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Impact of Mergers and Acquisitions on Productivity of Indian Banks



ABSTRACT

In this paper, we examine how M&A affect Productivity in case of Indian banking sector. The sample of the study comprises of Indian banks merging from the period 2005-2010. Data Envelopment Analysis along with Malmquist Index approach is employed to test for the impact of Mergers and Acquisitions. We find that the average total factor productivity from 2005-2010 across the eight banks has shown a declining trend. The productivity has marginally increased for Bank of Baroda (0.3%) and Federal Bank (1.5%) but it has declined for all other banks. Overall the total factor productivity has decreased by 1.8%. As this change has not been substantial, it can be said that the merger and acquisition activity has not significantly impacted the total factor productivity of banks in India. We further observe that the decrease in total factor productivity was mainly due to decrease in technological and pure technical efficiency whereas technical efficiency remain unchanged and scale efficiency increased marginally. The study is extremely relevant for common shareholders, global fund managers as well as financial regulators as it gives insights on the relevance on Mergers & Acquisitions in Banking sector. The present research contributes to analysis of corporate restructuring in Indian banking sector.

Keywords: Mergers and Acquisitions, Total Factor Productivity, Efficiency, Banking
JEL Codes: G14, C12, C13

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INTRODUCTION

The structure and regulation of banking sector in India has undergone dynamic changes in the last decade (2000-2010). All important regulatory bodies and policy makers like the Reserve Bank of India (RBI), Ministry of Finance and related government and financial sector entities, have formulated various strategies to improve regulation in the sector which has made it globally competitive on metrics like growth, profitability and non-performing assets (NPAs). The banking index has grown at a compounded annual rate of over 51 per cent since April 2001 as compared to a 27 per cent growth in the market index for the same period. (McKinsey & Company 2010).

In the recent past, the Indian banking system has been undergoing major changes that have affected both its structure and the nature of strategic interaction among banking institutions. Different strategies have been adopted to tackle the demands of this new operating environment; one such strategy has been consolidation via mergers and acquisitions. Mergers are expected to help the banks to strengthen product portfolios, gain competitive advantage, reduce the gestation period for launching new business, achieve economies of scale and thereby enhance efficiency. The mergers are also aimed at exploiting synergies, reducing overlap in operations, reduce costs, reach global size, increase investment in technology for strategic gains and improve shareholder value. These forces of consolidation via merger have been extensively researched in number of studies by Berger (1999), Dymksi (1999), Group of ten (2001), Amel (2004) and Jones and Critchfield (2005).

In India, the banks have played a significant role in the development of the economy. However, with the structural reforms initiated in the real economy from the early 1990s, it was imperative that a vibrant and competitive financial system should be put in place to sustain the ongoing process of reforms in the real sector. The financial sector reforms have provided the necessary platform for the banking sector to operate on the basis of operational flexibility and functional autonomy, thereby enhancing efficiency, productivity and profitability. (SP Talwar)

The efficiency and competitiveness of financial institutions cannot be easily measured, since their products and services are of an intangible nature. Murray and Whilte (1983) and Gilligann (1984) utilize the translog cost function to examine and evaluate scale and scope of economies in various banking firms across Canada and US respectively. Hunter (1990) analyzes U.S. bank production using an intermediation approach and multi-cost production function. The other method of bank performance measurement used by researchers like Revell (1980) is financial ratios like interest margin which is calculated as difference between interest income and paid divided by total assets.

The total factor productivity is also one of the measurement criteria that have gained significant attention these days. Productivity can be defined as the ratio of outputs generated

by a production unit to the inputs provided by decision making units. Sink and Tuttle (1989) promotes that performance is a complex inter-relationship between seven performance criteria vis effectiveness, efficiency, quality, productivity, quality of work life, innovation and profitability. This study focus on productivity as a criteria to measure the impact of mergers and acquisition on efficiency of banks. It uses Data Envelopment Analysis (DEA) and Malmaquist Index (MI) approach to measure productivity of banks and decompose it into technical efficiency, technological efficiency, pure technical efficiency, scale efficiency.

The rest of the paper is organized into following section. Section II - Review of literature; Section III Research Methodology Section IV- Findings and conclusion.

Section II- Review of Literature

This section details the past studies that have been conducted to estimate the productivity and efficiency of banks using DEA and Malmquist Index model.

Saha and Ravishankar (2000) have calculated and analyzed the productivity of twenty five public sector Indian Commercial Banks. They used intermediate approach for input and output variables. Their results concluded that the public sector banks, in general had improved their overall efficiency scores; however, there were few banks which continued to be at lower end of the efficiency scales.

Pal et. al. (2002) estimated the productivity of major Indian commercial banks in 2002. The study's input variables were net worth, borrowings, operating expenses, number of employees in the country and number of bank branches in the country and the output variables were deposits, net profits, advances, non-interest income and spread. The DEA model was applied on these variables to calculate relative efficiency. The sample consisted of 68 banks out of which 24% were efficient. They found that the privately owned banks performed better than the foreign owned banks.

Krishnasamy et al. (2004) analyzed the nature and extent of productivity change of ten anchor Malaysian banks post merger over the period 2000 to 2001 within the framework of DEA. They employed two inputs (i.e. labor and total assets) and two outputs i.e. advances and total deposits). The study found that for the period 2000 and 2001, out of ten banks, only two did not achieve an increase in the total factor productivity. However, overall as a group the ten anchor banks have shown improved performance in terms of total factor productivity by 5.1%. The source of this total productivity change could primarily be attributed to the technological change rather than the technical efficiency change.

Sufian Fadzlan (2005) investigated the productivity change in Malaysian Banks using Malmquist approach. The productivity of these banks has declined by 6.3%. This was mainly due to technological change of negative 6.1%. The study also concluded that there was marginal improvement in scale efficiency of these banks.

Ready (2006) applied DEA approach to estimate the total factor productivity, technical and scale efficiency changes in 192 regional rural banks. Their results concluded that service provision had higher technical efficiency as compared to parent public sector banks. The rural banks had higher profitability in total factor productivity growth. These banks achieved economies of scale due to large asset base and mergers.

Ramakrishna Ramanathan (2007) used DEA and Malmquist productivity Index (MPI) to assess the efficiencies of 55 banks in countries of Gulf Cooperation Council. The input variables were fixed assets, deposits and short term funding, equity, personal expenses and the output variables were loans and other earning assets.

Sanjeev (2006) examined the efficiency of private, public, and foreign banks operating in India and tried to establish relationship between the efficiency and non-performing assets in the banks. The study used DEA for the analysis and concluded that there is an increase in the efficiency in the post-reform period. It was also found that NPA and efficiency are negatively related.

Kumar and Gulati (2007) analyzed the technical efficiency of public sector banks in India. The study used Charnes, Cooper and Rhodes (CCR) model and Andersen and Petersen's super-efficiency models of DEA. The results concluded that, the overall level of technical inefficiency in Indian public sector banking industry was around 11.5%. They also found that as compared to domestically owned private banks and state-owned banks, the foreign banks were more cost efficient but less profit-efficient.

Alias (2008) analysed the productivity of Malaysian banking sector throughout the period of pre- and post-merger years (1993-2004). The study analyzed commercial banks, merchant banks & finance companies. It used Malmquist Productivity index to measure the total factor productivity (TFP) change and its various efficiency components. The results revealed that major productivity increase was because of the technological change, which contributed about 6.1% of productivity growth, rather than the technical efficiency change, which accounts for 0.2% decline. The researchers also found that the merger process led to improvements in productivity and efficiency of the banking sector which could be attributed to the utilization of their scale economies and this ultimately led to improvement in their efficiencies.

Dash and Charles (2009) investigated the technical efficiency of 49 Indian banks, segmented in terms of ownership using DEA. The input variables used were borrowings, deposits, fixed assets, net worth, and operating expenses whereas the output variables were advances & loans, investments, net interest income, and non-interest income. It was observed that 89.8% of the sample banks were efficient and 10.2% were inefficient.

The thorough review of literature concludes that past studies have focussed on analysing the productivity of banks using

DEA and MPI. However the impact of mergers on bank efficiency has not been studied so far. The present study takes this research gap and tries to estimate the productivity of Indian Commercial Banks that have undergone mergers and acquisition activity from 2005-2010.



OBJECTIVES OF THE STUDY:

The following are the objectives of the study:

- 1) To decompose efficiency into technical efficiency, technological efficiency, pure technical efficiency, scale efficiency and total factor productivity using Data Envelopment Analysis (DEA).
- 2) To evaluate and analyze the efficiencies and thereby measure the productivity of banks after merger using Malmquist Productivity Index (MPI).
- 3) To investigate the extent of merger and acquisition activity affecting the efficiency of Indian Banking sector from 2005-2010.

Section III- Research Methodology

Data and sample of study

The study examined eight commercial banks in India which had been through merger or acquisition process from 2005-2010. Only those banks for which data was available for all the selected variables across five years were considered under the sample. The following mergers were studied:

Bank of Baroda	Corporation Bank
Federal Bank Ltd	HDFC Bank Ltd
ICICI Bank Ltd	IDBI Bank Ltd
State Bank of India	Vijaya Bank Ltd

Variables

The study will examine six input and four output variables for measuring the bank efficiency through DEA.

The input variables are:

- 1) **Operating expenses:** Operating expenses are the expenses incurred in conducting the bank's ongoing operations. These include human resources cost like cost for regular activities and day to day operations such as salaries and wages of bank's operating staff, establishment cost like rent for building and facilities, repair and maintenance of machines and depreciation; marketing expenditures and administrative and general expenses.
- 2) **Interest expenses:** Interest expense is the cost incurred by the bank on borrowed funds. The components of this are deposits from customers, financial institutions and other companies.
- 3) **Borrowings:** The borrowings by the bank can be within India or outside. This generally include refinance, borrowings from RBI, Inter-bank & other institutions

- 4) **Deposits:** This is the main source of bank's funds. They are classified as demand deposits, savings bank deposits and term deposits
- 5) **Fixed assets:** Fixed assets in a bank may include premises, as well capital work in progress, wholly or partly owned by the banking Assets company for the purpose of business. Banks all branch offices building and land will be part of its fixed asset, if these are owned by of bank. Bank may have other fixed assets like furniture, fixtures, equipment, computers and ATM Machines. All addition in it will add in the opening balance of fixed asset.
- 6) **Net Worth of a Bank** includes paid up capital of bank. If bank is incorporated outside India, then its start up capital will be shown under this schedule in balance sheets. Along with this Reserves & Surpluses including Statutory reserve, Capital reserve, Share premium reserve, revenue reserve and balance of profit & loss account also form a part of net worth.

The output variables are:

- 1) **Net interest income:** This income measures the difference between interest received on loans given to customers and interest paid by the bank to its depositors. The banks which receive high interest charges have high net interest income leading to better profitability and overall stability.
- 2) **Non-interest income:** Non-interest income is generated partly by service charges on deposit accounts, but the bulk of it comes from the off-balance-sheet activities, which generate fees or trading profits for the bank. Banks charge fees that provide non-interest income as a way of generating revenue and ensuring liquidity in the event of increased default rates. This component of total income makes up a significant portion of most banks' revenue.
- 3) **Total loans and advances:** The banks loan includes working capital finance and term finance. Working capital finance is extended for client's operating expenses, purchasing inventory and receivables financing. Under Term Finance, banks offer finance for capital expenditure / acquisition of fixed assets towards starting / expanding a business or industrial unit or to swap with high cost existing debt from other bank / financial institution. The advances of bank includes bills purchased and discounted, cash credits, overdrafts & loans repayable on demand, term loans
- 4) **Investments:** The investments of bank include investment inside and outside India. The banks can invest in form of government securities, other approved securities, shares, debentures and bonds..



METHODOLOGY ADOPTED:

To estimate the efficiency and productivity of banks in India the study used Data Envelopment Analysis (DEA). Data envelopment analysis (DEA), introduced by

Charnes et al. (1978) based on Farrell's work (Farrell, 1957), is a nonparametric technique for measuring the relative efficiency of a set of similar units, usually referred to as decision making units (DMUs). It was initially used to assess the relative efficiency of not-for-profit organizations such as schools and hospitals; however, gradually its application has been extended to cover for-profit organizations as well. Its first application in banking industry appeared with the work of Sherman and Gold (1985). Over the years, DEA has emerged as a very potent technique to measure the relative efficiency of banks (Berger and Humphrey, 1997). DEA is capable of handling multiple inputs and outputs without requiring any judgment on their importance. DEA identifies the efficiency in a particular bank by comparing it to similar banks regarded as efficient, rather than trying to associate a bank's performance with statistical averages that may not be applicable to that bank (Avkiran, 2006). Using linear programming technique, the various DEA models intend to provide efficiency scores under different orientations and assumptions of returns-to-scale (Kumar and Gulati 2008).

One of the ways to measure productivity changes under DEA is Malmquist Index. Using Malmquist the profit maximization or cost minimization assumption is not required. Moreover, Malmquist Index does not require input and output prices and it is possible to calculate productivity only with information on quantity. In case of panel data by using Malmquist Index, the productivity change can be decomposed into technical efficiency change (TEC) and technological change (TC). (Grifell and Lovel 1996). The drawback of the Malmquist index is the necessity to compute the distance functions, but this problem is solved by the technique of Data Envelopment Analysis (DEA).

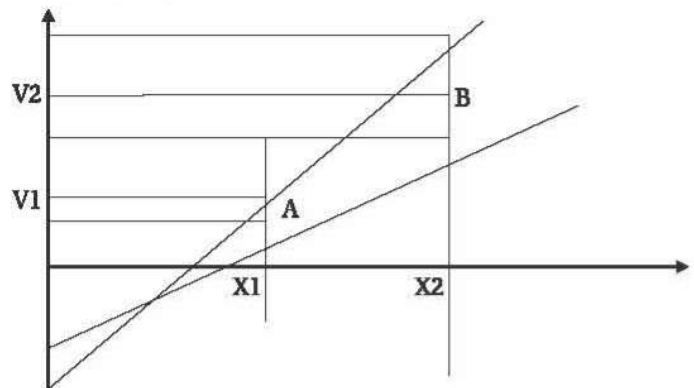


Figure 1: Construction of Malmquist Index

(Fare, 1994), (Kadir, Selamat, Idros 2010): The figure depicts two production frontiers of a certain bank, Bank V of time 1 and time 2, using x as input and y as output. Points A and B are the observations in time 1 and 2, respectively. S1 and S2 are the rays from origin represent the production frontiers for time 1 and 2, respectively.

The Malmquist Productivity Index (MI) measures the productivity changes between frontier S1 and frontier S2 by generally computing the geometric mean of adjacent year's index value, while allowing the best frontier to shift

The Malmquist index and is given by the formula:

$$MI = \sqrt{(Q_1Q_2)/(Q_3Q_4)} \text{ -----Eq. 1}$$

where

$$Q1 = fa(Sa)$$

$$Q2 = fa(Sb)$$

$$Q3 = fb(Sa)$$

$$Q4 = fb(Sb)$$

The expression in above Equation 1 gives an interpretation of the geometric means of the two efficiency ratios: the first being the efficiency change measured by period technology and the other the efficiency change measured by period technology.

MI>1 indicates progress in the multi-factor productivity of the DMU from period s to t, while MI=1 and MI<1 indicate the status quo and decay in the multi-factor productivity, respectively.

The MI in equation can be further decomposed into technical efficiency change (TEC) and technical change (TC):

$$TFP = TEC \times TC \text{ -----Eq. 2}$$

The TEC indicates that if a bank moves closer to the frontier, it means that the bank has converged to the more advanced banks. However, if a bank moves away from the frontier, it means that the bank is diverging away from the more advanced banks.

On the other hand, the TC indicates if the frontier moves outward, it means that there is technological advancement or innovation, taking all the banks in the market into account as well. If the frontier is inward, there is technological decline.

Taking into consideration the applicability of DEA and Malmquist index approach in evaluating the performance of entities, such as educational departments (schools, colleges and universities), agricultures, health care (hospitals and clinics), banking, courts, agricultures, business firms, cities, countries, regions and many other, Data Envelopment Analysis (DEA) and (input-or-output based) Malmquist Index methods are used as the productivity measurements in this study.

As given by Malmquist approach, the total factor productivity

is a composition of technical efficiency change, technological change, pure technical efficiency change and scale efficiency.

Technical efficiency means that the given resources are transformed into goods and services without waste, that producers are doing the best job possible of combining resources to make goods and services. There is no waste of material inputs and no workers or resources are idle. The maximum amount of productivity is obtained from the given resource inputs that are producing a larger output with same inputs or same output with less of one or more inputs.

Technological efficiency is an engineering matter and results from introduction of new technologies leading to innovation, new inventions and diffusion of synergies. A company is able to maximize this efficiency by expansion of best production frontier which results into higher output even with given inputs. While technical efficiency focuses number of inputs technological efficiency emphasis the quality of inputs.

Pure Technical Efficiency is a measure of technical efficiency without scale efficiency and purely reflects the managerial performance to organize the inputs in the production process. Thus, PTE measure has been used as an index to capture improved management practices, managerial performance i.e. ability to organize the bank's inputs, production plan and industrial relationships.

Scale Efficiency provides the ability of the management to choose the optimum size of resources, i.e., to decide on the bank's size. It means to choose the scale of production that will attain the expected production level. Inappropriate size of a bank (too large or too small) may sometimes be a cause of technical inefficiency

Section IV- Findings and Conclusions

The current study uses MPI under DEA to find out the growth in productivity of eight banks in India from 2005-2010. It decomposes the efficiency into technical efficiency change, technological change, pure technical efficiency change and scale efficiency.

Productivity changes in banks can be summarized in following tables

Table 1: Bank wise changes in Productivity

Table 1	MALMOQUIST INDEX SUMMARY OF FIRM MEANS				
Firm Name	EFFCH	TECHCH	PECH	SECH	TFPCH
Bank Of Baroda	1.016	0.987	1.000	1.016	1.003
Corporation Bank	1.000	0.979	1.000	1.000	0.979
Federal Bank Ltd.	1.006	1.009	1.000	1.006	1.015
HDFC Bank Ltd.	1.000	0.977	1.000	1.000	0.977
ICICI Bank Ltd.	1.000	0.979	1.000	1.000	0.979
IDBI Bank Ltd	1.000	0.934	1.000	1.000	0.934
State Bank Of India	1.005	0.985	1.000	1.005	0.990
Vijaya Bank Ltd	0.975	1.008	0.981	0.994	0.983
Mean	1.000	0.982	0.998	1.003	0.982

From table 1 it can be contended that the average total factor productivity from 2005-2010 across the eight banks has shown a declining trend. The productivity has marginally increased for Bank of Baroda (0.3%) and Federal Bank (1.5%) but it has declined for all other banks. Overall the total factor productivity has decreased by 1.8%. As this change has not been substantial, it can be said that the merger and acquisition activity has not significantly impacted the total factor productivity of banks in India. The total factor productivity values across various banks can be depicted in the following chart:

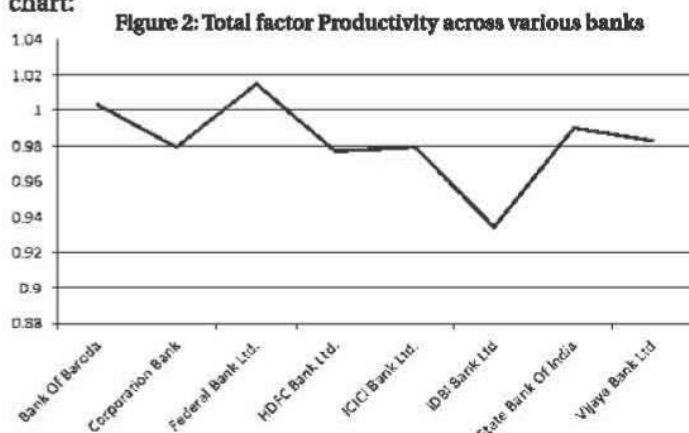


Table 2: Total Factor Productivity and its decomposition into various forms:

Year	EFFCH	TECHCH	PECH	SECH	TFPCH
2006	1.004	0.920	0.997	1.007	0.924
2007	1.017	0.975	1.003	1.014	0.992
2008	0.996	0.974	0.993	1.003	0.970
2009	0.994	0.978	0.997	0.997	0.972
2010	0.991	1.069	0.998	0.992	1.059
Mean	1.000	0.982	0.998	1.003	0.982

The technical efficiency of the bank is its ability to transform multiple resources into multiple financial services (Bhattacharyya et al., 1997). A bank is said to be technically inefficient if it operates below the frontier. The results reflected in Table 2 depict that after merger the technical efficiency has remained unchanged. This means that the banks have remained on the production frontier even after acquiring other banks. They are efficient as before but the efficiency has not increased after the merger. Although the resource utilization process in these banks is functioning well and the production process is not characterizing any waste of inputs but the merger has not been able to bring about any positive impact on the above process.

The technological efficiency can be attributed to technological progress and better quality of inputs. However, in the sample banks this efficiency has shown decline by 1.8%. These results indicate that although the country has witnessed a technological evolution and customers have become more IT savvy to handle technological devices yet banks have not been able to provide these services effectively to the customers despite going through the merger.

The pure technical efficiency is an indicator of managerial effectiveness without considering the impact of scale of

operations. A glance at Table 2 shows that the pure technical efficiency has declined by 0.2 percent. The main reason for this fall is the declining trend shown by Vijaya Bank (-1.9 percent). This efficiency has remained unchanged for all other banks in the sample. Hence most of the banks were able to remain at the best practices frontier. But this frontier did not move upwards after the merger.

The scale efficiency reflects the overall size of the bank. The change in scale efficiency has shown an increasing trend of 0.3 percent for the sample banks. It was observed that scale efficiency change was maximum for Bank of Baroda (1.6 percent) and showed a negative growth for Vijaya Bank (0.6 percent). The result also indicates that after the merger most of the banks were able to increase the efficiency of managing their scale of operations.

It has been analyzed that the decrease in total factor productivity was mainly due to decrease in technological and pure technical efficiency whereas technical efficiency remain unchanged and scale efficiency increased marginally.



CONCLUDING OBSERVATIONS

Mergers constitute an important tool of corporate strategy. Strategic management theory regards merger of banks as more value creating due to higher realization of synergies.

However, the empirical analysis from the present study depicts that merger has not enhanced the total factor productivity of banks in India during 2005-2010. This is in support with the general banking literature which has shown evidence that merger and acquisition may not be able to improve the banking efficiency of the acquirer banks or target banks as expected. Although the Indian Banking industry has been able to perform the task of efficient management of resources with maturity and vitality; however global financial crisis had set in 2008 which had an impact on their operating efficiency and productivity. Moreover, Cuesta and Orea (2001) find that it takes about ten years for the banks to recover their technical efficiency level to the same as in the pre-merger and acquisition year. The synergistic effect of merger did not help the Indian banks to nullify the devastating effect of financial crisis; therefore, it will take longer than ten years for these merged banks to show an improvement in the efficiency parameters. Thus, in order to achieve better productivity Indian Banking industry needs to take suitable actions such as improve management expertise to enhance the managerial performance, restructure the policies and procedures to adapt better technology and strengthen itself significantly if it has to support the modern and vibrant economy which India aspires to be. So, it can be concluded that though mergers are desirable as internationalization of financial services is setting its pace yet these mergers have not resulted in any improvement in the total factor productivity of Indian Banks.

However, the past trend of the developing countries reflects that they have failed to respond to changing market needs which has undersized the development of their financial sector. A weak and ineffective banking structure is the main hindrance for continued growth which will harm the long-term health of their economies.

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