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## Impact of Merger on Efficiency of Commercial Banks: A Case Study

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### ABSTRACT

**Purpose:** The study aims to see the impact of bank mergers on their efficiency.

**Design/Methodology/Approach:** The present study has considered 8 bank mergers during the period 2007-2019. Using Data Envelopment Analysis, three three-year pre-merger efficiency of anchor banks has been compared with its three-year post-merger efficiency.

**Findings:** The study has shown that there is no difference in the pre and post-merger efficiency of ICICI Bank, Indian Overseas Bank, and HDFC Bank. However, SBI and Kotak Mahindra Bank witnessed a decline in scale efficiency after a merger. Bank of Baroda also witnessed a decline in managerial and scale efficiency after a merger.

**Research Limitations:** The study has only considered three pre-merger and post-merger years. Secondly, the study is based on secondary data. So the results are dependent upon the authenticity of the data collected.

**Managerial Implications:** The present study is a guide for policymakers and researchers in the area of bank mergers. It suggests the sincere need to revisit and review past bank mergers in the light of findings of the present study.

**Originality/Value:** This study is original and one of its kind because none of the studies have considered bank mergers during this particular study period (2007-19).

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## Introduction

The banking industry is the key driver of all the economic activities in any economy. The smooth sailing of any economic activity is heavily dependent on the supply of adequate funds, the bulk of which is provided by the banking industry ([Agarwal et al., 2019](#)). Therefore, banks deserve significant attention in any economy. During the last few decades, the structure of banks has undergone metamorphic changes. Banks are no longer a controlled system rather they have turned into a liberalized one. With this, there has been much increase in competition among banks at domestic and global levels. To withstand this intense competition, the government and the policymakers introduced several policies and economic reforms in the banking industry. These economic reforms were cautiously introduced as per Narsimham committee recommendations in 1991 and 1998 followed by Verma committee report in 1999. Among the several measures adopted by the policymakers, bank consolidation through mergers emerged as one of the most preferable ones.

Mergers and acquisitions are a global way to corporate restructuring. The series of merger waves in the financial service industry has also paved the way for the emergence and growth of financial institutions and large-sized banks ([Jayadev & Sensarma, 2007](#)). The major mergers in the present day situation have been ignited by cutthroat competition as well as the need to do away with managerial, operational, and financial weakness and foster financial health. The major driving force behind mergers in banks is the need to economize on cost by reaching global size and enhancing efficiency and profitability, followed by the “too big to fail” theory ([Chandra Mondal et al., 2017](#)). Also, cost minimization and good financial planning are the need of the hour for expanding the bank’s business. This purpose can be achieved through mergers and acquisitions in banks ([Kitti 2020](#)). When it comes to mergers in banks, it can be either forced mergers or market driven mergers. The objective of the forced merger is to protect the depositors. Whenever a few banks are identified as weak with huge NPAs and a continued erosion of net worth, a forced merger is initiated to merge weak banks with strong banks. Against this, the voluntary merger is initiated due to the benefits of market dynamics such as economies of

scale, reduced risk due to a diversified portfolio, reduced cost, and in turn better performance ([Singla 2015](#)).

The purpose of a merger be it voluntary or forced is always the improvement in the financial performance of the banks. Mergers are initiated with the hope of getting the benefits of scale economies, better management, and lower costs. While some of the studies have found results in favor of merger ([Berger et al., 1997](#); [Sufian & Abdul Majid, 2008](#)) others have found that there is no significant gain in efficiency due to merger ([Kaur & Kaur 2010](#)).

Given this, the present study takes into consideration all the bank mergers initiated and implemented during the period 2007-2019. The present work aims to compare the three year pre and post merger efficiency scores of each anchor bank with itself and also to compare the efficiency score of anchor banks with their equivalent control banks to find if the performance of anchor banks has improved or not due to merger vis-à-vis their non-merged counterparts. This will provide insight to the policymakers and the banks regarding the effectiveness of the bank mergers initiated in the Indian banking industry.

## Mergers in the Indian Banking Industry

The history of mergers and acquisitions relates to the amalgamation of three presidency banks into one namely Imperial Bank of India in 1921. Then there occurred a series of merger waves in the Indian banking industry. Pre-nationalization period (1961-69) itself witnessed 46 bank mergers. All these were aimed to uplift weaker banks. Due to the improved post-merger bank performance, the government continued with the policy of merging banks, some for getting synergetic benefits and others for revival. In the year 1998, Narsimham committee also recommended in its report the need for stronger banks for the healthy growth of the economy. In the same fray, mergers and acquisitions in the banks were promoted with full vigor.

In this context, it is to be mentioned that the period 2007-2019 witnessed several mergers between various private banks and among public banks and private banks as well. The details of the mergers studied in the present paper are given in Table 1.

**Table 1: List of all Bank Mergers during 2007-2019**

Year	Target Bank	Acquirer Bank	Reason of Merger
2007	Sangli Bank	ICICI	Expansion of size
2007	Bharat Overseas Bank	Indian Overseas Bank	Restructuring of weak banks
2008	Centurion Bank of Punjab	HDFC	Expansion of Size
2008	State Bank of Saurashtra	SBI	Expansion of Size
2010	Bank of Rajasthan	ICICI	Expansion of Size
2015	ING Vysya Bank	Kotak Mahindra	Expansion of Size
2017	State Bank of Patiala	State Bank of India	Expansion of Size
2017	State Bank of Mysore	State Bank of India	Expansion of Size
2017	State Bank of Hyderabad	State Bank of India	Expansion of Size
2017	State Bank of Bikaner & Jaipur	State Bank of India	Expansion of Size
2017	State Bank of Travancore	State Bank of India	Expansion of Size
2017	Bhartiya Mahila Bank	State Bank of India	Expansion of Size
2019	Dena Bank & Vijaya Bank	Bank of Baroda	Expansion of Size

Source: Report on Trends and Progress of Banking in India

## Review of Literature

There exist several studies on the impact of the merger on the efficiency analysis of banks in European countries and the USA ([Jayaraman et al., 2014](#)). However, when it comes to the Indian context, scant attention has been paid by the researchers. In this context, some of the relevant works of literature reviewed are summarized below:

[Bharathi & Ravindran \(2010\)](#) have studied the pre-merger and post-merger operational efficiency of Indian banks. For this purpose, they have taken a sample of 9 banks depending on the availability of 5-year before and after-merger data of all mergers from 1995 onwards. The findings of the study have shown that there is an insignificant difference in NPAs, PE, ROA, Book value per share, and Market Capital. However, there exists a strong relationship among earning among earnings per share, profit per employee, business per employee, and capital adequacy. The study concludes that during the post-merger period, the banks were efficient enough. [Kaur & Kaur \(2010\)](#) have examined the cost efficiency of the banks which were merged after the liberalization covering the period 1990-08. For this purpose, the researchers have used DEA on unbalanced panel data to evaluate the cost efficiency separately under the common frontier

and separate frontier. The study has shown that in comparison to the public banks which are 73.4% efficient, their private counterparts are more cost efficient (76.3%). The researchers have concluded that to some extent, mergers have been successful. However, the policy makers need to revisit the merger policy of merging weak banks with strong banks to protect the interest of depositors of weak banks because this can adversely affect the quality of assets for strong banks. [Jatkar \(2012\)](#) in his study has analyzed the consolidation trends in global and Indian banks and then after, did an event study of stock returns to ascertain shareholders' views. The study has revealed that forced mergers do not benefit the shareholders of the target bank and acquirer bank. It is a voluntary merger that benefits the shareholders of both the target bank as well as the bidder banks with additional benefits to the bidder banks' shareholders. The researcher stands in favor of bank mergers due to several emerging challenges such as financial inclusion, the need for larger investment banks, Basel requirements, and full convertibility. [Kumar \(2013\)](#) has studied the impact of the merger of Bharat Overseas Bank with Indian Overseas Bank on their efficiency. The study has compared the pre and post merger performance of the target and acquirer bank on several parameters such as

PPE, BPE, investment, advances, interest on income, ROA, and NPAs. The study has concluded that the performance of the bank in the post-merger period has improved significantly concerning all the parameters used. Another study was done by [Singla \(2015\)](#) using the sample of 6 merger cases for the period 2000-2006. The researcher has resorted to various ratios relating to liquidity, efficiency, profitability, and capital structure to compare the performance of banks before and after the merger. The researcher has concluded that a merger strategy can be a success for expansion and growth in Indian banks however, it does not guarantee increased profitability, efficiency, liquidity, and capital base.

[Sethy \(2017\)](#) has attempted to analyze the efficiency of all associate banks of the state bank group for the period 2005 to 2016. The researcher has resorted to DEA to measure operational efficiency along with several other ratios such as PE ratio, earning per share, and market price to book value of equity. Using Krushkal Wallis test the study has shown that there is insignificant among the banks in terms of performance indicators used. However, SBI, SBP, SBOI, and SBS have performed comparatively better as compared to the other banks. The study stands in favor of the merger and concludes that the merger has a favorable effect on the performance of SBI. [Lalitha \(2018\)](#) in his study on the impact of mergers on operating efficiency has taken three private banks and three public acquirer banks. To analyze the 5-year pre and post-merger financial performance, the study has resorted to several accounting ratios such as CAR, ROE, NIM, ROI, and absolute measures of operating profit and net profit. The discriminate analysis has shown that return on equity has been an important discriminating factor and the banks with either lower or higher of this ratio have improved their performance both before and after the merger period.

[Kumar, N. et al., \(2019\)](#) have studied the impact of mergers on banks' efficiency in India. For this purpose, the five leading cases of merger viz. merger of GTB with OBC, BOP with CB, BOM with ICICI, BSB with BOB, and Times Bank with HDFC bank during the period 2000 to 2005 are taken into consideration. The study has found merger gains in all except one case of merger of OBC with GTB. The study has also concluded that

forced mergers lead to a decline in efficiency and voluntary mergers boost efficiency. [Kitti \(2020\)](#) did a study on the "Impact of Bank Mergers on Efficiency of Banks in India" and used Data Envelopment Analysis (DEA) to measure the impact of the merger on both technical as well as the scale efficiency of HDFC and SBI during pre-merger period, merger period and post-merger period. The study has shown that the merger has been successful for both the two selected banks and both the banks have gained the benefit of economies of scale.

The review of literature in respect of the Indian context has clearly shown that the majority of the studies have used traditional accounting ratios as a proxy of bank efficiency. However, the present study has used DEA to calculate the efficiency in banks viz. TE, PTE, and SE. Being non-parametric, DEA works by the linear program which facilitates the use of several outputs and inputs at the same time and there is no superimposition of any specific functional form in DEA, therefore, it is considered superior to the traditional accounting ratios.

Secondly, none of the studies has been undertaken covering the entire merger cases during the period 2007-2019. As these years have been very happening years of the Indian banking industry, therefore, doing the impact analysis of mergers on the efficiency of the banks during this period assumes a greater significance. Given this, the present study is undertaken to bridge the above mentioned research gaps.

## Data Envelopment Analysis (DEA)

### DEA Framework

This study has used DEA to see the impact of mergers on the efficiency of Indian banks. DEA was developed by Farrell in 1957 to measure the efficiency of several DMUs be it schools, hospitals, banks, or any other financial institution. Under this, the weighted sum of outputs is divided by the weighted sum of inputs to calculate the efficiency score of any DMU and this takes the value somewhere between 0 and 1 ([Bandyopadhyay et al., 2018](#)). The firm which gets the efficiency score of 1 is taken as a 100% efficient firm and this lies on the efficient frontier. The other firms that get a score less than 1 are taken as inefficient ones. The inefficient firms are expected to follow the

operating practices of the efficient DMU. It is to be mentioned here that a firm is taken as the efficient firm only concerning the other firms and not in isolation.

DEA has been preferred in this study because it offers several benefits over the other methods. It joins several piecewise linear combinations to form different facets to form a convex convex-shaped production possibility set ([Berg et al., 1991](#)). Secondly, being a non-parametric method it does not go by the assumption of a specific functional form of the dataset ([Abramo & D'Angelo 2009](#)). Thirdly, it facilitates the use of inputs and outputs with entirely different units of measurement without the need for standardization ([Sathye 2003](#)).

### **Inputs and Outputs Used**

In DEA literature, the variables are denoted as inputs and outputs. No standard rule has been made for selecting inputs and outputs. It freely depends upon the researcher. However, the literature related to banking says that while selecting inputs and outputs, there are two common approaches vis. production approach and intermediation approach.

The production approach as pioneered by Benston in the year 1965, considers the banks as service providers to its customers. Therefore, this approach ignores all the interest costs and considers only the non-interest based cost (operating costs).

The intermediation approach being another approach of DEA as proposed by Sealey and Lindley in the year 1977 considers the banks as a financial intermediary and service provider. Under this approach, both interest cost and non-interest based cost (operating costs) are taken into consideration.

The production approach ignores the interest cost and therefore, it is more suitable for analyzing the branch level data because interest cost is not under the control of any particular bank branch. Against this, the intermediation approach is more suitable while analyzing the bank level data. At the bank level, the aim is not only to reduce the operating cost rather the aim is to reduce the total cost ([Berger et al., 1997](#)).

Given this, the present research work has resorted to the Intermediation approach for calculating the efficiency scores. Because the present work has taken into its consideration, the bank level data and not branch level data, therefore, Intermediation approach is applied in the study. Going by the intermediation approach, the study has used two inputs namely interest expenses and operating expenses and on the same token, the outputs used are net interest income and other income. Net interest income captures the income earnings of the bank from fund-based activities. Other income captures the income earnings of the bank from various off-balance sheet and other fee-based activities. It is worth mentioning here that the selection of these inputs and outputs coincides with the studies by several other researchers such as ([Ataullah et al., 2004](#); [Drake & Hall 2003](#); [Marjanoviæ et al., 2018](#); [Sathye 2003](#)).

### **Model Used**

Initially, Charnes, Cooper, and Rhodes (CCR) introduced DEA in the literature relating to Operations Research in the year 1978. The CCR model named after them is applicable in the technologies that are characterized by constant returns to scale (CRS). Therefore, Banker Charnes and Cooper extended the CCR model and came up with the BCC model to make it possible to work for the technologies exhibiting variable returns to scale (VRS) ([Ray 2014](#)). Under DEA, there are two models. Input-oriented DEA model is applied when the objective is to reduce or contract the input without touching the output. An alternative to this is the output-oriented model which is applied when the objective is to expand the output without reducing the inputs. Thus, the input-oriented model is governed by the minimization criteria and the output-oriented model is governed by the maximization criteria. The efficiency scores when computed under CCR assumption give the same result for both input and output-oriented models and this efficiency score is denoted as overall technical efficiency (OTE). However, the efficiency scores computed under the VRS assumption differ from each other. It bifurcates the cause of efficiency into pure technical efficiency and scale efficiency.

Given this, the present study has applied the input-oriented DEA model because input conservation is comparatively easier for the banks as compared to output expansion. Also, the output expansion for banks depends on factors that are embedded in the economy and are external.

**Formulation of Linear Programming under BCC Model**

In line with [Dinberu & Wang \(2018\)](#) the input oriented BCC model based LP equation is:

Minimize  $\theta_q$

Subject to

$$\sum_{t=1}^n x_{ij} \alpha_j \leq \theta_t x_{it}; i = 1,2, \dots, m$$

$$\sum_{t=1}^n y_{rj} \alpha_j \geq y_{rt}; r = 1,2, \dots, s$$

$$\sum_{t=1}^n \alpha_j = 1$$

$$\alpha_j \geq 0; j = 1,2, \dots, n$$

Where  $\theta_q$  = input technical efficiency of a

DMU<sub>q</sub>

$Y_{ij}$  = i<sup>th</sup> output used by DMU<sub>t</sub>

$x_{ij}$  = i<sup>th</sup> input used by DMU<sub>t</sub>

$Y_{rj}$  = r<sup>th</sup> output used by DMU<sub>j</sub>

$x_{ij}$  = i<sup>th</sup> input used by DMU<sub>j</sub>

$\alpha_j$  = the weight given to DMU<sub>j</sub>

**Research Methodology**

The efficiency scores have been computed under the VRS (BCC model) assumption using input oriented model of DEA for three years pre and post merger periods. When the merger was initiated and implemented before the initial 6 months in any financial year, that entire year is taken as the post-merger financial year and similarly, when a merger was found to be initiated and implemented after the passage of 6 months in any financial year, then that whole financial year is taken as the pre-merger year ([Jayaraman et al., 2014](#)). For collecting data, several secondary sources are used such as annual reports and financial statements of respective banks and the website of Reserve Bank of India (RBI).

Following [Jayaraman et al. \(2014\)](#) in this paper a comparison is made between the efficiency scores of anchor banks with their equivalent control bank. This is done to justify the effect of the merger. Non-merged equivalent control banks are identified based on total assets. Those banks which are not merged and whose total assets are close to the merged banks are identified and selected. It is to be mentioned here that there is no equivalent non-merged bank for SBI. As ICICI Bank has the nearest total assets to SBI but being merged bank it has been excluded from the analysis. The list of merged banks and their equivalent non-merged peers is given in Table 2.

**Table 2: List of Merged Banks and their Non-Merged Control Banks**

Merged Banks	Non-Merged Banks
ICICI bank	Canara bank
Indian Overseas bank	United Commercial Bank Ltd. (UCO)
HDFC bank	Union Bank of India (UBI)
Kotak Mahindra bank	Indusind bank
Bank of Baroda (BOB)	Axis bank
State Bank of India (SBI)	-

Source: Author's Own Compilation

If the control banks as compared to the anchor banks have been doing better in the post-merger period, and the efficiency of anchor banks has declined after the merger in comparison to the pre-merger period efficiency, it can be interpreted as the after-effect of the merger which has deteriorated the efficiency of anchor banks and vice-versa.

## **Result Interpretation and Discussion**

### **Efficiency Analysis of Merged Banks and Control Banks**

Efficiency scores computed under the BCC model of DEA for the anchor banks and their equivalent control banks are presented in Table 3.

A perusal of Table 3 shows that ICICI bank was 100% input efficient during the pre-merger period with full managerial efficiency as well as scale efficiency. After the merger of Sangli Bank with ICICI Bank no change was found in the efficiency score of ICICI Bank and it remained fully input efficient during all the post-merger years as well. This denotes that the merger of Sangli Bank with ICICI Bank does not affect the efficiency of ICICI Bank.

Against this, Canara Bank being the equivalent non-merged control bank showed a fluctuating trend in input efficiency. This was due to the fluctuating trend in scale efficiency during the entire study period (2005-10). However, during the entire study period, Canara Bank was found to be 100% managerially efficient with the year 2006 being the only exception. The findings so far indicate that ICICI is more input efficient than Canara Bank.

ICICI acquired Bank of Rajasthan during the year 2010. The analysis on this part has shown that during the pre-merger period (2008-10) as well as the post-merger period (2010-12), ICICI Bank remained 100% input efficient due to full managerial efficiency and scale efficiency. As no change in efficiency was found, therefore, it can be easily concluded that the merger does not affect the efficiency of ICICI Bank.

On the contrary, when we look at the

performance of Canara Bank, we found that during the period under consideration (2008-13), the input efficiency declined from 1.000 to 0.879. The efficiency declined because of the decline in managerial as well as the scale efficiency. Managerial efficiency declined from 1.000 to 0.951 and scale efficiency declined from 1.000 to 0.923. This denotes that ICICI is more input efficient as compared to the Canara bank.

As far as the Indian Overseas bank is concerned, it is revealed that the bank was 100% input efficient during both the pre-merger period and the post-merger period. The managerial efficiency as well as the scale efficiency of Indian Overseas Bank was found to be 100%.

Against this, the efficiency of UCO bank being the equivalent control bank has shown a declining trend during the period 2004-09. The input efficiency score declined from 0.942 to 0.781 indicating the increased input wastage from 5.8% to 21.9%. The decline in input efficiency occurred due to a simultaneous decline in both pure technical efficiency as well as scale efficiency. The PTE score declined from 0.953 to 0.843 and the scale efficiency score registered a decline from 0.971 to 0.925. This clearly shows that Indian Overseas bank is more input efficient than its equivalent non-merged counterpart.

As we look at the efficiency scores of HDFC bank, it is revealed that the bank was fully input efficient during the pre-merger period. The full input efficiency can be attributed to full managerial efficiency as well as the scale efficiency of HDFC bank. After HDFC Bank acquired Centurion Bank of Punjab, no change in efficiency occurred. This is evident because during the post-merger period, HDFC bank remained fully input efficient with an efficiency score of 1.000 in all the post-merger years.

On the contrary, its equivalent non-merged bank UBI has shown a different trend. During the entire period under consideration (2006-11), the input efficiency showed minor fluctuations and declined from 1.000 to 0.995. This decline mainly occurred due to the decline in scale efficiency from 1.000 to 0.995. As far

**Table 3: Efficiency scores of Merged Banks and Equivalent Control Banks**

Bank	Year	Period of Merger	TE	PTE	SE	Returns to Scale
ICICI	2005	Pre	1.000	1.000	1.000	CRS
	2006		1.000	1.000	1.000	CRS
	2007		1.000	1.000	1.000	CRS
	2008	Post	1.000	1.000	1.000	CRS
	2009		1.000	1.000	1.000	CRS
	2010		1.000	1.000	1.000	CRS
Canara Bank (Control bank)	2005		1.000	1.000	1.000	CRS
	2006		0.817	0.876	0.933	IRS
	2007		0.959	1.000	0.959	DRS
	2008		1.000	1.000	1.000	CRS
	2009		0.971	1.000	0.971	DRS
	2010		1.000	1.000	1.000	CRS
ICICI	2008	Pre	1.000	1.000	1.000	CRS
	2009		1.000	1.000	1.000	CRS
	2010		1.000	1.000	1.000	CRS
	2011	Post	1.000	1.000	1.000	CRS
	2012		1.000	1.000	1.000	CRS
	2013		1.000	1.000	1.000	CRS
Canara Bank (Control bank)	2008		1.000	1.000	1.000	CRS
	2009		0.971	1.000	0.971	DRS
	2010		1.000	1.000	1.000	CRS
	2011		1.000	1.000	1.000	CRS
	2012		0.981	1.000	0.981	DRS
	2013		0.879	0.951	0.923	DRS
Indian Overseas	2004	Pre	1.000	1.000	1.000	CRS
	2005		1.000	1.000	1.000	CRS
	2006		1.000	1.000	1.000	CRS
	2007	Post	1.000	1.000	1.000	CRS
	2008		1.000	1.000	1.000	CRS
	2009		1.000	1.000	1.000	CRS
UCO bank (Control)	2004		0.942	0.953	0.971	IRS
	2005		0.923	0.951	0.971	IRS
	2006		0.817	0.876	0.933	IRS
	2007		0.794	0.831	0.957	IRS
	2008		0.899	0.979	0.918	IRS
	2009		0.781	0.843	0.925	IRS
HDFC	2006	Pre	1.000	1.000	1.000	CRS
	2007		1.000	1.000	1.000	CRS
	2008		1.000	1.000	1.000	CRS
	2009	Post	1.000	1.000	1.000	CRS
	2010		1.000	1.000	1.000	CRS
	2011		1.000	1.000	1.000	CRS

Bank	Year	Period of Merger	TE	PTE	SE	Returns to Scale
UBI (Control bank)	2006		1.000	1.000	1.000	CRS
	2007		1.000	1.000	1.000	CRS
	2008		0.871	0.876	0.994	IRS
	2009		1.000	1.000	1.000	CRS
	2010		1.000	1.000	1.000	CRS
	2011		0.995	1.000	0.995	DRS
SBI	2006		0.925	1.000	0.925	DRS
	2007	Pre	0.898	1.000	0.898	DRS
	2008		0.950	1.000	0.950	DRS
	2009		0.982	1.000	0.982	DRS
	2010	Post	0.791	1.000	0.791	DRS
	2011		0.919	1.000	0.919	DRS
	2015		0.848	1.000	0.848	DRS
	2016	Pre	0.814	1.000	0.814	DRS
	2017		0.834	1.000	0.834	DRS
	2018		0.791	1.000	0.791	DRS
	2019	Post	0.732	1.000	0.732	DRS
	2020		0.792	1.000	0.792	DRS
Kotak Mahindra	2013		1.000	1.000	1.000	CRS
	2014	Pre	1.000	1.000	1.000	CRS
	2015		1.000	1.000	1.000	CRS
	2016		0.860	1.000	0.860	IRS
	2017	Post	0.963	1.000	0.963	IRS
	2018		0.978	1.000	0.978	IRS
Indusind (Control bank)	2013		0.884	1.000	0.884	IRS
	2014		0.923	1.000	0.923	IRS
	2015		1.000	1.000	1.000	CRS
	2016		1.000	1.000	1.000	CRS
	2017		1.000	1.000	1.000	CRS
	2018		1.000	1.000	1.000	CRS
BOB	2017		0.894	0.952	0.941	IRS
	2018	Pre	0.887	0.955	0.928	IRS
	2019		0.886	0.984	0.901	IRS
	2020		0.795	0.847	0.938	IRS
	2021	Post	0.736	0.764	0.963	IRS
	2022		0.781	0.841	0.929	IRS
Axis (Control bank)	2017		1.000	1.000	1.000	CRS
	2018		0.989	1.000	0.989	DRS
	2019		0.992	1.000	0.992	DRS
	2020		1.000	1.000	1.000	CRS
	2021		1.000	1.000	1.000	CRS
	2022		1.000	1.000	1.000	CRS

Source: Annual Reports of respective banks and Author's Own Compilation

as managerial efficiency is concerned, it stood at 100% throughout the period under consideration. This indicates that HDFC bank is slightly more input efficient than UBI.

When it comes to SBI, the study has shown that before SBI acquired SBS, an increasing trend was found in the input and scale efficiency. Before the merger period (2006-08), the input and scale efficiency increased simultaneously from 0.925 to 0.950. Also, during this period, the managerial efficiency of SBI was 100%. In the immediate year after the merger, the efficiency of SBI declined sharply from 0.995 to 0.925. This decline mainly occurred due to the deterioration in scale efficiency. The year 2010 witnessed a more serious decline in scale efficiency. It came down to a low of 0.791 from a high of 0.982. Then after, it improved and increased to 0.919 in the year 2011. As the pre-merger efficiencies (input and scale) of SBI were higher than the post-merger efficiencies, it is evident that the merger of SBS with SBI has adversely affected the efficiency of SBI. Also, it is revealed that both before and after the merger, SBI was found to operate at DRS. This denotes the need for downsizing the scale of operations of SBI to become scale-efficient.

SBI witnessed a second phase of merger in the year 2017 when all the associate banks were merged with SBI. The analysis on this ground has shown that during the pre-merger period (2015-17), the input efficiency and scale efficiency of SBI declined from 0.848 to 0.834. However, the managerial efficiency stood at 100%. In the immediate next year after SBI took over its associate banks, the input and scale efficiency declined further from 0.834 to 0.791. This decline continued in the next year 2019 and input efficiency and scale efficiency reached a low of 0.732. Then, the input and scale efficiency increased to 0.792 in the year 2020. It is evident that the input efficiency and scale efficiency of SBI were higher before the merger and the same witnessed a decline after the merger. This denotes that the merger adversely affected the scale efficiency and in turn the overall input efficiency of SBI. The major cause of declining scale efficiency in SBI is its supra-optimal scale size. To become scale

efficient, SBI needs to downsize its scale of operation.

The analysis of the merger of ING Vysya with Kotak Mahindra Bank has shown that during the pre-merger period (2013-15) input efficiency of Kotak Mahindra Bank was 100%. Before the merger, it operated with full managerial efficiency and scale efficiency. However, the post-merger period witnessed a decline in efficiency. During the year 2016, the immediate year after the merger, the overall technical efficiency declined sharply from 1.000 to 0.860 due to the decline in scale efficiency from 1.000 to 0.860. But then-after an increasing trend was found in the efficiency. The input efficiency and scale efficiency increased to 0.963 and 0.978 during the years 2017 and 2018 respectively. It is evident that before the merger, Kotak Mahindra Bank operated at the efficient frontier under CRS but after the merger, it started operating below the frontier and exhibited IRS. This indicates the need for increasing the scale size in Kotak Mahindra to make it scale efficient. Though the managerial performance was 100% both before and after the merger, it witnessed a decline in scale efficiency after the merger. On this ground, it can be concluded that the merger failed to provide any efficiency gain to the anchor bank and rather, it adversely affected its scale efficiency and input efficiency.

When we look at the efficiency scores of the non-merged bank Indusind, we find that it has performed much better than Kotak Mahindra. It is revealed that during the years 2013 and 2014, IndusInd Bank operated below the efficiency frontier with the input efficiency score and scale efficiency score being 0.884 and 0.923 respectively. Then it became 100% input efficient in all the rest of the years (2015-18) under consideration. This happened because Indusind became scale efficient and managerially efficient in the later years. This situation clearly shows that the merger harmed the scale efficiency of Kotak Mahindra Bank.

Analysis for BOB has shown that during the pre-merger period (2017-19), the input efficiency declined from 0.894 to 0.886. This

indicates the increased input wastage from 10.6% to 11.4%. This can be attributed to the decline in scale efficiency from 0.941 to 0.901. However, as far as managerial efficiency is concerned, it increased from 0.952 to 0.984. After the merger of Dena and Vijaya Bank with BOB, the input efficiency declined further from 0.795 in the year 2020 to 0.781 in the year 2022. This decline occurred due to a simultaneous decline in both managerial efficiency and scale efficiency. During this period (2020-22), the managerial efficiency declined from 0.847 to 0.841 and scale efficiency also declined from 0.938 to 0.929. However, BOB remained more scale efficient than managerially efficient. During all these years, BOB operated at IRS. This denotes that BOB needs to increase its scale size to become scale efficient. As the post-merger input efficiency and managerial efficiency of BOB have been lower than the pre-merger efficiencies, therefore, it can be inferred that the merger negatively affected the efficiency of BOB. Although BOB experienced slight efficiency gains from the merger due to some increase in scale efficiency, the gains from this are much lower in comparison to the loss from reduced managerial efficiency.

Contrary to this, Axis Bank being the non-merged peer bank has performed much better than BOB. Axis Bank was found to operate at the efficient frontier with a 100% efficiency level during the entire study period (2017-22) with the year 2018 and 2019 being the exceptional years. During the year 2018, the efficiency score of Axis Bank stood at 0.989. But, this increased to 0.992 (very close to 1) during the year 2019. The efficiency increased due to an increase in scale efficiency. With this, Axis Bank became 100% input efficient along with being managerially efficient and fully scale efficient. This clearly indicates that the merger of Dena Bank and Vijaya Bank in BOB failed to provide any efficiency gains to BOB and adversely affected the managerial performance and input efficiency and therefore, its equivalent non-merged bank Axis has outperformed BOB.

Of the 8 merger cases studied, the change in efficiency is evident in the case of 3 anchor banks viz. SBI, Kotak Mahindra and BOB.

These banks witnessed a change in efficiency in terms of a decline in input efficiency. In the other 5 cases, no change occurred in efficiency after the merger.

### **Analysis of Efficiency Changes in Merged Banks**

To find the extent to which the merger has provided benefit to the anchor banks, the present study has compared the post-merger overall input efficiency of anchor banks with the average input efficiency of the control group of banks. Following [Gourlay et al., \(2006\)](#) the study has resorted to the technical efficiency changes analysis. The analysis on this front helps find if there are any efficiency gains to the anchor banks from the merger to achieve the possible competitive advantage over the non-merged control banks. The technical efficiency changes are computed by subtracting the average input efficiency scores of control banks from the overall input efficiency scores of merged banks in the respective year. The results in this regard are presented in Table 4.

A perusal of Table 4 shows that there is a positive TE change in ICICI bank, IOB, and HDFC bank during all the post-merger years. This shows that these acquirer banks are far more efficient than their equivalent non-merged banks. Against this, the TE change in Kotak Mahindra Bank has been negative during the first post-merger year 2016. Then, the TE change turned positive during the post-merger years 2017 and 2018. This indicates that initially, the control banks were better in performance as compared to the Kotak Mahindra. However, later on, Kotak Mahindra Bank surpassed the control banks with higher input technical efficiency. The analysis of TE changes in BOB has shown that the TE change is negative during all the post-merger years. This denotes that BOB is less input efficient in comparison to its equivalent non-merged banks.

### **Mann-Whitney U Test**

Mann-Whitney U Test is a non-parametric equivalent to the independent sample t-test. The study has resorted to the test because it will indicate the direction of change in TE

**Table 4: Changes in TE of Anchor Banks**

Anchor Banks	Post-Merger Year	TE	Average TE of Control Banks	“TE
ICICI	2008	1.000	0.932	0.068
	2009	1.000	0.915	0.085
	2010	1.000	0.946	0.054
ICICI	2011	1.000	0.984	0.984
	2012	1.000	0.975	0.975
	2013	1.000	0.948	0.948
Indian Overseas	2007	1.000	0.921	0.079
	2008	1.000	0.932	0.068
	2009	1.000	0.915	0.085
HDFC	2009	1.000	0.915	0.085
	2010	1.000	0.946	0.054
	2011	1.000	0.984	0.016
Kotak Mahindra	2016	0.860	0.882	-0.022
	2017	0.963	0.943	0.020
	2018	0.978	0.941	0.038
BOB	2020	0.795	0.955	-0.16
	2021	0.736	0.966	-0.23
	2022	0.781	0.965	-0.184

Source: Annual Reports of respective banks and Author's Own Compilation

between merged banks and control banks and also if the difference in the efficiency scores of merged banks and control banks is significant or not during pre and post-crisis periods separately. The results in this regard are shown in Table 5.

A perusal of Table 5 shows that the mean efficiency scores of merged banks are higher in comparison to the control banks during the pre-crisis period. However, the significance value is  $.151 > .05$ . This indicates that there is

no significant difference in the efficiency scores of merged banks and control banks.

On the same token, the Mann-Whitney Test was applied to the post-merger efficiencies of merged banks and control banks. The results in this regard are presented in Table 6.

A perusal of Table 6 has shown that the significance value is  $1.000 > 0.05$ . This denotes the insignificant difference in the mean efficiencies of the two groups of banks.

**Table 5: Results of Mann-Whitney U Test during Pre-Merger Period**

Banks	N	Mean Rank	Sum of Ranks	Test Statistic	Significance
Merged	5	7.00	35.00		
Control	5	4.00	20.00	5.000	0.151

**Table 6: Results of Mann-Whitney U Test during Post-Merger Period**

Banks	N	Mean Rank	Sum of Ranks	Test Statistic	Significance
Merged	5	7.00	35.00		
Control	5	4.00	20.00	4.000	1.000

## Conclusion

The present study has seen the impact of bank mergers on their efficiency for the period spanning 2007-2019. Indian banking industry witnessed a series of bank mergers during this period. Using the VRS assumption of DEA, the cause of efficiency in acquirer banks is bifurcated into pure technical efficiency and scale efficiency. The three year pre-merger efficiency of each anchor bank is compared with its three year post-merger efficiency to find the changes in efficiency due to the merger. Also, a comparison is done between the efficiency of each anchor bank with equivalent non-merged control banks to find the changes in the efficiency of the anchor banks with its peer control banks. To find any efficiency gains from the merger to the anchor banks, a yearly comparison is done between the post-merger overall input efficiency of merged banks and the average input efficiency of a control group of banks.

The analysis of 8 merger cases has shown that the anchor banks witnessed no efficiency gains from the merger. Rather, the mergers harmed the scale efficiency of the banks. It is evident that SBI after it acquired the State Bank of Saurashtra and the other associate banks, witnessed a decline in scale efficiency. On the same token, Kotak Mahindra Bank also witnessed a decline in scale efficiency after it acquired ING Vysya Bank. Contrary to this, IndusInd Bank being the equivalent non-merged bank has performed better than Kotak Mahindra Bank. BOB experienced a decline in managerial efficiency after its merger with Dena Bank and Vijaya Bank. On the contrary, Axis Bank being the non-merged control bank has performed better in comparison to BOB. The results of the Mann-Whitney U Test have shown that the difference in efficiency scores between merged banks and control banks is statistically insignificant. Thus, it can be safely concluded that the merged and non-merged banks are similar in performance which indicates no significant efficiency gains have arisen from the merger. The following results are in line with ([Jayaraman et al., 2014](#)).

The analysis has also shown that more public banks have witnessed a decline in efficiency after mergers. In private banks, mergers have not had any adverse effect on efficiency with Kotak Mahindra Bank being the only exception that experienced a decline in efficiency after it acquired ING Vysya Bank.

## Implication and Outlook

The study has shown that there exists an insignificant difference in the pre and post-merger efficiency of the anchor banks (ICICI Bank, IOB, and HDFC Bank) and that two of them (SBI and Kotak Mahindra Bank) have also witnessed a decline in scale efficiency with a decline in both managerial and scale efficiency in one case (Bank of Baroda). This implies that the bank mergers have not been successful as far as the efficiency gains are concerned.

In light of the above findings of the study, it can be suggested that the government and policymakers need to revisit and review their merger policies before implementing them again in any form in the future.

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## List of Abbreviations

- PPE - Profit per Employee  
BPE - Business per Employee DMUs - Decision Making Units  
ROA - Return on Assets  
NPAs - Non-Performing Assets  
PE ratio - Price Earning ratio  
SBI - State Bank of India  
SBP - State bank of Patiala  
SBOI - State bank of Indore  
SBS - State bank of Saurashtra  
CAR - Capital adequacy ratio  
ROE - Return on equity  
NIM - Net interest margin  
ROI - Return on investment  
GTB - Global Trust bank  
OBC - Oriental Bank of Commerce  
BOP - Bank of Punjab  
CB - Centurion bank  
BOM - Bank of Madurai  
BSB - Benares State bank  
BOB - Bank of Baroda  
DEA - Data Envelopment Analysis  
TE - Technical Efficiency  
PTE - Pure Technical Efficiency  
SE - Scale efficiency