Analysing The Mega-Merger Scheme of Public Sector Banks in India using Difference-in-Differences Analysis

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Abstract

Purpose: This study examines the causal impact of government-mandated mergers on the financial performance, operating efficiency, and asset quality of Indian public sector banks (PSBs), addressing a critical methodological gap in the literature that incorporates merger effects with concurrent macroeconomic and sectoral trends.

Methodology: Employing a quasi-experimental difference-in-differences (DiD) framework, we analysed the 2020 consolidation wave involving the reduction of Indian PSBs from 27 to 12. The researcher selected the Punjab National Bank (PNB) and Canara Bank as the sample, using the Bank of India as a matched control group. This study utilizes quarterly panel data spanning 16 pre-merger quarters (2016-2020) and 16 post-merger quarters (2021-2025), to examine five key performance metrics: Net Interest Margin (NIM), Return on Assets (ROA), Capital Adequacy Ratio (CAR), Cost-to-Income Ratio (CIR), and Net Non-Performing Assets (Net NPA) Ratio. We contrast the DiD estimates with conventional paired t-test results to isolate merger-specific effects from sector-wide trends.

Findings: Paired t-tests indicate statistically significant improvements across all performance metrics for both merged banks. The DiD analysis reveals a starkly different causal narrative. For PNB, only ROA and CIR exhibit statistically significant merger effects, both negative, with ROA declining and CIR increasing as direct consequences of integration, contradicting paired t-test inferences. For Canara Bank, DiD results demonstrate significant cost efficiency gains (CIR reduction) attributable to the merger, while all other performance dimensions exhibit no statistically significant merger effects despite paired t-test improvements.

Originality: This study uses the difference-in-differences methodology for Indian PSB mergers, providing credible causal estimates by constructing appropriate counterfactuals from non-merged PSBs operating under identical regulatory and ownership structures.

Keywords: Mergers and acquisitions, operating efficiency, asset quality, DiD analysis, financial performance

Introduction

Mergers and acquisitions are strategic tools that aim to channelize the diverse capabilities of entities being merged and bringing a holistic output in terms of financial, operational and technical performance. Many theories have been associated with mergers. Most importantly, synergy theory states that the combined capability of a merged firm will be more than the sum of the individual competencies of the firms involved in the Mergers & Acquisitions(M&A) deal. A merger is not simply the addition or integration of resources; instead, it creates a multiplier effect on firm performance. M&As are strategic decisions that involve huge costs and are irreversible in nature. Entering a M&A deal involves several complex decision-making processes. In some cases, mergers may bring immediate improvements, while in others, we have to wait a long time to see the merger deal become fruitful. Many merger deals have taken place around the world to date, and an important point to note is that not all of them had been successful. Therefore, analyzing the impact of mergers provides key insights.

The consolidation of banking institutions through mergers and acquisitions (M&A) has been identified as a strategic response to rising competition, regulatory imperatives, economies of scale and scope, and evolving financial markets (Altunbaş & Marqués, 2008; Martynova & Renneboog, 2006). In banking, mergers are often pursued to improve operational efficiency, strengthen capital buffers, optimize branch and staff networks, harness synergies, and enhance market competitiveness.

In India, the banking sector has witnessed waves of consolidation, especially among public sector banks (PSBs). Historically dominated by state-owned banks, the Indian banking system has been subject to periodic restructuring to address legacy issues such as non-performing assets (NPAs), inefficiencies in branch/staff deployment, and the need to scale up to meet global competition. The announcement in August 2019 by the Government of India to merge ten PSBs into four anchor banks marked one of the largest consolidation exercises in Indian banking history(Table I). These mergers were motivated by the objectives of creating stronger banking entities, reducing overlapping branch networks, improving fund mobilization and credit allocation, and establishing globally competitive institutions(Sharma & Mahapatra, 2022).

Table I. Public Sector Banks That Underwent the Mega Merger

Anchor Bank	Merger Date	Absorbed Banks	Post-Merger Assets (₹ Cr, 2024)
State Bank of India	Apr 1, 2017	5 Associate Banks + Bharatiya Mahila Bank	61,79,693
Bank of Baroda	Apr 1, 2019	Vijaya Bank + Dena Bank	18,55,000
Punjab National Bank	Apr 1, 2020	Oriental Bank of Commerce + United Bank of India	18,28,000
Canara Bank	Apr 1, 2020	Syndicate Bank	15,51,000
Union Bank of India	Apr 1, 2020	Andhra Bank + Corporation Bank	15,95,000
Indian Bank	Apr 1, 2020	Allahabad Bank	8,42,000

Source: RBI press release, Annual Reports

Table II Remaining Unmerged Public Sector Banks in India

Bank	Assets (₹ Cr, 2024)
Bank of India	10,50,000
Central Bank of India	4,50,000
Indian Overseas Bank	3,50,000
UCO Bank	2,80,000
Bank of Maharashtra	2,50,000
Punjab & Sind Bank	1,20,000

Source: RBI press release, Annual Reports

Many studies have been conducted in the Indian financial sector after mergers to identify whether they have led to significant improvements in financial and operational performance. (Abbas et al., 2014; Kemal, 2011; Pahuja & Aggarwal, 2016; Shah & Khan, 2017; Mantravadi & Reddy, 2008; Muhammad et al., 2019) Studies dealing with the recent mega merger have

been limited. This may be because mergers require some initial years to begin showing the effects. Most previous studies conducted in India relating to merger impact use key financial ratios and paired t-tests as tools for analysis. However, there is a limitation in using the paired t-test because it can only identify whether there were significant improvements after the merger. We cannot estimate the improvement to the merger alone, as it requires further quasi-experimental analysis. In the context of this study, we conduct a difference-in-differences (DiD) analysis comparing pre and post-merger periods for Punjab National Bank(PNB) and Canara Bank, using a control bank that did not undergo a merger.

This study contributes to the literature by focusing specifically on two anchor PSBs in India, applying a rigorous DiD methodology with controls, and exploring heterogeneity across merged entities. It offers practical implications for policy makers and banking practitioners: mergers should be accompanied by strong integration planning, governance oversight, and continuous monitoring of cost-efficiency metrics.

Literature Review

Mergers and acquisitions have emerged as strategic tools for achieving economies of scale, expanding the market presence, and improving financial stability in the global banking scenario. (Berger et al., 1999; DeLong, 2001). The basic assumption underlying consolidation strategies is that combined entities can realize cost efficiencies through branch rationalization, technology integration, and cancellation of duplicate operations while simultaneously, enhancing revenue generation through cross-selling opportunities and market power (Rhoades, 1998; Houston et al., 2001). However, empirical evidence on whether bank mergers actually deliver these outcomes remains unclear, with studies reporting mixed outcomes across different geographical contexts and methodological approaches (Pilloff & Santomero, 1998; Amel et al., 2004).

In the Indian context, mega mergers of public sector banks (PSBs) undertaken between 2017 and 2020, which reduced the number of PSBs from 27 to 12, represent one of the most significant restructuring exercises in the nation's banking history. The government’s major aim was to bring operational efficiency to Indian PSBs and make them as efficient as India’s private sector banks. There have been many studies on Indian PSB mergers and most of them followed similar methodologies in analysing the data. Early studies employed event study methodologies to identify short-term market reactions, while more recent investigations have utilized accounting-based performance metrics and frontier efficiency techniques such as Data

Envelopment Analysis (Bahrini,2017; Sufian & Habibullah, 2009). Most studies on the impact of mergers in the banking sector have used paired t-tests to compare pre-merger and post-merger ratios. However, there is a limitation to this study. A paired t-test can confirm whether there is a significant difference between the two periods, but we cannot conclude that the merger's impact made this difference. Therefore, in this study, DiD analysis is used by including a control bank(a peer bank that didn't undergo a merger) to test the definite impact of the merger.

The theoretical justification for bank mergers lies in two fundamental hypotheses: the efficiency hypothesis and market power hypothesis (Pilloff, 1996). The **efficiency hypothesis** states that mergers enable merged entities to exploit economies of scale, thereby reducing the per-unit costs of intermediation. Berger et al. (1999) demonstrated that U.S. bank mergers during the 1990s generated cost efficiencies ranging from 5% to 20%, primarily through branch consolidation and back-office integration. However, subsequent research by Rhoades (1998) and Amel et al. (2004) question whether these economies persist beyond asset thresholds of $10-25 billion, suggesting potential diseconomies of scale for megabank mergers. The **market power hypothesis** argues that consolidation enhances pricing power by reducing competition, enabling merged banks to charge higher loan rates and offer lower deposit rates (Hannan & Prager, 2004). This argument is supported by Focarelli and Panetta (2003), who found that Italian bank mergers initially reduced deposit rates but improved follow-up efficiency.

Cross-country evidence of bank merger outcomes reveals considerable differences, depending on regulatory regimes, market structures, and macroeconomic conditions**.** Healy et al. (1992) and Cornett and Tehranian (1992) find limited evidence of post-merger profitability gains in U.S. bank mergers during the 1980s, with only 30-40% of transactions achieving positive abnormal returns. Akhavein et al. (1997) found that in-market U.S. bank mergers generate profit efficiency improvements of 15-18%, primarily through expense reduction, while market-extension-mergers yield little benefit. Houston et al. (2001) examined 64 large U.S. bank mergers (1985-1996) and found that cost reduction forms 75% of proven synergies, with minimal revenue synergies. Larger banks have better management, resource efficiency, and technological capabilities to control their overall risk(Hussain and Bashir, 2020). Hence, merger deals involving small banks will have a minimal impact. Du and Sim (2016) analyse 114 bank mergers across 20 emerging economies and find that only 28% show improved cost efficiency post-merger, with the remainder experiencing stagnant or declining productivity. Sufian and Habibullah (2009) investigate Malaysian bank mergers conducted during the 1997

Asian financial crisis and suggest that there was an initial decline in operational efficiency, followed by a gradual recovery after 4-5 years. Adhikari et.al (2022) conducted a study of two Nepalese banks to evaluate the impact of mergers. The researcher used different variables to measure profitability, liquidity, leverage and shareholder wealth. Three-year data pertaining to pre- and post-merger were analysed using paired t-test. The study concludes that one of the banks showed significant improvement in profitability and liquidity after the merger but lagged behind all other parameters. For the second bank all parameters yielded insignificant results, which questions the motive for the merger. Overall, these studies highlight the importance of institutional quality and regulatory watch in determining a merger's success.

The measurement of bank merger performance has evolved from simple pre-post comparisons to sophisticated quasi-experimental designs. Accounting based approaches examine changes in financial ratios, operating metrics, and profitability indicators by comparing pre-merger and post-merger periods. These methods offer several advantages such as, direct measurement of operational outcomes, and accessibility of data from regulatory filings. However, this approach suffers from omitted variable bias if concurrent macroeconomic trends, regulatory changes, or industry shocks differentially affect merged and non-merged banks (Barber & Lyon, 1996). For instance, Indian PSB mergers occurred together with the Insolvency and Bankruptcy Code (2016) implementation, the COVID-19 pandemic (2020), and substantial government capital infusion, all of which independently affect bank performance. Without appropriate control groups, attributing performance changes solely to mergers is methodologically incorrect. Data envelopment Analysis (DEA) is a good tool for analysing the impact of mergers on bank performance (Aranha et.al 2024). Applications to bank mergers assess whether combined entities move closer to the efficiency frontier post-merger. Notable implementations include Berger and Humphrey (1992) for U.S. banks, Altunbaş and Molyneux (1996) for European banks, and Bahrini (2017) for bank mergers in the Middle East and North Africa. In the Indian context, Bhatia and Mahendru (2015), and Jayaraman and Srinivasan (2014) employed DEA to evaluate PSB efficiency trends. This study attempts to incorporate difference-in-differences (DiD) analysis in merger studies. (Bertrand et al., 2004; Angrist & Pischke, 2009). The DiD estimator compares performance changes for merged banks (treatment group) relative to non-merged banks (control group), effectively differentiating between time-invariant bank characteristics and common macroeconomic trends. The validity of DiD rests on the parallel trends assumption that, in the absence of the treatment, merged and non-merged banks would have experienced identical performance trajectories.

The Indian banking sector reforms commenced with the nationalization waves of 1969 and 1980, which created a public sector dominated landscape comprising 27 PSBs by 1991 (Narasimhan Committee, 1991). During this period, mergers were infrequent and typically involved the absorption of weak private banks by stronger PSBs rather than strategic consolidation. Notable examples include the New Bank of India's merger with the Punjab National Bank (1993) and Benares State Bank's integration with the Bank of Baroda (2002).

Financial sector liberalization following the 1991 Narasimhan Committee recommendations sparked a wave of private bank entries and initiated debates about PSB consolidation to enhance competitiveness (Narasimhan Committee, 1998). However, the actual merger activity remained limited, with only three significant PSB consolidations during this period:

1. **Times Bank merger into HDFC Bank (2000**
2. **Bank of Madura-ICICI Bank merger (2001**
3. **State Bank of Indore and State Bank of Saurashtra mergers into SBI (2008-2010)**

The limited PSB merger activity during 1991-2015, despite repeated committee recommendations (Narasimhan II, 1998; Ganguly Committee, 2000), reflects political resistance, union opposition, and concerns about job losses. This dormancy changed dramatically after 2014, with government prioritization of PSB consolidation as a solution to mounting NPA stress. The contemporary merger wave commenced with SBI's absorption of five associate banks and Bharatiya Mahila Bank in April 2017, followed by the Bank of Baroda's merger with Vijaya Bank and Dena Bank in April 2019, culminating in four simultaneous mega-mergers in April 2020 (PNB-OBC-UBI, Canara-Syndicate, Union Bank-Andhra Corporation, and Indian Bank-Allahabad). This consolidation reduced PSBs from 27 to 12, creating four banks with assets exceeding ₹8 lakh crore.

Studies on the impact of the merger of Indian PSBs have revealed mixed results. Some studies suggest that the effects of M&As on financial performance in the banking sector do not significantly improve in the post-merger period (Pahuja & Aggarwal, 2016; Shah & Khan, 2017). However, other studies have found that, the effects of M&As on financial performance in the banking sector showed significant improvements compared to the pre-merger period (Patel, 2018; Agarwal et al.,2019). Patel (2018) studied the impact of mergers on the financial performance of five Indian banks' data selected from 2000 to 2014, using ratio analysis and a paired sample t-test. The findings conclude that ratios such as earnings per share, profit per employee, and business per employee positively impacted the four banks in the sample in the post-merger period. However, one bank did not show a significant positive movement.

Therefore, the results vary according to the individual bank's performance. However, most banks in the sample effectively utilised assets, equity, and investment, leading to positive impacts on profitability in the post-merger period. Agarwal et al. (2019) study the effects of M&As on the performance of commercial banks in India from 2008 to 2018. The study selected four samples and the impacts of M&As in the pre-post-merger period were measured through five accounting ratios using the CAMEL framework and the paired t-test. The findings conclude that M&As have a more significant effect on the performance of private commercial banks than public banks. A study by Elumilade(2010) showed that merger improved competitiveness among banks in Nigeria. A study conducted by Abdulwahab and Ganguli (2017) in Bahrain showed that the overall financial performance of local banks did not significantly improve after the merger, because of the external shock of the global financial crisis of 2007 and the stringent policies of the Central Bank of Bahrain.

Research Methodology

This study is mainly aimed at using DiD analysis, a quasi-experimental design to empirically test whether the improvements seen after the merger are actually caused by the merger alone, or if there are any other factors that make up such improvements. Table 1 shows that six Public Sector Banks in India underwent a mega merger process between 2017 and 2020. Of these six banks, the researcher selected two banks, Punjab National Bank and Canara Bank. The reason for selecting these two banks was that the complete quarterly data regarding the selected performance parameters were available for these banks. Another reason for selecting these two banks was that, to compare merged banks with a control bank, there must be almost matching asset sizes between the banks. With this criterion, the Bank of India is the only peer close to the merged banks in terms of asset size and operation scale. (Table II). Hence, the researcher finalised the two samples. Previous studies used different financial ratios to study the impact of mergers on financial, operational, liquidity, and asset quality parameters (Agarwal et al. (2019). Most previous studies have used annual data. For mega-mergers, using yearly data provides only four possible observations. Hence, the researcher used quarterly data sourced directly from the investor presentations of the selected banks. Since every ratio is not reported quarterly, the researcher finalised it with five key parameters Net Interest Margin, Return on Assets, Net NPA Ratio, Capital Adequacy Ratio and Cost to Income Ratio. (Adhikari et.al 2022; Patel 2018, Table III)

Table III. Variables Used in The Study

Parameter	Variables	Description
Profitability	Net Interest Margin(NIM)	Interest earned-interest expense/Total Assets
	Return on Assets(RoA)	Net profit after tax/ Total Assets
Solvency	Capital Adequacy Ratio (CAR)	Total Equity / Total Assets
Asset Quality	Net NPA Ratio	Net NPA / Total Advances
Operational Efficiency	Cost to Income Ratio (CIR)	Operating expenses / Operating Income

Source: Author Compilation

Hypotheses

H1: There is significant difference in key parameters after post merger

H2: Merger had significant impact on key parameters.

Data Analysis

This section deals with the results of the paired t-test comparing the key variables before and after the merger followed by the results of the DiD analysis, which is a crucial component of this study.

Table IV Result of Paired t Test of Pre-Post Merger of Punjab National Bank

Paired Samples Test

	Paired Differences								H1 Support
				95% Confidence Interval of the Difference					
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)	
POST_ROA - PRE_ROA	.49625	.83245	.20811	.05267	.93983	2.385	15	.031	S
POST_NIM - PRE_NIM	.41875	.37797	.09449	.21734	.62016	4.432	15	.000	S

POST_NPA - PRE_NPA	-5.37250	2.26576	.56644	-6.57984	-4.16515	-9.485	15	.000	S
POST_CAR - PRE_CAR	3.95937	1.50404	.37601	3.15793	4.76081	0.5315		.000	S
POST_CIR - PRE_CIR	5.53125	5.91054	1.47764	2.38174	8.68076	3.74315		.002	S

Table IV shows that all parameters of Punjab National Bank show statistically significant positive movements following the merger. There was a marginal improvement in the RoA by 0.49% and NIM by 0.41%. The NPA ratio underwent a sharp reduction of 5.37%, and CAR improved by 3.9%. The most contradictory result here is the increase in the Cost to Income Ratio, which shows a negative effect of mergers. To confirm whether it was a merger alone that showed such effects, the data needed to be further analysed using the DiD method.

Table V Result of Paired t Test of Pre – Post Merger of Canara Bank

Paired Samples Test

	Paired Differences								H1
				95% Confidence Interval of the Difference				Sig. (2-tailed)	Support
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df		
POST_ROA PRE_ROA	-.84313	.67526	.16881	.48331	1.20294	4.994	15	.000	S
POST_NIM PRE_NIM	-.39312	.15448	.03862	.31081	.47544	10.180	15	.000	S
POST_NPA PRE_NPA	--4.37250	.72546	.18136	-4.75907	-3.98593	-24.109	15	.000	S
POST_CAR PRE_CAR	-3.03188	1.04765	.26191	2.47362	3.59013	11.576	15	.000	S
POST_CIR PRE_CIR	--4.46875	1.38968	.34742	-5.20926	-3.72824	-12.863	15	.000	S

All parameters show significant movements in the post-merger period compared to pre-merger period(Table V). RoA shows a slight increase of 0.84%, NIM has the narrowest improvement of 0.39%, NPA ratio has been substantially reduced by 4.37%, Capital Adequacy Ratio has increased by 3.03%, and Cost to Income Ratio, which is a crucial indicator of operational efficiency, has decreased by 4.46%. By seeing such figures, we can say that there have been improvements in key parameters after the merger, but whether this improvement has been effected as a result of the merger can be proven only through further analysis

Results of DID Analysis

To evaluate the impact of the merger of PSBs, the paired t-test cannot be sufficient because it can suggest whether there are improvements in the post-merger period compared to pre-merger. However, it cannot accurately predict whether the changes in the post-merger period can be attributed to the merger alone or whether there are any other factors that need to be studied. DiD analysis serves this purpose by testing whether the improvement or decrease in the parameters is actually due to the merger. The DiD approach is a quasi-experimental technique that is widely used in event studies to estimate causal effects by comparing changes in outcomes over time between a treatment group and a control group (Angrist & Pischke,2009). The validity of the DiD approach rests on the parallel trend assumption: In the absence of a merger, the treatment and control banks would have experienced similar trends in performance metrics. While this assumption cannot be directly tested post treatment, the researcher has included a comparable peer bank(Bank of India) as the control group to enhance the credibility of this assumption. Therefore, the treatment banks are CANARA BANK and PUNJAB NATIONAL BANK, who underwent mergers in 2020. The BANK OF INDIA was selected as the control group because it has the best possible match to the treatment banks in terms of asset size.

The DiD equation is

$$Y_{it} = \beta 0 + \beta Group_i + \beta 2 Time_t + \beta 3 (Group_i * Time_t) + €_{it}$$

Where,

Y_{it} = Performance metric(RoA, NIM, NETNPA,CAR,CIR) for bank I at time t

$Group_i$ = Dummy variable(1=merger bank 0= control bank(BoI)

$Time_t$ = Dummy variable(1=post merger 0=pre merger period)

$Group_i * Time_t$ = Interaction term capturing the impact of merger

$€_{it}$ = Error Term

Table VI DiD Analysis Results of PNB-BOI

	R^2 value	F ratio	F sig.	Constant	Sig.	Group coefficient	Sig.	Time coefficient	Sig.	Group * Time	Sig.	H2Support
RoA	.377	12.12	.00	-.591	.00	0.581	.012	1.21	.00	-.723	.026	S
NIM	.341	10.328	.00	2.406	.00	.137	.216	.385	.001	.034	.828	NS
NET NPA	.719	51.094	.00	6.88	.00	1.126	.70	-5.13	.00	-.24	.782	NS
CAR	0.78	70.97	.00	12.70	.00	-1.297	.001	3.494	.00	.465	.386	NS
CIR	.179	4.367	.08	51.48	.00	-4.734	.01	.676	.706	4.856	0.059	S

Table VI shows the results of DiD analysis of the Punjab National Bank. In the case of RoA, the model explained 37% of the variations. The group coefficient value of .581, which is statistically significant, shows that the treatment bank had a slightly higher RoA than the control bank before the merger. The RoA of the control bank improved over time by 1.21 points and this is statistically significant. Therefore, in addition to merger, there is a time related improvement. The DiD estimator shows that the merger actually led to a decrease in the RoA of the treatment bank, and the result is statistically significant. This is a concern for the management.

For NIM, the model explained 34% of the variation. The group coefficient is not statistically significant, which shows that there were no major differences between banks before the merger. However, the time coefficient value reveals that there is a significant time related improvement in the control bank's NIM. However, the DiD estimator was not statistically significant. Hence, the merger had no positive impact on the NIM of Punjab National Bank.

In the case of the Net NPA Ratio, the model explained 72% of the variation. The group coefficient value of 1.126 shows that the NPA ratio is slightly higher for the treatment bank before the merger although, it is not statistically significant. The time coefficient value of -5.133 shows a significant time related decrease in the Net NPA ratio of the treatment bank. However the DiD estimator was not statistically significant. Therefore, the merger had no significant impact on the Net NPA ratio of Punjab National Bank.

In the case of CAR, the model explains 78% of the variation. The group coefficient is significant and shows that the CAR of the treatment bank is slightly lower than that of the control bank before the merger. The CAR of the control bank increased significantly by 3.49

points during the post-merger period, which shows that there is a time related improvement in CAR. The DiD estimator shows a slight improvement in the CAR of the treatment bank, but this is not statistically significant. Therefore, the merger had no significant impact on the Capital Adequacy Ratio of Punjab National Bank.

For CIR, the model explained 18% of the variation. The group coefficient value of -4.734(p=0.01) shows that the CIR of the treatment bank was significantly lower than that of the control bank before the merger. There were no significant time related improvements in control bank's CIR. In addition, the DiD estimator showed a value of 4.856(p=0.059), which is significant at the 90% confidence level. This indicates that the merger led to an increase in operational costs, whereas the actual intention of the merger was to increase operational efficiency.

The DiD analysis results revealed a shocking finding that the merger caused a significant increase in operational costs. The merger was aimed at improving operational efficiency, but ultimately it led to an increase in costs. Other parameters show no significant effects due to the merger.

Table VII DiD Analysis Results of CANARA-BOI

	R^2 value	F ratio	F sig.	Constant	Sig.	Group coefficient	Sig.	Time coefficient	Sig.	Group * Time	Sig.	H2 Support
RoA	.493	19.42	.00	-.591	.00	.602	.005	1.219	.00	-.376	.208	NS
NIM	.324	9.59	.00	2.406	.00	.056	.594	.385	.00	.008	.956	NS
NET NPA	.85	113.62	.00	6.88	.00	-.645	.083	-5.13	.00	.76	.147	NS
CAR	.778	70.27	.00	12.70	.00	-.004	.989	3.494	.00	-.462	.31	NS
CIR	.26	7.03	.00	51.48	.00	-.927	.527	.676	.645	-5.144	.015	S

Table VII displays the results of DiD analysis of the Canara Bank. The model explained 49% of the variation in RoA. Overall, the model is highly significant. The Group coefficient shows the pre-merger difference between the two banks in RoA. The treatment bank had a slightly higher RoA (0.602) before the merger, which is significant. The time coefficient value of 1.219 shows that the control bank showed a significant improvement in RoA by 1.2

percentage. The DiD estimator showed that the merger led to a reduction in RoA by .376 points but this result was not statistically significant. Therefore, the merger had no significant impact on the RoA of Canara Bank.

For NIM, the model explained 32% of the variation. The group coefficient value of 0.05 shows that the treatment bank had a minimal higher NIM than the control bank before the merger, but this was not statistically significant. The time coefficient shows a significant value of .385, which means that there is a significant time related improvement in NIM in the case of the control bank. However, the DiD estimator was not significant. Hence the merger had no significant impact on the NIM of Canara bank.

In the case of NET NPA ratio, the model explained 85% of the variation. The group coefficient value of -.645 shows that the treatment bank had a slightly lower NPA ratio than the control bank before the merger, although this was not statistically significant. The time coefficient shows a highly significant value of -5.13 which confirms that there is a time related improvement in the asset quality of the control bank. However, the DiD estimator was not significant. Hence the merger had no significant impact on the Canara Bank's asset quality.

In the case of Capital Adequacy Ratio, the model explains 77% of the variation. The group coefficient value is not significant meaning that there was little difference between the banks before the merger. However, the time coefficient shows a significant value, indicating that the CAR of the control bank increased by 3.5 points over time. The DiD estimator shows that the merger slightly decreased CAR(by.46 points), although it was not significant. Thus, the merger had no significant impact on the Capital Adequacy Ratio of Canara Bank.

In the case of the Cost to Income Ratio, the model explains 26% of the variation. In this case, the group coefficient and time coefficient values were not statistically significant. This shows that before the merger, there were few differences in operational efficiency between the treatment and control banks. In addition, there was no significant time related improvement in the control bank's CIR. However, here, the DiD estimator shows a highly significant value of -5.144, which is concrete evidence that the merger helped to improve the operational efficiency of Canara Bank. Thus, the merger had a significant impact on improving the operational efficiency of Canara Bank. In the case of all other parameters, improvements or deteriorations occur owing to time related factors or any other factors that are beyond the scope of this study.

Conclusion

The findings of the paired t-test are consistent with those of previous studies. All parameters considered in this study showed significant movement after the merger. In the case

of Punjab National Bank, there was a slight increase in RoA post-merger by 0.49%. The Net interest margin also showed a marginal increase. The NPA ratio decreased by 5%. CAR also improved. However, when the DiD analysis was conducted the researcher understood that all those improvements were time related, as the control bank also underwent significant improvements. Surprisingly, RoA showed a decrease of 0.7% when the specific effect of the merger was analysed. The improvement in Net NPA post-merger was also a time related improvement that can be attributed to factors other than the merger. In the case of Cost to Income Ratio, even the model explains only 18% of the variation, but the impact of the merger is still significant at the 90% confidence level. Instead of reducing, CIR increased post-merger, which shows that merger had a negative impact on operational efficiency. To conclude, the merger had a significant effect on the RoA and CIR of the Punjab National Bank, but the effect was opposite to intentions. The RoA decreased and the CIR increased. The government aimed to improve the operational efficiency. This was the major aim of the mega merger. However, the merger led to an increase in cost burden. It is possible that these are short-term effects, and the situation may improve in the upcoming quarters.

All parameters of Canara Bank also showed significant positive movements after the merger. When DiD analysis was conducted, all parameters except the Cost to Income Ratio showed movements that were independent of the merger effect. This is proven because the same parameters in the case of the control bank (Bank of India) showed significant improvements during the same period. Thus, it can be concluded that these movements were not affected by the merger, but can be the effect of other macro-economic variables outside the scope of this study. However, the Cost to Income Ratio declined significantly by 5.1% ($p = 0.01$). Therefore, Canara Bank's management was highly successful in reducing its operational costs as an impact of the merger.

Thus, to conclude, most of the improvements we see in both banks after the merger were not the actual impact of the merger, because the control bank that did not undergo merger also showed such improvements over the same period. This can be due to time related improvements or other macroeconomic factors, such as interest rates, GDP growth, and specific bank reforms that led to these improvements. The specific impact of mergers may be realised in the coming years. The management of the bank has to keep checking all the parameters with respect to financial, operational, liquidity and asset quality performances to achieve maximum potential utilisation of the merger strategy. Researchers can further extend this study to other public sector banks, and compare them with their private sector counterparts to determine

whether PSBs through mergers can achieve the efficiency level of private sector banks. Another recommendation is that, researchers can add other important macroeconomic variables as control factors in the DiD experiment to test how these policy developments can impact performance.

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