Original Research Article

IMPACT OF MERGER ON PROFITABILITY OF BANKS: A STUDY WITH REFERENCE TO PUBLIC SECTOR BANKS IN INDIA

.

ABSTRACT

|  |
| --- |
| **Aims:** To investigate the impact of bank mergers on the financial performance of public sector banks in India, specifically examining the effects on Net Interest Margin (NIM), Return on Assets (ROA), and Return on Equity (ROE), and to assess the role of bank-specific factors in influencing these outcomes.**Study design:** Analytical study using panel regression analysis with fixed-effects (FE) and random-effects (RE) models, supported by descriptive statistics and correlation matrix, to evaluate the impact of mergers and bank-specific factors on profitability.**Sample and Duration of Study:** The study focuses on five public sector banks in India (Bank of Baroda, Canara Bank, Indian Bank, Punjab National Bank, Union Bank of India), using quarterly data from March 31, 2015, to March 31, 2024, covering pre- and post-merger periods (mergers effective from April 1, 2019, for Bank of Baroda, and April 1, 2020, for others).**Methodology:** The study included five public sector banks, analysing quarterly financial data over six years. Panel regression models (FE and RE) were employed, with NIM, ROA, and ROE as dependent variables, and a merger dummy variable (0 for pre-merger, 1 for post-merger) as the primary independent variable. Bank-specific control variables included Capital Adequacy Ratio (CAR), Debt-to-Equity Ratio (DE), Cost-to-Income Ratio (CI), Gross Non-Performing Assets (GNPA), and Cash-to-Total Assets (CTA). Hausman tests were used to determine model preference.**Results:** The mergers significantly increased NIM, ROA, and ROE, with stronger effects under FE models for NIM and ROA, and RE models for ROE. GNPA and CI were consistently negative and significant, indicating adverse effects of poor asset quality and operational inefficiency. CAR positively influenced ROA and ROE, but its impact on NIM was insignificant. DE showed mixed, often negative effects under FE models. CTA remained insignificant across all specifications. The findings highlight mergers and internal efficiency as critical drivers of bank profitability and resilience.**Conclusion:** The study demonstrates that bank mergers significantly enhance the financial performance of public sector banks in India, as evidenced by increased NIM, ROA, and ROE. Effective management of asset quality and operational efficiency further strengthens profitability and resilience post-merger. |

*Keywords: Bank Merger, Public sector banks, Financial Performance*

1. INTRODUCTION

The Indian banking sector has experienced substantial transformation in recent years, primarily driven by the government's initiative to consolidate public sector banks (PSBs) with the aim of enhancing their financial resilience, operational efficiency, and global competitiveness. (Jha & Premanand, 2023; Kaur & Bala, 2024; Chandan L et al., 2024; Patel, 2018) The merger of public sector banks, particularly the merger of Bank of Baroda (BOB), Vijaya Bank, and Dena Bank in March 2018, followed by the mega-merger of Canara Bank (CB), Indian Bank (IB), Punjab National Bank (PNB), and Union Bank of India (UBI) with other smaller PSBs in August 2019, marked a pivotal milestone in banking reforms. (Deolalkar, n.d.; Hosapeti & Rathi, n.d.; Krishnudu G. Chinni, 2022; Nag J & B N, 2024) These mergers aimed to create larger, more robust banking entities capable of addressing challenges such as rising non-performing assets (NPAs), capital inadequacy, and inefficiencies in operations, while also strengthening their ability to support India's growing economy.

This study examines the impact of these mergers on the financial performance of the resultant PSBs, focusing on key metrics such as profitability, asset quality, capital adequacy, operational efficiency, and liquidity. (Ashton, 2012; Carey, 1975; Carletti et al., 2007; Das & Kumbhakar, 2022; Utami et al., 2022) The consolidation wave was driven by the rationale that larger banks could leverage economies of scale, streamline operations, and improve risk management, thereby enhancing financial stability. (Budhedeo & Pandya, 2018; Deolkar, n.d.; Kumar, 2023) However, the mergers also posed challenges, including integration complexities, cultural disparities, and short-term financial strain due to harmonisation costs. By analysing pre- and post-merger financial data, this study seeks to evaluate whether these consolidations have achieved their intended objectives and to provide insights into the broader implications for India's banking sector reforms.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Recent studies have examined the impact of mergers on the financial performance of Indian public sector banks. (Kausingh & Sridharan, 2019; Sandeep et al., 2018) While some studies indicate positive outcomes, such as improved performance, cost reduction, and increased sales, others suggest mixed results. (Bhaskaran et al., 2016; Pandian K. S., 2020; Rathee et al., 2015) Mergers have been found to enhance capital adequacy, loan-to-deposit, and debt-to-equity ratios for some banks. (Patel & Patel, 2015) However, not all mergers result in significant improvements in financial performance. (Khan & Faisal, 2023; M Miyan & Mohammad, 2017; Mitra et al., 2021) A comprehensive analysis of merged public sector banks revealed notable improvements in financial ratios post-merger, including liquidity, profitability, return, and solvency. (K. A. Goyal & Joshi, n.d.; Jain & Jain, 2020) Despite potential benefits, mergers may also lead to challenges such as cultural differences, employee discontent, and unmanageable branch networks. Overall, the impact of mergers on public sector banks in India appears to vary, with some institutions experiencing more positive outcomes.

**2.1. Merger and Return on Shareholder’s Fund**

Mergers in the banking sector have mixed effects on financial performance. (Rani & Sangeeta, 2023) Some studies report positive impacts, with BOB experiencing increased operating and net profits post-merger. (Adhikari, 2023) Similarly, Nepalese commercial banks demonstrated improved profitability in terms of EPS, ROA, and NPM after mergers. However, other studies have indicated negative effects on key financial ratios. (Patel, 2018) A study of Indian banks found decreased ROE, ROA, and net profit ratios following mergers, although EPS and employee productivity improved. (Handyanto et al., 2021) Research on companies listed in the Sharia Securities List revealed no significant changes in DER, NPM, ROE, and ROA post-merger, suggesting that expected synergies were not achieved. These varied outcomes highlight the complexity of merger impacts and the need for careful consideration in merger decisions.

$Hθ\_{1}$*=There is no significant impact of the merger on return on shareholder’s funds of public sector banks.*

**2.2. Merger and Return on Assets**

The impact of mergers on ROA and the overall financial performance of banks has been examined in several studies. (Nissa, 2022) Research on Indonesian Islamic banks found that ROA positively affects net income after the merger. (Fitriyani et al., 2023) However, another study on Bank Syariah Indonesia reported mixed results, with some banks showing improved ROA post-merger while others experienced a decline. (Adhikari, 2023) In Nepal, a study of commercial bank mergers revealed statistically significant improvements in ROA and other profitability measures like Earnings Per Share (EPS) and Net Profit Margin (NPM) after the merger. (Hadi, 2024) Additionally, research on Indonesian companies listed on the stock exchange found that ROA had a significant positive impact on firm value both before and after mergers and acquisitions. These studies suggest that while mergers can potentially improve ROA and financial performance, the outcomes may vary depending on the specific circumstances and institutions involved.

$Hθ\_{2}$*=There is no significant impact of the merger on the return on assets of public sector banks.*

**2.3. Merger and Net Interest Margin**

Mergers and acquisitions (M&A) in the banking sector have mixed impacts on financial performance. (Huian, 2011) While some studies found improved NIM post-merger, (Dwi Agustin & Nansih Widhiastuti, 2021) others reported significant differences in NIM before and after M&A. (Bhandari & Pradhan, 2024) M&A can positively affect return on assets (ROA) and return on equity (ROE) in Nepalese banks, (Huian, 2011) but may not improve ROA or ROE in Romanian banks. (Bhandari & Pradhan, 2024) Non-performing loans tend to decrease after mergers, positively impacting profitability. (Fulop et al., 2002) However, mergers can also have negative consequences, including disruptions to service delivery, delayed service development, and challenges in integrating organisational cultures. Additionally, expected management cost savings may not materialise within the first two years post-merger. Overall, the impact of M&A on bank performance varies across financial metrics and contexts.

$Hθ\_{3}$*=There is no significant impact of the merger on* *the net interest margin of public sector banks.*

**3. METHODOLOGY**

This study investigates the impact of mergers on the financial performance of selected Indian public sector banks. This study uses descriptive statistics, a correlation matrix, and panel regression analysis to study whether mergers enhance profitability and how bank-specific factors influence the outcomes.

**3.1. Objective**

The overall objective of this study is to examine the impact of mergers on the financial performance of public sector banks.

1. To study the impact of the merger on the return on shareholder’s funds.
2. To study the impact of the merger on the return on assets.
3. To study the impact of the merger on the net interest margin.

**3.2. Sample, data and period of the study**

This study investigates a sample of five public sector banks: Bank of Baroda, Canara Bank, Indian Bank, Punjab National Bank, and Union Bank of India. The study covers a total period of six years, quarterly data from March 31, 2015, to March 31, 2024, to study the impact of mergers w.e.f. April 1, 2020, for the selected banks and 1st April 2019 (in the case of Bank of Baroda) for public sector banks.

**3.3. Variables**

In the regression equations, ROE, ROA, and NIM are the dependent variables, taken as proxies for profitability. Merger is an independent dummy variable, in which 0 represents the pre-merger period and 1 represents the post-merger period. As for the bank-specific control variables, CAR stands for capital adequacy, DE for leverage, Cost to Income for operating efficiency, GNPA for asset quality, and cash to total assets for liquidity.

**Table 1: Variables of the study**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Notation | Measures | Previous Studies |
| Dependent Variables |
| Profitability | Return on assets (ROA) | $$\frac{Net profit }{ Total assets}$$ | (Batwo Michael & Guidi, 2020; Krishnankutty & Kumar Mohanty, 2018) |
| Return on equity(ROE) | $$\frac{Net profit }{ Shareholders Equity}$$ | (Al-Homaidi et al., 2020; Pratiwi Nila et al., 2018; Yahya et al., 2017) |
| Net interest margin (NIM) | $$\frac{Net Interest Income}{Total Asset}$$ | (Prasanna P. Krishna et al., 2014; Radivojevic & Jovovic, 2017) |
| Independent Variables |
| Merger | Merger | Dummy Variable | (Jallad et al., 2025) |
| Control Variables |
| Capital Adequacy | Capital Adequacy Ratio (CAR) | $$\frac{Tier I + Tier II Capital }{Risk Weighted Assets}$$ | (Grullon et al., 1997; Jadhav et al., 2021; Senan et al., 2022) |
| Leverage | Debt to Equity(DE) | $$\frac{Total Outside Liabilities }{Shareholders Fund}$$ | (Fahlevi et al., 2020; Pratiwi Nila et al., 2018; Rehan et al., 2018) |
| Asset Quality | Gross Non-performing Assets (GNPA) | $$\frac{Gross NPA }{Gross Advances}$$ | (Gandhi, 2015; A. Goyal & Verma, 2018; Sharma & Parasar, 2020; Zaman & Bhandari, 2022) |
| Efficiency | Cost to Income(CI) | $$\frac{Operating cost }{Operating income}$$ | (DeYoung, 1991; Hensel, 2006; Mahesh & Bhide, 2008; Resti, 1998) |
| Liquidity | Cash to Total Asset (CTA) | $$\frac{Total Cash }{Total assets}$$ | (Carletti et al., 2005; Malandrakis, 2014) |

*(Source: Compiled by the author)*

**3.4. Model Specification**

The following regression equations model the impact of a merger on bank profitability using ROE, ROA, and NIM as dependent variables, each serving as a proxy for profitability. The independent variables include a dummy variable for mergers and several bank-specific control variables. These models are used to quantify whether mergers enhance profitability and to identify the factors that drive these outcomes.

$ROA\_{it}$=$β\_{0}$ + $β\_{1}Merger\_{i,t}$ + $β\_{2}CAR\_{i,t}$ + $β\_{3}DE\_{i,t}$ + $β\_{4}GNPA\_{i,t}$ + $β\_{5}CI\_{i,t}$ + $β\_{6}CTA\_{i,t}$ + $ε\_{it}$ (1)

$ROE\_{it}$=$β\_{0}$ + $β\_{1}Merger\_{i,t}$ + $β\_{2}CAR\_{i,t}$ + $β\_{3}DE\_{i,t}$ + $β\_{4}GNPA\_{i,t}$ + $β\_{5}CI\_{i,t}$ + $β\_{6}CTA\_{i,t}$ + $ε\_{it}$ (2)

$NIM\_{it}$=$β\_{0}$+ $β\_{1}Merger\_{i,t}$ + $β\_{2}CAR\_{i,t}$ + $β\_{3}DE\_{i,t}$ + $β\_{4}GNPA\_{i,t}$ + $β\_{5}CI\_{i,t}$ + $β\_{6}CTA\_{i,t}$ + $ε\_{it}$ (3)

where,

* *Y*: The dependent variable (ROE, ROA, or NIM, depending on the model).
* *β₀*: The intercept represents the value of the dependent variable when all independent variables are zero.
* *Merger*: A dummy variable (0 = pre-merger, 1 = post-merger) that captures the merger’s effect on profitability.
* *CAR*: Measures a bank's capital strength, reflecting its ability to absorb losses.
* *DE*: The debt-to-equity ratio typically indicates financial leverage and risk.
* *CI*: A ratio reflecting operational efficiency (lower values indicate better efficiency).
* *GNPA*: A measure of asset quality, with higher values indicating poorer loan quality.
* *CTA*: A liquidity measure that shows the proportion of cash relative to total assets.
* *β₁* to *β₆*: Coefficients estimating the impact of each independent variable on the dependent variable.
* *ε:* represents the error term that accounts for the variation in the model that remains unexplained.

Each model uses the same independent variables but differs in the dependent variable to assess profitability from various perspectives.

3. ANALYSIS AND INTERPRETATION

The analysis covers descriptive statistics, correlation matrix and panel regression using fixed and random effects.

**4.1. Descriptive statistics**

Table 2 provides summary statistics for several financial variables across 165 observations.

**Table 2: Descriptive statistics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Obs.** | **Mean** | **Std. dev.** | **Min** | **Max** |
| Merger | 165 | 0.485 | 0.501 | 0 | 1 |
| NIM | 165 | 2.608 | 0.360 | 1.934 | 3.648 |
| ROE | 165 | 4.231 | 7.712 | -27.447 | 18.983 |
| ROA | 165 | 0.279 | 0.474 | -1.644 | 1.083 |
| CAR | 165 | 13.516 | 1.767 | 9.200 | 16.966 |
| DE | 165 | 15.101 | 2.183 | 11.196 | 29.243 |
| GNPA | 165 | 9.908 | 3.384 | 3.719 | 18.379 |
| CTA | 165 | 3.917 | 0.719 | 1.810 | 6.618 |
| CI | 165 | 46.776 | 3.331 | 36.932 | 56.753 |

***Source:***Computed by the author

The Net Interest Margin (NIM) has a mean of 2.607 and a low standard deviation of 0.360, suggesting stable values clustered closely around 2.6%. Return on Equity (ROE) shows a mean of 4.231 but a high standard deviation of 7.712, reflecting significant variability in profitability relative to equity. Return on Assets (ROA) has a mean of 0.278 and a standard deviation of 0.474, indicating moderate dispersion around a low positive return. The Capital Adequacy Ratio (CAR) has a mean of 13.516 and a standard deviation of 1.767, showing relatively stable capital reserves. The Debt-to-Equity ratio (DE) has a mean of 15.101 and a standard deviation of 2.183, suggesting moderate variation in leverage. Gross Non-Performing Assets (GNPA) has a mean of 9.908 and a standard deviation of 3.384, indicating notable variability in asset quality. The Cost-to-Assets ratio (CTA) has a mean of 3.917 and a standard deviation of 0.719, reflecting stable cost management. Lastly, the Cost-to-Income ratio (CI) has a mean of 46.777 and a standard deviation of 3.331, showing moderate variation in operational efficiency.

**4.2. Correlation Matrix**

Table 3 shows the correlation matrix revealing the relationships between independent variables, with Variance Inflation Factors (VIF) indicating multicollinearity.

**Table 3: Correlation Matrix**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Merger** | **CAR** | **DE** | **GNPA** | **CTA** | **CI** | **Mean VIF** |
| Merger | 1 |  |  |  |  |  |  |
| CAR | 0.688 | 1 |  |  |  |  |  |
| DE | -0.049 | -0.333 | 1 |  |  |  |  |
| GNPA | -0.346 | -0.616 | 0.123 | 1 |  |  |  |
| CTA | 0.232 | 0.234 | -0.107 | 0.063 | 1 |  |  |
| CI | 0.117 | -0.054 | 0.207 | -0.040 | 0.009 | 1 |  |
| VIF | 2.180 | 3.570 | 1.260 | 1.820 | 1.150 | 1.090 | 1.85 |
| 1/VIF | 0.458 | 0.280 | 0.792 | 0.550 | 0.871 | 0.918 |  |

*Source: Computed by the author*

The strongest positive correlation is between "merger" and CAR (0.688), suggesting that mergers are associated with higher capital adequacy ratios. CAR also shows a strong negative correlation with GNPA (-0.616), indicating that higher capital reserves are linked to lower non-performing assets. DE has a weak negative correlation with CAR (-0.333) and a weak positive correlation with CI (0.207), suggesting an association between leverage and cost-to-income ratios. GNPA has a moderate negative correlation with "merger" (-0.346), implying that mergers may be linked to better asset quality. CTA shows weak positive correlations with "merger" (0.232) and CAR (0.234), while CI has minimal correlations with other variables, with the strongest being a weak positive link with DE (0.207). Overall, the correlations were generally weak to moderate, with no extreme multicollinearity issues based on the VIF values.

**4.3. Regression model taking the dependent variable as NIM**

The first regression equation model examines how merger and bank-specific factors affect ROE. ROE is a key metric for shareholders; therefore, this model helps assess whether mergers improve returns on equity while controlling for bank-specific factors.

**Table 4:** Regression model for NIM

|  |  |  |
| --- | --- | --- |
| **Variables** | **Random-effects** | **Fixed-effects** |
| **NIM** | **Coefficient** | **P>z** | **Coefficient** | **P>t** |
| Merger | 0.515 | *.00\** | 0.472 | *.00\** |
| CAR | -0.055 | .004\* | -0.034 | .073\*\*\* |
| DE | -0.058 | *.00\** | -0.023 | .060\*\*\* |
| GNPA | -0.032 | *.00\** | -0.026 | .002\* |
| CTA | 0.005 | .847 | 0.023 | .401 |
| CI | -0.025 | *.00\** | -0.015 | .012\*\* |
| \_cons | 5.434 | *.00\** | 4.063 | *.00\** |
| R-squared | 0.608 | Overall = 0.559 |
|  | Wald chi2 = 245.3 | F(6,154) = 32.64 |

*Note: \*p < 0.01, \*\*p < 0.05 and \*\*\*p < 0.10*

*Source: Computed by the author*

The random-effects (RE) and fixed-effects (FE) regression models for NIM, with overall R-squared values of 0.608 (RE) and 0.559 (FE), indicate moderate explanatory power. In both models, the merger variable has a significant positive effect (RE: 0.515, *P = .00*; FE: 0.472, *P = .00*), suggesting that mergers increase NIM. GNPA (RE: -0.032, *P = .00*; FE: -0.026, *P = .002*) and CI (RE: -0.025, *P = .00*; FE: -0.015, *P = 0.012*) are significant and negative in both models, indicating that higher non-performing assets and cost-to-income ratios reduce NIM. CAR and DE are significant in the RE model (CAR: -0.055, *P = .004*; DE: -0.058, *P = 0.00*) but marginally insignificant in the FE model (CAR: -0.034, *P = .073*; DE: -0.023, *P = 0.060*), suggesting weaker evidence of impact in the FE model. CTA was insignificant in both models (RE: 0.005, *P = .847*; FE: 0.023, *P = .401*). The RE model’s higher Wald chi-square (245.3) compared to the FE model’s F-statistic (32.64) reflects a stronger overall fit, but the Hausman test favours the FE model because of systematic coefficient differences. The FE model accounts for bank-specific effects, reducing the constant term (4.063 vs. 5.434 in RE), suggesting unobserved heterogeneity influences NIM. The fixed-effects model is preferred because it consistently estimates the coefficients by controlling for unobserved heterogeneity across banks, whereas the RE model is inconsistent under these conditions.

**4.4. Regression model taking the dependent variable as ROA**

The second regression equation model evaluates the effect of the merger and control variables on ROA. ROA reflects how efficiently a bank uses its assets to assess the merger’s impact on its overall operational efficiency.

**Table 5:** Regression model for ROA

|  |  |  |
| --- | --- | --- |
| **Variables** | **Random-effects**  | **Fixed-effects** |
| **ROA** | **Coefficient** | **P>z** | **Coefficient** | **P>t** |
| Merger | 0.168 | .012\*\* | 0.186 | .010\*\* |
| CAR | 0.063 | .010\*\* | 0.051 | .046\*\* |
| DE | -0.024 | .041\*\* | -0.041 | .012\*\* |
| GNPA | -0.066 | *.00\** | -0.072 | *.00\** |
| CTA | -0.029 | .393 | -0.042 | .257 |
| CI | -0.027 | *.00\** | -0.028 | *.00\** |
| \_cons | 1.746 | .003\* | 2.317 | .001\* |
| R-squared | 0.637 | 0.633 |
|   | Wald chi2 = 277.77 | F(6,154) = 35.96 |

*Note: \*p < 0.01, \*\*p < 0.05 and \*\*\*p < 0.10*

*Source: Computed by the author*

The overall R-squared values of 0.637 (RE) and 0.633 (FE) indicate that about 63% of ROA variation is explained. In both models, mergers had a significant positive effect (RE: 0.168, *P = .012*; FE: 0.186, *P = .010*), suggesting that mergers increase ROA. CAR is also positive and significant (RE: 0.063, *P = .010*; FE: 0.051, *P = .046*), indicating that higher capital adequacy increases ROA. DE (RE: -0.024, *P = .041*; FE: -0.041, *P = .012*) and GNPA are significant and negative in both models (RE: -0.066, *P = .00*; FE: -0.072, *P = .00*), showing that higher leverage and non-performing assets reduce ROA, with stronger effects in the FE model. CI is significant and negative (RE: -0.027, *P = .00*; FE: -0.028, *P = .00*), indicating that higher cost-to-income ratios reduce ROA. CTA is insignificant in both models (RE: -0.029, *P = .393*; FE: -0.042, *P = .257*). The constant term is larger in the FE model (2.317 vs. 1.746 in RE), reflecting the bank-specific effects. The RE model’s Wald chi-square (277.77) and FE model’s F-statistic (35.96) confirm strong model significance, but a prior Hausman test (chi2 = 20.04, *P = .001*) favours the FE model due to systematic coefficient differences, suggesting that unobserved heterogeneity affects ROA.

**4.5. Regression model taking the dependent variable as ROE**

The third regression equation model analyses the impact of the merger and control variables on Net Interest Margin. NIM is critical for banks reliant on interest income; therefore, this model helps evaluate whether mergers enhance interest-based profitability.

**Table 6: Regression models for ROE**

|  |  |  |
| --- | --- | --- |
| **Variables** | **Random-effects** | **Fixed-effects** |
| **ROE** | **Coefficient** | **P>z** | **Coefficient** | **P>t** |
| Merger | 2.793 | .013\*\* | 3.289 | .006\* |
| CAR | 1.118 | .006\* | 0.840 | .049\*\* |
| DE | -0.086 | .665 | -0.533 | .05\*\* |
| GNPA | -1.052 | *.00\** | -1.147 | *.00\** |
| CTA | -0.494 | .387 | -0.738 | .230 |
| CI | -0.432 | *.00\** | -0.507 | *.00\** |
| \_cons | 21.618 | .027\*\* | 37.325 | .002\* |
| R-squared  | 0.609 | 0.596 |
|   | Wald chi2(6) = 246.4 | F(6,154) = 33.68 |

*Note: \*p < 0.01, \*\*p < 0.05 and \*\*\*p < 0.10*

*Source: Computed by the author*

The overall R-squared values of 0.609 (RE) and 0.596 (FE) indicate that approximately 60% of the ROE variation is explained by the model. In both models, merger has a significant positive effect (RE: 2.793, *P = 0.013*; FE: 3.289, *P = 0.006*), suggesting mergers increase ROE, with a stronger effect in the FE model. CAR is also positive and significant (RE: 1.118, *P = .006*; FE: 0.839, *P = .049*), indicating that higher capital adequacy enhances ROE. GNPA (RE: -1.052, *P = .001*; FE: -1.147, *P = .001*) and CI (RE: -0.432, *P = .001*; FE: -0.508, *P = .001*) are significant and negative in both models, showing that higher non-performing assets and cost-to-income ratios reduce ROE, with stronger effects in the FE model. DE is insignificant in the RE model (-0.0856, *P = .665*) but marginally significant and negative in the FE model (-0.533, *P = .050*), suggesting that leverage may reduce ROE in the FE framework. CTA is insignificant in both models (RE: -0.494, *P = .387*; FE: -0.738, *P = .230*). The constant term is notably larger in the FE model (37.325 vs. 21.618 in RE), reflecting the bank-specific effects. The RE model’s Wald chi-square (246.4) and the FE model’s F-statistic (33.68) confirm the strong model significance. The Hausman test for the ROE regression indicates that the differences in coefficients between the FE and RE models were not systematic. Therefore, the RE model is preferred as it is both consistent and efficient under these conditions.

**5. CONCLUSION**

The analysis demonstrates that mergers significantly improve banks’ financial performance by enhancing NIM, ROA, and ROE, underscoring the strategic value of consolidation in the banking sector. However, the findings also highlight the persistent challenges of high non-performing assets and operational inefficiencies, which consistently erode profitability. Capital adequacy is a crucial driver of asset and equity returns, reinforcing the role of prudent capital management. Meanwhile, leverage (DE) presents risks to profitability in certain contexts, suggesting the need for balanced financing structures. Model selection indicates that accounting for unobserved heterogeneity is essential, as FE models provide more reliable estimates for NIM and ROA, whereas RE is more suitable for ROE. Together, these results suggest that while mergers are beneficial, their long-term performance depends critically on effective risk management and operational efficiency.

**5.1. Policy Implications**

1. Encouraging Strategic Mergers: Policymakers and regulators should support well-planned bank mergers, as evidence indicates that consolidation enhances profitability and operational efficiency. However, mergers should be driven by strategic complementarities rather than by short-term objectives.
2. Capital Adequacy Enforcement: Since higher CAR boosts ROA and ROE, regulators should continue enforcing capital adequacy norms, ensuring that banks maintain sufficient buffers to absorb shocks while supporting growth.
3. Prudent Leverage Management: The mixed results for DE imply that an excessive reliance on debt financing may undermine profitability. Regulatory frameworks should encourage balanced capital structure to sustain financial stability.
4. Bank-Specific Risk Recognition: The differences between the FE and RE results highlight the importance of considering unobserved heterogeneity across banks. Regulatory oversight and bank strategies should account for institution-specific dynamics rather than adopting uniform approaches.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The authors hereby state that no generative artificial intelligence (AI) tools were used in this work.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

References

Adhikari, P. R. (2023). Pre and Post-Merger Financial Performance Analysis of Commercial Banks in Nepal. *The International Research Journal of Management Science*, *8*(1), 2717–4867. http://www.ncm.edu.np

Al-Homaidi, E. A., Almaqtari, F. A., Yahya, A. T., & Khaled, A. S. (2020). Internal and external determinants of listed commercial banks’ profitability in India: dynamic GMM approach. Internal and external determinants of listed commercial banks’ profitability 35. In *Int. J. Monetary Economics and Finance* (Vol. 13, Issue 1).

Ashton, J. K. (2012). Do Depositors Benefit from Bank Mergers? An Examination of the UK Deposit Market. *International Journal of the Economics of Business*, *19*(1), 1–23. https://doi.org/10.1080/13571516.2012.642636

Batwo Michael, E., & Guidi, F. (2020). *The determinants of commercial banks’ profitability in the South-Eastern Europe region: a system GMM approach*.

Bhandari, S., & Pradhan, R. S. (2024). Nepalese Journal of Management Impact of merger and acquisition on the performance of Nepalese commercial banks. In *NEPALESE JOURNAL OF MANAGEMENT* (Vol. 11, Issue 2).

Bhaskaran, R., Bhalla, L., Sarin, V., Kaur, S., Rahman, A., Singh, G., Bhattacharya, A. M., Kumar Jha, A., & Verma, P. (2016). Non-performing assets of public and private sector banks in India-a comparative study. In *Int. J. Services and Operations Management* (Vol. 25, Issue 2).

Budhedeo, S. H., & Pandya, N. P. (2018). Financial Performance of Public Sector Banks in India: A Post Reform Analysis. *Indian Journal of Finance*, *12*(10), 7. https://doi.org/10.17010/ijf/2018/v12i10/132491

Carey, R. G. (1975). Evaluation under the bank merger act of 1960 of the competitive factors involved in bank mergers. The regulatory agencies compared. *Journal of Monetary Economics*, *1*(3), 275–308. https://doi.org/10.1016/0304-3932(75)90015-X

Carletti, E., Hartmann, P., & Spagnolo, G. (2005). *Bank Mergers, Competition and Liquidity* (Sveriges Riksbank Working Paper Series No. 182). https://hdl.handle.net/10419/82498

Carletti, E., Hartmann, P., & Spagnolo, G. (2007). Bank mergers, competition, and liquidity. *Journal of Money, Credit and Banking*, *39*(5), 1067–1105. https://doi.org/10.1111/j.1538-4616.2007*.00*58.x

Das, A., & Kumbhakar, S. C. (2022). Bank Merger, Credit Growth, and the Great Slowdown in India. *Economic and Political Weekly*, *57*(20), 58–67.

Deolkar, G. H. (n.d.). *The Indian Banking Sector on the Road to Progress*. Retrieved August 18, 2025, from https://www.academia.edu/10273221/The\_Indian\_Banking\_Sector\_On\_the\_Road\_to\_Progress

DeYoung, R. E. (1991). The efficiencies defence and commercial bank merger regulation. *Review of Industrial Organization*, *6*(3), 269–282. https://doi.org/10.1007/BF00378126

Dwi Agustin, R., & Nansih Widhiastuti, R. (2021). Dampak Merger dan Akuisisi Pada Kinerja Keuangan (Studiu Kasus Sektor Perbankan di Indonesia). *Remitance Jurnal Akuntansi Keuangan Dan Perbankan*, *2*(2), 16–24.

Fahlevi, M., Abdi, M. N., Zuhri, S., Dasih, I., & Maemunah, S. (2020). THE IMPACT OF MERGER AND ACQUISITION ON FINANCIAL PERFORMANCE IN INDONESIA. *Journal of Reseacrh in Business, Economics, and Education*, *2*(1), 326–338. http://e-journal.stie-kusumanegara.ac.id

Fitriyani, E., Oktavia, L., Magdalena, S., Gunardi, G., & Kesumah, P. (2023). ANALISIS PERKEMBANGAN NPM, ROA DAN ROE PADA BANK SYARIAH INDONESIA SEBELUM DAN SESUDAH MERGER. *Jurnal Ekonomi Manajemen Bisnis Dan Akuntansi: EMBA*, *1*(2), 75–83. https://doi.org/10.59820/emba.v1i2.42

Fulop, N., Protopsaltis, G., Hutchings, A., King, A., Allen, P., Normand, C., & Walters, R. (2002). Process and impact of mergers of NHS trusts: Multicentre case study and management cost analysis. *British Medical Journal*, *325*(7358), 246–249. https://doi.org/10.1136/bmj.325.7358.246

Gandhi, K. (2015). Non-Performing Assets: A study of State Bank of India. *International Journal of Research in All Subjects in Multi Languages*, *3*(3), 24–29. www.raijmr.com

Goyal, A., & Verma, A. (2018). Slowdown in Bank Credit Growth: Aggregate Demand or Bank Non-performing Assets? *Margin*, *12*(3), 257–275. https://doi.org/10.1177/0973801018768985

Goyal, K. A., & Joshi, V. (n.d.). MERGERS IN BANKING INDUSTRY OF INDIA: SOME EMERGING ISSUES. *Asian Journal of Business and Management Sciences*, *1*(2), 157–165. www.ajbms.org

Grullon, G., Michaely, R., & Swary, I. (1997). Capital adequacy, bank mergers, and the medium of payment. *Journal of Business Finance and Accounting*, *24*(1), 97–124. https://doi.org/10.1111/1468-5957*.00*97

Hadi, Y.-. (2024). Pengaruh ROA, TATO, CR, Dan DER Terhadap Nilai Perusahaan Sebelum Dan Sesudah Merger & Akuisisi Di BEI 2015-2020. *Eqien - Jurnal Ekonomi Dan Bisnis*, *13*(02), 223–235. https://doi.org/10.34308/eqien.v13i02.1773

Handyanto, S., Astuti, M. S., & Ajiputra, K. S. (2021). Indonesia Sharia Bank Merger Process Reviewed from Business Competition Laws. *Lex Scientia Law Review*, *5*(1), 45–62. https://doi.org/10.15294/lesrev.v5i1.46288

Hensel, N. D. (2006). Cost-efficiencies, profitability, and strategic behavior: Evidence from Japanese commercial banks. *International Journal of Managerial Finance*, *2*(1), 49–76. https://doi.org/10.1108/17439130610646162

Hosapeti, G. S., & Rathi, R. (n.d.). *Impact of Merger and Acquisition on Financial Performance of Public Sector Banks: A Case Study on Bank of Baroda*. www.ijfmr.com

Huian, M. C. (2011). Post M & A accounting performance of Romanian Banks. *Creating Global Competitive Economies: A 360-Degree Approach - Proceedings of the 17th International Business Information Management Association Conference, IBIMA 2011*, *4*, 2399–2414. https://doi.org/10.5171/2012.184557

Jadhav, J. J., Kathale, A., & Rajpurohit, S. (2021). An Impact of Capital Adequacy Ratio on the Profitability of Private Sector Banks in India – A Study. *International Journal of Engineering and Management Research*, *11*(5). https://doi.org/10.31033/ijemr.11.5.5

Jain, A., & Jain, P. (2020). The merger of banks in India: Boon or bane for the Indian economy? *EUROPEAN JOURNAL OF INTERDISCIPLINARY RESEARCH*, *1*(1), 46–51. https://doi.org/10.5281/zenodo.4006607

Jallad, R., Tina, A., & Persakis, A. (2025). Mergers and Acquisitions’ Moderating Effect on the Relationship Between Credit Risk and Bank Value: A Quantile Regression Approach.

*Journal of Risk and Financial Management*, *18*(2). https://doi.org/10.3390/jrfm18020100

Jha, S. S., & Premanand. (2023). Merger of Indian Banks. *VEETHIKA-An International Interdisciplinary Research Journal*, *9*(3), 1–5. https://doi.org/10.48001/veethika.2023.09.03.001

Kaur, G., & Bala, A. (2024). Merger as an only rescue/choice: lessons from a public sector bank of India. *Journal of Banking Regulation*, *25*(2), 95–111. https://doi.org/10.1057/s41261-023-00216-9

Kausingh, Y. B., & Sridharan, N. (2019). “A Study on Mergers and Acquisition of Banks in India.” *Journal of Information and Computational Science*, *9*(8), 928–937. www.joics.org

Khan, Dr. A. K., & Faisal, Dr. S. M. (2023). A Study of the State Bank of India’s Performance Using the CAMELS Method of Analysis. *Journal of Corporate Finance Management and Banking System*, *34*, 13–26. https://doi.org/10.55529/jcfmbs.34.13.26

Krishnankutty, R., & Kumar Mohanty, B. (2018). Determinants of Profitability in Indian Banks in the Changing Scenario. *International Journal of Economics and Financial Issues*, *8*(3), 235–240. https:www.econjournals.com

Krishnudu G. Chinni. (2022). Analysis of NPAs in Banking Sector-A Case Study of Public and Private Sector. *Anveshana’s International Journal of Research in Regional Studies, Law, Social Sciences, Journalism and Management Practices*, *7*(10), 1–10. http://publications.anveshanaindia.com/wp-content/uploads/2022/11/ANALYSIS-OF-NPAs-IN-BANKING-SECTOR-A-CASE-STUDY-OF-PUBLIC-AND-PRIVATE-SECTOR.pdf

Kumar, A. (2023). Impact of Merger on Efficiency, Stability, and Competitiveness of Public Sector Banks. *Competition Commission of India Journal on Competition Law and Policy*, 111–134. https://doi.org/10.54425/ccijoclp.v4.136

M Miyan, & Mohammad. (2017). A Comparative Statistical Approach towards NPA of PSU and Private Sector Banks in India. *International Journal of Advanced Research in Computer Science*, *8*(1), 46–6. https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=09765697&AN=121481316&h=WafSvKyQOLH5SKUwpb4KgHHa%2FpTTip4sf%2BNVM4JS%2BhFhEgbGiCfjKEsrrfgwhyDQuvGBFsICrkHRBgl5DT029A%3D%3D&crl=c

Mahesh, H. P., & Bhide, S. (2008). Do Financial Sector Reforms Make Commercial Banks More Efficient? A Parametric Exploration of the Indian Case. *Margin*, *2*(4), 415–441. https://doi.org/10.1177/097380100800200404

Malandrakis, I. K. (2014). Liquidity risk and credit risk: a relationship based on the interaction between liquid asset ratio, non-performing loans ratio and systemic liquidity risk. *Int. J. Financial Engineering and Risk Management*, *1*(4), 375–400.

Mitra, Dey Samuel S, Sharma Arpita, Hembrom Payal, Khan Aparajita, & Uzma. (2021). Finding the Influence of NPAs on Profitability-A Juxtaposition of Public and Private Sector Banks in India. *Amity Business Review*, *22*(2), 89. https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=09722343&AN=159019306&h=phb5z%2BJ9%2FKrPw%2BnRdL0UuBXbFrHS8Gub0CCOhYnF0YftHFvnvteM9dDFFlGX7CIG5y0iOKfdxJ6JvDUDwYNcpA%3D%3D&crl=c

Mr. Chandan L, Mr. Kiran S, & Mr. Prajwal A L. (2024). A Study on Impact of Merger on Performance of Selected Private Sector and Public Sector Banks. *International Journal of Advanced Research in Science, Communication and Technology*, 143–146. https://doi.org/10.48175/ijarsct-22717

Nag J, Prof. V., & B N, Dr. P. (2024). Analyzing The Merger Impact on Financial Performance Of Canara Bank: An Approach Based on the CAMELS Framework. *Educational Administration Theory and Practices*. https://doi.org/10.53555/kuey.v30i5.5230

Nissa, I. K. (2022). Analisis Dampak Merger Perbankan Syariah BUMN Pada Laba Bersih Terhadap Kinerja Keuangan. *Jurnal Ilmiah Ekonomi Islam*, *8*(1), 397. https://doi.org/10.29040/jiei.v8i1.4300

Pandian K. S. (2020). PERFORMANCE OF MERGED NATIONALIZED COMMERCIAL BANKS IN INDIA-A COMPARATIVE ANALYSIS OF PRE-AND POST-MERGER. *Primax International Journal of Commerce and Management Research*, *8*(3), 100–114. https://doi.org/10.17605/OSF.IO/P4JBN

Patel, R. (2018). Pre & Post-Merger Financial Performance: An Indian Perspective. In *Journal of Central Banking Theory and Practice* (Vol. 7, Issue 3, pp. 181–200). Sciendo. https://doi.org/10.2478/jcbtp-2018-0029

Prasanna P. Krishna, Thenmozhi M., & Rana Nimit. (2014). “Determinants of non-performing advances in Indian banking system.” *Banks and Bank Systems*, *9*(2), 65–77.

Pratiwi Nila, Fitri Hasmaynelis, & Murni Sastila dan. (2018). COMPARATIVE ANALYSIS OF FINANCIAL PERFORMANCE COMPANY BEFORE AND AFTER MERGER AND ACQUISITION TO ENTRANCHMENT MANAGEMENT. *Jurnal Apresiasi Ekonomi*, *6*(2), 124–132.

Radivojevic, N., & Jovovic, J. (2017). Examining of determinants of non-performing loans. *Prague Economic Papers*, *26*(3), 300–316. https://doi.org/10.18267/j.pep.615

Rani, N., & Sangeeta, Dr. (2023). Effect of Mergers on Bank of Baroda Before and After, a Study of the Banking Sector. *Financial Engineering*, *1*, 307–315. https://doi.org/10.37394/232032.2023.1.29

Rathee, R., Kuhar, D., & Siwach, P. (2015). Non-Performing Assets in SBI (State Bank of India). *Global Journal of Enterprise Information System*, *7*(1), 56–58. www.gjeis.org

Rehan, M., Imran Khan, M., & Kamran Khan, M. (2018). Effects of Merger and Acquisition on the Profitability of Banks. *EUROPEAN ACADEMIC RESEARCH*, *6*(8), 4029–4044. www.euacademic.org

Resti, A. (1998). Regulation can foster mergers, can mergers foster efficiency? The Italian case. *Journal of Economics and Business*, *50*(2), 157–169. https://doi.org/10.1016/s0148-6195(97)00075-1

Sandeep, P., Khanwalker, M., & Gupta, A. (2018). Merger of Public Sector Banks in India-Synergies at Work. *Pragyaan: Journal of Management*, *16*(2), 58–63. www.rbi.org.in

Senan, N. A. M., Belhaj, F. A., Al-Matari, E. M., Al-Faryan, M. A. S., & Al-Homaidi, E. A. (2022). Capital adequacy determinants of Indian banks listed on the Bombay Stock Exchange. *Investment Management and Financial Innovations*, *19*(2), 167–179. https://doi.org/10.21511/imfi.19(2).2022.14

Sharma, A., & Parasar, A. (2020). A study on loan approval and non-performing asset—Segment identification. *Journal of Public Affairs*, *20*(2). https://doi.org/10.1002/pa.2015

Utami, A. D., Risfandy, T., & Rahardjoputri, R. (2022). Islamic banks’ merger: the case of Bank Syariah Indonesia. *International Journal of Monetary Economics and Finance*, *15*(3), 201–212. https://doi.org/10.1504/ijmef.2022.126904

Yahya, A. T., Akhtar, A., & Tabash, M. I. (2017). The impact of political instability, macroeconomic and bank-specific factors on the profitability of Islamic banks: Empirical evidence. *Investment Management and Financial Innovations*, *14*(4), 30–39. https://doi.org/10.21511/imfi.14(4).2017.04

Zaman, M. S., & Bhandari, A. K. (2022). Stressed assets, off-balance sheet business activities and performance of Indian banking sector: a DEA double bootstrap approach. *Studies in Economics and Finance*, *39*(4), 572–592. https://doi.org/10.1108/SEF-09-2020-0369