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# Financial performance of banking sector: the role of board gender diversity as a moderating factor

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**Abstract**
**Purpose** – This study examines the impact of the cost-to-income ratio (CIR), loan-to-deposit ratio (LDR), and capital adequacy ratio (CAR) on return on equity (ROE), with board gender diversity (BGD) as a moderating factor. Firm size (SIZE) and non-performing loans (NPL) are included as control variables. **Method** – A panel data regression approach using the fixed effect model (FEM) is applied, covering 47 banking companies listed on the Indonesia Stock Exchange (IDX) between 2021-2023, resulting in 141 observations. **Findings** – The findings show that CIR and LDR negatively affect ROE. CAR and SIZE positively affect ROE. BGD negatively affects ROE but strengthens the negative relationship between CIR, LDR, and ROE. However, BGD cannot moderate the relationship between CAR and ROE. NPL shows do not affect ROE. **Implications** – These results have important implications for banking management and regulators, emphasizing the need for strategies to enhance operational efficiency, improve liquidity risk management, and strengthen governance through gender diversity on boards. The theoretical implications of this study suggest that gender diversity on boards can improve strategic decision-making and risk management. From a practical standpoint, the insights are particularly relevant to the banking sector in Indonesia, where such practices can contribute to both improved financial performance and sustainable governance.
**Keywords:** return on equity, cost to income ratio, loan to deposit ratio, capital adequacy ratio, board gender diversity.

## Introduction

Examining the results of financial organizations over the long run is a good way to measure the state of the system and a nation's economic progress (Widarjono, Anto, and Sidiq 2022). Banks are vital to economic stability as financial mediators because they transfer funds from savings to debt. The original intent of the financial market was to achieve maximum efficiency (Jagirani, Chee, and Kosim 2023). Thereafter, financial performance becomes more effective, which in turn causes an economic domino effect that gets better over time. Return on equity (ROE) is a key indicator of a bank's profitability. This indicator displays the efficiency with which a bank generates profits from the capital its shareholders have invested. The more efficiently a bank returns equity to its shareholders, the greater its ROE. Hence, it is preferred by investors looking for bank investments with good returns (Mirović et al. 2024). Maintaining efficient operations, preventing operational inefficiencies, and maintaining a solvent bank with stable corporate capital is crucial for maximizing return on equity (ROE) (Elekdag, Malik, and Mitra 2020).

The banking industry's ROE is affected by several important metrics, the most important of which are the cost-to-income ratio (CIR), the loan-to-deposit ratio (LDR), and the capital adequacy ratio (CAR). The CIR provides insight into operational efficiency by comparing a bank's operating expenses to its income. A lower CIR shows that the bank is more efficient, which means it can maximize its earnings (Chantha et al. 2024). The LDR, however, shows how efficiently a bank lends out the money it gets from outside sources. The profitability and liquidity of the bank can be determined by examining this ratio (Elekdag, Malik, and Mitra 2020). A bank's capacity to absorb operational-related financial risks is evaluated by the CAR. Banks with a greater CAR are better equipped to deal with these risks and maintain more stable operations (Dao and Nguyen 2020; Ernayani 2024).

Previous studies have highlighted varying effects of corporate governance on bank performance, but the results remain inconsistent. Alabi, Olaoye, and Ojo (2022); Setiawati, Orbaningsih, and Muawanah (2024) suggest that corporate governance, particularly board gender diversity (BGD), plays a crucial role in improving financial performance by enhancing strategic decisions, oversight, and risk management. Brahma, Nwafor, and Boateng (2021) found that boards with greater gender diversity tend to make better decisions, improving efficiency and innovation. In contrast, other studies have shown a negative or no significant effect of BGD on financial outcomes (Ali and Shah 2024). Moreover, a study by Mirović et al. (2024) indicates that gender diversity on boards might hinder financial performance in specific contexts due to more cautious decision-making. While prior research has explored financial ratios' relationships with bank performance, there is a lack of consensus in the findings. Studies such as Alabi, Olaoye, and Ojo (2022) suggest positive relationships between corporate governance and performance, while others, including Setiawati, Orbaningsih, and Muawanah (2024), have found inconsistent results. For example, while CIR and LDR have been linked to negative impacts on ROE (Mamun, Islam, and Sarker 2022), others, such as Yudistira and Ristati (2022), report positive effects.

Furthermore, the role of BGD as a moderating variable in these relationships remains under-explored. This study fills this gap by examining how BGD moderates the effects of CIR, LDR, and CAR on ROE, with a focus on the Indonesian banking sector. This inconsistency in the literature highlights a gap in understanding how BGD moderates the relationship between financial indicators (such as CIR, LDR, and CAR) and ROE. While some studies report a positive effect, as shown by Sarkar and Selarka (2021); Najaf et al. (2024), others show a negative or neutral impact, such as the study conducted by Kabir et al. (2023), particularly in the context of emerging economies like Indonesia. Despite the growing body of literature on financial performance indicators, there is limited research on how these indicators interact with corporate governance factors, specifically board gender diversity (BGD), in the context of Indonesian banks. While studies such as Olalere et al. (2020); Slimen et al. (2022); Chantha et al. (2024) have primarily focused on the financial ratios (CIR, LDR, CAR), they have largely neglected the role of governance factors like BGD. This oversight creates a significant research gap, especially in Indonesia's unique regulatory environment and evolving corporate governance landscape. This study resolves these inconsistencies by providing evidence on the moderating role of BGD in the relationship between financial ratios and bank performance in Indonesia's banking sector.

Therefore, this study is important as it clarifies the role of BGD as a standalone determinant and as a moderator that could influence how operational efficiency, liquidity management, and capital adequacy translate into financial performance within the Indonesian banking context. Addressing this research gap will contribute valuable insights into theory and practice by enhancing the understanding of how gender-diverse boards interact with financial indicators to affect return on equity (ROE). Moreover, the study can inform policymakers and banking institutions on effective governance strategies that support sustainable financial performance in emerging economies. The novelty of this study lies in its examination of BGD as a moderating variable in the relationship between financial indicators (CIR, LDR, CAR) and bank performance. Previous studies such as that conducted by Brahma, Nwafor, and Boateng (2021); Harymawan and Nismara (2022); Githaiga (2024) have not fully explored the impact of gender diversity on boards in moderating this relationship. By including BGD as the main moderator, it is new and worthy of further study. This study aims to contribute to the understanding of how internal banking performance indicators, namely the cost-to-income ratio (CIR), loan-to-deposit ratio (LDR), and capital adequacy ratio (CAR) affect profitability as measured by return on equity (ROE) while examining the moderating role of board gender diversity (BGD). By incorporating firm size (SIZE) and non-performing loans (NPL) as control variables. This research provides empirical insights into the strategic role of board diversity and financial management in enhancing bank performance. The study will inform policymakers and banking institutions on how governance factors and financial efficiency jointly influence shareholder value in the Indonesian banking sector.

## Literature review

*Agency theory*

When analyzing the dynamics between shareholders and company management, agency theory is indispensable, particularly in the financial sector (Resa, Mithi, and Kosgei 2022). This theory has been developed by Jensen and Meckling (1976). It emphasizes the agency link between shareholders (the principals) and managers (the agents). Shareholders in a banking company typically look to managers to maximize their return on equity (ROE) to measure the bank's profitability. Conflicts of interest or agency difficulties can arise when managers' goals do not coincide with those of the shareholders (Githaiga 2024). This study utilizes agency theory to elucidate the relationship between return on equity (ROE) and important financial metrics, including cost-to-income ratio (CIR), loan-to-deposit ratio (LDR), and capital-adequacy ratio (CAR). Managers at financial institutions may increase earnings by minimizing losses and increasing operational efficiency (Najaf et al. 2024). Nevertheless, these managers may make choices detrimental to the bank without sufficient supervision, such as elevating credit risk through an increase in the LDR or disregarding cost efficiency, as shown by a high CIR. There is a tight relationship between agency theory and gender diversity on corporate boards. There is a belief that a more diversified board can improve supervisory efficiency and decrease the chances of conflicts of interest in the bank's management. According to Kabir et al. (2023), a more diverse board with members of different genders improves an organization's accountability and transparency by adding new viewpoints to strategic decision-making. In this approach, gender diversity plays a crucial role in governance by resolving agency concerns and ensuring management prioritizes investor interests. By incorporating these concepts, agency theory provides a robust framework for comprehending the interconnections among the study's variables. This provides valuable insights into the internal dynamics that impact a bank's financial outcomes and highlights the need for strong corporate governance in reducing agency problems and improving profitability.

*Return on equity (ROE)*

ROE is a financial performance metric that indicates how effectively a company utilizes its shareholders' equity to generate net income (Ningsih et al. 2022). It is an essential measure of profitability, particularly in the banking sector, reflecting managerial efficiency and value creation for investors (Giannopoulos, Pilcher, and Salmon 2024). ROE is commonly used to evaluate the ability of banks to convert equity capital into profits over a given period

(Rakshit 2023). A higher ROE indicates better financial performance and efficient capital utilization, making it a key indicator in performance assessments and investment decisions (Lawati 2021).

*Cost to income ratio (CIR)*

CIR is a widely used measure of a bank's operational efficiency, calculated by dividing operating expenses by operating income (Abdulla and Ebrahim 2022). A lower CIR denotes higher efficiency, implying that a smaller portion of income is used to cover costs (Blatter and Fuster 2022). This ratio is critical in performance evaluation as it captures the bank's ability to manage operating costs relative to revenue generation (Lahouel, Taleb, and Kossai 2022). It also serves as a diagnostic tool in assessing internal productivity and the effectiveness of cost control mechanisms (Mamun, Islam, and Sarker 2022).

*Loan to deposit ratio (LDR)*

The loan deposit ratio (LDR) reflects the proportion of a bank's deposits lent out as loans (Rajindra et al. 2021). This ratio indicates a bank's liquidity and efficiency in channeling customer deposits into revenue-generating assets. A balanced LDR suggests optimal asset-liability management, while an excessively high or low LDR may signal either overexposure to credit risk or underutilization of available funds (Guzel 2021). Therefore, LDR plays a vital role in assessing banks' lending practices' risk and sustainability (Khatiwada et al. 2024).

*Capital adequacy ratio (CAR)*

Capital adequacy ratio (CAR) measures a bank's capital relative to its risk-weighted assets, reflecting its capacity to absorb financial shocks and maintain solvency (Snjawi and Essa 2021). A higher CAR indicates a strong capital position, regulatory compliance, and resilience against credit, market, and operational risks. It is a crucial measure for ensuring financial stability and is closely monitored by regulators to safeguard depositors and the banking system (Sebayang 2020).

*Board gender diversity (BGD)*

Board gender diversity (BGD) refers to the proportion of women serving on a company's board of directors (Carvajal, Nadeem, and Zaman 2022). It is increasingly recognized as a dimension of good corporate governance that may enhance board dynamics, decision-making quality, and organizational performance. The presence of diverse perspectives, including gender diversity, can improve the board's oversight capabilities, encourage more inclusive leadership practices, and reduce the likelihood of groupthink (Luh 2025). Board gender diversity can positively influence strategic decision-making and firm outcomes, particularly in contexts that demand ethical considerations, risk management, and long-term planning (Brahma, Nwafor, and Boateng 2021; Kabir et al. 2023).

*Hypothesis development*

According to agency theory, poor cost management (indicated by a high CIR) directly impacts ROE by reducing the efficiency of generating profits. High CIR can reflect inefficient managerial behavior, which ultimately lowers ROE. This is a conflict of interest between agents and principals, where managers do not maximize the welfare of capital owners. Previous research by Mamun, Islam, and Sarker (2022) supports this negative relationship between CIR and ROE. A high CIR suggests operational inefficiencies, which, in turn, reduce profitability. One important metric for operational efficiency is the Cost to Income Ratio (CIR), which compares a company's operating expenses to its overall revenue. Companies with lower CIR are better at controlling their spending (Kong et al. 2024). In contrast, ROE is a

measure of a company's profitability that reveals the efficiency with which it produces net income for its shareholders from the invested equity capital. In theory, there is a negative correlation between CIR and ROE. A lower ROE could be the result of a higher cost-in-revenue (CIR), which indicates that operational costs consume a larger portion of revenue (Mamun, Islam, and Sarker 2022). Companies with a lower CIR are more likely to have efficient operations management, which increases net income and positively affects return on equity (Feriandy 2024). As a result of ineffective management of operational expenses such as labor, technology, and infrastructure costs, shareholders may see a decrease in their available profits when the CIR is high in the banking (Panca and Sudrajad 2023). This correlation allows us to formulate the hypothesis in the following:
H1: CIR negatively affects ROE.

Agency theory posits that a high LDR can increase liquidity risks, leading to potential defaults and reduced profitability. LDR is closely related to ROE because it reflects how managers manage productive assets (credit). A high LDR can indicate agency problems, impacting ROE. Khatiwada et al. (2024) found that a higher LDR negatively impacts ROE due to increased risk exposure. Managers may push for higher LDRs without assessing risk, harming shareholders' returns. The LDR is an important indicator of a bank's liquidity since it shows how much money customers deposit is turned into loans compared to how much money the bank gets from other sources (Maulida, Nurodin, and Nugroho 2022). The efficiency with which a business turns its owners' equity into profit is shown by a crucial profitability statistic known as ROE (Lawati 2021). Since a high LDR boosts liquidity risks, the probability of non-performing loans, and the cost of borrowing for the bank, it can negatively influence ROE (Khatiwada et al. 2024). Banks have a higher chance of defaults, larger loss provisions, and lower net profits when they lend aggressively without properly evaluating loan quality. Higher interest expenses further reduce profitability when relying on external borrowing owing to constrained liquidity. Loan income might fall due to worsening economic conditions or higher interest rates, which would be bad for the bank's financial health and ROE (Mahesta 2023). This correlation allows us to postulate the following:
H2: LDR negatively affects ROE.

According to agency theory, a higher CAR indicates better financial stability and risk management, which can enhance profitability and increase ROE (Sebayang 2020). This aligns with findings from Dao and Nguyen (2020), who report that banks with more substantial capital buffers perform better financially. Banks with higher CAR can better manage financial risks, inspire trust among investors, help keep operations steady, and boost ROE (Sebayang 2020). Financial institutions with a higher CAR can better weather the storm of NPL, which could threaten their long-term viability and profitability. The ability to offer loans with lower risk or create new financial products to increase income are two examples of strategic expansion initiatives that banks can undertake with a strong capital foundation (Yudistira and Ristati 2022). Customers, investors, and regulators all see these banks more positively, boosting their operational efficiency, capital availability, and reliability (Dao and Nguyen 2020). A higher CAR makes banks less vulnerable to insolvency concerns, meaning they can borrow money at better interest rates and consistently grow their profits. A solid capital base does double duty: it protects banks against economic storms and lays the groundwork for steady profits and increased shareholder returns (Charisma, Bramasto, and Nisa 2022). This correlation allows us to formulate the hypothesis in the following:
H3: CAR positively affects ROE.

Agency theory suggests that gender-diverse boards reduce agency problems by improving governance practices. BGD enhances decision-making, risk management, and financial outcomes (Ali and Shah 2024). A more balanced board provides diverse perspectives, leading to better strategic decisions that improve ROE. Better decision-making,

creativity, and management are all outcomes of a gender-diverse board of directors (Harymawan and Nismara 2022). Having women on boards can enhance corporate governance, managerial oversight, and risk analysis by bringing new viewpoints (Najaf et al. 2024). Companies get a better sense of market trends and stakeholder concerns when there is a more balanced representation of genders, which leads to improved financial performance (Sarkar and Selarka 2021). Several studies have found that companies with diverse boards are better able to comply with regulations, handle risks with more care, and refrain from making hasty decisions that could hurt their finances (Peng, Qi, and Wang 2022; Nurhalisa and Hernawati 2023). Gender diversity boosts profits by strengthening ties with consumers and investors, which is especially important in the modern business environment where sustainability and inclusiveness are highly prized (Wu, Furuoka, and Lau 2022). For example, a rise in stock value and confidence from investors is a common outcome for companies that actively work to eliminate gender bias in leadership positions. An increasingly profitable and equity-rich company can be the long-term outcome of a gender-diverse board's efforts to enhance corporate strategy and operations (Maxfield and Wang 2024). This correlation allows us to formulate the hypothesis in the following:
H4: BGD positively affects ROE.

Gender diversity on board directors can significantly enhance cost control and operational efficiency, mainly when evaluated through the CIR. CIR, as a measure of the proportion of a bank's operating expenses to its income, is a critical indicator of efficiency where a higher ratio indicates poorer performance and lower profitability. In this context, BGD plays a moderating role by contributing to more comprehensive oversight of cost-related decisions. Diverse boards, particularly those with female representation, tend to demonstrate greater diligence, ethical sensitivity, and a long-term strategic orientation, collectively leading to improved scrutiny of operational expenditures. Githaiga (2024) emphasizes that gender-diverse boards can identify inefficiencies and initiate cost-saving measures without undermining the quality of services or growth initiatives. This moderating effect can be understood through agency theory, which addresses conflicts of interest between shareholders (principals) and management (agents) that can lead to inefficiencies such as high operational costs. Agency theory posits that stronger board oversight reduces such agency problems. A more gender-diverse board enhances this oversight by bringing diverse perspectives, increasing accountability, and promoting transparency, collectively reducing agency costs related to operational inefficiencies (Kabir et al. 2023; Githaiga 2024). Consequently, BGD strengthens the governance mechanisms that ensure managers control costs effectively, thereby mitigating the negative impact of a high CIR on ROE.
H5: BGD strengthens the relationship between CIR and ROE.

In the context of the LDR, BGD plays a vital moderating role by enhancing the board's oversight capacity, particularly in credit policy formulation and liquidity risk management, which are central to sustainable banking performance (Ali and Shah 2024). A gender-diverse board brings a broader range of perspectives, ethical considerations, and decision-making styles, often promoting more cautious, inclusive, and well-balanced lending strategies. This diversity in thinking and governance style helps mitigate overly aggressive credit expansion, which, if left unchecked, may increase the bank's exposure to liquidity risks and default probabilities. Boards with greater gender diversity are better positioned to weigh the trade-offs between growth-oriented lending and prudent liquidity control, ensuring that credit allocation decisions do not compromise the bank's ability to meet short-term obligations or regulatory capital requirements (Maxfield and Wang 2024). Consequently, the presence of women in boardrooms contributes to stronger checks and balances in financial decision-making, thereby reducing the adverse effect of high LDR on ROE by fostering more sustainable and risk-aware lending policies that ultimately support long-term profitability.

This moderating effect is grounded in agency theory, which explains the conflicts of interest between shareholders (principals) and managers (agents) that may lead to excessive risk-taking and inefficient liquidity management. Managers may pursue aggressive loan growth to boost short-term performance, potentially jeopardizing the bank's liquidity and shareholders' wealth. Gender-diverse boards, by enhancing oversight and introducing diverse perspectives, reduce agency problems by enforcing prudent credit policies and cautious liquidity risk management (Kabir et al. 2023; Ali and Shah 2024). This improved governance aligns managerial actions with shareholder interests.

H6: BGD strengthens the relationship between LDR and ROE.

Regarding the CAR, BGD can potentially strengthen the effectiveness of capital utilization by fostering more strategic, balanced, and inclusive decision-making processes, reducing cognitive and behavioral biases in risk-related deliberations, and enhancing overall risk governance within the boardroom. Gender-diverse boards, through their broader perspectives and diverse leadership styles, may encourage more disciplined capital allocation strategies that not only ensure regulatory compliance but also support the bank's financial resilience in volatile environments. Although some empirical studies, such as those by Orazalin and Baydauletov (2020), suggest that BGD may not have a statistically significant moderating effect on the direct relationship between CAR and ROE, it is important to acknowledge the qualitative contributions of diversity in strengthening oversight functions, promoting transparency, and reinforcing accountability in capital structure management. While not always immediately reflected in performance metrics, these governance improvements can play a vital long-term role in supporting sustainable profitability and maintaining investor confidence in the banking sector, particularly as regulatory frameworks and stakeholder expectations become increasingly complex and demanding. From the agency theory perspective, CAR represents a critical buffer that protects banks against insolvency risks arising from agency problems between shareholders and management. Effective capital adequacy mitigates the potential for excessive risk-taking by managers who may prioritize short-term gains over the bank's long-term stability. While CAR is heavily influenced by external regulatory requirements that limit managerial discretion, BGD contributes by enhancing governance mechanisms that ensure compliance, transparency, and prudent capital management (Orazalin and Baydauletov 2020; Kabir et al. 2023). Thus, although the moderating impact of BGD on the CAR-ROE relationship may be statistically limited, its role in reinforcing the principles of agency theory through improved oversight and accountability remains essential for sustaining financial performance in the long run.

H7: BGD strengthens the relationship between CAR and ROE.

The following framework (Figure 1) illustrates the relationship between financial indicators (CIR, LDR, CAR), BGD, and ROE, as well as the proposed moderating effects of BGD.

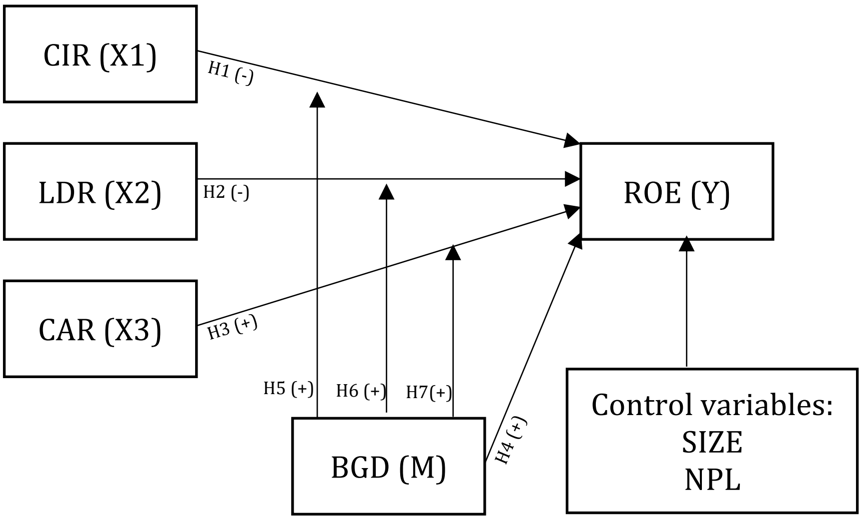


Figure 1 research framework

**Method**

This study uses a quantitative approach with secondary data. One of the most important parts of the financial system is the banking sector, which acts as a go-between for people who have extra money and others who need it. This study looked at 47 banks listed on the Indonesia Stock Exchange (IDX) over three years, from 2021 to 2023, for 141 observations per firm year. The study used a census sampling strategy, meaning every single bank in the country was considered. Every bank listed on the IDX throughout the observation period was included in the study, as no special criteria were utilized to choose them. This study investigates key variables categorized into independent, dependent, moderating, and control variables. The dependent variable is ROE, which measures bank profitability. The independent variables include CIR, LDR, and CAR, each representing internal financial performance indicators. BGD serves as the moderating variable, aiming to evaluate its influence on the relationship between financial indicators and profitability. Meanwhile, SIZE and NPL are control variables accounting for external factors affecting ROE. Table 1 displays the variables that were examined in the study.

Table 1 research variables

| Variables | Formulas | Source | Scale |
|---|---|---|---|
| Return on equity (ROE) | ROE = Net profit after taxes / total shareholder equity | Lawati (2021) | Ratio |
| Cost to income ratio (CIR) | CIR = Operating expenses / operating revenue | Kong et al. (2024) | Ratio |
| Loan to deposit ratio (LDR) | LDR = Total loans / total deposits | Mahesta (2023) | Ratio |
| Capital adequacy ratio (CAR) | CAR = (Tier 1 capital + tier 2 capital) / (risk weighted assets) | Dao and Nguyen (2020) | Ratio |
| Board gender diversity (BGD) | BGD = (Number of women on board / total number of board members) x 100 | Brahma, Nwafor, and Boateng (2021) | Ratio |

| Variables | Formulas | Source | Scale |
|---|---|---|---|
| Firm size (SIZE) | SIZE= Ln (total assets) | Yudistira and Ristati (2022) | Ratio |
| Non-performing loan (NPL) | NPL = Non-performing loans / total loans | Sebayang (2020) | Ratio |

The panel data regression analysis is used in this work to combine time-series data from 2021–2023 with cross-sectional data from 47 banks. The common effect, fixed effect, and random effect are considered in each of the three models. Three tests, the Chow, Hausman, and Lagrange multiplier tests, will be executed using the EViews software to assess these models. Here is the main outline of the model:

$$ROE_{it}=\beta_{0it} + \beta_1 CIR_{it} + \beta_2 LDR_{it} + \beta_3 CAR_{it} + \beta_4 BGD_{it} + \beta_5 CIR*BGD_{it} + \beta_6 LDR*BGD_{it} + \beta_7 CAR*BGD_{it} + \beta_8 SIZE_{it} + \beta_9 NPL_{it} + \varepsilon_{it}$$

## Results and discussion

This part thoroughly presents the study findings using an analytical technique that is suitable and pertinent to the research aims. The presentation is conducted methodically to test the hypotheses that have been previously made and to examine the link between the study's main factors. This leads to a better and more quantifiable understanding of the phenomena that have been examined.

Table 2 descriptive statistics

| Variables | Mean | Maximum | Minimum | Std. dev. |
|---|---|---|---|---|
| ROE | 2.581 | 27.310 | -95.440 | 18.816 |
| CIR | 95.581 | 428.400 | 34.130 | 51.390 |
| LDR | 92.798 | 527.910 | 0.000 | 59.636 |
| CAR | 44.557 | 390.500 | 10.780 | 48.327 |
| BGD | 15.756 | 50.000 | 0.000 | 13.438 |
| SIZE | 31.474 | 35.315 | 28.407 | 1.680 |
| NPL | 2.979 | 14.090 | 0.000 | 2.344 |

Source: secondary data (processed, 2025)

Table 2 shows the descriptive statistics of the study variables, which stand for differences in bank features and financial performance. Banks with high profitability and those with significant losses are both shown by the data, which reveal an average ROE of 2.581 percent with a range of 27.31 percent to -95.44 percent. Banks with extremely low operational efficiency are indicated by CIR's extremely high maximum value of 428.400% and an average of 95.581%. A bank that relies heavily on outside funding may have an LDR as high as 92.798%, with a wide range of 0.000% to 527.910%. Banks' capital adequacy varies greatly, with a standard deviation of 48.327 and an average of 44.557%. On average, 15.756% of women are on BGD's board of directors, which is low compared to other companies. The size of banks is typically uniform, as indicated by the SIZE average of 31.474 and standard deviation of 1.680. Meanwhile, NPL ranges from 2.979% on average to 14.090% at the highest, showing that the institution's credit quality differs.

Table 3 Chow test result

| Effects test | Statistic | d.f | Prob. |
|---|---|---|---|
| Cross-section F | 4.329 | (46,90) | 0.000 |
| Cross-section Chi-square | 164.562 | 46 | 0.000 |

Source: secondary data (processed, 2025)

Table 3 shows that the results of the Chow test produce that the fixed effect model (FEM) was the better choice, with a Chi-square value of 164.562 and a p-value of 0.000.

Table 4 Hausman test result

| Test summary | Chi-sq. statistic | Chi-sq. d.f | Prob. |
|---|---|---|---|
| Cross-section random | 15.507 | 4 | 0.003 |

Source: secondary data (processed, 2025)

Table 4 shows that the fixed effect model (FEM) is better than the random effect model (REM) according to the Hausman test results; the Chi-square value is 15.507, and the p-value is 0.0038. According to the results of the Chow and Hausman tests, the FEM is the best model to use. Hence, finding the best model does not necessitate a Lagrange multiplier test.

The test for robustness addresses the issue of outliers and anomalous data by employing the robust regression method. This approach provides estimates less sensitive to outliers and is particularly useful when data transformations are insufficient to correct irregularities (Amado 2025). As shown in Table 5, the robustness test yields a high Adjusted R-squared value, indicating that the model maintains strong explanatory power even after controlling for potential outlier effects. This result confirms that robust regression effectively mitigates the influence of outliers without compromising the model's overall predictive quality.

Table 5 robustness test results

| Variables | Coefficient | Std. error | t-statistic | p-value |
|---|---|---|---|---|
| CIR | -0.472 | 0.023 | -20.469 | 0.000 |
| LDR | -0.159 | 0.041 | -3.886 | 0.000 |
| CAR | 0.071 | 0.042 | 1.688 | 0.094 |
| BGD | -1.001 | 0.162 | -6.198 | 0.000 |
| CIR*BGD | 0.008 | 0.001 | 6.582 | 0.000 |
| LDR*BGD | 0.004 | 0.002 | 2.110 | 0.037 |
| CAR*BGD | 0.003 | 0.002 | 1.103 | 0.272 |
| SIZE | 0.215 | 0.089 | 2.416 | 0.017 |
| NPL | -0.362 | 0.331 | -1.092 | 0.277 |
| Observation | | | | 141 |
| Adj. R-Square | | | | 0.796 |

Source: secondary data (processed, 2025)

Table 6 shows that ROE is significantly and negatively affected by CIR (coefficient = -0.459, t = -21.786 < 1.96, p = 0.000 < 0.05) and LDR (coefficient = -0.170, t = -4.587 < 1.96, p = 0.000 < 0.05), while it is positively affected by CAR (coefficient = 0.128, t = 3.210 > 1.96, p = 0.002 < 0.05). Hypotheses H1, H2, and H3 are accepted. BGD negatively affects ROE (coefficient = -1.058, t = -7.189 < 1.96, p = 0.000 < 0.05). Hypothesis H4 is rejected. Furthermore, the interactions between CIR*BGD (coefficient = 0.008, t = 7.303 > 1.96, p = 0.000 < 0.05) and LDR*BGD (coefficient = 0.004, t = 2.802 > 1.96, p = 0.006 < 0.05) show strengthening the relationship between variables. Hypothesis H5 and H6 are accepted.

However, the interaction between CAR*BGD is not statistically significant (coefficient = 0.002, t = 0.758 < 1.96, p = 0.450 > 0.05), indicating that BGD cannot moderate the relationship between CAR and ROE. Hypothesis H7 is rejected. The SIZE is positively significant (coefficient = 2.526, t = 5.376 > 1.96, p = 0.000 < 0.05), whereas NPL does not show a significant effect (coefficient = -0.143, t = -0.472 < 1.96, p = 0.638 > 0.05). The regression model explains 83.2% of the variation in ROE, as indicated by the adjusted R-square of 0.832, suggesting a robust and reliable model. The remaining 16.8% of the variation may be due to external or unobserved factors not accounted for in the analysis.

Table 6 hypothesis test results

| Variables | Coefficient | Std. Error | t-statistic | p-value |
|---|---|---|---|---|
| CIR | -0.459 | 0.021 | -21.786 | 0.000 |
| LDR | -0.170 | 0.037 | -4.587 | 0.000 |
| CAR | 0.128 | 0.040 | 3.210 | 0.002 |
| BGD | -1.058 | 0.147 | -7.189 | 0.000 |
| CIR*BGD | 0.008 | 0.001 | 7.303 | 0.000 |
| LDR*BGD | 0.004 | 0.002 | 2.802 | 0.006 |
| CAR*BGD | 0.002 | 0.002 | 0.758 | 0.450 |
| SIZE | 2.526 | 0.470 | 5.376 | 0.000 |
| NPL | -0.143 | 0.303 | -0.472 | 0.638 |
| Observation | | | | 141 |
| Adj. R-Square | | | | 0.832 |

Source: secondary data (processed, 2025)

*Cost to income ratio (CIR) and return on equity (ROE)*

The findings reveal that CIR negatively affects ROE. Specifically, as CIR increases, indicating higher operating expenses relative to income, the financial performance of banks, measured by ROE, declines significantly. This result implies that banks with less efficient cost management tend to generate lower shareholder returns (Karki et al. 2023). This finding supports the agency theory framework, which posits that operational inefficiencies often arise from agency problems where managers prioritize short-term operational targets or personal benefits over long-term shareholder wealth maximization. Ineffective oversight can allow managers to incur unnecessary costs, leading to an elevated CIR that erodes profitability. Our findings align with prior empirical studies by Panca and Sudrajad (2023); Kong et al. (2024), which also reported a negative association between CIR and bank profitability. Similarly, Mamun, Islam, and Sarker (2022) documented that operational inefficiencies reflected in a high CIR negatively impact the financial outcomes of banking institutions.

However, some contrasting studies suggest that under certain circumstances, increased operating expenses may correspond with investments in technology or personnel that could enhance future performance (Slimen et al. 2022; Florid and Purnamasari 2023). These studies argue that an initially higher CIR may not always signal inefficiency but could reflect strategic spending aimed at long-term growth, which may temporarily suppress profitability measures like ROE. The negative effect of CIR on ROE is primarily due to persistent inefficiencies in operational cost control within the Indonesian banking sector. The managerial focus on short-term cost minimization without adequate strategic investment likely undermines sustainable profitability. This situation is further exacerbated by the agency problem, where the separation of ownership and control leads to misaligned incentives between shareholders and managers (Resa, Mithi, and Kosgei 2022). Regulatory oversight and corporate governance mechanisms may not fully mitigate these agency costs, allowing inefficient cost behaviors to persist (Setiawati, Orbaningsih, and Muawanah 2024). The implications of this finding are critical for banking management and regulators. Banks must strengthen internal controls and governance structures to reduce unnecessary costs and improve operational efficiency. Encouraging transparent cost management and aligning managerial incentives with long-term shareholder value can help lower CIR and enhance ROE. Regulators might consider introducing policies incentivizing cost-efficiency without compromising service quality or innovation. The significant negative relationship between CIR and ROE highlights the need for Indonesian banks to prioritize efficient operational management to improve profitability. This reinforces agency theory's emphasis on controlling managerial discretion to protect shareholder interests and supports findings from multiple empirical studies (Mamun, Islam, and Sarker 2022; Kong et al. 2024).

*Loan to deposit ratio (LDR) and return on equity (ROE)*

The findings reveal that LDR negatively affects ROE. A high LDR reflects an aggressive lending strategy, where a larger portion of deposits is converted into loans. While this may initially seem favorable for revenue generation, it also increases the bank's liquidity risk and the likelihood of loan defaults, ultimately eroding profitability. This finding indicates that banks with higher LDR experience lower ROE, signaling diminished financial performance (Regmi et al. 2024). This outcome aligns with prior empirical studies by Florid and Purnamasari (2023); Khatiwada et al. (2024), who similarly highlight the risks associated with excessive lending without adequate liquidity and credit risk management. Sathyamoorthi et al. (2019) also emphasize that elevated LDR raises liquidity risk, potentially increasing interest expenses and default probabilities, negatively affecting profitability. Agency theory offers a useful lens for interpreting these findings, suggesting that managers (agents) may prioritize rapid loan growth to enhance short-term financial indicators or personal incentives, often neglecting the long-term liquidity stability of shareholders (principals). This misalignment leads to agency problems, such as higher risk exposure and lower ROE.

However, some contrasting studies present a more nuanced view. For instance, Maulida, Nurodin, and Nugroho (2022); Yudistira and Ristati (2022) suggest that an optimal level of LDR may positively contribute to profitability by efficiently deploying deposits into productive loans, provided that risk controls are adequate. These findings indicate that the relationship between LDR and ROE is not strictly linear and may depend on the quality of credit risk management and the regulatory environment. The negative effect of high LDR on ROE in Indonesian banks is primarily due to insufficient risk mitigation and liquidity management practices, which amplify agency costs. The regulatory framework in Indonesia, while progressively strengthening, still allows room for managerial discretion that may not always align with shareholder interests. This reality is compounded by market pressures to rapidly grow loan portfolios, potentially at prudent liquidity buffers' expense (Setiawati, Orbaningsih, and Muawanah 2024). The implications of these findings underscore the necessity for banks to balance growth ambitions with robust risk management. Regulators should enforce stringent liquidity requirements and promote governance practices that align managerial incentives with sustainable profitability. The significant negative impact of LDR on ROE highlights the importance of adequate liquidity and credit risk management within the Indonesian banking sector. This result reinforces the agency theory perspective on managerial risk-taking behavior and emphasizes the need for enhanced oversight and alignment of interests to safeguard shareholder value.

*Capital adequacy ratio (CAR) and return on equity (ROE)*

The findings reveal that CAR positively affects ROE. Banks with higher CAR tend to achieve better financial performance. This suggests that a strong capital base is a crucial buffer against financial risks and economic shocks, enhancing the bank's ability to generate shareholder returns (Slimen et al. 2022). This finding is consistent with agency theory, which explains that managers with access to solid capital resources are better positioned to make strategic decisions aligned with shareholder interests, focusing on long-term stability and profitability rather than short-term gains (Azura et al. 2023). A well-capitalized bank can offer loans with lower credit risk and diversify into new financial products, supporting sustainable profit growth. This positive influence of CAR on ROE aligns with prior empirical studies such as Sebayang (2020); Yudistira and Ristati (2022), who observed that banks with higher CARs exhibit stronger financial outcomes, including improved ROE.

Moreover, CAR is an important signaling mechanism to investors and regulators, indicating the bank's capacity to withstand economic downturns and maintain operational stability (Dao and Nguyen 2020). This perception can lower the cost of capital and increase investor confidence, further boosting profitability. However, it is important to note some studies that have reported mixed or non-significant relationships between CAR and profitability in specific contexts, particularly in highly regulated environments where capital levels may be mandated and less flexible (Olalere et al. 2020; Slimen et al. 2022). These findings suggest that additional capital may not significantly enhance profitability beyond a certain regulatory threshold. In the Indonesian banking context, the positive effect of CAR on ROE can be attributed to ongoing regulatory improvements and a competitive banking environment that rewards prudent capital management. Banks with higher CAR can better absorb shocks from non-performing loans and economic volatility, reducing agency costs related to risk-taking behaviors by management (Setiawati, Orbaningsih, and Muawanah 2024). This reflects a reality where capital adequacy is a key component of sound governance and risk management, ultimately supporting sustainable shareholder value (Bhattarai 2021). This finding underscores the importance of bank management maintaining robust capital buffers to comply with regulatory requirements, enable strategic flexibility, and enhance profitability. Regulators should continue to enforce and monitor capital adequacy standards while encouraging banks to optimize capital usage to maximize returns without compromising stability. The positive relationship between CAR and ROE affirms agency theory's perspective on the role of capital in aligning managerial actions with shareholder interests, supporting findings across multiple empirical studies and highlighting the critical role of capital adequacy in banking sector performance.

*Board gender diversity (BGD) and return on equity (ROE)*

The findings reveal that BGD negatively affects ROE. This indicates that greater gender diversity on the board is associated with lower short-term profitability in the Indonesian banking sector. This suggests that gender-diverse boards may adopt more cautious and risk-averse decision-making styles, reducing the bank's willingness to pursue high-risk, high-return strategic initiatives (Yuliana and Kholilah 2019). While potentially beneficial for long-term stability, such conservatism may hinder immediate profitability by avoiding lucrative but riskier opportunities (Sarkar and Selarka 2021). This finding is consistent with prior research by Alabi, Olaoye, and Ojo (2022); Wu, Furuoka, and Lau (2022), who observe that increased gender diversity can lead to more conservative governance approaches that may constrain short-term financial gains. Similarly, Harymawan and Nismara (2022); Mirović et al. (2024) argue that the advantages of gender diversity are sometimes muted when female board members have limited influence in key strategic decisions. Nurhalisa and Hernawati (2023) further support this view, noting that board gender diversity may unexpectedly depress short-term profitability due to heightened risk aversion. Conversely, other studies highlight the positive effects of BGD on firm performance, emphasizing improvements in corporate governance, innovation, and stakeholder relations (Brahma, Nwafor, and Boateng 2021; Sarkar and Selarka 2021). These contradictory results suggest that the impact of BGD on profitability is context-dependent, varying by industry, country, and governance culture.

From the agency theory perspective, this negative relationship may reflect the complex dynamics of principal-agent interactions. While diverse boards theoretically reduce agency costs by improving oversight and aligning managerial actions with shareholder interests, the heightened risk sensitivity introduced by gender diversity could lead to overly cautious management, which may limit value-maximizing risk-taking. In the Indonesian banking context, where regulatory pressures and market conditions are evolving, this cautiousness might be more pronounced, affecting short-term ROE negatively. Furthermore, cultural factors and board power structures may limit female directors' influence, reducing the potential positive effects of gender diversity on strategic risk-taking (Kabir et al. 2023; Maxfield and Wang 2024). The implications of these findings suggest that simply increasing the proportion of women on boards is insufficient to enhance profitability; it is equally important to empower female directors to participate meaningfully in strategic decisions. Banks and regulators should create inclusive board environments that leverage diverse perspectives without compromising balanced risk-taking (Tania and Hesniati 2022). Over time, this could reconcile short-term profitability pressures with long-term sustainable governance. While BGD generally improves governance quality, its negative association with short-term ROE in this study highlights the need for a nuanced understanding of gender diversity's effects, integrating agency theory with the socio-cultural and regulatory realities of emerging markets like Indonesia.

*Moderating role of board gender diversity (BGD) on cost to income ratio (CIR) and return on equity (ROE)*

The findings reveal that BGD strengthens the relationship between CIR and ROE, strengthening the negative impact of CIR on ROE. This suggests that banks with more gender-diverse boards tend to exercise more vigilant oversight over operational costs, amplifying the effect of cost efficiency on profitability (Atif, Liu, and Huang 2019). Gender-diverse boards bring a broader spectrum of experiences, values, and risk perceptions into decision-making, enabling them to identify inefficiencies, question established practices, and advocate for innovative cost-saving strategies that management might overlook. Consequently, these boards foster a culture of accountability and transparency, leading to more sustainable and performance-oriented budgeting (Brahma, Nwafor, and Boateng 2021; Alabi, Olaoye, and Ojo 2022). This finding aligns with agency theory, highlighting the importance of effective monitoring to align managerial behavior with shareholders' interests. Agency problems arise when managers, acting as agents, may not optimally control costs, potentially reducing shareholder value (Dwaikat, Qubbaj, and Queiri 2021). Gender diversity enhances the board's monitoring capacity, mitigating agency costs related to inefficient operational expenditure. This interpretation is supported by Githaiga (2024), who underscores that diversity in board composition improves oversight functions, particularly in managing costs and enhancing financial performance.

Previous empirical research supports these findings. For example, Brahma, Nwafor, and Boateng (2021); Kabir et al. (2023) demonstrate that gender-diverse boards are linked to better governance practices and improved cost control, positively affecting firm profitability. Similarly, Alabi, Olaoye, and Ojo (2022) find that boards with greater female representation tend to adopt rigorous cost management policies that safeguard firm performance. Contrasting evidence exists, however. Some studies, such as Ali and Shah (2024), suggest that gender diversity may neutralize or weaken board effectiveness under certain cultural or organizational conditions, where female directors may lack sufficient influence or experience to impact cost management decisively. Moreover, diversity initiatives may initially increase decision-making complexity in some contexts, potentially delaying cost control measures (Mirović et al. 2024). The results in the Indonesian banking context reflect a reality where gender-diverse boards effectively strengthen cost oversight, reducing inefficiencies that negatively impact ROE. This relates to evolving governance standards and increasing recognition of women's value in boardrooms, fostering more robust managerial accountability. The implications of this finding are significant for banking management and regulators. Enhancing board gender diversity promotes inclusivity and tangibly improves operational efficiency and shareholder returns by strengthening governance oversight. Banks should, therefore, actively promote diversity policies and empower female directors to participate fully in financial oversight. Regulators could incentivize gender diversity as part of broader efforts to improve banking sector transparency and efficiency (Yuliana and Kholilah 2019). The moderating role of BGD on the CIR–ROE relationship highlights how diversity enhances the board's capacity to control costs and align management actions with shareholder interests, reinforcing core agency theory principles and contributing to improved financial performance.

*Moderating role of board gender diversity (BGD) on loan to deposit ratio (LDR) and return on equity (ROE)*

The findings reveal that BGD strengthens the relationship between LDR and ROE, mitigating the negative impact of a high LDR on bank profitability. Specifically, gender-diverse boards are associated with more cautious and balanced decision-making, which proves especially valuable when banks face pressure to aggressively increase loan disbursements to meet growth targets (Atif, Liu, and Huang 2019). High LDR values, reflecting an aggressive lending stance relative to available deposits, elevate liquidity risks that can threaten the bank's long-term profitability if inadequately managed. The presence of women on boards tends to enhance oversight by scrutinizing such risk-prone strategies and advocating for prudent credit policies aligned with liquidity management and regulatory compliance (Dwaikat, Qubbaj, and Queiri 2021). This strengthened governance helps ensure that credit expansion does not jeopardize the bank's financial health, supporting more sustainable ROE outcomes. This finding aligns with prior research by Ali and Shah (2024), who report that boards with greater gender diversity exhibit superior monitoring of risk-taking behaviors and foster sound credit governance. Similarly, Maxfield and Wang (2024) highlight that gender-diverse boards provide critical checks and balances that mitigate managerial tendencies to prioritize short-term loan growth at the expense of sustainable financial performance. Such evidence supports the positive moderating role of BGD in enhancing the quality of lending decisions, which in turn protects and potentially improves shareholder returns over time. However, some studies have reported mixed results regarding the influence of BGD on lending risk and financial performance. For example, Kabir et al. (2023) found contexts where gender diversity did not significantly moderate risk-taking behaviors, attributing this to the limited empowerment of female directors or prevailing cultural dynamics that constrain their influence. These conflicting findings underscore the importance of contextual factors such as board dynamics, regulatory environment, and market maturity in shaping the effectiveness of gender diversity on boards.

The observed moderating effect can be explained through agency theory, which describes the conflicts of interest between shareholders (principals) and managers (agents). Managers may pursue aggressive lending to boost short-term performance or personal gains, increasing liquidity risks detrimental to shareholders. Gender-diverse boards, by bringing broader perspectives and heightened vigilance, reduce agency costs by enforcing more prudent risk management and credit policies (Tania and Hesniati 2022). In the Indonesian banking context, where regulatory reforms and governance standards continue to evolve, BGD contributes meaningfully to aligning managerial decisions with long-term shareholder value by strengthening liquidity risk oversight. The implications of this research emphasize the value of promoting gender diversity within bank boards as a mechanism to enhance governance and risk management capabilities. Banks should empower female directors and foster inclusive decision-making environments to maximize the benefits of diversity. Furthermore, regulators should consider policies incentivizing gender diversity as part of comprehensive efforts to strengthen the financial sector's stability and performance. The moderating role of BGD on the LDR–ROE relationship illustrates how gender diversity enhances board effectiveness in mitigating liquidity risks from aggressive lending, thereby supporting sustainable bank profitability by agency theory.

*Moderating role of board gender diversity (BGD) on capital adequacy ratio (CAR) and return on equity (ROE)*

The findings reveal that BGD cannot moderate the relationship between CAR and ROE. This suggests that the impact of CAR on bank profitability is primarily governed by structural and regulatory factors rather than the composition or characteristics of the board of directors (Azura et al. 2023). CAR is a regulatory measure reflecting a bank's capital relative to its risk-weighted assets; it is primarily determined by standardized prudential frameworks and regulatory mandates, limiting managerial discretion and, by extension, the influence of board governance, including gender diversity on its effectiveness (Bhattarai 2021). This finding aligns with prior research by Orazalin and Baydauletov (2020), who argue that capital adequacy stabilizes and regulates banking performance that operates independently of board composition. Similarly, Olalere et al. (2020); Slimen et al. (2022) highlight that while governance factors impact many aspects of bank management, capital adequacy ratios are predominantly influenced by external regulatory requirements rather than internal governance dynamics. From the agency theory perspective, while board diversity generally enhances oversight and aligns managerial actions with shareholder interests, the standardized and mandatory nature of capital adequacy regulation means that managerial discretion related to CAR is limited. Thus, the moderating potential of BGD on the CAR-ROE relationship is constrained because decisions regarding capital buffers and risk-weighted assets are more technical and regulatory-driven than subject to strategic boardroom debate (Olalere et al. 2020).

However, BGD may contribute indirectly by strengthening broader governance practices, improving transparency, and reinforcing accountability in capital management, even if such contributions do not translate into a measurable moderation effect on CAR's direct influence on profitability. The lack of a statistically significant moderating effect does not negate the qualitative value of gender-diverse boards in promoting prudent financial policies and risk governance in a highly regulated environment (Slimen et al. 2022). This finding indicates that regulators and bank management should recognize the distinct roles that regulation and governance play in shaping bank performance (Dwaikat, Qubbaj, and Queiri 2021). While fostering board diversity remains critical for overall governance quality, capital adequacy is best managed through robust regulatory frameworks complemented by adequate but standardized internal controls (Orazalin and Baydauletov 2020). The implication is that initiatives to improve bank profitability through governance should consider board diversity's limited role in influencing capital adequacy directly but emphasize its importance in other areas of strategic decision-making and risk oversight. The inability of BGD to moderate the CAR–ROE relationship highlights the dominance of regulatory constraints over discretionary governance in capital management, reinforcing agency theory's insight that regulatory environments shape the scope of managerial and board influence on key financial metrics.

*Firm size (SIZE) and return on equity (ROE)*

Although firm size (SIZE) was not included as a primary hypothesis in this study, the analysis reveals that SIZE significantly and positively affects Return on Equity (ROE). This indicates that larger banks tend to be more profitable than smaller ones. As a control variable, SIZE helps account for structural differences among banks that could influence profitability independently of the leading financial indicators examined. The contribution of SIZE to ROE can be explained by the strategic advantages that larger banks possess, such as economies of scale that reduce operational costs, greater product diversification that spreads risk, and a more substantial market presence that supports competitive positioning. Larger banks also have improved access to capital markets and often implement more sophisticated governance and risk management practices, which enhance overall performance (Maulida, Nurodin, and Nugroho 2022; Yudistira and Ristati 2022).

This finding is consistent with the work of Yudistira and Ristati (2022), who similarly found a positive relationship between bank size and profitability. From the agency theory perspective, larger organizations typically have better-developed internal controls and monitoring mechanisms, which help align managerial decisions with shareholder interests and reduce agency costs (Azura et al. 2023). Including SIZE as a control variable in this study strengthens the validity of the main findings by isolating the effects of the primary independent variables (CIR, LDR, CAR) and the moderating variable (BGD) on ROE. It ensures that the observed relationships are not confounded by differences in bank size, which could otherwise bias the results. The significant positive effect of SIZE as a control variable underscores its importance in explaining variations in bank profitability. It contributes to a more comprehensive understanding of the determinants of ROE in the Indonesian banking sector.

*Non-performing loan (NPL) and return on equity (ROE)*

Although NPL was not included as a primary hypothesis in this study, the analysis indicates that NPL does not directly affect ROE significantly. This suggests that, within the sample of Indonesian banks, the adverse impact of credit risk as measured by NPL on profitability is effectively managed and does not immediately deteriorate bank returns. This result aligns with agency theory, which posits that when bank management actively mitigates risks through prudent loan loss provisions and efficient credit management practices, the negative consequences of NPLs on profitability can be controlled (Azura et al. 2023). Specifically, banks typically set aside provisions to absorb potential losses from non-performing loans, thereby cushioning their financial performance against credit shocks (Florid and Purnamasari 2023). This proactive risk management ensures profitability, as measured by ROE, remains stable despite fluctuations in NPL levels.

Moreover, banks that have historically experienced high NPL ratios often develop more robust risk management frameworks, restructure problematic loans, and enhance loan monitoring and collection processes. Such strategies help minimize the long-term adverse effects of NPLs on profitability (Sebayang 2020; Charisma, Bramasto, and Nisa 2022). By controlling for NPL in the regression model, this study accounts for variations in credit risk exposure across banks, thus isolating the effects of other independent variables and the moderating role of BGD on financial performance. Including NPL as a control variable strengthens the reliability of the study's findings by adjusting for credit risk heterogeneity, which is a critical determinant of bank profitability. It ensures that the observed relationships between CIR, LDR, CAR, BGD, and ROE are not confounded by differences in loan quality and credit risk management among banks. While NPL does not directly influence ROE in this context, its role as a control variable is vital for capturing the effect of credit risk and enhancing the robustness of the empirical analysis on bank profitability in Indonesia.

## Conclusions

This study provides several important insights into the factors influencing the banking sector's ROE. The results indicate that ROE is negatively affected by the CIR and the LDR and positively affected by the CAR and firm size (SIZE). Remarkably, NPL do not directly affect ROE. Furthermore, BGD strengthens the relationships between CIR and ROE and between LDR and ROE, enhancing the detrimental effects of these ratios on profitability. However, BGD cannot moderate the relationship between CAR and ROE, confirming that gender diversity does not impact on the correlation between capital adequacy and profitability. These findings emphasize the need for banks to focus on improving operational efficiency. A combination of enhanced worker efficiency reduced unproductive costs, and technological advancements could help achieve this goal. Financial institutions should adopt a more comprehensive liquidity management strategy to mitigate the impact of a high LDR on profitability. Additionally, for gender diversity on boards to be effective, it should extend beyond representation and be actively involved in strategic decision-making. By pursuing growth strategies supported by robust asset expansion and sound capital management, banks can leverage their scale to gain a competitive advantage in the market.

The study's theoretical implications underscore the importance of operational efficiency, liquidity management, and strong corporate governance as essential drivers of profitability. While gender diversity on boards indirectly affects profitability through improved governance and decision-making, its direct moderating role in the relationship between CIR, LDR, and ROE is significant. Policymakers and financial authorities should consider incentivizing banks to enhance their operational efficiency and increase women's involvement in strategic decision-making, as this could directly impact profitability. Additionally, regulators can use the study's findings to strengthen governance through gender diversity, operational efficiency, and risk management, promoting stability within the banking sector. The findings of this study suggest that banks need to invest in improving cost management and liquidity strategies to enhance profitability. Gender diversity in decision-making positions should be encouraged, as it can improve governance and mitigate operational inefficiencies. These strategies will allow banks to achieve long-term financial stability and growth, essential for maintaining competitive advantage.

One limitation of this study is its focus on the banking sector in Indonesia, which may limit the generalizability of the findings to other countries or sectors with different economic conditions and regulatory frameworks. Future research could explore the relationship between board gender diversity and ROE in different geographical regions or industries to determine whether the findings are consistent. Additionally, further research could investigate the specific mechanisms through which BGD moderates the relationships between financial indicators and profitability, including examining the individual contributions of male and female board members in decision-making processes.

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