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OFF-BALANCE SHEETS ITEMS AND POST-MERGER PRODUCTIVITY: AN EMPIRICAL STUDY OF INDIAN COMMERCIAL BANKS

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Abstract
The purpose of this article is to investigate the effect that mergers and acquisitions have had on the efficiency of the Indian banking industry. When assessing total factor productivity change indexes of the acquirer banks in post-merger periods with the application of semi-parametric Malmquist productivity index, the study attempts to investigate the significance of include off-balance sheet (OBS) items in the definition of banks' outputs. The empirical analysis of the study comprised participation from six Indian commercial banks in the merger that took place between 2017 and 2021. The necessary information was taken from the annual reports of the various banks that were accessed through the websites of the BSE and the NSE. The study found that including non-interest income in efficiency measurements lowers bank productivity. The percentage drop is modest and appears to be more due to technology than efficiency. The increased non-interest income share of acquiring banks after the merger does not increase bank efficiency.

Keywords: M&A, Off-balance Sheets' Items, Non-interest Income, DEA

Introduction
The expansion of the banking business can be significantly bolstered through mergers and acquisitions (M&A). Banks look favourably upon M&A as a means of increasing productivity, sustaining exposure, and enhancing competition (Agnihotri, 2013; Kalra et al., 2013; Steigenberger, 2017). Godbole (2013) defines a merger as "the combination of all the assets, liabilities, loans & business of two or more companies such that one of them survives." Banks can gain from diversification as a result of the merger by concentrating more on contemporary business operations than conventional ones that intensify market competitiveness (Mantravadi & Reddy, 2008; Chatterjee, 2007). In recent decades, the Indian banking sector has seen a wave of M&A as a means of achieving expansion. Similar to other countries, M&A in the Indian banking sector aid in the improvement of institutions' productivity and expertise (Kotnal, 2016). The Indian government mega-merged 10 public sector banks into four in 2019. This is done to achieve economies of scale and efficiently cover banking product and technology gaps. (Al-Sharkas et al., 2008; Al-Khasawneh, 2013; Wu et al., 2014; Jasrotia & Agarwal, 2020). The current state of the economy is making it difficult for smaller banks to obtain resources and technology, which raises concerns about their ability to continue operating. Their

reorganization through M&A can bring some relief and help in their rebirth (Singh, 2009; Forsans & Balasubramanyam, 2010; Kotnal, 2016). To corroborate this, Kasman et al. (2013) provided evidence showing how stimulating M&A activity inside the financial sector and market-driven consolidation of smaller banks increases the profitability of the involved banks. The concept of banking mergers and acquisitions was studied by financial institutions as a potential competitive strategy on a worldwide scale. The banking activities of many nations are brought into the M&A process in order to generate synergy and enter new markets (Martynova et al., 2007; Altunbas &Marques, 2008). The reduction of financial costs, the expansion of business opportunities, and other advantages are examples of the synergy benefits that can accrue to banking institutions as a result of the cooperative efforts of two or more financial institutions (Ravenscraft & Scherer, 1987). Due to this, both the corporate and academic worlds have given great emphasis to the significance of bank performance following mergers. Researchers came to conflicting conclusions about how M&A affected banks' performance. Several academics demonstrated, using an approach based on operating performance, that there was an improvement in bank performance after the merger (Healy et al., 1992; Manokaran & Radharukkumani, 2014; Muhammad et al., 2019). However, few studies show that mergers do not increase banks' operating performance (Rahman & Limmack, 2004; Pawaskar, 2001; Mantravadi & Reddy, 2008). The effectiveness and output of banks can also be significantly influenced by M&A in a significant way. The performance of a bank is evaluated based on its efficiency, which can be defined as the most effective strategy for maximizing output while minimizing the amount of resources required. (Jaouadi & Zorgui, 2014). On the other hand, productivity is a measurement of how effectively certain manufacturing inputs result in a particular output. Establishing performance benchmarks for banks following M&A activity is a topic of concern for bank management, industry experts, economists, and national governments. Productivity and efficiency are indications of an organization's overall success.

Studies of Banks Mergers and Acquisitions Performance

In a merger, there is an anchor bank and a merging bank or banks where the latter combines with the former. As technology continues to advance and the world becomes more globalized, more and more businesses are discovering that mergers are a strong growth strategy for banks (Kumar, 2011). Researchers analyzed merger results using operating measurements and share price changes. The operating performance technique compares bank efficiency and performance before and after the merger, while the share price approach analyzes how the merger affected bank share prices. Researchers compared bank financial parameters pre- and post-merger to assess operating effectiveness. According to various studies, the merger had a favorable and considerable impact on liquidity, profitability, and investment ratios, but a negative impact on solvency (Ghosh, 2001; Pawaskar, 2001; Ramaswamy & Waegelein, 2003; Ramakrishnan, 2008; Singh et al., 2010; Manokaran & Radharukkumani, 2014; Abdou et al., 2016; Kotnal, 2016; Khan & Javed, 2017; Akpan et al., 2018; Muhammad et al., 2019; Senger et al., 2021). Sinha and Gupta (2011) discovered that banks could benefit from synergy in the long run following the merger. According to studies, public sector banks experienced the most significant productivity change after the merger than any other sector (Natarajan & Kalaichelvan, 2011; Thota & Subrahmanyam, 2020). On the other hand, several researchers noticed either a relative decline or no change in the performance of banks after the merger

(Kalra et al., 2013; Delong & Deyoung, 2007; Shah & Khan, 2017; Ravichandran et al., 2010; Abbas et al., 2014; Pazarskis et al., 2006; Straub, 2007; Kumar & Suhas, 2010; Patel, 2018). Nevertheless, a vulnerability in financial ratios causes them to be seen as misleading performance indicators. These ratios can misinterpret increases in size and scope efficiency with what is known as X-efficiency gains (Yang, 2009). In light of this, recent research has made explicit use of efficiency frontier methodologies to determine the effects of bank mergers on banks' efficiency and productivity.

An efficient frontier firm maximizes production with the given inputs or fewer inputs. Rhoades (1998) found efficiency benefits in most of nine US mergers, contrary to Berger & Humphrey (1992) and Hay & Liu (1998), who found no efficiency improvement of banks following the 1980s merger. Akhavein et al. (1997) and Healy et al. (1992) observed that operating cash flow returns increased after the merger, improving US banks' profit efficiency rank. Kay (2003) and Cornett & Tehranian (1992) also found that mergers improved US banks' capacity to obtain loans, leading to efficiency improvements. Nevertheless, during the same period, Pilloff and Santomero (1998) documented no empirical evidence for performance gains through mergers in the US banking sector. Lin (2005) and Peng & Wang (2004) found a positive association between bank mergers and cost efficiency in the Taiwanese banking sector. Afza and Yusuf (2012) investigate the cost and profit efficiency impact of mergers during 1998-2006 in Pakistan banking sector and documented an improvement in the banks' cost efficiency after the merger. However, they did not find any significant evidence for profit efficiency. In this line, Indian bank mergers were unlikely to bring an immediate improvement in profit performance, and cost gains may be forthcoming only for the smaller banks and not for bigger banks (Sensarma & Jayadev, 2010). These results were also consistent with (Jayaraman et al., 2014), who concluded that after the merger, four banks out of a sample of six Indian banks were operating under the efficiency frontier. Their technical efficiency also improved slowly in the third year of the post-merger period.

Relevance of Off-Balance Sheets' Items on Bank Productivity

In this modern era, core banking products are not enough for banks to compete (Gurjar et al, 2021). The 1990s witnessed significant growth in bank income generated through non-traditional activities (also known as Off-balance sheet items). After liberalisation in monetary policy, innovation and technological advancement led to an increase in off-balance sheet items (OBSI) in India (Kumar, 2011). Banks may use OBSI to augment earnings to offset reduced spreads on traditional on-balance-sheet corporate lending businesses. Studies suggested that excluding these items in productivity evaluation can mislead the findings. In this context, Siems and Clark (1997) outlined that excluding OBSI in efficiency evaluation can understate bank output and have an important economic effect on banks' efficiency. Similarly Rogers (1998), by employing Distribution Free Approach (DFA) technique, analysed cost and profit efficiency in his paper and concluded by understating bank efficiency due to the omission of OBS items. These results were also supported by Stiroh (2000) and Rime and Stiroh (2003), who found that as the efficiency measures of banks are sensitive to output specification, the omission of OBS can, mislead the results and understate the profit efficiency. Similarly, considering an alternative model, Tortosa- Ausina (2003) concluded that average cost efficiency might be enhanced by including OBS items in the cost function. In their study, Casu and Girardone

(2005) stated that OBSI prioritised technological change over efficiency change and that leaving out these factors misleads European banks' efficiency results. Pasiouras (2008) outlined the insignificant effect of OBS items on banks' efficiency with a sample of Greek commercial banks. Jagtiani et al. (1995) also concluded with a small effect of these items on measures of scale economies of US banks.

The study aims to examine the efficiency scores of Indian commercial banks post-merger, including OBSI in the input-output function as an additional output to estimate the changes in efficiency measures. The following section contains the research methodology. Further study contains data analysis and discussion in the fourth section and ends with the conclusion and suggestions of the study in the fifth section.

Research Methodology

The Fischer (1922), Tornqvist (1936), and Malmquist (1953) indices are three commonly used indices to evaluate technological changes. The Malmquist index is more popular than Fischer and Tornqvist index because it does not presuppose profit maximisation and cost minimisation. Additionally, it is optional to know the input and output prices. Additionally, it enables the decomposition of productivity changes into two components: technical change and technical efficiency change. The primary drawback of this method is that it requires the computation of distance functions that can be solved using the Data Envelopment Analysis (DEA) technique. As a result, in this study, we generated the decomposed efficiency indices using DEA-Malmquist techniques to understand better the effect of OBSI on the post-merger productivity of Indian Commercial Banks.

Malmquist (1953) extended that total factor productivity can measure the change in total output to input. In his study, Cave (1982b) elaborates theoretical framework of productivity indices for efficiency. The Malmquist productivity index is another derivation of this approach which is extensively used to measure efficiency change. This section presents the Malmquist productivity index between period t and t+1. Let x^t represent the input vector, $x^t = (x_1{}^t,...,x_m{}^t)$ and y^t represent the output vector $y^t = (y_1{}^t,...,y_n{}^t)$ in period t = 1, 2, …, t. The Malmquist productivity index between period t and (t+1) can be defined as

$$M_{t,t+m}(y^{t+1}, y^t, x^t) = \frac{D^t(y^t,x^t)}{D^{t+1}(y^{t+1},x^{t+1})} \times \left[\frac{D^t(y^t,x^t)}{D^t(y^{t+1},x^{t+1})} \times \frac{D^{t+1}(y^t,x^t)}{D^t(y^{t+1},x^{t+1})}\right] \quad (1)$$

Where D represents the inverse of the distance function introduced in Caves et al. (1982). M is the geometric mean of two inverse distance functions with different input ratios. The period t Malmquist index, represented by the first ratio, gauges changes in productivity from period t to period (t+1), using period t technology as a reference point. The period (t+1) Malmquist index, the second ratio, provides a measurement of the change in productivity from period t to period (t+1), using period (t+1) technology as a baseline. M indicates a fall in productivity, M>1 indicates stagnation, and M1 indicates that period (t+1) productivity was higher than period t productivity.

A useful feature of the Malmquist productivity index, first noted by Fare et al. (1985), is that it can be decomposed into the product of an index of technical efficiency change and an index of technical change by rearranging (1) as follows:

$M_{t,t+m}(y^{t+1}, y^t, x^t) =$

$$\frac{D^t(y^t,x^t)}{D^{t+1}(y^{t+1},x^{t+1})} \times \left[\frac{D^t(y^t,x^t)}{D^t(y^{t+1},x^{t+1})} \times \frac{D^{t+1}(y^t,x^t)}{D^t(y^{t+1},x^{t+1})}\right]^{1/2} \quad (2)$$

In (2), the first component is the catching-up effect; it is greater than, equal to, or less than one if the producer moves closer to, unchanging, or diverges from the best practice. The square root expression expresses technical change, which is greater than, equal to, or less than one when best practice is improving, unaltered, or worsening.

Local indices are M and its two subcomponents. Their values may differ between producers and between related time periods. As a result, manufacturers' technical efficiency can fluctuate over time, increasing in some cases and decreasing in others. Similar to how some producers might show technical advancement and others might show technical slippage, these things can vary with time. This characteristic gives the explanation for the observed pattern of productivity change between producers and over time a great deal of flexibility.

Calculation and decomposition of the adjacent period version of the Malmquist index expressed by (2) include four different functions, $D^t(y^t,x^t)$, $D^t(y^{t+1,\ xt+1})$, $D^{t+1}(y^t, x^t)$, and $D^{t+1}(y^{t+1}, x^{t+1})$, which are the reciprocal of the technical efficiency in di ca tors. The DEA method calculates frontier functions, which are then used to calculate radial measures of a firm's efficiency. Seiford and Thrall (1990), Fare et al. (1994), and Fare and Grosskopf (1996), among others, offer a good literature review on this subject. The DEA optimisation problem for firm h in period s with a sample of J firms producing n outputs using m inputs and using period r frontier as a benchmark is

$MinE^h_{rs}$ h=1,….,J;r,s=1,….s

St

$$\sum_{h=1}^{J} \mu_h y^s_{nh} \geq y^s_{nh}\ n = 1, \ldots., n \text{ output}$$

$$\sum_{h=1}^{J} \mu_h y^s_{mh} \geq y^s_{mh}\ m = 1, \ldots., m \text{ input}$$

$$\mu_h \geq 0 \quad (3)$$

Solving the problem for each DMU, we get E^h_{rs}, that is, Farrel's technical efficiency index for the constant returns to scale case. For the variable returns to scale case, we need to include in (3) one additional restriction, $\sum \mu_h$=1. This paper will follow the procedure adopted by Pastor et al. (1997), Grenfell and Lovel (1996), and Price and Weyman- Jones (1996), among others, to decompose the technical efficiency (TE) into scale efficiency (SE) and pure technical efficiency (PTE), with

$$E_h = \frac{x_h^{CRS}}{x_h} = \frac{x_h^{VRS}}{x_h} \times \frac{x_h^{CRS}}{x_h^{VRS}} = PTE_h \times SE_h \quad (4)$$

Where x is the observed input consumption, x^{CRS} is optimal input consumption under constant returns to scale, and x^{VRS} is optimal input consumption under variable returns to scale. Suppose SE is equal to or less than one. In that case, the firm is operating at the optimal and sub-optimal scale, respectively, and (1-SE) the potential reduction in input quantities were the firm able to operate at the constant returns to scale frontier. Finally, the decomposition in (5) will allow decomposing of the sources to catch up.

$$CU(y^{t+1}, x^{t+1}, y^t, x^t) = \frac{E^{t+1,t+1}}{E^{t,t}} = \frac{PTE^{t+1,t+1}}{PTE^{t,t}} \times \frac{SE^{t+1,t+1}}{SE^{t,t}} \quad (5)$$

The first and second components represent changes in technical efficiency due to changes in pure technical efficiency and scale efficiency, respectively.

Data and Results

Six Indian commercial banks involved in the merger were studied empirically from 2017-2021 (Table 1). The required data were extracted from the annual reports of selected banks collected through the website of BSE and NSE.

The Production Approach (Benston, 1965) and The Intermediation Approach are used to select inputs and outputs for bank efficiency evaluation (Sealey & Lindley, 1977). The study followed Drake (2001), Isik and Hassan (2003), Miller and Noulas (1996), and Fukuyama (1995, 1993) in selecting appropriate input-outputs for analysis under the intermediation approach. Berger and Humphrey (1997) found this approach more suitable for the efficiency evaluation of entire financial institutions as it considers banks as financial intermediaries. This approach posits total loans and securities as outputs, whereas deposits with labour and fixed assets as inputs. To analyse the impact of OBS items on post-merger bank productivity, we set two models, with and without OBS and measure the difference to evaluate the change.

Table 1. Indian Commercial Banks

Name of the Bank	Year	Abbreviation Used
State Bank of India	2017	SBI
Bank of Baroda	2019	BOB
Canara Bank	2020	CB
Punjab National Bank	2020	PNB
Indian Bank	2020	IB
Union Bank of India	2020	UBI

As per the intermediation approach, the study used three inputs and two outputs in model A, which consist of total loans and investment & dealing securities as outputs and fixed assets, deposits and provision for employees as inputs. Further, in model B, one additional output, non-interest income (a proxy for off-balance sheets' items), was incorporated to analyse the efficiency change. Non-interest income is defined as fee income, investment income and other income, which consist of commission, service charges, guarantee fees, net profit from the sale of investment securities and foreign exchange profit (Sufian & Ibrahim, 2005). Table 2 represents the summary of extracted data for analysis.

Table 2. Mean, Maximum and Minimum of Selected Inputs and Outputs (,000)

Outputs		2017	2018	2019	2020	2021
Total loans	Minimum	1276992820	1565689285	1812619124	1978870115	3640102406
	Maximum	15710783811	19348801891	21858769177	23252895607	24494977911
	Mean	5216675623	6038465399	6698110320	7387249401	9040117476
Investments	Minimum	675517886	713977665	649921742	812416880	1765369662

	Maximum	765989630	106098671 50	967021947 5	104695451 75	135170520 51
	Mean	235385374 4	293951464 7	282578727 0	328655883 0	462607979 2
Non-interest Income	Minimum	22113716	24058373	18828896	33124643	60792538
	Maximum	354609275	446006871	367748878	452214780	434963747
	Mean	109834550	124128778	105291807	135332225	168956778
Inputs						
Labour	Minimum	19914866	2100253 8	22228725	24729630	63782381
	Maximum	264892801	3317867 95	410547068	457149678	509360001
	Mean	78272913	9625656 5	107451014	124019893	171083939
Fixed Assets	Minimum	34426046	3418345 5	37622928	38957442	73438719
	Maximum	429189179	3999225 11	391975694	384392818	384192419
	Mean	115759792	1121321 53	114244406	119170324	138971834
Deposits	Minimum	1825092825	2082942 217	242075946 8	260225897 0	538071114 9
	Maximum	20447513947	2706343 2850	291138601 07	324162073 43	368127707 96
	Mean	7207177807	8469086 695	913855059 2	103794950 06	137122625 28

Table 3 shows the Malmquist index summary of annual means. All indices are relative to the previous year; hence, the output begins with the year 2018.

Table 3. Summary of Annual Means for Malmquist - Model A

Year	Technical Efficiency Change	Technological Change	CU decomposition		TFP
			Pure Technical Efficiency	Scale Efficiency	
2017	-	-	-	-	-

2018	1.006	1.046	1.008	0.998	1.053
2019	0.995	0.986	0.994	1.001	0.982
2020	0.995	1.009	0.996	0.999	1.005
2021	0.990	0.973	0.988	1.003	0.964
GM	0.997	1.003	0.996	1.000	1.000
Summary of annual means for Malmquist index- Model B					
Year	Technical Efficiency Change	Technological Change	CU decomposition		TFP
			Pure Technical Efficiency	Scale Efficiency	
2017	-	-	-	-	-
2018	0.999	1.015	1.000	0.999	1.014
2019	0.997	0.935	0.996	1.001	0.932
2020	0.994	1.046	0.996	0.998	1.040
2021	1.006	0.989	1.005	1.001	0.996
GM	0.999	0.995	0.999	1.000	0.994

As per the results shown in Table 4 following model A, analysis suggests that out of six banks, no banks showed an increase in technical efficiency, out of which SBI, BOB and UBI were stagnant, and three banks, namely CB, PNB and IB showed regress in technical efficiency. Through the division of technical analysis into two parts, namely pure technical efficiency and scale efficiency, analysis reveals some intriguing findings. Only IB bank suffers from scale efficiency. CB bank resulted in negative technical efficiency due to managerial inefficiency by a 1.8% decrease in pure technical efficiency. On the other hand, PNB bank regresses with its pure technical efficiency by only 0.4%.

Table 4. Malmquist Index Summary of Bank Means- Model A

Bank	Technical Efficiency Change	Technological Change	CU Decomposition		TFP
			Pure Technical Efficiency	Scale Efficiency	
SBI	1.000	0.996	1.000	1.000	0.996
BOB	1.000	1.022	1.000	1.000	1.022
CB	0.986	0.922	0.982	1.004	0.978
PNB	0.996	1.028	0.996	1.000	1.024
IB	0.999	0.969	1.000	0.999	0.968
UBI	1.000	1.015	1.000	1.000	1.015

GM	0.997	1.003	0.996	1.000	1.000

The findings reveal that for Indian commercial banks, post-merger scale efficiency contributed mainly because of technical efficiency. The study found that only the Indian bank showed a decline in scale efficiency of 0.1%, whereas only the Canara bank showed an increase of 0.4%, and the other four banks were stagnant.

Model A also reveals that the total factor productivity of Indian banks after the merger experience a stagnant average. In these findings, three banks, SBI, CB and IB, showed a decline in total factor productivity by 0.4%, 2.2% and 3.2%, respectively. On the other hand, BOB, PNB and UBI showed an increase in total factor productivity by 2.2%, 2.4% and 1.5%, respectively.

According to Model B, the DEA-Malmquist result indicates a marginal improvement in the technical efficacy of Indian banks following the merger. None of the selected bank experience declines in technical efficiency. Only Canara Bank experienced an increase of 1.4% in technical efficiency. However, other banks maintained their scores of technical efficiencies throughout the study.

From Table 5 below, it is clear that the inclusion of non-interest income as a proxy of OBS items in the output definition has contributed positively to the technical change of Indian banks post-merger. In model 2, post-merger Indian banks exhibit 0.5% technological regress, with five banks with the largest regress of 2.1% of Indian banks followed by 1.3% of PNB. Only BOB showed a stagnant situation of technological change.

Table 5. Malmquist Index Summary of Bank Means- Model B

Bank	Technical Efficiency Change	Technological Change	CU Decomposition		TFP
			Pure Technical Efficiency	Scale Efficiency	
SBI	1.000	0.992	1.000	1.000	0.992
BOB	1.000	1.022	1.000	1.000	1.022
CB	1.000	0.993	1.000	1.000	0.993
PNB	0.996	0.987	0.996	1.000	0.983
IB	0.999	0.979	1.000	0.999	0.978
UBI	1.000	0.998	1.000	1.000	0.998
GM	0.999	0.995	0.999	1.000	0.994

Furthermore, the inclusion of non-traditional activities caused the TFP growth of Indian banks after the merger to decline by an average of 0.6%. Only BOB among six banks shows a 2.2% TFP growth rate in model 2 as in model 1. Therefore the study findings, which are in line with

Pasiouras (2008), showed that off-balance sheet items had a negligible impact on banks' productivity after mergers for Indian commercial banks.

Conclusions

This study makes an effort to explore, through the utilization of the non-parametric Malmquist Productivity Index, to what degree the addition of OBS items in the output definition of Indian commercial banks influences the estimated TFP change indexes following the merger during the time span of 2017-2021. Specifically, this investigation focuses on the Indian banking industry. The findings of the study were analyzed, and the conclusion reached was that the inclusion of non-interest revenue in the measuring of efficiency results in a lower assessed level of productivity for banks. However, the percentage decline is lower, and it appears to be more attributable to changes in technology than to changes in efficiency. This demonstrates that there is not a significant boost in bank efficiency associated with the rising non-interest income share of acquiring banks following the merger of the two financial institutions.

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