
DIGITAL TRANSFORMATION AND GREEN CREDIT: STRATEGIC IMPLICATIONS FOR BANK PROFITABILITY

Grecia Alvionita Simanjorang¹
Universitas Trisakti, Jakarta, Indonesia

Febria Nalurita²
Universitas Trisakti, Jakarta, Indonesia
febria.nalurita@trisakti.ac.id

Farah Margaretha Leon³
Universitas Trisakti, Jakarta, Indonesia



Abstract

This study seeks to examine the impact of non-performing loans, the loan-to-deposit ratio, green credit, and digitalisation on the profitability of Indonesia's banking system, while considering bank size and bank age as control factors. This research is distinctive due to its incorporation of green credit and digitalisation in response to the increasing significance of sustainability and technical advancement in the financial sector. This study utilises secondary data obtained from the annual reports of banking firms listed on the Indonesia Stock Exchange (IDX) for the years 2019 to 2024. The sample was chosen by a purposive sampling technique. The investigation utilised imbalanced panel data regression with a fixed effects model, leveraging EViews 9 software. The findings demonstrate that non-performing loans adversely and significantly impact profitability, while the loan-to-deposit ratio positively and significantly influences profitability. Additionally, green credit exerts a positive and significant effect on profitability, and both bank size and bank age as control variables significantly affect profitability. In contrast, digitalisation exerts no substantial influence on profitability. The findings underscore the necessity for banks to adeptly manage credit risk and optimise digital transformation to improve financial performance, alongside the vital role of government in fostering and developing green credit programs.

Keywords: Digitatization, Non Performing Loan, Green Credit, Profitability, Loan to Deposit Ratio

INTRODUCTION

By helping to keep the country's financial system stable and by effectively supporting economic activity, the banking sector is vital to economic progress (Putri & Nalurita, 2024). Stable and profitable banks often have large asset bases. Public and investor trust in banks rises when their reputations are solid, which in turn aids management in sustaining consistent financial performance and lessens the likelihood of manipulation from within (Maulana et al., 2025). Outstanding financial performance demonstrates a company's operational efficiency, structural strength, and competitiveness amid market dynamics (Wu & Cheng, 2024).

Banks entering new markets and expanding their business activities will face increasing exposure. The most common risks include credit risk, liquidity risk, and market risk, which can affect the bank's lending decisions (Razermera et al., 2024). Maintaining financial institutions' profitability and stability relies heavily on effective credit management. This strategy provides banks with the opportunity to mitigate credit risk (Winiadi et al., 2024).

The allocation of Third-Party Funds (TPF) in the form of credit, as reflected in the Loan to Deposit Ratio (LDR), demonstrates a bank's capability in managing credit and deposits (Olofin et al., 2024). Proper LDR management helps banks maintain sufficient liquidity to meet lending demand and is a crucial factor in maintaining bank profitability. Non-performing loans pose a potential loss to banks when borrowers are unable to meet their debt obligations, especially when banks are unable to manage risk effectively, resulting in bank bankruptcy (I. Saleh & Abu Afifa, 2020). An increase in Net Performing Loans (NPLs) requires banks to increase reserves to cover potential losses and a decline in financial performance (B. A. Saleh & Paz, 2023).

The shift towards a sustainable economy cannot be propelled without sustainable finance. Sustainable development initiatives rely heavily on instruments like "Green Credit" and "Economic Stimulus" for their funding (Judijanto et al., 2024). Climate impacts put pressure on banks to be socially responsible (Sun et al., 2024). Banks provide financial support for the environment, contributing to new profit growth from a sustainable economy. Banks may boost their bottom lines and do more financially by offering green lending ((Sun et al., 2024). Banks need to adjust their strategies based on data sources and market position to balance the benefits and costs of implementing green loans (Yin, 2021). Banks must tighten green lending requirements to maintain financial stability (Mirovic et al., 2023).

Banks that adopt and implement new technologies can improve operational efficiency, innovation, and overall performance, thereby impacting company profitability (Nurjanah & Amrizal, 2024). Digital transformation theory explains how companies adopt digital technology to transform business processes, operational models, and strategies to increase efficiency and create added value (Plekhanov et al., 2023). Digitalization in the banking sector was introduced to respond to innovation and change. Innovations in payment technologies such as mobile banking, QR codes, and contactless payments also support the development of the digital economy (Chauhan & Sharma, 2024). Digitalization is changing the way the economic sector operates, including the financial sector. Digital financial services such as e-wallets simplify financial transactions for payments, fundraising, investments, and credit loans (Nalurita et al., 2022). Digital innovation helps banks

understand customers and improve lending decisions (Nguyen et al., 2023). Easily accessible and understandable mobile-banking applications can help make banking transactions faster and more efficient (Alifia et al., 2024).

Amidst the pressures of climate change and rapid digital transformation, banks face demands for rapid adaptation. Traditional strategies that relied solely on asset size, loan-to-deposit ratios, or non-performing loan levels are now considered insufficient to address the challenges of the times. Two new approaches—green credit and the digitalization of financial services—are increasingly gaining attention as keys to sustainable profitability. Green credit has traditionally been analyzed in the context of sustainability and environmental risk management, while digitalization tends to be discussed in terms of operational efficiency and expanding access to financial services. However, the direct link between these two variables and bank financial performance, particularly profitability, has received little attention. Therefore, this study offers a new perspective by combining the dimensions of sustainability through green credit and technological innovation through digitalization as complementary strategies for improving bank profitability. This approach is relevant in addressing contemporary challenges facing the banking sector, which faces pressure to implement sustainable finance principles while simultaneously adapting to the acceleration of digital transformation.

REVIEW OF LITERATURE

Profitability

The bank capital theory that was put forward discusses the role of bank capital in maintaining the stability and sustainability of the banking sector. The research results. (Caena & Redecker, 2019) state that probability reflects the actual situation of bank growth, which is formed from two main sources: ROA and ROE. A bank's revenue growth is obtained through non-interest income to minimize the risks associated with traditional income. (Mulbah et al., 2024) Bank profitability is measured by the return on assets indicator, where financial stability is crucial for maintaining sustainable economic growth. Profitability is important not only to investors but also to all stakeholders.

Non-Performing Loan

When a borrower does not pay back a loan as agreed upon, the loan is considered non-performing (NPL). Non-Performing Loans (NPLs) are loans for which at least some of the original payment is still owing after the due date has passed (Fadun & Silwimba, 2023) (Razermera et al., 2024) found that ROA was negatively correlated with non-performing loans. Because loan interest makes up the bulk of a bank's revenue, a rise in non-performing loans would have a negative impact on financial performance. (Ghosh & Mondal, 2022) explain that banks not only function as depository institutions but also provide credit facilities, which are inherently vulnerable to credit risk. Declining bank performance as a result of loan defaults demonstrates this susceptibility. (Mulbah et al., 2024) the high ratio of non-performing loans in banks can reduce investor interest in investing capital, as investors desire to invest in strong financially profitable institutions. This suggests that the presence of non-performing loans has a negative relationship with the level of bank profitability. The following theory can be formulated using the aforementioned description:

H1: Non-performing loans have an impact on profitability

Loan to Deposit Ratio

The LDR is a measure of a bank's efficiency in handling its savings and loan portfolios (Al Zaidanin & Al Zaidanin, 2021). The LDR is a key indicator of credit management efficiency and lending policy, reflecting the quality of a bank's assets. A balance between liquidity and profitability, along with effective managerial skills, indicates that banks are increasingly allocating funds to anticipate future withdrawal requests, which in turn leads to optimal profitability (Ayalew, 2021). explain that optimal LDR management enables banks to maintain sufficient liquidity to meet credit needs. (Mulbah et al., 2024) investors are more drawn to organizations with a track record of consistent and strong financial performance, so it stands to reason that a rise in non-performing loans at banks would dampen their enthusiasm for investing in those institutions. Research by (Abdulrauf et al., 2024) came to the conclusion that LDR significantly increase profits. It was said that microbanks' short-term profitability increases as their percentage of liquidity strength increases. Based on the information provided, we can formulate the following hypothesis:

H2: Loan to deposit ratio has an effect on profitability

Green Credit

Green credit is financing for individual and corporate customers whose business activities are oriented towards environmental conservation (Song et al., 2019). Green credit is essential for the long haul as much as it is for the near term. Financial results can improve and risk can be mitigated through the use of green credit. (Zhang, 2018) (Li & Chen, 2024) describe how green financing can boost the bottom line of financial institutions. Funding for environmentally friendly bank projects can build a better reputation and attract customers who care about sustainability. (Xi et al., 2022) prove that green credit boosts bank profits, outlining how green sustainability in development is promoted by its adoption. The green credit business can contribute positively in the long term to bank profitability through the provision of environmentally friendly loans. Banks are able to provide loans to companies that provide new, environmentally friendly, and energy-efficient innovations, thus maintaining a stable loan structure in the long term. (Khan & Dash, 2014). In light of the foregoing, one possible hypothesis is as follows:

H3: Green credit has an impact on profitability

Digitalization

Digitalization and financial technology play a crucial role in the long-term sustainability of banking operations. These innovations enable 24/7 banking services, expanding service reach, efficiency, and convenience for customers. (Al-Shouha et al., 2024) Technological developments have significantly transformed the banking sector by introducing ATM services, internet banking, and mobile banking, which facilitate easier access for customers to meet their needs without visiting the bank, thereby positively impacting banking profitability (Yılmaz & Yıldırım, 2024). (Alfawareh et al., 2025) found that digital payments significantly boost profitability, which in turn improves the economy and the banking sector's capacity to profit from digital payments and other market shifts. (Medyawati et al., 2021) The study found that the characteristics related to ATMs had a favorable and statistically significant effect on profitability. Automated teller machines (ATMs) are a type of early digitization that can boost productivity and asset profitability. (Shihadeh et al., 2018) explain that there is a positive and significant influence between ATM variables on profitability; this strengthens the argument that ATMs are the initial milestone

of banking digitalization, which can increase operational efficiency, expand access, and increase customer satisfaction. (Magallón González et al., 2023), research shows that automated teller machines (ATMs) significantly boost profits, suggesting that digital physical infrastructure like ATMs is still useful for this purpose. The following theories can be formulated from the foregoing description:

H4: Digitalization has an impact on profitability

Bank Size

In order for a business to succeed in the long run, the assets it owns must be able to produce tangible economic value. Among the many measures of a business's size, total assets under control stands out (Sari et al., 2022). Findings (Chand et al., 2024) Because bigger banks are able to take advantage of economies of scale and negotiate better terms through agreements, there is a clear positive association between bank size and profitability, obtaining funding sources at lower costs, and influencing interest rates and service costs due to dominance. (Mulbah et al., 2024) demonstrated a significant positive impact between bank size and profitability. Bank size can drive improved bank profitability due to its ability to utilize resources, capabilities, and market presence. This, in turn, increases public trust in banking. (Adem, 2022) Research indicates that bank profitability increases with bank size. It is possible to formulate the following theories in light of the foregoing information.

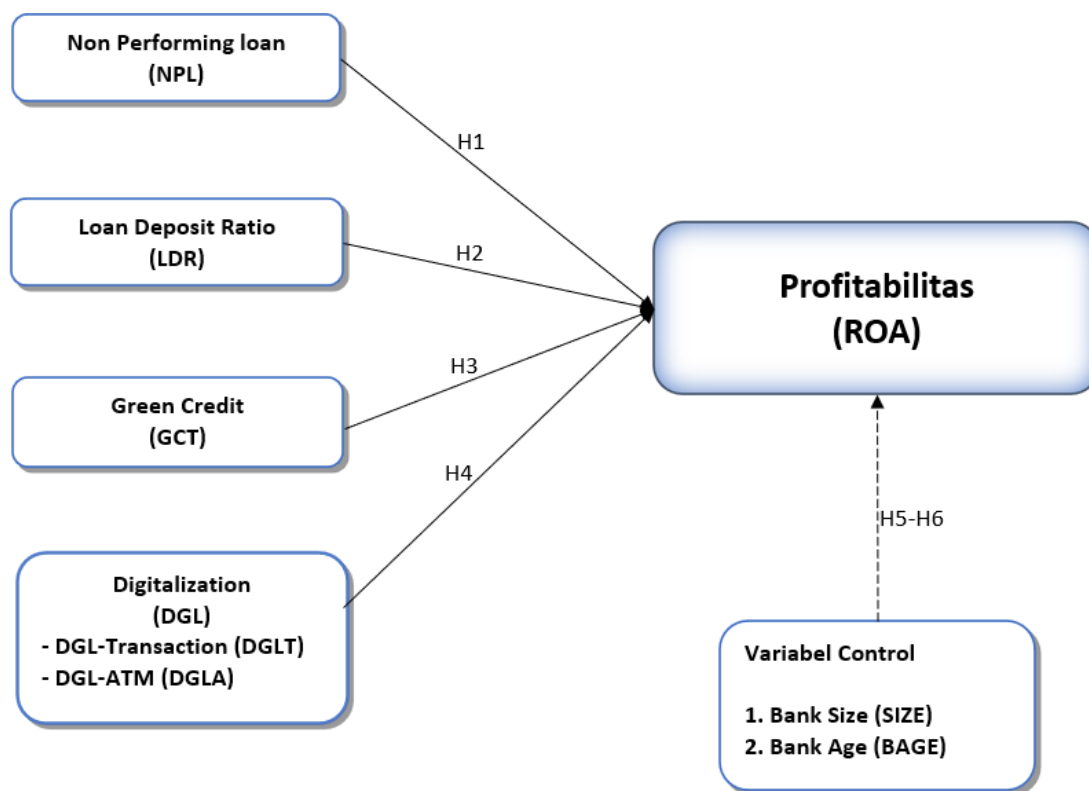
H5: Bank size has an effect on profitability

Bank Age

Bank age is one factor that significantly influences performance. Bank age is measured by the length of time the banking institution has been in existence, reflecting its operational experience (Adem, 2022) (Ayalew, 2021) discovered a favorable correlation between the age of a bank's operations and its profitability. This is because banks that have been operating for longer tend to have a superior position compared to newer banks in various key banking performance indicators (KPIs), such as number of customers, deposits, and loans and credit provided. A study by (Alfawareh et al., 2025) revealed a negative effect of bank age on profitability. Therefore, choosing an older bank underlies the bank's stability in managing its finances. Research by (Gupta & Mahakud, 2020) illustrates the detrimental and statistically significant impact of bank age on profitability. This precludes more established financial institutions from making the most of the positive reputation they have worked so hard to establish. Meanwhile, younger banks tend to be more profitable because they are able to explore new opportunities. (Alfawareh et al., 2025) argue that family ownership in banks prioritizes long-standing banks over younger ones. Based on these results, it seems that the longer a bank has been around, the less profitable it is. In light of the foregoing, we can formulate the following hypotheses:

H6: Bank age has an effect on profitability

Figure 1. Conceptual Framework



Source: Data Author (2025)

RESEARCH METHOD

The purpose of this study was to investigate the relationship between profitability and the following variables: size, age of the institution, green credit, non-performing loans, loan deposit ratio, digitization, and non-performing loans. Secondary data is used in this quantitative study. The information used in this study came from a variety of sources, including the official websites of the companies that were the focus of the research throughout the past six years (2019–2024) and the Indonesia Stock Exchange (IDX) (<https://www.idx.co.id/>). This study's data came from financial reports and annual reports that were made public on the websites of the companies involved, as well as the IDX, the Indonesia Stock Exchange. The characteristics under study were used to tailor the purposive sampling approach, which was then used to choose a representative sample. Using EViews version 9 as a statistical analysis tool, this study employed unbalanced panel data regression as its analytical technique. The following table presents the values of the research variables and how they were measured:

Table 1.
Variable Measurement

Variables	Measurement	Reference
Dependent Variable		
Return on Asset (ROA)	<i>Net Income</i> <i>Total Asset</i>	(Mulbah et al., 2024), (Jalloh, 2024)

Independent Variable		
Non-Performing Loan (NPL)	$\frac{\text{Non Performing } L}{\text{Gross Loan}}$	(Mulbah et al., 2024) (Razermara et al., 2024) (Al Zaidanin & Al Zaidanin, 2021)
Loan to Deposit Ratio (LDR)	$\frac{\text{Loan}}{\text{Customer Deposit}}$	(Mulbah et al., 2024) (Razermara et al., 2024)
Green Credit	$\frac{\text{Green Loan}}{\text{Total Loan}}$	(Zhang, 2018) (Wanting, 2020) (Li & Chen, 2024)
Digitalization	Financial transactions made through mobile banking Number of ATMs	(Yılmaz & Yıldırım, 2024)
Control Variables		
Bank Size	Natural Logarithm of Total Assets	(Adem, 2022)
Bank Age	Number of years the bank operated	(Alfawareh et al., 2025)

Determining the most appropriate model to use in the research is done through the Chow Test and the Hausman Test as follows:

Table 2.
Results of Chow Test

Effects Test	Statistics	df	Prob.	Decision
ROA Model				
Cross-section Chi-square	188.257578	20	0.0000	H0 is rejected, Fixed Effect is selected

Table 3.
Results of Hausman Test

Effects Test	Statistics	df	Prob.	Decision
ROA Model				
Random cross-section	49.319805	7	0.0000	H0 is rejected, Fixed Effect is selected

Chow Test Results:

To determine if the Common Effect Model (CEM) or the Fixed Effect Model (FEM) is the better panel model to utilize, the Chow test was performed using the results table. Table 2 displays the outcomes of the Chow test. According to the data in the table, the p-value for the ROA model's chi-square cross-section is $0.0000 < 0.05$, which means that the null hypothesis (Ho) is rejected and the alternative hypothesis (Ha) is accepted. Therefore, the Fixed Effect Model (FEM) is the best fit for this model.

Hausman Test Results:

After choosing the Fixed Effect Model (FEM) from the Chow test findings, the Hausman test is run. When deciding between the Fixed Effect Model (FEM) and the Random Effect Model (REM), the Hausman test is utilized. Table 2 displays the results of the Hausman test processing. We may infer that the Fixed Effect Model (FEM) is the proper model because the table shows that the p-value of the random cross-section is $0.0000 < 0.05$, which indicates that H_0 is rejected and H_a is accepted.

The F test assesses whether all independent factors in the research model concurrently affect the dependent variable, as illustrated in Table 2 below:

Table 4.
Results of the F Test

Model	F value	Sig Value
ROA	28.72974	0.000000

Table 5.
Results of the Goodness of Fit Test

Dependent	R2	Adjusted R2
ROA	0.908633	0.877006

F-Test Results:

According to the F-test results, the F-statistic probability yields a value of $0.000000 < 0.05$. So, the regression model is appropriate for this study because the results show that the independent variables (NPLs, loan-to-deposit ratio, green credit, digitalization, bank size, and bank age) influence the dependent variable (ROA).

Goodness of Fit Test Results:

The outcomes of the coefficient of determination test are presented in Table 2. The calculated adjusted R2 value is 0.877006. This outcome indicates that the fluctuations or conduct of the independent variables—specifically non-performing loans, loan-to-deposit ratio, green credit, digitization (quantified by the number of transactions and ATMs), bank size, and bank age—can account for 0.877006% of the variation in return on assets. The residual 12.2994% indicates that return on assets may be affected by other factors not accounted for in this model. Consequently, these findings suggest that ROA has an adequate model fit.

The panel data regression model in this work is described as follows:

$$ROA_{it} = \alpha_0 + \beta_1 NPL_{it} + \beta_2 LDR_{it} + \beta_3 GCT_{it} + \beta_4 DGLT_{it} + \beta_5 DGLA_{it} + \beta_6 SIZE_{it} + \beta_7 BAGE_{it} + e_{it}$$

Where :

- α = Constant
- $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ = Regression Coefficient
- ROA =Return on Asset
- NPL =Non-Performing Loan
- Long Distance Relationship =Loan Deposit Ratio
- GCT =Green Credit
- DGLT =Digitalization of Transactions
- DGLA =ATM Digitalization
- SIZE =Bank Size

BAGE	=Bank Age
i	=Sample company
t	=Year of research
e	=Error

RESULTS AND DISCUSSION

The t-statistic test assesses the degree to which each independent variable partially elucidates the dependent variable. Hypothesis testing is conducted by referring to the profitability value (p-value) obtained from the analysis using Eviews 9.

Table 6.
T-Test Results

Variable	Coefficient	Prob.	Conclusion
C	-0.978686	0.00000	-
NPL	-0.381234	0.00000	Significant Negative
Long Distance Relationship	0.006416	0.00000	Significant Positive
GCT	0.015193	0.00000	Significant Positive
DGLT	-0.000227	0.4203	No effect
DGLA	-0.002072	0.3158	No effect
SIZE	0.080227	0.00000	Significant Positive
BAGE	-0.002345	0.00000	Significant Negative

The results of multiple regression statistical processing produce a regression model equation, namely:

$$ROA = -0.978686 - 0.381234 \text{ NPL} + 0.006416 \text{ LDR} + 0.015193 \text{ GCT} - 0.000227 \text{ DGLT} - 0.002072 \text{ DGLA} + 0.080227 \text{ SIZE} - 0.002345 \text{ BAGE}$$

The Impact of Non-Performing Loans on Profitability

The first hypothesis test found that non-performing loans significantly reduce profitability. High NPLs reflect an increased risk of default by borrowers, resulting in decreased interest income and increased provision for credit losses. This situation will reduce net profit, making effective credit risk management vital to sustaining asset quality and bank profitability.

Study Animasaun et al. (2025) demonstrate that the variables pertaining to non-performing loans have a substantial and adverse effect on profitability. This demonstrates that a decline in bank profitability is associated with an increase in non-performing loans. This discovery further supports the idea that high nonperforming loans (NPLs) cut into interest income, the backbone of bank profits, and highlights the need for efficient methods of credit risk management to keep banks afloat and profitable.

Study Al Zaidanin & Al Zaidanin (2021b) demystify the relationship between nonperforming loans (NPLs) and profitability in traditional banking institutions. This result is consistent with previous studies as well(Ghosh & Mondal, 2022). Demonstrate how nonperforming loans (NPLs) considerably cut into profitability. When NPLs are high, it means credit quality is going down, which means commercial banks are taking a financial hit.

Study (Razmerera et al., 2024) clarify that non-performing loans have an effect on profitability; a negative coefficient shows that a growth in NPL would lower bank performance, which is significant because interest on disbursed loans is the bank's primary source of income.

The Influence of Loan to Deposit Ratio on Profitability

The second hypothesis test showed that the loan-to-deposit ratio significantly and positively affects profitability. A higher LDR ratio indicates that a larger share of external funding is being funneled into the bank's credit operations, which can lead to higher profitability for the bank. If a bank has a high LDR ratio, it means they are good at using the money they get to finance various operations, which means they make a lot of interest. For this reason, the LDR is a measure of the effectiveness of banking intermediation; a bank's bottom line will improve as a result of well-managed credit growth.

Study Hermuningsih et al. (2022) assert that profitability is greatly affected favorably by the loan-to-deposit ratio. According to the results, a greater LDR indicates a more successful bank. This is a reflection of the bank's efficiency in distributing loans with the gathered funds. A larger amount of resources will be required to back a bank with high liquidity. The ability of a bank to support operational activities and extend credit is bolstered when the public, investors, and creditors prefer to put their cash with a bank that has significant liquidity.

Study (Ayalew, 2021), as a critical component of financial success, this study demonstrates that the LDR significantly and positively impacts profitability. When the LDR rises gradually, it means the bank has optimized its role as an intermediary, which is good for their bottom line. Maximizing profits is heavily dependent on efficient fund management, and this study adds to the growing body of data that this is the case.

The Impact of Green Credit on Profitability

Third hypothesis test findings show that green credit has a favorable and statistically significant impact on profitability. Distributing green credit contributes to increasing bank profitability. The greater the credit disbursement to environmentally friendly sectors, the higher the bank's profit level. This finding indicates that investing in green financing supports sustainable development and has a positive economic impact on financial institutions. (Li & Chen, 2024) It was discovered that the green credit variable has a positive and statistically significant effect on profitability. This means that as the distribution of green credit increases, the profitability of the bank also rises.

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A second phase of the sustainable finance roadmap was issued by the Financial Services Authority (OJK) to expand sustainable financial products and human resources, as well as to strengthen green infrastructure and regulations in the financial services sector. POJK No. 51/POJK.03/2017 addressed the implementation of sustainable finance for

financial services institutions, issuers, and public companies. The OJK is committed to promoting sustainable financing. In line with research (Xi et al., 2022) demonstrates that green credit significantly and positively affects Chinese banks' profitability. Green lending has monetary advantages that boost banks' bottom lines. The active role of banks in supporting the green economy adds value to the bank's reputation. However, banks need to maintain the consistency and sustainability of the green credit program to continue contributing to profitability.

The Impact of Digitalization on Profitability

The Impact of Digitalization Transactions (DGLT) on Profitability

Digitalization of transactions has little influence on profitability, according to the results of the fourth hypothesis test. Tambunan & Aziza (2024) explained that transaction digitization had no effect on profitability, indicating no significant difference in profitability before or after the bank transformed into a digital bank. Financial performance is not always significantly affected by the digitalization process. This indicates that the potential for digitalization through mobile banking services still needs to be strategically optimized to make a real contribution to increasing profitability through strengthening service quality, increasing digital literacy among the public, and integrating digital technology into all lines of the bank's operational processes.

A study by Imamah & Ayu Safira (2021) stated that there is no effect of transaction digitization on profitability. The analysis shows that although mobile banking is part of the digital transformation of banking, its existence has not been able to make a real contribution to increasing efficiency or bank profitability directly. This finding may be caused by the low level of mobile banking feature utilization by customers, the high cost of technology implementation compared to the revenue generated, the fact that digitalization requires a large investment, and the suboptimal integration of digital systems into the bank's overall business strategy. Mobile banking still plays more of a role as a service facility and convenience for customers, rather than as a strategic instrument in improving the bank's financial performance.

The Impact of ATM Digitalization (DGLA) on Profitability

The fourth hypothesis test found no correlation between digitalization of ATMs and profitability. Increasing the number or intensity of ATM use as part of transaction digitalization has not significantly contributed to the efficiency of asset utilization in generating profits. Implicitly, this finding reflects that the existence of ATMs, a form of conventional digitalization, has not fully increased bank profitability. This decline could be due to several factors, such as high operational and maintenance costs for ATMs, limited innovation in ATM-based services, and a shift in customer preferences toward more sophisticated digital options such as mobile banking and internet banking.

Study Doran et al., (2022) Financial institutions' bottom lines are unaffected by automated teller machine (ATM) transactions, according to the study's findings. Furthermore, this finding is related to the context of the sudden and ongoing COVID-19 pandemic, which has triggered a multidimensional crisis, including in the financial and banking sectors. Lockdowns and mobility restrictions significantly accelerated ATM usage, with customers increasingly inclined to use digital services such as mobile banking or internet banking to continue their business. The COVID-19 pandemic has encouraged every company, including those in the banking sector, to utilize financial technology and digital

services as the primary alternative to maintain the continuity of banking operations and customer service. As a result, the pandemic led to the discontinuation of ATMs, which now serve as an alternative option for customers in need of cash. However, the massive spread of COVID-19 has accelerated digitalization, which was initially used during the pandemic crisis but has not yet fully matured in terms of innovation, security, efficiency, and system reliability. Although quantitatively, digitalization adoption has increased rapidly, there has not been a significant direct correlation to increased banking profitability.

This finding is in line with research by Tanha et al. (2024), which explains that ATMs have no effect on profitability; this indicates that ATMs are not a factor that consistently contributes to profitability. Kumar et al. (2022) explains that ATMs have no influence on profitability; this shows that in Japanese banks, ATMs only provide certain types of services and play a greater role in reducing customer waiting times rather than directly improving the bank's financial performance.

The Influence of Bank Size on Profitability

There is a positive and statistically significant relationship between bank size and profitability, according to the fifth hypothesis test. The bigger the bank, the better off it is financially. Large banks are often better able to diversify their risk and asset portfolios, have access to more funding options, and run their operations more efficiently due to economies of scale. When it comes to fundraising and lending, larger banks have greater leverage and are more likely to earn the confidence of both parties.

Study Mehzabin et al. (2023), Corbet et al. (2024), (Xi et al., 2022) There is strong evidence that larger banks are more profitable. This indicates that the larger and stronger a bank, the higher its financial performance. Larger banks tend to demonstrate better financial performance because they have stronger resources, a broader operational scale, and a greater ability to manage risk and diversify their assets. Anh & Huong (2024b) confirm that bank size has a positive and significant impact on profitability, as larger banks have the capacity to utilize resources and access larger market opportunities and broader funding. This reinforces the notion that company size is a crucial factor in driving bank financial performance.

The study by Abdou & Alarabi (2024) indicates that economies of scale are more beneficial to larger banks. Mengstie et al. (2024b) suggest that bank size has a positive and significant effect on profitability. Banks with large assets and extensive networks can more effectively distribute risk and generate income from various business lines, thus creating stable long-term profitability. This finding indicates that the larger a bank's scale, the greater its ability to create operational efficiency, access funding sources, and diversify risk. Larger banks tend to have more established organizational structures, better technology, and broader business networks, enabling them to maximize assets to generate profits.

The Influence of Bank Age on Profitability

The results of the sixth test indicate a negative and significant effect of bank age on profitability. The older a bank is, the lower its profitability tends to be. This finding may reflect efficiency challenges faced by banks with longer operating years, such as complex organizational structures, high operating expenses, or limited ability to adapt to technological innovation and market changes. Bank age is not always an indicator of performance excellence, especially in the context of profitability, which is measured through asset efficiency, such as ROA.

Study Senan et al. (2021) The study found that bank age had a negative and significant effect on profitability, indicating that as a bank's age increases, its growth and ability to generate profits tend to reach the peak of the bank's cycle. Sanyaolu et al. (2019) and (Gupta & Mahakud, 2020) explain that there is a negative and significant influence between the variable of bank age and profitability. Older banks are often unable to effectively capitalize on their established historical image or reputation and experience decreased adaptability to modern market dynamics. (Xi et al., 2022) argue that while older banks are typically associated with larger institutional size and stronger asset structures, this does not always translate into optimal financial performance. This is because older banks are potentially dependent on conventional systems and experience a relatively slower rate of technology adoption. These factors can hinder efficiency and innovation in generating profits.

CONCLUSION

This study concludes that while green credit significantly enhances bank profitability through sustainable financing mechanisms, digital transformation has not yet demonstrated a measurable impact on financial performance. Credit risk, particularly non-performing loans, remains a major barrier to optimal profitability, while factors such as bank size and effective intermediation through loan-to-deposit ratios contribute positively. Interestingly, bank age shows a negative effect, indicating that maturity does not guarantee efficiency or adaptability. Overall, the findings emphasize the strategic role of sustainable finance, institutional reforms, and improved risk management in ensuring profitability in the era of digitalization and green transition.

Recommendations

Future research should address the study's limitations by expanding the scope of independent variables, including managerial efficiency, CSR, and default rate, which may further explain variations in profitability. Cross-country comparative studies involving financial institutions from nations such as Japan and China are also recommended to enrich the literature on green credit and digital transformation. For policymakers, governments are encouraged to strengthen fiscal incentives and infrastructure for sustainable finance, while regulators such as the Financial Services Authority (OJK) should refine green taxonomy and enhance digital governance standards. Bank Indonesia is advised to integrate sustainability and digital inclusion into monetary policies to ensure alignment between financial stability and innovation. By addressing these aspects, future studies and policy interventions can create a stronger foundation for profitability, sustainability, and resilience in the banking sector.

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