and increasing awareness of environmental sustainability are driving fundamental transformations in the world's financial sector, including the banking industry. Amid pressure to meet net-zero commitments and the Sustainable Development Goals (SDGs), banks no longer play only the role of conventional intermediaries but also that of agents of transition to a green economy. One of the concrete forms of this role is the distribution of sustainability-based financing, namely green loans and Sustainability-Linked Loans (SLL).

Green loans are credit facilities used exclusively for projects or assets that provide environmental benefits, such as renewable energy, energy efficiency, clean water management, and environmentally friendly transportation. In Indonesia, the basis for green loan regulation is the Financial Services Authority Regulation (POJK) Number 51/POJK.03/2017 on the Implementation of Sustainable Finance for Financial Services Institutions, Issuers, and Public Companies. This regulation requires large banks to prepare a Sustainable Finance Action Plan (RAKB) that includes targets for green credit disbursement (Handayani et al., 2020).

Sustainability-Linked Loan (SLL), on the other hand, is a more innovative financing instrument in which the loan interest rate is directly linked to the achievement of the debtor's Sustainability Performance Targets (SPTs). Unlike green loans that are use-of-proceeds or earmarked, SLL does not require funds to be used for certain projects; rather, it provides financial incentives in the form of interest rate reductions if the debtor meets the agreed sustainability indicators (Ferilli et al., 2025). This flexibility makes SLL increasingly in demand among corporations and banks worldwide, in line with the widespread adoption of the Loan Market Association (LMA) SLL Principles.

From a profitability perspective, the growth of green loans and SLL portfolios could have a dual impact on banks. On the one hand, these two instruments can open new market segments, improve the bank's reputation, and reduce credit risk in the long run because debtors that operate sustainably tend to have greater business resilience (Maztoul, 2025). On the other hand, the high initial implementation cost, the need for environmental risk analysis capacity, and possibly thinner credit margins can suppress banks' profitability in the short term (Riyanti et al., 2025).

Empirical evidence regarding this relationship is still diverse and inconclusive. Riyanti et al. (2025) found that the presence of green loans in banks' credit portfolios negatively affects the profitability of Indonesian banks, consistent with Asfahaliza and Anggraeni (2022), who also found that green banking negatively influences banking profitability during 2016–2021. On the other hand, Sutrisno et al. (2024) demonstrate that green credit positively affects bank profitability in Indonesia. These findings are supported by Anggraini and Iqbal (2022), who show the positive influence of green banking on the profitability of Islamic Commercial Banks, and Ningsih et al. (2020), who find a similar pattern in Islamic banks in Indonesia. Mirovic et al. (2023) identified that green loans moderate the relationship between bank liquidity and profitability, while Ferilli et al. (2025) revealed that green bonds - instruments with similar characteristics to SLL - have a positive effect on credit quality and bank profitability. The diversity of these findings suggests that the relationship between sustainable financial instruments and bank financial performance is highly dependent on the institutional and regulatory context of each country.

Although studies on green banking and green credit on the profitability of banks in Indonesia are relatively widely carried out (Asfahaliza & Anggraeni, 2022; Anggraini & Iqbal, 2022; Ningsih et al., 2020; Setiawan et al., 2018), research that specifically examines Sustainability-Linked Loan in the context of Indonesian banking is still very limited, even though this instrument has grown rapidly globally since the issuance of the SLL Principles guide by the Loan Market Association (LMA) in 2019. Previous research has not answered two important questions: first, whether the performance-based incentive mechanism in SLL has a different impact on profitability than the use-of-proceeds mechanism in green loans; and second, how the two instruments perform when tested simultaneously in a single model, rather than separately. This gap is the main motivation and novelty of this study: comparing the simultaneous influence of two sustainable lending instruments - green loans and SLL - on the profitability of banks in Indonesia.

Thus, this study examines the association between green loans, Sustainability-Linked Loans, and the profitability of

banks in Indonesia, proxied by Return on Assets (ROA), using a balanced panel of eight conventional commercial banks over 2021-2025 (40 bank-year observations). The contributions of this research are: (1) providing the first scale-adjusted quantitative measurement of SLL exposure across Indonesian conventional banks; (2) testing both instruments jointly within a single specification that controls for bank size and capital adequacy and for unobserved bank heterogeneity; (3) demonstrating that the association between sustainable lending and profitability reported in parts of the existing literature may reflect differences in bank scale rather than the instruments themselves; and (4) documenting the disclosure and measurement conditions that currently bound quantitative research on SLL in Indonesia.

Because this study reports a null result, it is important to state precisely what is claimed as novel, so that the contribution is not read as resting on a strength of evidence the data do not provide. The novelty claimed here is not the magnitude or the significance of an estimated effect. It lies in three narrower and empirically defensible places. First, to the best of our knowledge, this is the first study to quantitatively measure Sustainability-Linked Loan exposure on a scale-adjusted basis across Indonesian conventional banks. In contrast, prior Indonesian literature has treated SLL only conceptually. Second, the two instruments are tested jointly using a formally selected panel estimator and banking control variables, which allows a specific and falsifiable claim to be evaluated rather than merely asserted. Third, and most substantively, the analysis identifies why an association that appears strong in pooled estimation is not robust: it is absorbed by bank size. That finding is itself an empirical result; it is reproducible from the data reported in this manuscript, and it carries a methodological implication for how the existing literature on sustainable lending and bank performance should be read. A null result established under a correctly specified model is a stronger empirical contribution than a significant coefficient recovered from a misspecified one.

2. LITERATURE REVIEW

2.1 Legitimacy Theory, Stakeholder Theory, and Sustainable Lending Mechanism

This research is based on two main theories, used in a complementary manner, to explain why green loans and SLL can affect bank profitability, rather than simply defining the concepts. Legitimacy Theory states that companies, including banks, operate within the framework of social contracts with society and seek to maintain their legitimacy by aligning operational values with applicable social norms (Pratiwi et al., 2022). Associated with green loans, green lending is a bank's response to institutional pressure to contribute to environmental conservation and to close the legitimacy gap between public expectations and the bank's business practices. When this legitimacy gap is successfully closed, banks gain indirect benefits, including strengthened reputation, customer trust, and access to funding that can ultimately support long-term financial performance.

Stakeholder Theory states that banks are accountable not only to shareholders but also to all stakeholders, including customers, regulators, employees, and the wider community. This theory helps explain why sustainable finance, especially SLL, can affect profitability: SLL explicitly aligns the interests of banks as creditors with those of debtors and environmental stakeholders through interest-rate incentive mechanisms tied to sustainability achievements. Oktaviani et al. (2022) emphasized that stakeholder theory, legitimacy, and signals together form the design of sustainability strategies for banking companies.

More specifically, the mechanism by which SLL affects profitability can be explained through the credit risk channel. The SPT provisions in SLL require debtors to achieve certain sustainability performance indicators, and their achievement is monitored periodically by banks. This monitoring process functions as an additional monitoring mechanism (extra screening and monitoring) that helps banks detect the debtor's operational and reputational risks early, thereby reducing the probability of default and improving the quality of the bank's productive assets (Maztoul, 2025). As credit risk decreases, the cost of servicing impairment losses (CKPN) can be reduced, thereby improving ROA. This mechanism underlies the argument that SLL has the potential to exert a stronger influence on profitability than green loans, because green loans allocate funds to specific projects (use-of-proceeds) whose financial benefits tend to be realized in the longer term and are accompanied by higher project verification costs.

2.2 Green Loans and Bank Profitability

A green loan is a credit facility whose funds are exclusively allocated to finance or refinance green projects that are verifiable and meet certain sustainability criteria. Handayani et al. (2020) explained that green loans are an important policy for banks to support environmentally friendly and sustainable development, with banks playing a key role in advancing sustainable economic development.

Riyanti et al. (2025), in their comprehensive study of Indonesian conventional banks, revealed that the presence of green loans in banks' credit portfolios negatively affects profitability, as measured by ROA, ROE, and NIM. These findings are consistent with Zhou et al. (2024), who found that green loans reduce the net profit of Chinese commercial banks, and with Asfahaliza and Anggraeni (2022), who found that the implementation of green banking reduces the profitability of Indonesian banks during 2016–2021. On the other hand, Sutrisno et al. (2024) demonstrate a positive influence of green credit on the profitability of Indonesian banks, particularly small banks. Zhao (2024) also emphasized that the green credit ratio significantly increases the ROA and ROE of Chinese commercial banks. Similar positive findings were also reported by Anggraini and Iqbal (2022) on Islamic Commercial Banks Indonesia and Ningsih et al. (2020) on Islamic Commercial Banks.

Sutrisno and Furqan (2023) found that green credit has a positive and significant effect on bank profitability in Indonesia. Viverita (2023) found that the distribution of green credit has a significant negative effect on the bank's ROA but not on NIM. Mirovic et al. (2023) show that the presence of green loans in a bank's portfolio moderates the influence of liquidity on bank profitability. From the perspective of meta-analysis, Muchiri et al. (2025) concluded that there was a statistically insignificant positive influence between green banking and green financing activities on bank profitability, while Setiawan et al. (2018) emphasized that the benefits of green banking on the performance of Islamic banks are long-term and do not always appear in short observation periods.

Based on Legitimacy Theory and empirical evidence showing potential reputational benefits as well as reduced long-term credit risk - although previous research results have been mixed - the study formulated the first hypothesis directionally:

H1: Green loans have a positive effect on bank profitability (ROA) in Indonesia.

2.3 Sustainability-Linked Loan (SLL) and Bank Profitability

Sustainability-Linked Loan (SLL) is a financing instrument that integrates financial incentives with the achievement of debtors' sustainability targets. Unlike green loans, which bind the use of funds to specific projects, SLL provides flexibility in fund use but links interest rates to agreed-upon Sustainability Performance Targets (SPTs) (Ferilli et al., 2025). This ratchet mechanism creates an incentive for debtors to seriously improve their sustainability performance, as success in achieving tax returns can result in a reduction in interest rates.

For banks as lenders, SLL offers several advantages. First, SLL allows banks to expand their customer base sustainably without strict sectoral restrictions, such as in green loans. Second, as explained in the theoretical framework above, monitoring the debtor's sustainability performance inherent in SLL serves as an additional supervisory mechanism that reduces credit risk (Maztoul, 2025). Ferilli et al. (2025) revealed that green bonds, instruments similar to SLL in their relationship with ESG performance, have a positive effect on credit portfolio quality and banks' profitability.

Fourinda and Fadjar (2024) prove that sustainable credit has a positive and significant effect on bank profitability. Ratnasari et al. (2021) found that the daily operations of green banking positively affect the bank's profitability. Bimantara et al. (2025) revealed that ESG disclosure has a positive and significant effect on the net income of the strongest banks in Asia. Nurhalida and Shofwan (2023) found that simultaneously, all ESG variables have a significant effect on the profitability of banks in Indonesia. Karisma and Rani (2023), in a comparative study on sustainable banking performance, found that first-mover banks in sustainable finance practices tend to have more stable performance. Pradipta et al. (2022) and Puspa and Fransisca (2025) also found that sustainability disclosures are associated with better banking financial performance. Sa'adah et al. (2025) revealed that the implementation of green finance has the potential to increase long-term financial stability and improve the profitability of the banking sector, while internationally, Yadav and Agarwal (2026) found that green banking practices have a positive

effect on the profitability of banks in India, indicating a relatively consistent pattern in the context of other developing countries.

Based on the Stakeholder Theory and the mechanism of credit risk reduction through SPTs monitoring as described in section 2.1, and supported by the majority of the empirical evidence above, this study formulates a second hypothesis directionally:

H2 : Sustainability-Linked Loan (SLL) has a positive effect on bank profitability (ROA) in Indonesia.

3. RESEARCH METHOD

3.1 Research Design and Approach

This study uses a quantitative approach with an associational design to examine the relationship between green loans and SLL and bank profitability, measured by ROA. The data are balanced panel data combining a cross-sectional dimension (8 banks) and a time-series dimension (5 years, 2021-2025), yielding 40 bank-year observations. The model includes banking control variables, and the estimator is selected formally rather than assumed. The design supports conditional association rather than causal identification, and the coefficients are interpreted accordingly throughout.

The estimator is selected through a formal specification procedure. Three estimators are estimated - the Common Effect Model (CEM/pooled OLS), the Fixed Effect Model (FEM), and the Random Effect Model (REM) - and three specification tests are applied: the Chow test (CEM versus FEM), the Hausman test (FEM versus REM), and the Breusch-Pagan Lagrange Multiplier test (CEM versus REM). As reported in section 4.1.3, the Chow and Hausman tests both indicate that the Fixed Effect Model is preferred; therefore, it is used for the main results. Fixed-effect estimates are reported with standard errors clustered by bank, which is robust to both the serial correlation and the within-bank dependence expected in a panel of this shape.

3.2 Population and Sample

The population of this study comprises conventional commercial banks registered with the Financial Services Authority (OJK) and/or listed on the Indonesia Stock Exchange (IDX) that consistently published annual reports and/or sustainability reports during the 2021-2025 observation period. The sampling technique employed was purposive sampling based on predetermined criteria.

The sample selection process was conducted through several stages. First, the study identified conventional commercial banks that met the initial population criteria. Second, banks that did not consistently publish annual reports and/or sustainability reports during the observation period were excluded. Third, banks that did not disburse and/or did not disclose the nominal value of green loans and/or Sustainability-Linked Loans (SLL) were excluded, because the research variables could not be measured consistently for those banks. Fourth, banks with incomplete financial data needed to measure the research variables were excluded. Finally, banks that underwent mergers, acquisitions, or significant changes in banking status during the observation period were excluded to maintain the consistency and comparability of the panel data.

Based on these selection criteria, eight conventional commercial banks were selected as the final research sample: Bank Mandiri, Bank Rakyat Indonesia (BRI), Bank Negara Indonesia (BNI), Bank Central Asia (BCA), Bank Tabungan Negara (BTN), Bank Permata, Maybank Indonesia, and Bank Danamon. Observing each bank over five years produces a balanced panel of 40 bank-year observations. The sampled banks are named explicitly to ensure transparency and replicability.

The 2021-2025 observation period was selected to capture recent developments in sustainable financing practices in the Indonesian banking sector, particularly the emergence and disclosure of green loans and Sustainability-Linked Loans following the publication of the SLL Principles in 2019 and the consolidation of sustainable finance reporting under POJK No. 51/POJK.03/2017.

Transparency regarding the status of the 2025 data is essential for interpreting the results. At the time of data collection, complete audited annual reports and assured sustainability reports for the 2025 financial year were not yet available for all sampled banks. The 2025 figures are therefore drawn from interim, unaudited disclosures published by the banks (quarterly

and preliminary full-year financial publications and preliminary sustainable finance disclosures). In contrast, the 2021-2024 figures are taken from complete audited annual reports and published sustainability reports. Because unaudited interim figures are not fully comparable with audited annual figures, all analyses are additionally re-estimated on the fully audited 2021-2024 subsample, and this restricted specification is reported alongside the full-sample results in section 4.1.10. Readers who regard the 2025 disclosures as insufficiently comparable may treat the 2021-2024 estimates as the primary results without altering the study's substantive conclusions.

The size of the sample requires a fuller explanation than a simple acknowledgment of limitation, because it follows from the research question rather than from the effort devoted to data collection. Indonesia has well over a hundred conventional commercial banks. However, the variable of interest exists only where a bank both operates Sustainability-Linked Loan facilities and discloses their value in a form that can be measured consistently across years. Applying the selection criteria in sequence, the binding constraint is not the requirement to publish annual or sustainability reports, which most commercial banks satisfy, but the requirement to disclose SLL exposure in measurable terms, which very few satisfy. The eight banks analyzed here, therefore, approximate the population of Indonesian conventional banks that disclosed measurable SLL exposure during the observation period, rather than constituting a small sample drawn from a large population. The limitation is accordingly one of statistical power and of generalisability beyond the disclosing group, not of sampling bias in the conventional sense, since no larger pool of qualifying banks has been excluded. The sample cannot be enlarged by further searching; it can only grow as disclosure practice broadens, which is the regulatory implication developed in section 5.

Comparability across periods has been established along four dimensions, since a panel is informative only if each year is measured on the same footing. First, definitional consistency: ROA is taken from the Performance Ratios table of each bank's published financial statements using the definition applied by the supervisory authority (profit before tax over average total assets), so that no part of the variation across years reflects a change in how the variable was computed. Second, consistency of reporting position: every observation is taken at the December position, so no year is represented by a part-year figure. Third, consistency of the reporting entity: banks that underwent mergers, acquisitions, or changes of banking status during the observation period were excluded at the sampling stage. Fourth, consistency of scale: all monetary variables are expressed relative to total assets, so that observations remain comparable across banks that differ in size by a factor of approximately eighteen. The one dimension on which full comparability is not achieved is audit status, since the 2025 figures are interim while earlier years are audited; this is addressed by re-estimating the model on the audited years alone and reporting that specification in section 4.1.10.

3.3 Research Variables and Data Sources

This study examines two explanatory variables of interest, namely Green Loan (X1) and Sustainability-Linked Loan (SLL) (X2); one dependent variable, Return on Assets (ROA) (Y); and two banking control variables, bank size and capital adequacy. The operational definitions and measurements are presented in Table 1.

Table 1 | Research Variables and Data Sources

Variable	Measurement	Operational Definition	Unit
Return on Assets (ROA) (Y)	Profit before tax / Average total assets x 100%	Bank profitability as defined by the Indonesian Financial Services Authority (OJK), taken directly from the Performance Ratios table of each bank's published financial statements	Percent (%)
Green Loan (X1)	Green loan value / Total assets x 100%	Green lending exposure scaled by total assets, from sustainable financing disclosures in each bank's annual and/or sustainability report	Percent (%)
Sustainability-Linked Loan (X2)	SLL value / Total assets x 100%	SLL exposure scaled by total assets, following the Sustainability-Linked Loan Principles (LMA/APLMA, 2019)	Percent (%)
Bank Size (control)	Natural logarithm of total assets	Bank scale, controlling for the systematic profitability advantage of larger banks	ln(Rp trillion)

Capital Adequacy (control)	Capital Adequacy Ratio (CAR/KPMM)	Capital strength, from the Performance Ratios table of each bank's published financial statements	Percent (%)
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Source: Compiled by the authors (2026).

The data used in this study are secondary data obtained from the annual reports, published financial statements, and/or sustainability reports of each sampled bank during the 2021-2025 observation period, as described in section 3.2. The reports are obtained from the respective banks' official websites and from publicly available information disclosure platforms. Return on Assets is measured according to the definition used by the Indonesian Financial Services Authority (OJK), namely profit before tax divided by average total assets. It is taken directly from the Performance Ratios (Rasio Kinerja) table in each bank's published financial statements rather than recomputed by the authors. This definition was adopted in preference to a net-profit-to-total-assets construction for two reasons. First, it is the measure that Indonesian banks are required to report and that the supervisory authority uses to assess bank profitability, so it is the convention followed in the Indonesian banking literature with which these results are compared. Second, because it is disclosed directly rather than derived, it can be verified against the source documents by any reader, which removes a potential source of computational inconsistency across banks and years.

Green Loan and SLL are measured as the disclosed exposure divided by total assets and multiplied by 100, rather than in nominal terms. This is a deliberate correction of measurement. The sampled banks differ in total assets by a factor of approximately eighteen, from Rp 160.81 trillion to Rp 2,829.95 trillion, so a nominal measure would conflate the size of a bank's sustainable lending commitment with the size of the bank itself. Total assets are used as the denominator rather than total credit because the sampled banks do not disclose a consistently defined credit denominator - the reporting base varies across banks and years. In contrast, total assets are reported uniformly and audited. Section 4.1.10 reports the model re-estimated on nominal exposures as a specification comparison, and the contrast between the two is itself informative. Where a bank reports no SLL facility in a given year, the value is recorded as zero, distinguishing the absence of SLL activity from the absence of measurable information; banks disclosing only project or borrower counts without a corresponding value are excluded.

The measurement of SLL follows the definition provided in the Sustainability-Linked Loan Principles developed by the Loan Market Association (LMA) and the Asia Pacific Loan Market Association (APLMA). SLL refers to loan facilities in which the loan's financial characteristics, generally the applicable interest rate, are linked to the borrower's achievement of predetermined Sustainability Performance Targets (SPTs). To enhance transparency and replicability, the data sources used to measure the research variables are documented in Appendix 1. The appendix provides information on the relevant annual reports and/or sustainability reports used for each sampled bank and observation year.

3.4 Estimation Strategy and Model Specification

The estimated model relates bank profitability to the two sustainable lending instruments:

Three further steps bring the measurement of the variables into line with accepted practice. First, ROA is no longer computed by the authors but taken directly from the Performance Ratios table of each bank's published financial statements under the supervisory definition, measured at the December position for every bank-year. This removes computational discretion and allows every observation to be traced to a specific line in a specific published document. Second, the control variables are drawn from the same table in the same documents, so the entire dataset rests on a single class of audited sources. Third, all monetary variables are scaled, as described above. One qualification is recorded openly: total assets are reported on a consolidated basis for all banks, whereas the ratios are reported on an individual (bank-only) basis for five banks and on a consolidated basis for two, following the format in which each bank publishes them. This is the standard reporting practice in Indonesian banking and is noted here for transparency, not concealment.

$$ROA(i,t) = a(i) + b1\ GL(i,t) + b2\ SLL(i,t) + b3\ SIZE(i,t) + b4\ CAR(i,t) + e(i,t)$$

where ROA(i,t) is the return on assets of bank i in year t in percent; GL(i,t) and SLL(i,t) are green loan and SLL exposure

as a percentage of total assets; $SIZE(i,t)$ is the natural logarithm of total assets; $CAR(i,t)$ is the capital adequacy ratio in percent; $a(i)$ is a bank-specific intercept under the fixed-effect specification; and $e(i,t)$ is the error term. Because the dependent variable and both explanatory variables of interest are measured in percentage points, b_1 and b_2 are interpreted as the percentage-point change in ROA associated with a one-percentage-point increase in the corresponding exposure ratio, holding the other variables constant. The model is estimated in three nested specifications - the two instruments alone, then adding size, then adding capital adequacy - so that the stability of the coefficients of interest can be observed directly as controls are introduced.

Each specification is estimated using CEM, FEM, and REM, and the estimator is selected based on the Chow, Hausman, and Lagrange Multiplier tests. The classical assumption tests - normality (Jarque-Bera), multicollinearity (centered VIF), heteroscedasticity (Breusch-Pagan-Godfrey), and autocorrelation (Breusch-Godfrey) - are applied to each specification and reported in full, including where an assumption is not satisfied.

3.5 Banking Control Variables

Bank profitability is known to depend on characteristics such as size, capital adequacy, asset quality, intermediation intensity, and operating efficiency. Both reviewers of this manuscript identified the omission of such controls as a threat to the validity of the estimates, and this revision incorporates them. The model includes bank size, measured as the natural logarithm of total assets, and capital adequacy, measured by the CAR reported under the supervisory framework.

The choice of these two controls, rather than a fuller set, is governed by the size of the panel and by the theoretical structure of the study. With 40 observations, a specification containing two variables of interest, two controls, and an intercept leaves 35 residual degrees of freedom, which supports stable inference; adding five controls would reduce this to roughly five observations per estimated parameter, rendering the coefficients unstable. Bank size is indispensable because the explanatory variables are scaled exposures, and the sampled banks differ in scale by a factor of approximately eighteen. Capital adequacy was selected in preference to operating efficiency (BOPO) for two reasons: BOPO shares components with ROA by construction and would introduce a partly tautological relationship, and complete BOPO data consistently could not be obtained for all sampled bank-years.

Non-performing loans are deliberately excluded from the baseline specification, even though they are available for every bank year. The theoretical framework in section 2.1 argues that SLL affects profitability through a credit-risk channel; controlling for NPL would therefore close the very pathway the study seeks to test and would bias the SLL coefficient towards zero for reasons unrelated to the absence of an effect. NPL is instead used as the dependent variable in a separate mechanism test reported in section 4.1.11, which is the methodologically appropriate way to examine a proposed channel.

3.6 Robustness Strategy

Five robustness checks are specified in advance. First, heteroscedasticity-consistent (HC3) standard errors guard against inference that depends on the assumed error structure, and fixed-effect estimates are also reported with standard errors clustered at the bank level. Second, influence diagnostics (Cook's distance and externally studentized residuals) identify observations with disproportionate leverage, and the model is re-estimated excluding the most influential observation. Third, ROA is winsorized at the 5th and 95th percentiles. Fourth, the model is re-estimated using only the audited years (2021-2024). Fifth, the model is re-estimated on nominal rather than scaled exposures, so that the effect of the measurement correction described in section 3.3 can be observed directly.

This section contains as much material and methods as possible to provide ideas to the reader through the methods used. References are written using the APA format, for example: (Sa'aati, 2003) (references to this template are only examples). Sub-subtitles about this method consist of at least one type of research; location research; source of legal material; data collection technique; and data analysis.

4. RESULTS AND DISCUSSION

The consequences of introducing controls are substantial and are reported in full in section 4.1.8. The coefficient on SLL falls from -2.456 in the unconditional specification to -1.406 once size is added, and to a statistically indistinguishable -0.262 once bank fixed effects are also imposed. This pattern is the central empirical finding of the revised study and vindicates the reviewers' concern: without controls, the model recovers bank scale rather than instrument effects

4.1 RESULTS

4.1.1. Descriptive Statistics

Descriptive statistics for the research variables across the 40 bank-year observations are presented in Table 2. All monetary variables are expressed as a percentage of total assets, following section 3.3.

Table 2 | Descriptive Statistics (N = 40)

Variable	Mean	Median	Std. Dev.	Minimum	Maximum	Skewness
ROA (%)	2.316	2.115	1.241	0.700	4.860	0.481
Green Loan (% of assets)	0.868	0.514	0.910	0.031	3.795	1.581
SLL (% of assets)	0.398	0.351	0.289	0.016	1.010	0.506
Bank Size, ln(assets)	6.465	6.570	0.978	5.080	7.948	-0.038
CAR (%)	24.903	24.825	5.195	18.500	38.700	0.892
NPL gross (%)	2.521	2.805	0.758	0.960	3.700	-0.366

Source: processed data (2026)

Table 2 shows a panel that is far better behaved than nominal measurement would suggest. ROA averages 2.316% and ranges from 0.700% to 4.860%, with mild positive skewness (0.481). Green loan exposure averages 0.868% of total assets and SLL exposure 0.398%, confirming that both instruments remain a very small share of the balance sheet even among banks that disclose them: at the median, SLL accounts for roughly one-third of one percent of assets. This magnitude is central to interpreting the results, because a portfolio of that size cannot plausibly move an aggregate ratio such as ROA by an economically meaningful amount. The scale correction applied in section 3.3 is substantial: measured nominally, green loan exposure ranges over a factor of 23.7 and total assets over a factor of 17.6, so nominal figures would have been dominated by bank size rather than by lending behavior.

4.1.2. Correlation Matrix

Table 3 reports the Pearson correlation matrix for the research variables.

Table 3 | Pearson Correlation Matrix

Variable	ROA	GL	SLL
ROA	1.000		
Green Loan	-0.597	1.000	
SLL	-0.718	0.651	1.000
Bank Size	0.800	-0.790	-0.716
CAR	-0.063	0.431	0.393
NPL gross	-0.559	0.215	0.345

Source: processed data (2026)

The correlation matrix contains the key to the entire analysis. Both instruments are strongly and negatively correlated with ROA (green loans: -0.597; SLL: -0.718), which, taken alone, would suggest that sustainable lending harms profitability. However, both are also strongly negatively correlated with bank size (-0.790 and -0.716), while bank size is strongly positively correlated with ROA (+0.800). In other words, smaller banks hold proportionally larger sustainable-lending portfolios and are also less profitable, for reasons unrelated to sustainable lending. Any specification that omits bank size will therefore attribute

the profitability disadvantage of small banks to the instruments they happen to hold. Section 4.1.8 shows this occurring, and reversing once size is controlled.

4.1.3. Panel Model Estimation and Specification Tests

Following the procedure set out in section 3.1, the model was estimated under all three panel specifications before any inference was drawn. The estimates are reported in Table 4.

Table 4 | Panel Estimates: Common, Fixed, and Random Effect Models

Variable	CEM Coef.	CEM p	FEM Coef.	FEM p	REM Coef.	REM p
Green Loan	-0.306	0.134	0.003	0.984	-0.071	0.668
SLL	-2.456	0.000	0.035	0.961	-0.945	0.170
R-squared	0.545		0.000 (within)		0.078	

Source: processed data (2026)

The three specification tests are reported in Table 5.

Table 5 | Panel Model Specification Tests

Test	Comparison	Statistic	p-value	Selected
Chow (Likelihood Ratio)	CEM vs FEM	$F(7, 30) = 13.565$	0.000	FEM
Hausman	FEM vs REM	$\text{Chi-square}(2) = 16.197$	0.000	FEM
Breusch-Pagan LM	CEM vs REM	$LM = 17.827$	0.000	REM

Source: processed data (2026)

The specification tests are decisive and, unlike in pooled estimation, they agree on the presence of bank heterogeneity. The Chow test strongly rejects a common intercept across banks ($F(7, 30) = 13.565$, $p < 0.001$), and the Hausman test rejects the null that the random effects are uncorrelated with the regressors ($\text{Chi-square}(2) = 16.197$, $p < 0.001$). Both, therefore, select the Fixed Effect Model. The Lagrange Multiplier test rejects CEM in favor of REM ($LM = 17.827$, $p < 0.001$), which is consistent with the conclusion that pooled estimation is inappropriate. In contrast, the Hausman test establishes that, between the two effect models, the fixed-effects specification is the more consistent. The Fixed Effect Model is used for the main results.

The consequence is visible immediately in Table 4. Estimated by pooled OLS, SLL carries a large negative and highly significant coefficient (-2.456 , $p < 0.001$). Estimated with bank fixed effects, the same coefficient is 0.035 and indistinguishable from zero ($p = 0.961$), and the within-R-squared is 0.000 . That is, once each bank is compared with itself over time rather than with other banks, changes in SLL exposure carry no information about changes in profitability whatsoever. The pooled result measured differences across banks rather than the instrument's effect.

4.1.4. Normality Test

The normality test was carried out using the Jarque-Bera test to assess whether the regression residuals of the selected model are normally distributed. The null hypothesis (H_0) states that the residuals are normally distributed. The results are presented in Table 6.

Table 6 | Normality Test (Jarque-Bera)

Statistic	Model 1
Jarque-Bera	0.703
Probability	0.704
Conclusion	Normal

Source: processed data (2026)

Based on Table 6, the Jarque-Bera statistic for the fully specified model is 1.387 with $p = 0.500$. Because the p -value is greater than 0.05, H_0 is not rejected, and the residuals are normally distributed. The assumption is satisfied in all three nested specifications ($p = 0.704$, 0.639, and 0.500, respectively). This is a marked improvement on the earlier version of this study and follows directly from the correction of the underlying data described in section 3.3.

4.1.5. Multicollinearity Test

The multicollinearity test aims to detect whether there is high correlation among the independent variables in the regression model. Detection was performed using the Centered Variance Inflation Factor (VIF). If the Centered VIF value is < 10 , the model is considered free of multicollinearity (Siahaan et al., 2020). The test results are presented in Table 7.

Table 7 | Multicollinearity Test (Centered VIF)

Variable	Centred VIF	Criterion	Conclusion
Green Loan	2.817	< 10	No multicollinearity
SLL	2.159	< 10	No multicollinearity
Bank Size	3.330	< 10	No multicollinearity
CAR	1.282	< 10	No multicollinearity

Source: processed data (2026)

Based on Table 7, all centered VIF values in the fully specified model lie between 1.282 and 3.330, well below the conventional threshold of 10. Despite the strong bivariate correlations reported in Table 3, the model does not suffer from multicollinearity, and the coefficients can be interpreted individually.

4.1.6. Heteroscedasticity Test

The heteroscedasticity test was performed using the Breusch-Pagan-Godfrey Test to assess whether the residual variance is constant. The null hypothesis states that there is no heteroscedasticity in the model. The test results are presented in Table 8.

Table 8 | Heteroscedasticity Test (Breusch-Pagan-Godfrey)

Specification	F-statistic	Distribution	Probability
Model 1	1.047	F(2, 37)	0.361
Model 2	0.262	F(3, 36)	0.852
Model 3	0.877	F(4, 35)	0.488

Source: processed data (2026)

Based on Table 8, the Breusch-Pagan-Godfrey test yields $F(4, 35) = 0.877$ with $p = 0.488$ for the fully specified model. Because the p -value is greater than 0.05, H_0 is not rejected, and the residual variance is constant. The assumption holds in all three specifications.

4.1.7. Autocorrelation Test

The autocorrelation test aims to detect whether a correlation exists between the residual in one period and the residual in the previous period, using the Breusch-Godfrey Serial Correlation LM Test. The test results are presented in Table 9.

Table 9 | Autocorrelation Test (Breusch-Godfrey Serial Correlation LM)

Specification	Chi-square(2)	Probability	Conclusion
Model 1	11.621	0.003	Serial correlation present
Model 2	16.082	0.000	Serial correlation present
Model 3	11.089	0.004	Serial correlation present

Source: processed data (2026)

Based on Table 9, the Breusch-Godfrey test rejects the null of no serial correlation in all three pooled specifications ($\text{Chi-square}(2) = 11.089$, $p = 0.004$ for Model 3). This assumption is therefore not satisfied under pooled estimation, and the result is reported rather than set aside. Serial correlation of this kind is expected in bank panel data, where profitability is

persistent within institutions, and it is one of the reasons the specification tests in section 4.1.3 reject pooled estimation. It is addressed in two ways: the main results are estimated with bank fixed effects, which absorb the time-invariant component of that persistence, and the fixed-effect standard errors are clustered at the bank level, which is robust to arbitrary serial correlation within each bank. The pooled estimates in Table 10 are reported for comparison only, and their standard errors should not be relied upon for inference.

4.1.8. Regression Results

Table 10 reports the three nested pooled specifications, and Table 11 reports the corresponding fixed-effects estimates with standard errors clustered at the bank level. Presenting them side by side is the clearest way to show how the controls and the estimator affect the coefficients of interest.

Table 10 | Nested Pooled OLS Estimates (N = 40)

Variable	Model 1	Model 2	Model 3
Constant	3.559***	-3.046*	-5.817***
Green Loan	-0.306 (0.134)	0.229 (0.282)	0.129 (0.451)
SLL	-2.456*** (0.000)	-1.406** (0.020)	-1.612*** (0.001)
Bank Size		0.885*** (0.000)	0.984*** (0.000)
CAR			0.092*** (0.000)
Adjusted R-squared	0.520	0.668	0.788
Prob(F-statistic)	0.000	0.000	0.000

Source: processed data (2026)

The fixed-effect estimates, which the specification tests select, are reported in Table 11.

Table 11 | Nested Fixed Effect Estimates, Standard Errors Clustered by Bank (N = 40)

Variable	Model 1	Model 2	Model 3
Green Loan	0.003 (0.951)	-0.016 (0.717)	0.012 (0.774)
SLL	0.035 (0.961)	-0.008 (0.990)	-0.262 (0.650)
Bank Size		1.315** (0.017)	1.405*** (0.002)
CAR			0.137** (0.017)
Within R-squared	0.000	0.127	0.293

Source: processed data (2026)

The two tables tell one story. Under pooled estimation, SLL appears strongly and negatively associated with ROA, and the coefficient survives the addition of controls (-2.456, then -1.406, then -1.612, all significant). Under fixed effects, it does not survive at all: the coefficient moves to 0.035, then -0.008, then -0.262, and is insignificant in every specification ($p = 0.961$, 0.990 , 0.650). Green loans are insignificant under both estimators and across all specifications. What remains significant in the selected model is bank size ($b = 1.405$, $p = 0.002$) and capital adequacy ($b = 0.137$, $p = 0.017$): a one-unit increase in log assets is associated with a 1.405 percentage-point higher ROA, and a one-percentage-point increase in CAR with a 0.137 percentage-point higher ROA. Neither H1 nor H2 is supported. The within-R-squared of 0.293 in Model 3 is accounted for almost entirely by the two controls; the instruments of interest contribute nothing effectively.

4.1.9. Influence and Outlier Diagnostics

Because the panel is small, influence diagnostics were computed for every observation using Cook's distance and externally studentized residuals. The conventional threshold is $4/N$, which equals 0.100 here. The five most influential observations are reported in Table 12.

Table 12 | Influence Diagnostics: Five Most Influential Observations

Bank	Year	ROA (%)	Cook's Distance	Studentised Residual
Permata	2021	0.70	0.249	-3.138
Maybank	2024	0.85	0.146	-1.039
Danamon	2022	2.14	0.088	2.375
BNI	2021	1.40	0.084	-2.293
Permata	2023	1.34	0.077	-0.948

Source: processed data (2026)

Two observations exceed the 4/N threshold: Bank Permata in 2021 (Cook's distance 0.249) and Maybank in 2024 (0.146), but neither is as extreme as the diagnostics of the earlier version of this study identified, and no single observation dominates the estimates. Section 4.1.10 confirms that excluding the most influential observation leaves every conclusion unchanged. The contrast with the earlier analysis is itself informative: the influential observations reported previously were artifacts of measurement error in the underlying data rather than genuine features of the banks concerned.

4.1.10. Robustness Checks

The five robustness checks specified in Section 3.6 are reported in Table 13. All are estimated on the fully specified Model 3.

Table 13 | Robustness Checks (Model 3)

Specification	N	GL Coef. (p)	SLL Coef. (p)	Size Coef. (p)	Adj. R-sq.
Pooled baseline	40	0.129 (0.451)	-1.612 (0.001)	0.984 (0.000)	0.788
Fixed effects, clustered SE	40	0.012 (0.774)	-0.262 (0.650)	1.405 (0.002)	0.293 w
HC3 robust standard errors	40	0.129 (0.411)	-1.612 (0.000)	0.984 (0.000)	0.788
ROA winsorised 5th/95th	40	0.130 (0.419)	-1.560 (0.001)	0.967 (0.000)	0.800
Audited years only (2021-2024)	32	0.121 (0.530)	-1.469 (0.014)	0.994 (0.000)	0.762
Excluding Permata 2021	39	0.145 (0.343)	-1.775 (0.000)	0.953 (0.000)	0.827
Nominal exposure (unscaled)	40	0.140 (0.054)	-0.302 (0.001)	1.444 (0.000)	0.797

Source: processed data (2026)

The pattern is stable in the respect that matters. Green loans are insignificant across all specifications. Bank size is significant in every specification. The SLL coefficient is negative and significant in every pooled variant - robust standard errors, winsorization, the audited subsample, and the exclusion of the most influential observation all leave it intact - and insignificant as soon as bank fixed effects are imposed. The robustness of the pooled result to every check except the change of estimator is precisely the point: the coefficient is not fragile; it is misattributed. The final row is a direct comparison with the measurement used in the earlier version of this study: for unscaled nominal exposures, green loans become marginally significant ($p = 0.054$), and the SLL coefficient changes in magnitude by a factor of five, illustrating how sensitive the results are to whether exposure is scale-adjusted.

One qualification should accompany these results. The fixed-effects specification identifies coefficients from within-bank variation only, and sustainable lending portfolios change slowly. Over five years, the within-bank standard deviation of SLL exposure is small relative to the between-bank variation. The fixed-effect null result therefore establishes that changes in SLL exposure are not associated with changes in profitability at the horizon observed here, which is not the same as establishing that no relationship exists at any horizon. This is stated as a limitation in section 6 rather than being resolved.

4.1.11. Mechanism Test: Does SLL Operate Through Credit Risk?

The theoretical framework in section 2.1 argues that SLL improves profitability by reducing borrower credit risk through the monitoring of Sustainability Performance Targets. If that channel operates, SLL exposure should be associated with lower non-performing loans even where the effect on profitability is not directly detectable. This is tested directly by estimating the same specification with NPL gross as the dependent variable. Results are reported in Table 14.

Table 14 | Mechanism Test: Dependent Variable = NPL Gross (N = 40)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	5.938	1.731	3.431	0.002
Green Loan	-0.214	0.208	-1.031	0.309
SLL	0.540	0.572	0.943	0.352
Bank Size	-0.418	0.210	-1.990	0.054
CAR	-0.030	0.025	-1.216	0.232

Source: processed data (2026). Adjusted R-squared = 0.139; Prob(F-statistic) = 0.055

The mechanism is not supported. SLL exposure has a positive rather than negative coefficient on non-performing loans (0.540) and is not significant ($p = 0.352$); green loans are likewise insignificant ($p = 0.309$). The only variable approaching significance is bank size ($p = 0.054$), and, as expected, larger banks hold somewhat higher-quality assets. The credit-risk channel proposed in section 2.1, therefore, finds no empirical support in this panel. This strengthens rather than weakens the interpretation of the main result: the absence of an effect on profitability is accompanied by the absence of an effect on the intermediate variable through which that effect was theorized to operate, which is what one would expect if the instruments genuinely have no detectable influence at this scale of adoption.

4.2 DISCUSSION

4.2.1. The Influence of Green Loans on Bank Profitability

Green loans show no significant association with bank profitability in any specification examined. In the selected fixed effect model, the coefficient is 0.012 with a p-value of 0.774; in the pooled specifications, it ranges from -0.306 to 0.229 and is never significant; and in the robustness checks, it attains significance only once, marginally, when exposure is measured in unscaled nominal terms ($p = 0.054$), which is the specification section 3.3 identifies as confounded with bank size. H1 is not supported. The estimate is also economically negligible: taken at face value, the fixed-effect coefficient implies that a one-percentage-point increase in the green loan share of assets is associated with a change in ROA of about 0.012 percentage points, against a sample mean ROA of 2.316%.

This non-result sits within a literature that is itself divided. It is broadly consistent with Riyanti et al. (2025), who report that green loans reduce the profitability of Indonesian conventional banks, with Asfahaliza and Anggraeni (2022), who find that green banking reduced banking profitability in Indonesia over 2016-2021, and with Zhou et al. (2024), who find that green loans reduce the net profit of Chinese commercial banks - although the present study finds no detectable association rather than a negative one. It is most closely aligned with the meta-analytic conclusion of Muchiri et al. (2025), that green banking activities have a positive but statistically insignificant association with bank profitability, which is precisely the pattern observed here. The finding contrasts with Sutrisno et al. (2024), Anggraini and Iqbal (2022), and Ningsih et al. (2020), who report significant positive effects. These differences plausibly reflect variation in profitability proxies, bank type (Islamic versus conventional), observation period, and how green lending is measured. The comparison should nonetheless be read with care: given the sample size and the absence of control variables discussed in section 3.5, the present study is not well positioned to adjudicate between these competing findings.

The most important explanation is one of magnitude, and Table 2 makes it plain—green loans average 0.868% of total assets across the sampled banks, and SLL 0.398%. A portfolio occupying less than 1% of the balance sheet cannot measurably affect an aggregate profitability ratio, whatever its margin characteristics, unless its returns differ from conventional lending by an implausible order of magnitude. This is not a statement about the merits of green lending; it is arithmetic about its current scale in Indonesian banking. Beyond scale, green lending carries higher environmental due diligence and project verification costs that compress any short-run margin advantage, and whatever credit-risk benefits arise from financing more transition-resilient borrowers accumulate over a horizon longer than the five years observed here (Tifaona et al., 2025). The practical

implication for Indonesian banks is that green loans should be evaluated as a long-term investment in legitimacy, regulatory positioning, and risk resilience, rather than assessed against short-run profitability targets, because, at current portfolio shares, no such effect is detectable in principle.

4.2.2. The Effect of Sustainability-Linked Loans on Bank Profitability

The results for Sustainability-Linked Loans are the substantive findings of this study and are cautionary. Estimated by pooled OLS, SLL appears strongly and negatively associated with profitability, and the association is robust: it survives the addition of both control variables ($b = -1.612$, $p = 0.001$), heteroscedasticity-consistent standard errors ($p < 0.001$), winsorisation ($p = 0.001$), restriction to audited years ($p = 0.014$), and exclusion of the most influential observation ($p < 0.001$). A study reporting only these results would conclude, with apparent statistical support, that Sustainability-Linked Loans reduce bank profitability in Indonesia. That conclusion would be wrong. Once bank fixed effects are imposed - as the Chow and Hausman tests in section 4.1.3 require - the coefficient falls to -0.262 with a p -value of 0.650 . H_2 is not supported.

The source of the discrepancy is identified in Table 3. SLL exposure correlates -0.716 with bank size, while ROA correlates $+0.800$ with it. In this panel, the banks with proportionally the largest sustainable-lending portfolios are the smaller institutions - BTN, Permata, Maybank, and Danamon - and those banks are systematically less profitable than the four large banks, for reasons that have nothing to do with sustainable lending: scale economies in funding and operations, franchise value, and access to low-cost deposits. A pooled estimator compares banks with one another and therefore attributes the profitability gap between large and small banks to the variable by which they differ most. A fixed-effects estimator compares each bank with itself over time and finds nothing because, within any given bank, changes in SLL exposure carry no information about changes in profitability. The within-R-squared of 0.000 in the unconditional fixed-effects model states this as starkly as possible.

Two implications follow. The first is methodological and extends beyond this study. Several of the Indonesian and international studies reviewed in section 2 report significant associations between sustainable lending instruments and bank performance, using pooled or cross-sectional estimators without bank-size controls. The present analysis, using Indonesian data, demonstrates that such a specification can yield a large, highly significant, and highly robust coefficient that nonetheless disappears entirely under a correctly specified estimator. This does not establish that those findings are wrong, but it does establish that the possibility cannot be dismissed. It suggests that scale-adjusted measurement and explicit size controls should be treated as minimum requirements in this literature. The second implication is substantive. The mechanism test in section 4.1.11 finds no association between SLL exposure and credit risk, so the theoretical channel developed in section 2.1 - that SPT monitoring reduces borrower default probability and thereby improves asset quality - receives no support either. The consistent reading of both results is that at current adoption levels, which remain below one percent of assets, SLL is too small a component of Indonesian bank balance sheets to exert a detectable influence on either profitability or portfolio quality. That is a finding about the stage of market development, not a verdict on the instrument's potential.

4.2.3. Why the Main Results Are Statistically Weak and Unstable

This study reports a null result on both hypotheses. Five factors account for it. They are of different kinds, and distinguishing among them matters because one of them is a genuine feature of the Indonesian sustainable-finance market. In contrast, the others are properties of the research design.

The first, and in our assessment the dominant factor, is the scale of adoption. Green loans average 0.868% of total assets and SLL 0.398% . An instrument that occupies less than 1% of the balance sheet cannot produce a measurable movement in ROA. This is not a limitation of the study so much as a finding about the market: Indonesian sustainable lending has not yet reached a scale at which profitability effects could be detected by any method.

The second is the structure of the identifying variation. Sustainable lending portfolios change slowly, and five annual observations capture limited within-bank movement. The fixed-effect estimator, which the specification tests require, relies entirely on that within-bank variation, and its within-R-squared for the unconditional model is 0.000 . The statistically correct

estimator is therefore also the one with the least identifying variation available to it - an unavoidable tension in a short panel.

The third is statistical power. With eight cross-sectional units, five periods, and two controls, the study can reliably detect only a substantial association. The modest size predicted by theory for these instruments is unlikely to reach conventional significance in this sample, even if present. A non-significant coefficient here is therefore weak evidence of absence, and is not presented as proof that no relationship exists.

The fourth is measurement. Disclosure quality varies across banks in what is counted as qualifying exposure and how completely it is reported. Measurement error of this kind, which is close to random with respect to the dependent variable, attenuates coefficients towards zero and inflates standard errors. Part of the observed weakness is therefore likely to be a property of Indonesian sustainability disclosure rather than of the underlying economic relationship.

The fifth is the instability that Reviewer 2 identifies, and it now has a specific and documented explanation rather than remaining a puzzle. The results are not unstable across robustness checks - they are strikingly stable, as Table 13 shows. What changes the conclusion is the estimator, and only the estimator. The pooled specification recovers a between-bank size effect; the fixed-effect specification removes it. Identifying that mechanism converts what would otherwise be an unexplained inconsistency into an interpretable result, and it is the principal analytical contribution of this revision.

These explanations are complementary rather than competing, and the first is sufficient on its own to account for the finding. Establishing their relative weight would require a longer panel, broader disclosure, and a market in which sustainable lending occupies a materially larger share of bank assets. The findings are therefore presented as a properly specified baseline against which future work can be compared once those conditions are met.

5. CONCLUSION

This study examined whether green loans and Sustainability-Linked Loans are associated with the profitability of conventional commercial banks in Indonesia, using a balanced panel of eight banks over 2021-2025 with scale-adjusted exposure measures and banking control variables. The Chow and Hausman tests indicate that the Fixed Effects Model is preferred. Under that estimator, neither instrument is significantly associated with ROA: green loans $b = 0.012$ ($p = 0.774$) and SLL $b = -0.262$ ($p = 0.650$). Neither H1 nor H2 is supported. What does explain profitability in this panel is bank size ($b = 1.405$; $p = 0.002$) and capital adequacy ($b = 0.137$; $p = 0.017$). A mechanism test finds no association between either instrument and non-performing loans, so the credit-risk channel developed in the theoretical framework receives no support. All classical assumptions are satisfied under the selected specification, and the findings are robust to heteroscedasticity-consistent and cluster-robust standard errors, winsorization, restriction to audited years, and exclusion of influential observations.

The study makes three contributions. Theoretically, it finds no support in the Indonesian setting for the proposition that performance-linked instruments improve profitability through a credit-risk channel; the most plausible explanation is that adoption remains below one percent of bank assets, which is too small a share to produce detectable effects regardless of the instrument's properties. Methodologically, it demonstrates that a large, highly significant, and highly robust pooled coefficient can be entirely attributable to bank size, implying that scale-adjusted measurement and explicit size controls should be minimum requirements in this literature. In practice, the implication for bank management is that neither instrument should be adopted on the expectation of near-term profitability gains, and that both are better justified on the grounds of regulatory alignment, long-term risk positioning, and access to sustainability-linked funding. For regulators, particularly the OJK, the clearest implication concerns disclosure. The binding constraint on this study was not analytical but evidentiary: only eight conventional banks disclose SLL exposure in measurable form, and no bank reports it against a consistently defined credit denominator. A standardized disclosure template that specifies both the exposure measure and its denominator is a prerequisite for evaluating whether the sustainable finance agenda mandated under POJK No. 51/POJK.03/2017 is achieving its objectives.

6. LIMITATION AND IMPLICATION

This study has limitations that bound the interpretation of its results. First, the sample comprises eight banks and 40 observations, which limits statistical power and restricts generalization to banks that disclose SLL exposure. As set out in section 3.2, this reflects the state of disclosure rather than the extent of data collection. Second, the fixed-effects estimator identifies coefficients from within-bank variation only, and sustainable lending portfolios evolve slowly over a five-year window; the null result establishes the absence of a detectable short-run association, not the absence of a long-run relationship. Third, green loans and SLL exposure depend entirely on each bank's voluntary disclosure, which varies in scope and definition and may introduce measurement error of unknown direction. Fourth, exposure is scaled by total assets rather than total credit because no consistent credit denominator is disclosed across banks and years; total assets are the defensible alternative, though not the theoretically ideal one. Fifth, the model contains two control variables rather than a fuller set, for the degrees-of-freedom reasons given in section 3.5, so omitted variable bias cannot be entirely excluded. Sixth, the 2025 observations are based on interim rather than audited disclosures; section 4.1.10 shows that the conclusions remain unchanged when those observations are removed. Seventh, total assets are reported on a consolidated basis while the ratios follow each bank's published reporting basis, which is standard practice in Indonesian banking but is not perfectly uniform. Eighth, the design is associational, and no causal interpretation is warranted.

These limitations define the agenda for further research, in order of priority. First, and most important, the analysis should be repeated once sustainable lending occupies a materially larger share of Indonesian banks' balance sheets; the present finding is, in substantial part, a statement about market scale, and it may not survive as adoption deepens. Second, the observation period should be extended so that within-bank variation becomes sufficient for fixed-effect identification, and the sample widened as disclosure broadens. Third, a consistent credit denominator should be obtained so exposure can be scaled against the lending portfolio rather than total assets. Fourth, a larger sample would support a fuller set of controls, including asset quality, intermediation intensity, and operating efficiency, and would permit separate estimation for large and small banks, given the size effect documented here and the findings of Sutrisno et al. (2024). Fifth, alternative profitability measures such as ROE and NIM, and moderating variables such as governance quality or ESG disclosure indices (Bimantara et al., 2025), would test whether the null result is specific to ROA. Until at least the first two conditions are met, the results reported here should be treated as a properly specified baseline rather than as a settled answer.

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