

Research Article

Do Sustainability Finance Regulations Improve Bank Profitability? Evidence From Indonesian KBMI 2 Banks

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Abstract

Previous studies have mainly examined the link between voluntary sustainability reporting and corporate financial performance, offering limited evidence on mandatory sustainable finance regulations, especially among Indonesian KBMI 2 Banks. This study addresses this gap by assessing the effect of Financial Services Authority Regulation (POJK) No. 51/POJK.03/2017 on KBMI 2 Banks' financial performance using panel data. It applies a quantitative explanatory design to data from eight KBMI 2 Banks during 2016–2025. Return on Assets (ROA) measures profitability, while a policy dummy captures implementation of POJK No. 51/POJK.03/2017. Capital Adequacy Ratio (CAR), Non-Performing Loans (NPL), and the Operating Expenses-to-Operating Income Ratio (BOPO) are control variables. Panel regression results show that, before the regulation, CAR positively affected ROA and BOPO had a significant negative effect. After implementation, only BOPO remained significant; CAR, NPL, and the policy dummy were insignificant. Thus, the regulation has not directly improved short-term profitability. This study provides an early policy evaluation focused on KBMI 2 Banks, confirms operational efficiency as the main profitability driver, and offers insights for banks and regulators developing more effective sustainable-finance implementation strategies. It also underscores the need for longer implementation periods and supportive supervisory measures across Indonesia.

Keywords: POJK No. 51/POJK.03/2017, Sustainable Finance, KBMI 2 Banks, Return on Assets, Profitability

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1. Introduction

The implementation of sustainable finance has become a strategic agenda for the financial services industry worldwide, supporting sustainable development while strengthening resilience against Environmental, Social, and Governance (ESG) risks. In Indonesia, this commitment is embodied in Financial Services Authority Regulation (POJK) No. 51/POJK.03/2017 concerning the Implementation of Sustainable Finance for Financial Service Institutions, Issuers, and Public Companies.

The regulation requires financial institutions to prepare Sustainable Finance Action Plans and Sustainability Reports according to the implementation stages established by the Financial Services Authority (OJK). It represents a paradigm shift from voluntary sustainability disclosure toward mandatory disclosure, requiring sustainability principles to be integrated into business strategy, governance, and risk management.

For the banking industry, particularly KBMI 2 Banks, implementing POJK No. 51/POJK.03/2017 involves substantial organizational and financial adjustments. Compliance requires investment in reporting systems, governance enhancement, environmental and social risk management, and sustainable financing initiatives. These efforts are expected to strengthen corporate reputation, improve stakeholder confidence, reduce long-term risk, and create sustainable economic value (Ruiz & García, 2021; Neitzert & Petras, 2022). Consequently, OJK considers sustainable finance a key policy instrument to support Indonesia's transition to a low-carbon economy and achieve the Sustainable Development Goals (SDGs).

Despite these expected benefits, empirical evidence on the relationship between sustainable finance regulation and bank profitability remains inconclusive. While sustainability initiatives may improve governance, reputation, and stakeholder trust, they also impose substantial implementation costs, including investments in reporting systems, human capital, compliance, and information technology. As a result, financial benefits may emerge only after a considerable time lag. Moreover, previous studies have produced inconsistent findings, with some reporting positive effects on profitability (Buallay, 2019), others finding insignificant relationships, and some suggesting mixed or context-dependent outcomes depending on institutional settings, regulatory environments, and firm characteristics. These inconsistencies indicate that the effectiveness of mandatory sustainable finance regulation remains an unresolved empirical issue.

Existing studies have predominantly examined sustainability reporting as a voluntary disclosure practice rather than evaluating mandatory sustainable finance regulation as a public policy intervention. Most studies focus on the association between Sustainability Report disclosure and financial performance indicators such as Return on Assets (ROA), Return on Equity (ROE), or firm value. Consequently, current knowledge largely explains whether better sustainability disclosure is associated with superior financial performance but provides limited evidence on whether mandatory sustainability regulation itself improves bank profitability.

Another important limitation concerns the research context. Previous studies generally use heterogeneous samples of listed companies or banks with different sizes and business models. Such aggregation may conceal important differences across banking groups. KBMI 2 Banks represent a distinct segment of the Indonesian banking industry because they possess more limited capital capacity, fewer technological and financial resources, and lower organizational complexity than KBMI 3 and KBMI 4 Banks. These characteristics make compliance with mandatory sustainability reporting relatively more challenging and potentially produce different financial consequences. Therefore, KBMI 2 Banks warrant separate investigation rather than being combined with larger banks.

Based on these issues, this study identifies three research gaps. First, empirical evidence regarding the effectiveness of mandatory sustainable finance regulation remains limited because previous studies primarily examine voluntary sustainability disclosure rather than regulatory intervention. Second, little empirical evidence specifically addresses KBMI 2 Banks, despite their distinctive characteristics and strategic importance within Indonesia's banking system. Third, most previous studies rely on cross-sectional designs or conventional regression models that are less capable of capturing changes in financial performance before and after policy implementation.

This study contributes to both Indonesian and international sustainable finance literature in three ways. First, it shifts the analytical focus from voluntary sustainability disclosure to evaluating mandatory sustainable finance regulation as a public policy instrument. Second, it provides one of

the first empirical investigations specifically focusing on KBMI 2 Banks, thereby extending the limited evidence on medium-sized banks operating under mandatory sustainability regulation. Third, by employing panel data regression, the study controls for bank-specific heterogeneity and intertemporal variation, providing more robust evidence on regulatory effectiveness than conventional cross-sectional analyses. Accordingly, the findings complement previous international studies by demonstrating how mandatory sustainability regulation affects bank profitability in an emerging economy.

Based on the observed phenomenon, identified research gaps, and proposed contributions, this study examines the effect of implementing POJK No. 51/POJK.03/2017, particularly the mandatory Sustainability Reporting requirement, on the financial performance of Indonesian KBMI 2 Banks using panel data regression analysis. The findings are expected to provide empirical evidence regarding the effectiveness of sustainable finance regulation while offering practical insights for regulators and bank management in designing more effective sustainable finance implementation strategies and contributing to the growing international literature on sustainability regulation and banking performance.

2. Literature Review and Hypothesis

Stakeholder Theory

Stakeholder Theory argues that corporate sustainability practices respond to the expectations of regulators, investors, customers, employees, and society. In banking, sustainability reporting has evolved into a strategic governance tool that enhances transparency, accountability, and stakeholder engagement (Sebastiao et al., 2024). Indonesian evidence also shows that regulatory pressure, customer expectations, and government oversight improve disclosure quality (Renata et al., 2024). However, financial benefits may not be immediate due to substantial implementation costs. Thus, mandatory sustainability reporting may improve profitability indirectly through greater stakeholder trust, reduced information asymmetry, and better access to financial resources (Santosa et al., 2020).

Legitimacy Theory

Legitimacy Theory suggests that organizations seek social acceptance by aligning their activities with societal values and institutional expectations. Sustainability reporting serves as a strategic tool to communicate environmental and social responsibility and strengthen organizational legitimacy (Garcia-Sanchez & Araujo-Bernardo, 2020). Evidence shows that sustainability disclosure and ESG performance can enhance market recognition and corporate reputation (Eng et al., 2022; Ruiz & García, 2021). However, these benefits may not immediately increase profitability, as reputational gains typically emerge gradually through greater stakeholder confidence, lower financing costs, and stronger customer loyalty.

Sustainable Finance Regulation and Sustainability Reporting

In recent years, global ESG disclosure has shifted from voluntary to mandatory. Sebastiao et al. (2024) identify sustainable finance regulation, ESG integration, and green banking as key drivers of this development. Mandatory disclosure has transformed sustainability reporting into a regulatory mechanism integrated with governance and risk management, potentially improving transparency, market discipline, and financial resilience. However, its effectiveness remains uncertain because compliance costs, organizational adjustments, and technological investments may offset short-term financial benefits (Santosa, 2020).

Bank Profitability

Profitability is a key indicator of banking performance, reflecting management's ability to use assets efficiently while maintaining financial stability. Return on Assets (ROA) is widely used to measure bank performance because banking operations primarily depend on asset utilization (Anis et al., 2023; Jacoub et al., 2020). Sustainability practices may enhance profitability through greater efficiency, stronger governance, lower risk, and increased stakeholder confidence. However, empirical evidence remains mixed, as implementation costs may offset short-term financial benefits.

Sustainability Reporting and Bank Profitability

The relationship between sustainability reporting and financial performance remains one of the most debated issues in sustainable finance literature. Several international studies report a positive relationship between sustainability disclosure and profitability because transparent disclosure enhances corporate reputation, stakeholder trust, and access to capital (Buallay, 2019). Meta-analytic evidence also suggests that sustainability disclosure generally contributes positively to firm performance, although the magnitude of the relationship depends on institutional context and measurement approaches (Gupta & Das, 2022; Jacoub et al., 2020a). Conversely, evidence from emerging markets remains mixed. Reports no significant relationship between sustainability reporting and accounting-based financial performance, show that mandatory sustainability reporting primarily improves market-based performance rather than accounting profitability. Indonesian evidence likewise remains inconclusive, with some studies reporting insignificant or even negative short-term effects of ESG disclosure on profitability because investors continue to perceive sustainability initiatives as compliance costs rather than immediate value-creating investments. These inconsistent findings indicate that the effectiveness of mandatory sustainability regulation remains highly context-dependent, thereby justifying further investigation.

KBMI 2 Banks and Sustainable Finance

Although sustainable finance has become an important research topic, empirical evidence focusing specifically on medium-sized banks remains limited. Hummel et al. (2021) argue that sustainability implementation requires substantial organizational capabilities, including governance integration, internal control systems, and enterprise risk management. Consequently, banks with relatively limited financial and organizational resources face greater implementation challenges than larger institutions. This argument is particularly relevant for Indonesian KBMI 2 Banks, whose capital capacity and technological resources are considerably lower than those of KBMI 3 and KBMI 4 Banks. Therefore, the financial consequences of mandatory sustainability regulation are expected to differ across bank categories. Existing literature has rarely examined these differences, highlighting an important research gap that the present study addresses.

Capital Adequacy Ratio (CAR) and Profitability

Capital Adequacy Ratio (CAR) reflects a bank's ability to absorb unexpected losses while supporting lending activities and maintaining public confidence. However, previous studies report inconsistent findings regarding its relationship with profitability. Some studies conclude that adequate capital enhances profitability by strengthening financial stability, improving lending capacity, and reducing insolvency risk (Alkhazali et al., 2024; Khairunnisa et al., 2024). Conversely, other studies report insignificant or negative relationships because excessive capital may indicate inefficient resource allocation and lower asset productivity (Meidi & Tannia, 2025; Ananda et al., 2025). These conflicting findings suggest that the profitability effect of CAR depends on banks' ability to convert capital strength into productive assets. In the context of mandatory sustainable finance regulation, capital adequacy may become even more important because sustainability initiatives require additional investment in governance, information systems, and risk management. Accordingly, examining CAR together with the implementation of POJK No. 51/POJK.03/2017 provides a more comprehensive understanding of bank profitability.

Hypothesis Development

The Effect of Capital Adequacy Ratio (CAR) on Return on Assets (ROA)

Stakeholder Theory suggests that banks are expected to maintain adequate capital not only to satisfy regulatory requirements but also to protect the interests of depositors, investors, and other stakeholders. Similarly, Legitimacy Theory argues that maintaining strong capital adequacy enhances public confidence because it signals financial resilience and prudent governance. The implementation of POJK No. 51/POJK.03/2017 reinforces these expectations by requiring banks to integrate sustainability considerations into governance, strategic planning, and risk management. Consequently, banks with stronger capital positions are expected to possess greater financial capacity to invest in sustainability initiatives without jeopardizing profitability.

Empirical evidence, however, remains inconclusive. Several studies report that higher CAR improves profitability by strengthening lending capacity, reducing insolvency risk, and enhancing stakeholder confidence (Alkhazali et al., 2024; Khairunnisa et al., 2024). Conversely, other studies find insignificant or even negative relationships because excess capital may reduce asset-utilization efficiency when it is not translated into productive lending (Meidi & Tannia, 2025; Ananda et al., 2025). Under mandatory sustainable finance regulation, capital adequacy is expected to facilitate sustainability investment while maintaining financial stability. Therefore, this study proposes the following hypothesis:

H1: Capital Adequacy Ratio (CAR) positively affects the Return on Assets (ROA) of KBMI 2 Banks.

The Effect of Non-Performing Loans (NPL) on Return on Assets (ROA)

According to Stakeholder Theory, banks are expected to protect stakeholders' interests by maintaining prudent lending practices and preserving asset quality. Legitimacy Theory further suggests that effective credit risk management enhances organizational legitimacy because it demonstrates responsible governance and sustainable banking practices. POJK No. 51/POJK.03/2017 encourages banks to incorporate ESG considerations into lending decisions, which may improve borrower screening, portfolio quality, and long-term credit performance.

Nevertheless, empirical evidence regarding the profitability implications of NPL remains mixed. While deteriorating asset quality generally reduces profitability through higher loan-loss provisions, several studies suggest the effect weakens when banks maintain adequate capital buffers and effective provisioning policies. Recent evidence also indicates that credit quality influences the effectiveness of sustainability implementation because ESG-oriented lending practices strengthen long-term risk management rather than immediate accounting performance. Consequently, lower NPL is expected to contribute to higher profitability under sustainable finance implementation.

H2: Non-Performing Loans (NPL) negatively affect the Return on Assets (ROA) of KBMI 2 Banks.

The Effect of the Operating Expenses to Operating Income Ratio (BOPO) on Return on Assets (ROA)

Stakeholder Theory argues that efficient resource utilization enables banks to create greater value for stakeholders through improved financial performance. Legitimacy Theory likewise suggests that organizations implementing sustainability principles efficiently strengthen their legitimacy because stakeholders perceive sustainability initiatives as value-creating rather than merely compliance activities. Under POJK No. 51/POJK.03/2017, sustainability implementation is expected to improve operational processes through governance enhancement, digital transformation, stronger internal controls, and ESG integration into enterprise risk management.

Previous studies consistently identify operational efficiency as one of the strongest determinants of bank profitability. Buallay (2019) argues that sustainability initiatives create long-term value only when organizations manage implementation costs successfully. Similarly, Anis et al. (2023) demonstrate that sustainability governance improves profitability through enhanced operational efficiency, while studies on green banking indicate that lower BOPO significantly improves ROA. Therefore, operational efficiency is expected to remain the primary mechanism through which sustainable finance contributes to bank profitability.

H3: The Operating Expenses to Operating Income Ratio (BOPO) negatively affects the Return on Assets (ROA) of KBMI 2 Banks.

The Effect of the Implementation of POJK No. 51/POJK.03/2017 on Return on Assets (ROA)

Stakeholder Theory argues that mandatory sustainability reporting reduces information asymmetry, strengthens stakeholder confidence, and improves access to financial resources, thereby supporting long-term profitability. Legitimacy Theory further suggests that compliance with sustainability regulation enhances organizational legitimacy because banks demonstrate conformity with societal expectations and regulatory requirements. Consequently, mandatory

sustainable finance regulation is expected to improve financial performance through stronger governance, enhanced reputation, better risk management, and increased stakeholder trust.

However, empirical evidence remains inconsistent. International studies report that ESG implementation improves profitability by strengthening governance and stakeholder relationships (Buallay, 2019) whereas evidence from emerging markets indicates that mandatory sustainability reporting often produces insignificant short-term effects because implementation costs, organizational adjustments, and learning processes initially outweigh financial benefits. These conflicting findings suggest that the effectiveness of sustainable finance regulation depends on institutional context, implementation quality, and organizational capability. Since KBMI 2 Banks possess more limited financial and technological resources than larger banks, evaluating the impact of POJK No. 51/POJK.03/2017 within this banking segment is expected to provide important empirical evidence regarding the effectiveness of mandatory sustainability regulation.

H4: The implementation of POJK No. 51/POJK.03/2017 positively affects the Return on Assets (ROA) of KBMI 2 Banks.

3. Data and Methodology

Research Design

This study uses a quantitative approach and an explanatory research design to examine the effect of implementing Financial Services Authority Regulation (POJK) No. 51/POJK.03/2017 concerning the Implementation of Sustainable Finance for Financial Service Institutions, Issuers, and Public Companies on the financial performance of KBMI 2 Banks in Indonesia. An explanatory approach was selected because the study seeks to investigate the causal relationship between the implementation of the regulation as the independent variable and financial performance as the dependent variable while controlling for bank-specific internal factors.

The unit of analysis consists of banks classified as KBMI 2 Banks. The study employs secondary panel data, combining cross-sectional and time-series observations. Panel data analysis enables the study to examine changes in individual banks' financial performance over time while controlling for unobserved bank-specific heterogeneity. Consequently, panel data analysis is expected to provide more reliable estimates of the effect of implementing POJK No. 51/POJK.03/2017 on bank financial performance than analyses based solely on either cross-sectional or time-series data.

The observation period covers 2016–2025. This period captures both the pre-implementation and post-implementation phases of POJK No. 51/POJK.03/2017. For KBMI 2 Banks, compliance with the regulation became mandatory in 2020; therefore, the selected period includes four years before implementation and five years after, allowing an assessment of changes in financial performance following implementation.

The dependent variable is financial performance, proxied by Return on Assets (ROA). ROA was selected because it reflects a bank's ability to generate profits from its total assets. The primary independent variable is the implementation of POJK No. 51/POJK.03/2017, while the control variables include the Operating Expenses to Operating Income Ratio (BOPO), Capital Adequacy Ratio (CAR), and Non-Performing Loans (NPL). These control variables were selected because previous studies consistently identify them as key determinants of bank profitability.

Population and Sample

The population comprises banks that are classified as KBMI 2 under the OJK bank classification framework. KBMI 2 banks are selected as the research setting because they represent a relatively homogeneous group in terms of capitalization and business scale, while simultaneously occupying an important position between smaller and larger banking institutions.

Selecting KBMI 2 banks provides several methodological advantages. First, restricting the sample to a relatively homogeneous group of banks reduces heterogeneity associated with substantially different capital structures, business scales, risk-taking capacities, and regulatory characteristics. Second, it allows the study to examine whether sustainable finance regulation affects medium-sized

banks without results being dominated by very large banking institutions. Third, the focus on KBMI 2 provides a more specific empirical context that remains relatively underexplored in studies of sustainable finance regulation and banking performance.

Sampling Technique

The study employs purposive sampling rather than probability sampling because the objective is to construct a longitudinal sample that meets specific institutional, regulatory, and data requirements, rather than to obtain a statistically representative sample of all Indonesian banks.

Purposive sampling is appropriate for four reasons. First, banks must be consistently identifiable within the relevant KBMI 2 population, with historical classifications traceable to the regulatory implementation period. Second, the analysis requires continuous annual financial data for both pre- and post-implementation periods, as substantial missing observations could reduce the reliability of panel estimation. Third, publicly available information must be sufficient to measure the regulatory implementation variable and control variables consistently across banks and years. Fourth, the sample must meet the research design requirements, including the availability of annual reports, financial statements, sustainability disclosures, and historical banking classifications.

Accordingly, banks are included if they meet the following criteria:

1. It can be consistently classified within the KBMI 2 population or its historical classification can be reliably mapped to the KBMI framework.
2. Its financial statements provide sufficient data to calculate ROA, BOPO, CAR, and NPL.
3. Its annual reports and relevant disclosures are available throughout the observation period.
4. Its regulatory implementation status and implementation year can be reliably identified.
5. It has sufficient consecutive observations to contribute meaningfully to the panel analysis.

Based on these criteria, eight of the initial ten KBMI 2 banks are retained in the final sample.

Data Collection Method

This study employs secondary data collected from the official websites of each sample bank and relevant literature obtained through the documentation method. The data were analyzed using descriptive statistics and panel data regression analysis. All statistical analyses and hypothesis testing procedures were conducted using IBM SPSS software.

Panel Model Selection Procedure

The study applies a structured model-selection procedure as follows:

Step 1: Pooled OLS vs. Fixed Effects

A Chow/F-test determines whether bank-specific effects are jointly significant. If the null hypothesis that all bank-specific intercepts are equal is not rejected, pooled OLS is appropriate; if rejected, Fixed Effects (FE) is preferred.

Step 2: Pooled OLS vs. Random Effects

The Breusch–Pagan Lagrange Multiplier (LM) test assesses whether random bank-specific effects are significant. If you do not reject the null hypothesis, you may retain pooled OLS; if you do, Random Effects (RE) is preferred.

Step 3: Fixed Effects vs. Random Effects

The Hausman test examines whether bank-specific effects are correlated with the explanatory variables. If the null hypothesis is rejected, FE is preferred; otherwise, RE may be selected. Thus, the final estimator is determined based on the combined evidence from the F-test, LM test, and Hausman test rather than a single statistical test.

Endogeneity Concerns

Potential endogeneity is a key concern when assessing the relationship between sustainable finance regulation and bank profitability. Omitted-variable bias may arise because factors such as digital transformation, macroeconomic conditions, management quality, governance, and business

strategy affect both sustainability implementation and profitability. Reverse causality may occur if more profitable banks have greater capacity to implement sustainable finance initiatives, making the observed relationship partly reflect pre-existing bank characteristics. Measurement endogeneity may also arise when implementation is measured solely through sustainability reporting, as better-performing banks may disclose more information, making disclosure an outcome rather than an exogenous driver of performance.

4. Results

Panel Data Regression Results

Overview of Key Findings

Before presenting the detailed regression results, three key findings emerge. First, BOPO is the only variable consistently significant ($p < 0.01$) in both pre- and post-implementation periods, with standardized coefficients of -1.238 and -0.884, respectively, indicating that operational efficiency is the primary determinant of profitability among KBMI 2 banks. Second, CAR has a positive and significant effect on ROA before implementation ($p = 0.001$) but becomes insignificant afterward ($p = 0.200$), suggesting a weakened influence of capital adequacy following POJK No. 51/POJK.03/2017. Third, the POJK implementation dummy is insignificant ($p = 0.706$), indicating no detectable direct effect of the regulation on profitability during the observation period. Overall, profitability is driven primarily by operational efficiency, while regulatory effects may operate indirectly and require more time to materialize.

Model 1: Before the Implementation of POJK No. 51/POJK.03/2017

Table 1. Panel Data Regression Results: Model 1

Variable	B	Beta	t	Sig.	Decision
Constant	15.498	–	12.476	0.000	Significant
CAR (X1)	0.111	0.503	3.649	0.001	Significant
NPL (X2)	0.246	0.110	1.054	0.301	Not Significant
BOPO (X3)	-0.182	-1.238	-9.124	0.000	Significant

Table 1 shows that CAR has a positive and significant effect on ROA ($p = 0.001$). A one-unit increase in CAR is associated with a 0.111-unit increase in ROA. Thus, a 10-unit increase in CAR (e.g., 20% to 30%) is associated with an approximately 1.1 percentage-point increase in ROA, indicating a practically meaningful effect. The standardized coefficient (Beta = 0.503) confirms a moderately strong positive effect.

BOPO has a negative and significant effect on ROA ($p = 0.000$). A one-unit increase in BOPO reduces ROA by 0.182 units; therefore, a 5 percentage-point increase in BOPO is associated with an approximately 0.91 percentage-point decline in ROA. With Beta = -1.238, BOPO is the strongest predictor of profitability.

Meanwhile, NPL has no significant effect on ROA ($p = 0.301$), indicating insufficient evidence that credit risk affected profitability during the pre-implementation period.

Overall, before POJK No. 51/POJK.03/2017, KBMI 2 bank profitability was primarily driven by operational efficiency (BOPO) and, to a lesser extent, capital adequacy (CAR), while credit risk (NPL) was not significant.

Model 2: After the Implementation of POJK No. 51/POJK.03/2017**Table 2. Panel Data Regression Results: Model 2 (Including POJK Dummy Variable)**

Variable	B	Beta	t	Sig.	Decision
Constant	10.208	–	12.266	0.000	Significant
CAR (X1)	0.015	0.094	1.292	0.200	Not Significant
NPL (X2)	0.065	0.037	0.472	0.638	Not Significant
BOPO (X3)	-0.098	-0.884	-12.346	0.000	Significant
POJK (X4)	-0.218	-0.023	-0.379	0.706	Not Significant

Table 2 shows that BOPO is the only statistically significant variable after the implementation of POJK No. 51/POJK.03/2017 ($p = 0.000$), with a strong negative effect on ROA (Beta = -0.884). A 5 percentage-point increase in BOPO reduces ROA by approximately 0.49 percentage points, confirming that operational efficiency remains the dominant determinant of profitability.

In contrast, CAR becomes insignificant ($p = 0.200$), compared with $p = 0.001$ before implementation, while its coefficient declines from 0.111 to 0.015. This indicates a substantial weakening of capital adequacy's economic and statistical influence on profitability.

The POJK implementation variable (POJK_X4) is also insignificant ($p = 0.706$), indicating no direct statistically significant effect on ROA. NPL remains insignificant in both periods, suggesting that credit risk does not significantly explain variations in profitability.

Comparison of Financial Performance Before and After the Implementation of POJK No. 51/POJK.03/2017**Table 3. Comparison of Financial Performance**

Aspect	Before POJK	After POJK	Interpretation
Effect of CAR	Significant (B = 0.111)	Not Significant (B = 0.015)	The influence of CAR weakened substantially after the regulation's implementation.
Effect of NPL	Not Significant	Not Significant	No significant effect in either period.
Effect of BOPO	Significant (B = -0.182)	Significant (B = -0.098)	BOPO remained significant, but its negative coefficient shrank, indicating a weaker negative effect.
Effect of POJK	Not included	Not Significant ($p = 0.706$)	The regulation's implementation was not found to have a statistically significant effect on profitability.
Constant	15.498	10.208	The baseline ROA declined in the post-implementation period after controlling for the explanatory variables.

The comparative analysis shows that implementing POJK No. 51/POJK.03/2017 did not produce a statistically significant direct improvement in the profitability of KBMI 2 Banks during the observation period. Operational efficiency, as measured by BOPO, remained the most influential determinant of profitability before and after the regulation's implementation. Meanwhile, the positive contribution of capital adequacy diminished following the implementation period, whereas credit risk continued to show no statistically significant relationship with ROA. These findings suggest that the effects of sustainable finance regulation, if any, may operate through indirect channels (e.g., risk management, governance improvements) that our reduced-form model does not capture, a point we explore further in the Discussion section.

5. Discussion

The Effect of Capital Adequacy Ratio (CAR) on Return on Assets (ROA)

The first hypothesis (H1) proposed that CAR positively affects bank profitability (ROA), as stronger capital supports credit expansion, stakeholder confidence, and profit generation.

However, after mandatory Sustainability Reporting, CAR no longer has a statistically significant effect on ROA. Two factors may explain this. First, KBMI 2 Banks maintained CAR well above the regulatory minimum (approximately 20%–35%), limiting variation across banks and weakening its relationship with profitability. Second, POJK No. 51/POJK.03/2017 may have shifted banks' strategic focus from capital adequacy toward operational efficiency and sustainable finance compliance.

This finding is partly consistent with Buallay (2019), who found no significant short-term profitability effects of sustainability reporting in Middle Eastern banks, who suggested that ESG disclosure benefits in developing economies may emerge only after a 3-5 year lag. Thus, KBMI 2 Banks may be undergoing a similar adjustment phase in which operational and regulatory priorities have become more important profitability drivers than capital adequacy.

The Effect of Non-Performing Loans (NPL) on Return on Assets (ROA)

The second hypothesis (H2) proposed that NPL negatively affects bank profitability, as higher NPL requires greater loan loss provisions, reducing net income and ROA.

However, NPL is statistically insignificant in both the pre- and post-implementation models. This may reflect relatively homogeneous and manageable NPL levels, generally below 3%, along with adequate loan loss provisions that limit its direct impact on profitability.

This finding is consistent with recent evidence showing that the relationship between credit risk and bank profitability is context-dependent. In Indonesian banks, Setiawan et al. (2024) found that NPL had a negative but statistically insignificant effect on ROA, while loan-loss provisions had a significant negative effect. In contrast, Das and Uppal (2021) found that higher NPLs significantly reduced profitability among Indian banks. These mixed findings suggest that the insignificant NPL effect among KBMI 2 Banks may reflect manageable credit risk, effective provisioning, and Indonesia's prudential regulatory environment, making NPL a weaker direct determinant of profitability than operational efficiency.

The Effect of the Operating Expenses to Operating Income Ratio (BOPO) on Return on Assets (ROA)

The third hypothesis (H3) proposed that the Operating Expenses to Operating Income Ratio (BOPO) negatively affects ROA. Theoretically, operational inefficiency, reflected in a higher BOPO ratio, reduces profitability because operating expenses increase faster than operating income, unless the bank generates substantial and recurring non-operating income.

The empirical results strongly support this hypothesis. BOPO has a negative and statistically significant effect on ROA and is the only variable that remains consistently significant in both the pre-implementation and post-implementation periods. Furthermore, BOPO's standardized coefficient (Beta = -0.884) is the largest among all explanatory variables, indicating that operational efficiency is the primary determinant of profitability for KBMI 2 Banks. This dominance of BOPO aligns with the characteristics of Indonesian banking: KBMI 2 Banks operate in a highly competitive environment with relatively low net interest margins (averaging 3-4%), where cost control is essential to sustain profitability. Moreover, these banks' business model remains predominantly interest-income based, with limited diversification into fee-based and non-operating income, which amplifies the impact of operating expenses on profitability.

Nevertheless, the unstandardized coefficient of BOPO decreased from -0.182 before the implementation of POJK No. 51/POJK.03/2017 to -0.098 afterward. This reduction suggests that

although operational efficiency remains the dominant factor affecting profitability, the adverse impact of higher operating expenses on ROA became less pronounced after the regulation's implementation. However, this change should be interpreted cautiously, as it may also reflect other time-varying factors, such as macroeconomic conditions, technological investments, or competitive dynamics, rather than a direct causal effect of the POJK implementation.

The Effect of the Implementation of POJK No. 51/POJK.03/2017 on Return on Assets (ROA)

The fourth hypothesis (H4) proposed that mandatory Sustainability Reporting for KBMI 2 Banks, represented by POJK_X4, positively affects ROA. The findings do not support H4, as POJK No. 51/POJK.03/2017 shows a negative but statistically insignificant relationship with ROA. This aligns with previous studies suggesting that sustainability reporting may not improve short-term profitability because of compliance costs, operational adjustments, and efficiency challenges.

Several factors may explain the insignificant effect:

1. Implementation costs: System upgrades, data collection, training, and assurance fees may offset potential short-term benefits.
2. Institutional readiness: KBMI 2 Banks generally have fewer financial and organizational resources than KBMI 3 and 4, requiring investment in ESG systems, personnel, and governance.
3. Regulatory lag: The financial effects of sustainability regulation may emerge with a time lag as banks require time to develop ESG infrastructure, organizational capabilities, governance, and reporting systems. Recent evidence supports this dynamic effect: Bătae et al. (2021) find that prior-year environmental performance influences subsequent bank performance, while Azmi et al. (2021) show that ESG activities affect bank value through cash flows and operational efficiency. Gutiérrez-Ponce and Wibowo (2024) further find that ESG effects vary by dimension and institutional context.
4. Industry characteristics: High competition, relatively low net interest margins, and limited non-interest income make operational efficiency, reflected in BOPO, more influential on profitability than regulatory compliance.

Nevertheless, the insignificant direct effect does not imply that the regulation is ineffective. POJK No. 51/POJK.03/2017 may generate indirect and delayed benefits through improved risk management, governance, stakeholder engagement, and organizational capability. Some banks may also have already complied with sustainability requirements before mandatory implementation, reducing the observable policy effect.

Overall, the findings reinforce that the relationship between sustainability regulation and profitability is context-dependent. In emerging markets with limited institutional capacity, higher implementation costs, and traditional banking models, sustainability benefits may take longer to materialize. They may operate through different channels than in developed economies.

6. Conclusion

This study examines the effect of mandatory Sustainability Reporting under POJK No. 51/POJK.03/2017 on the profitability of KBMI 2 Banks in Indonesia using panel regression. The results show that BOPO is the only consistently significant variable, with a negative effect on ROA before and after implementation, confirming that operational efficiency is the main determinant of profitability. CAR has a positive and significant effect before implementation but becomes insignificant afterward, while NPL remains insignificant throughout the observation period.

Theoretical Contributions

The study contributes to sustainable finance literature in emerging markets by showing that: (1) the relationship between sustainability regulation and profitability is context-dependent; (2) operational efficiency may mediate the regulatory-profitability relationship; and (3) regulatory benefits may be delayed in emerging markets due to limited institutional capacity, compliance costs, and organizational adjustments.

Short- and Long-Term Regulatory Effects

In the short term (0-3 years), POJK No. 51/POJK.03/2017 has no significant direct effect on profitability, consistent with the compliance-cost argument. In the long term (beyond three years), the regulation may improve profitability indirectly through better risk management, governance, strategic positioning, stakeholder trust, and operational efficiency.

Study Limitations

The study has three main limitations: (1) the short post-implementation period (2019-2021) limits the assessment of long-term effects; (2) the focus on KBMI 2 Banks limits generalizability; (3) the binary policy dummy captures implementation but not the quality or depth of Sustainability Reporting.

Opportunities for Future Research

Future research should: (1) extend the observation period to 5-7 years; (2) compare KBMI 2, 3, and 4 Banks; (3) use Sustainability Report quality scores instead of binary measures; and (4) conduct qualitative research with bank managers and OJK officials to better understand implementation mechanisms and challenges.

Recommendations for Bank Management

1. Strengthen operational efficiency: Digitalize core banking processes, automate loan origination and customer onboarding, monitor expenses in real time, and implement activity-based costing.
2. Build ESG capacity: Establish sustainability teams or board-level committees, conduct materiality assessments, develop ESG data systems, and integrate ESG indicators into management KPIs.
3. Develop capacity progressively: Implement a three-year sustainability roadmap covering employee training, data infrastructure, and external assurance.
4. Adopt a strategic approach: Treat POJK No. 51/POJK.03/2017 as a long-term investment in governance, competitiveness, risk management, and sustainable performance, not merely a compliance requirement.

Recommendations for OJK/Regulators

1. Standardize Sustainability Report quality: Establish measurable indicators covering materiality, stakeholder engagement, SDG alignment, and integration with financial reporting.
2. Develop digital reporting systems: Strengthen an integrated digital platform with automated validation, benchmarking, and public accessibility.
3. Provide tiered implementation support: Tailor implementation timelines, technical assistance, and capacity-building programs to the resources of KBMI 2 Banks.
4. Strengthen outcome-based supervision: Assess not only report compliance but also improvements in governance, risk management, ESG performance, and sustainable financing.

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