SUMMARY AND CONCLUSIONS

I

It is well established from economic history that financial development is the key factor in the economic growth of an economy. Banking sector in most of the nations was subjected to regulations and repression during the 20th century. But the advent of globalisation, deregulation and harmonization of banking supervision laws in 1990s following the Basle process, provided a different platform to the banking sector worldwide. In the recent times banking sector has become very competitive, efficient and highly innovative.

The banking industry in India has a huge canvas of history, which covers the traditional banking practices from the phase of Britishers to nationalization-phase and from the nationalization-phase to the banking sector reforms. During pre-nationalization scenario, banks were under the control of big businessmen and industrialists who were responsible for concentration of wealth and economic power. Besides, financial presence of the banks was almost negligible because large part of the deposits of banks was utilized by the directors of banks to promote their personal interest or was used in business. Regulation was still only being introduced and unhealthy practices in the banks were then mere rules. A disturbing feature of the pre-nationalization banking policy was the negligible share of agricultural sector in bank credit.

Realizing the importance of the role of banks in all sectors of the economy, Government of India (GOI) and Reserve Bank of India (RBI) took several major initiatives after the country attained independence to gear up the banking system. The nationalization of the RBI in 1949 was the first step in this direction. In addition to this, 14 major banks in 1969 and 6 major banks in 1980 were also nationalized. With this, banks had been recognized as the most important instrument for strengthening the forces of socialism. There had been a structural change in the advances of commercial banks with emphasis shifted from security-based lending activities to need-based ones. Now banks lay more emphasis on the purpose of borrowing, the viability of projects and the entrepreneurial ability of the borrowers rather than status, reputation, specific
collaterals and the profitability consideration and they have adopted a very liberal attitude in giving credit to the common man by increasing confidence in his ability to work for economic betterment.

After the nationalization of major commercial banks, the Indian commercial banking undoubtedly made rapid progress in terms of geographical coverage, deposits mobilization and credit deployment. But in this process, efficiency, productivity and profitability suffered. Therefore, the government at this moment introduced Narasimham Committee I (1991) and II (1998) with the basic aim of establishing a sound and viable banking system, which would help the development of the real economy.

In India, finance is a matter of great concern especially in an agrarian sector in rural area. Realizing the feelings of rural masses, government of India took initiative to promote the growth of rural and agriculture sector with the establishment of Rural Banks. First report of the banking commission (B.C.R., 1972) recommended the establishment of rural banks to fill the gap of financial services in rural areas. The government appointed a working group on rural credit, the Narasimham Committee, in July, 1975. The committee observed that the cost structure of commercial banks, the approach of bank employees and the lack of a professional approach in the co-operative credit system were the main faltering blocks to rural credit. The committee also perceived that the deposits collected by banks from rural areas were not completely deployed there. The panel, therefore, recommended the creation of a new set of regionally oriented rural banks, which would combine a co-operatives local feel and a commercial bank's business acumen. The government accepted these recommendations and, accordingly, the ordinance of RRBs, 1975 was promulgated on September 26, 1975. This was swapped by the RRBs Act, 1976 on February 9, 1976. RRBs started their development process on 2nd October 1975 with the formation of the first five RRBs set up in four states. The first five RRBs were; Prathama Bank and Gorakhpur Kshetriya Gramin Bank in Uttar Pradesh, Haryana Krishi Gramin Bank in Haryana, Gour Gramin Bank in West Bengal and Jaipur-Nagpur Anchalik Gramin Bank, in Rajasthan. The mandate of these rural financial institutions was to:
Take banking to the doorsteps of the rural masses, chiefly in areas lacking banking amenities;

Make cheaper institutional credit accessible to the weaker sections of society, who were to be the only clients of these banks;

Activate rural savings and channelize them for supportive productive activities in rural areas;

Generate employment opportunities in the rural areas;

Bring down the cost of providing credit in rural areas; and

Provide credit and other facilities to the small and marginal farmers, agricultural laborers, artisans and small entrepreneurs and for matters connected therewith the incident thereto (Singh, 1983).

RRBs were started with initial issued and paid up capital of Rs. 25 lakh, with Rs. 1 crore as authorized share capital which was further increased to Rs. 5 crore in 1987. These banks are sponsored by public sector banks (PSBs) which partook 35 per cent of the share capital, and also provided technical and managerial support. The government of India possesses 50 per cent of share capital and the state government retains 15 percent.

Further branches, loans and deposits of RRBs also exhibit positive and notable growth. Still, RRBs have taken up various steps for a close look with regards to their notion, coverage area, financial viability and restructuring strategies etc. Therefore, various reform measures and recommendations made by committee had been introduced since 1975 which had indeed strengthened RRBs in preparation for the fresh global challenges ahead.

Most of the studies of RRBs analyzed performance; earning capacity, cost efficiency, branch expansion, lending pattern and determinants of profit and profitability of these banks. Negligible attention was paid to measure technical efficiency and total factor productivity growth of RRBs in India. Existing literature on efficiency and productivity growth of Regional Rural Banks in India at disaggregate level is multifarious. No subsequent attempt has been made to bifurcate the post-
liberalization period into distinct two sub-periods viz; first-generation reforms period (1991-1992 to 1997-98) and second-generation reforms period (1998-1999 to 2006-2007) to show the impact on efficiency and productivity scores of these banks of banking reforms. Therefore, the present study is an effort in this direction to enrich the already scant existing literature on measure of efficiency and productivity growth of RRBs in India.

**OBJECTIVES OF THE STUDY**

The study attempts

1. to measure technical efficiency and scale economies of Regional Rural Banks in India;

2. to pinpoint the sources of inefficiency among RRBs in India;

3. to rank the efficient banks on the basis of their performance;

4. to examine total factor productivity growth and its sources among RRBs in India and

5. to analyze the impact of banking reforms on the efficiency and total factor productivity growth of RRBs in India;

**Data Base:**

The study has considered a sample of 50 RRBs which have been uninterruptedly operating since 1991-1992 to 2006-2007 so as to make a balanced panel data set. The sample period is selected up to 2007 as a few sample banks were merged after this period.

As in the case of studies conducted by Howcroft and Attaullah (2006), Kaur and Jyoti (2005-06) and Zhao et al. (2008) for commercial banks in India, post-liberalization period has been divided into two sub-periods i.e., first-generation reforms period (1991-92 to 1997-98) and second-generation reforms period (1998-99 to 2006-07) to analyze the impact of reforms on the efficiency and behavior of total factor productivity (TFP) growth and its components among the RRBs.
The present study is based upon secondary data. The data have been culled out from various issues of Statistical Tables Relating to Banks in India; Report on Trend and Progress in Banking; Manual on Financial and Banking Statistics; RBI monthly Bulletins published by RBI and various issues of Financial Analysis of Regional Rural Banks; Regional Rural Banks Key Statistics and Review of Performance of Regional Rural Banks published by National Bank for Agriculture and Rural Development (NABARD). Apart from above mentioned sources, data has also been compiled from compact disc on “Statistical Tables Relating to Banks in India (including RRBs) 1979 to 2007” available from Reserve Bank of India, Mumbai.

These sources provide us the information on the assets, liabilities, earnings and expenses of banks on individual as well as group basis. Further National Income Statistics published by Center for Monitoring Indian Economy (CMIE) has been used for calculating Gross Domestic Product (GDP) price deflator. Data on Consumer Price Index (CPI) for Urban Non-Manual Employees has been taken from 'Brochure on Group and Sub-Group CPI Number', published by Central Statistical Organization, Ministry of Statistics and Programme, Implementation, Government of India, New Delhi.

**Definition and Measurement of Inputs and Outputs:**

The definition and measurement of inputs and outputs in the banking industry remains a contentious issue among researchers. Banks are typically multi-input and multi-output firms. As a result, defining what constitutes ‘input’ and ‘output’ is filled with difficulties, since many of the financial services are jointly produced and prices are typically assigned to a bundle of financial services.

Additionally, banks may not be homogeneous with respect to the types of outputs actually produced. Bergendahl (1998) highlighted this issue by mentioning that there have been almost as many assumptions of inputs and outputs as there have been applications of DEA. Mester (1987) and Berger and Humphrey (1997) identified two main approaches, the production approach (PA), and the intermediation approach (IA) for the specification of input and output variables whereas Freixas and Rochet (1999)
considered another third approach i.e., the modern approach (MA) which is also used in banking literature.

The selection of variables in productivity and efficiency related studies, in light of these approaches significantly affects the results. The production approach assumes that a bank by using traditional production factors like land, labour and capital produces desired output in the form of loans and other financial services. This approach recognizes the multiproduct role of the bank as a firm, where output comprises the services provided to customers in the form of number of accounts, types of transactions, documents processed or any specific product over the period. These activities are generally proxy by the number of deposits and loan accounts. The intermediation approach is based on intermediaries’ role of the bank assuming banking activities as transforming the funds borrowed from depositors into money lent to borrowers. Deposits and loans have different attributes where deposits are typically divisible, liquid, short-term and riskless; on the other hand loans are typically indivisible, illiquid, long-term and risky. It has considered funds generated through deposits and borrowings from financial markets as inputs, and loans and investment outstanding as outputs (Freixas and Rochet, 1999). The intermediation approach is more appropriate in the case of the main branch which is in charge of transforming the money borrowed from depositors into the money lent to borrowers. Whereas modern approach integrates the specific activities of bank like risk management and information processing agency probe into classical theory of the firm.

The present study is based on intermediation approach which is suitable for bank level efficiency. This approach also incorporated business objectives of the bank including profit maximization, cost minimization, service provision and intermediation. In this study, the input parameters are defined in terms of loanable funds \(X_1\), fixed assets \(X_2\) and wages \(X_3\) and output parameters are advances \(Y_1\) and total income \(Y_2\).

In line with the studies of Das (1997), Das (2000), Feng (2006), Gordan (2008) and Heshmati (2010), GDP price deflator (Banking and Insurance) has been used to deflate two outputs viz., advances and total income and two inputs viz., loanable funds.
and fixed assets in the present study. In addition, wages have been deflated by CPI for urban non-manual employees. All the nominal data has been converted into real prices (base 1999-2000 = 100) to mitigate the impact of rise in price level.

**Methodology:**

Data Envelopment Analysis (DEA), non-parametric frontier approach has been applied to examine the efficiency of RRBs in India. Over the past three decades, various DEA models have been widely used to evaluate the technical efficiency or technical effectiveness of decision making units (DMUs) in different organizations or industries. Its popularity is mainly attributable to its flexibility in application, and ability to deal with multiple inputs and outputs and it does not require an assumption about the mathematical form of the production function. This feature makes it very practical because it is usually hard to determine the functional relationship between the productive factors and the product. In view of this, researchers prefer DEA, non-parametric frontier approach to measure efficiency of any business undertaking. Further, Mann-Whitney U-test is used to study the changes in efficiency scores between two generation reforms periods.

The Malmquist Productivity Index (MPI) based on DEA models has been used to measure the total factor productivity (TFP) growth of RRBs in India. The Malmquist index has various advantages relative to the Fischer and Tornquist approaches as it does not require the profit maximization or the cost minimization assumption. Further, it does not require information on the input and output prices. Also if the researcher has panel data as in the case of our study, it allows the decomposition of productivity changes into various components as changes in technical efficiency, pure technical efficiency, scale efficiency, total factor productivity change (TFPC) and shifts in the efficiency frontier (technological change) over time. DEAP 2.1 program produced by Tim Coelli (1996) has been employed for the measurement of technical efficiency and Malmquist total factor productivity index and its components among RRBs in India.
Plan of the Study:

The present study has been planned into six chapters.

1. Introduction
2. Review of Literature
3. Data Base and Research Methodology
4. Technical Efficiency and Scale Economies of Regional Rural Banks in India
5. Total Factor Productivity Growth of Regional Rural Banks in India
6. Summary and Conclusions

First chapter is introductory in nature. It focuses on evolution of different phases of commercial banks in India and elaborates the origin and overall performance of RRBs in India since the period of inception. It further elaborates the objectives, rationale of the study and plan of the study.

Second chapter reviews the empirical studies on the working of RRBs in India highlighting the problems and prospects of RRBs. Further, it provides the review of studies on technical efficiency and total factor productivity growth of RRBs as well as a brief outline of empirical studies of commercial banks conducted at national and international level.

Third chapter explains database and research methodology. Various issues related to the measurement of variables in the banking sector have been discussed and the selection of variables for present study has been explained. It also covers the methodological framework of the applied techniques to examine efficiency and productivity growth of RRBs.

Fourth chapter describes the temporal average estimates of technical efficiency and its components i.e., pure technical efficiency (PTE) and scale efficiency (SE) among RRBs in India for the period 1991-92 to 2006-07, divided into two generation reforms period. In addition, it examines the average estimates of inter-bank and inter-period analysis of efficiency of these banks alongwith their Z-values. Further, it analyzes the period wise estimates of minimum average TE, PTE and SE scores, returns to scale and
the best practice sample RRBs. Besides this, it presents the association between bank size and scale economies of these banks.

Fifth chapter analyses the temporal growth rate of TFP and its components of the sample RRBs for the period 1991-92 to 2006-07, divided into two generation reforms periods. In addition, it describes the inter-period and inter-bank analysis of TFP and its components among these banks in India. Besides this, it analyzes the developments based on number and in percentage of RRBs with productivity progress (regress) and efficiency increase (decrease) and categorize the banks on the basis of quartiles of TFP growth, technological change and efficiency change.

Sixth chapter presents the brief summary of the study and concludes with the suggestions and scope for further study.

II

FINDINGS OF THE STUDY

Chapter IV: Technical Efficiency and Scale Economies of Regional Rural Banks in India

This chapter examines the impact of banking sector reforms on the technical efficiency (TE) and its components viz., pure technical efficiency (PTE) and scale efficiency (SE) of balanced panel data set of 50 sample RRBs in India for the period 1991-92 to 2006-07. Time period has been divided into two sub-periods i.e., first-generation reforms period (1991-92 to 1997-98) and second-generation reforms period (1998-99 to 2006-07) in order to study which generation reforms period has got greater impact on the efficiency of RRBs in India.

The empirical results shown by input-oriented DEA efficiency scores were obtained by running Charnes-Cooper-Rhodes (CCR) and Banker-Charnes-Cooper (BCC) model. Further, it examines the average estimates of inter-bank and inter-period analysis of efficiency of RRBs alongwith their Z-values. Mann-Whitney U-test has been executed to calculate Z-values. In addition, it presents the association between bank size and scale economics of these banks. It has been observed from empirical findings that;
4.1 Average TE has turned out to be 78.2 per cent for RRBs with standard deviation (SD) of 0.031 during the entire period. It ranged from minimum average score of 0.726 in 1994-95 to maximum average score of 0.821 in 2006-07. It infers that the technical inefficiency (TIE) of banks came out to be almost 21.8 per cent. Thus, the banks can curtail their input expenditures on loanable funds, fixed assets and labour by 21.8 per cent with the help of best practices and can produce the same level of outputs.

4.2 Average TE has turned out to be 76.1 percent for banks with SD of 0.021 during first-generation reforms period and during second-generation reforms period it was 80.3 percent with SD of 0.023. The comparative analysis of average TE scores of sample RRBs between these two distinct periods show that the degree of input waste was 23.9 per cent in the first generation-reforms period and the same declined to 19.7 per cent in the second generation-reforms period.

4.3 Average PTE score worked out to be 92 percent with SD of 0.027 during 1992-2007. And, it fluctuated from low value of 0.885 in the year 1992-93 to the highest value of 0.958 in the year 2005-06. The result indicates that some portion of TIE (i.e., 21.8 percent) is due to the incapability of the management to utilize the resources (i.e., 8 percent).

4.4 Average SE score worked out to be 84.6 percent with standard deviation of 0.032 during the study period. And, it upsurges from low value of 0.791 in the year 1994-95 to the highest value of 0.921 in the year 2006-07. The results indicate that average SIE is to the extent of about 15.4 percent is due to the choice of sub-optimal level of operation.

4.5 Average PTE score is estimated to be 90.2 percent with SD of 0.021 during first-generation reforms period, and it turned out to be 93.3 percent with SD of 0.023 during second-generation reforms period.

4.6 Similarly, average SE has worked out to be 83.1 percent with standard deviation measure of 0.024 during first sub-period and, average SE turned out to be 85.7 percent with SD of 0.034 during second sub-period.
4.7 The comparative analysis of average pure technical inefficiency and scale inefficiency between different periods indicates that pure technical inefficiency is to the tune of 9.8 percent in first-generation reforms period, declined to 6.7 percent during second-generation reforms period. This, in turn inferred that the degree of managerial incapabilities have declined by 3.1 percent during these periods. SIE has decelerated to 14.3 percent during second-generation reforms period in comparison to 16.9 percent during first-generation reforms period.

4.8 The information on the behavior of efficiency scores of PTE and SE in all the sample years show that the average PTE scores are higher than the average SE scores throughout the study period. Further, average scores of PTE has shown upward trend in comparison to the average SE scores in most of the time during the study period. No stable and consistent trend of average SE scores has been witnessed during the entire study period.


4.11 In first-generation reforms period, Faridkot Bathinda Kshetriya Grameen Bank and North Malabar Grameen Bank are considered to be the best practice banks having technical efficiency scores equal to one, while no bank was found to be technically efficient during second-generation reforms period.


4.14 In first-generation reforms period, Faridkot Bathinda Kshtriya Grameen Bank, North Malabar Grameen bank and Puri Gramya Bank emerged to be the best practice banks having pure technical efficiency score equal to one while in second-generation reforms period, Dhenkanal Gramya Bank, Malwa Grameen Bank and Vidisha Bhopal Kshetriya Grameen Bank turned out to be the best practice banks having pure technical efficiency score equal to one.


4.16 Arunachal Pradesh Rural Bank, Aurangabad Jalana Grameen Bank, Ballia Kshetriya Grameen Bank, Durg Rajnandgaon Grameen Bank, Ellaquai Dehati

4.17 Faridkot Bathinda Kshetriya Grameen bank and North Malabar Grameen Bank are found to be operating at optimal level having scale efficiency score equal to one during first-generation reforms period, and no bank was found to be operating at optimal level of scale efficiency score equal to one during second-generation reforms period.

4.18 Turning to the findings of significant differences in average technical efficiency and its components by employing non-parametric Mann-Whitney U-test, it has been found that 24 banks have shown significant differences in their average TE scores, 22 RRBs have experienced significant differences in their average PTE scores and 20 RRBs have shown significant differences in their average SE scores between first and second-generation reform periods. The remaining banks have not experienced differences in their average TE, PTE and SE scores during two sub-periods.

Similarly, Samastipur Kshetriya Grameen Bank has been noted with minimum level of TE scores in two consecutive years 1994-95 and 1995-96. Baitarni Gramya Bank experienced only once minimum TE score in 1992-93.


4.25 The empirical findings on returns-to-scale illustrate that out of 50 sample RRBs, majority of the 41 banks (i.e., 82 percent) during first-generation reforms period, 39 banks (i.e., 78 percent) during second-generation reforms period and 40 banks (i.e., 80 percent) during the entire study period are found to be operating at below their optimal size and thus, experiencing increasing returns-to-scale (IRS).

4.26 Furthermore, the empirical results show that 1 bank (i.e., 2 percent) during first-generation reforms period, 3 banks (i.e., 6 percent) during second-generation reforms period and 2 banks (i.e., 4 percent) during the entire study period are found to be operating at above their optimal size and thus, experiencing diminishing returns-to-scale (DRS).
4.27 In addition, the results explain that 10 banks (i.e., 20 percent) during first-generation reforms period, 8 banks (i.e., 16 percent) during second-generation reforms and 9 banks (i.e., 18 percent) during the entire study period are found to be operating at most productive scale size that is experiencing constant returns-to-scale (CRS).

4.28 The relationship between bank size and scale economies report that large-sized banks have realized maximum level of scale economies (i.e., 88.2 percent), followed by small-sized banks (i.e., 84.4 percent) and medium-sized banks (i.e., 79.4 percent) during the entire study period. The comparative analysis between two sub-periods highlight that during the first-generation reforms period, large-sized banks gained the maximum (90.9 percent) level of scale economies, followed by medium-sized banks (82.1 percent) and small-sized banks (81.6 percent). During the second-generation reforms period, small-sized banks gained the maximum (86.5 percent) level of scale economies followed by large-sized banks (86.1 percent) and medium-sized banks (77.2 percent). The results do not indicate consistent relationship between size and scale economies. However large-sized banks are observed to experience higher scale economies (with negligible difference in the second-generation reforms period from the small-sized banks). Thus, larger the size, higher the scale economies are confirmed from the results for the banks under consideration.

**Chapter V: Total Factor Productivity Growth of Regional Rural Banks in India**

This chapter analyses the temporal growth rate of total factor productivity change (TFPCH) and its components namely technological change (TECH), technical efficiency change (EFFCH), pure efficiency change (PEFFCH) and scale efficiency change (SEFFCH) among RRBs in India. Further, it describes the inter period and inter-bank analysis of TFP growth and its components. To view this objective, DEA based Malmquist Productivity Index (MPI) approach has been applied. In addition, the development based on number and in percentage of RRBs with productivity progress (regress) and efficiency increase (decrease) has been analyzed. Moreover, it categorizes
the sample RRBs on the basis of quartiles of TFP growth, efficiency change and technological change. The empirical findings reveal that:

5.1 RRBs have practiced total factor productivity change TFPCH growth at the rate of 1.45 percent per annum during 1993-2007. During this period, TFPCH realized this growth rate on account of 0.99 percent growth rate of technological progress and 0.62 percent of technical efficiency.

5.2 The period-wise analysis indicates that sample banks have experienced TFP growth at the rate of 3.05 percent per annum during first-generation reforms period. Over the period, technological change (frontier effect) increased TFP growth of RRBs by 2.93 percent per annum and technical efficiency (catching up effect) increased the level of TFP growth by 0.17 percent per annum. In second-generation reforms period, the banks showed decline in TFP growth at the rate of 0.39 percent per annum due to the technological change (i.e., -0.31 percent) rather than efficiency change (i.e., 0.92 percent) in comparison to the first-generation reforms period.

5.3 The empirical findings further describe that seven out of fifteen study years, RRBs have experienced total factor productivity gain. The positive growth rates have been observed during the years 1992-93, 1997-2001 and 2006-07 ranging from 0.9 (1999-2000) to 13.8 (1996-97) percent during these entire years. However, the productivity losses have been noticed in the remaining eight study years. The negative growth rates have been observed during the periods 1994-96 and 2002-06, ranging from -0.2 (1994-95) percent to -5.9 percent (1993-94) during this period.

5.4 The RRBs reported growth rate in terms of technological change index in the years 1996-97 and 2002-03 at the rate of (15.5 percent) and (7.9 percent) respectively. The sample banks have witnessed technological progress in eight study years and accordingly, technological regress in remaining years (7).

5.5 As for EFFCH index, RRBs experienced efficiency increase in seven years; while, efficiency decrease in remaining eight years of the study period. The efficiency increased during the years 1995-96, 1998-2001, 2003-04 and 2006-07
ranging from 0.3 (2000-01) percent to 9.6 (2003-04) percent. The efficiency decrease have been observed during the years 1993-95, 1996-97, 2000-01, 2002-03, 2004-05 and 2005-06 ranging from -0.2 percent (1992-93) to -8.8 percent (2002-03).

5.6 Malwa Gramin Bank has experienced TFP growth at the rate of 7.5 percent per annum, followed by Dhenkanal Gramya Bank (7.1 percent) per annum, Krishna Gramene Bank (6.8 percent) per annum and Hadoti Kshetriya Gramin Bank (4.5 percent) per annum during the entire study period 1993-2007.

5.7 Out of 50 sample RRBs, majority of banks (39) followed positive productivity growth rate during the entire period while remaining 11 RRBs experienced negative trend of growth rate. These banks can be termed as poor performers. Among poor performer RRBs, Ellaquai Dehati Bank has emerged to be the poorest with growth rate of -5.5 percent per annum.

5.8 The comparative analysis of the inter-bank total factor productivity growth rates between first-generation reforms period and second-generation reforms period show that Kshetriya Kisan Gramin Bank, Solapur Gramin Bank, Tripura Gramin Bank, Vidisha Bhopal Kshetriya Gramin Bank and Visweswaraya Gramin Bank have witnessed comparative acceleration in TFP growth. However, Chikmagalur Kodagu Gramin Bank, Etawah Kshetriya Gramin Bank, Hadoti Kshetriya Gramin Bank, Krishna Grameen Bank, Dhenkanal Gramya Bank, Hadoti Kshetriya Gramin Bank, Malwa Gramin Bank, North Malabar Gramin Bank, Pandyan Grama Bank and Puri Gramya Bank have witnessed comparative deceleration in TFP growth.


5.10 As for the sources of TFP growth, Parvatiya Grameen Bank has experienced technical efficiency change growth at the rate of 3.2 percent per annum,
followed by Krishna Grameen Bank and Mizoram Rural Bank recorded growth rate of 2.7 percent per annum during the period 1993-2007. However, the Etawah Kshetriya Grameen Bank, Jhabua Dhar Kshetriya Grameen Bank, Kosi Kshetriya Grameen Bank, Manipur Rural Bank, Mewar Anchalik Grameen Bank, Prathama Bank, Ratlam Mandsaur Kshetriya Grameen Bank, Rushikulya Gramya Bank, South Malabar Grammeen Bank, Sharda Grammeen Bank, Surguja Kshetriya Grameen Bank and Tripura Grameen Bank noted to be the least efficient at the rate of less than 1 percent per annum.

5.11 Out of 50 sample RRBs, majority of banks (36) followed positive growth rate of technical efficiency change during the entire study period. Further, remaining (14) RRBs followed negative trend of technical efficiency change growth rates. These banks can be termed as poor performers. Among poor performer RRBs, Ellaquai Dehati Bank and Nagaland Grammank Bank have emerged the poorest with growth rate of (-2.7 percent) per annum. Kamraz Gramin Bank, Kshetriya Kisan Gramin Bank and Vidisha Bhopal Kshetriya Gramin Bank recorded stagnant growth rate during the entire study period.

5.12 The comparative analysis of first-generation reforms period and second-generation reforms period illustrates that Baitarani Gramya Bank, Samastipur Kshetriya Grameen Bank, Solapur Grameen Bank and Visweshwaraya Grameen Bank have witnessed comparative acceleration in technical efficiency change growth rates. However, Devipatan Kshetriya Grameen Bank, Hadoti Kshetriya Grameen Bank, Kshetriya Kisan Grameen Bank, Mizoram Rural Bank and Pandyan Gramya Bank have witnessed comparative deceleration in EFFCH growth rates.

5.13 The comparative analysis of the two sub-periods show that Aurangabad Jalana Gramin Bank, Durg Rajnandgaon Gramin Bank, Ellaquai Dehati Bank, Gurgaon Gramin Bank, Himachal Gramin Bank, Jammu Rural Bank, Jhabua Dhar Kshetriya Gramin Bank and Rewa Sidhi Gramin Bank have experienced negative growth rate of EFFCH between respective reforms periods.

5.15 Malwa Gramin Bank and Dhenkanal Gramya Bank have registered technological change index at an exciting rate of (6.4 percent) per annum and (5.5 percent) per annum respectively during the entire study period.

5.16 Arunachal Pradesh Rural Bank, Ballia Kshetriya Gramin Bank, Chikmagalur Kodagu Gramin Bank, Devipatan Kshetriya Gramin Bank, Durg Rajnandgaon Gramin Bank, Kamraz Gramin Bank, Manipur Rural Bank, Mewar Anchalik Gramin Bank, Mizoram Rural Bank, Parvatiya Gramin Bank, Rushikulya Gramya Bank, Samastipur Kshetriya Gramin Bank, Sharda Gramin Bank, Solapur Gramin Bank, South Molabar Gramin Bank, Surguja Kshetriya Gramin Bank, Tripura Gramin Bank, Uttar Banga Kshetriya Gramin Bank and Visweshwaraya Gramin Bank have emerged to be least TECH productive at the rate of less than 1 percent per annum during the study period.

5.17 Out of 50 sample RRBs, majority of banks (39) experienced positive growth rate of technological change during the entire period. Further, remaining 11 RRBs have negative trend of growth rates. These banks are the poor performers. Among poor performer RRBs, Ellaquai Dehati Bank has emerged to be poor with least (negative) growth rate of -2.8 percent per annum.

5.18 The detailed study of growth rates of technological change index between first-generation reforms period and second-generation reforms period depict that although Dhenkanal Gramya Bank, Gurgaon Gramin Bank, Kosi Kshetriya Gramin Bank, Krishna Gramin Bank, Malwa Gramin Bank, North Malabar Gramin Bank and Prathama Bank, have witnessed positive growth rates, these
banks have experienced a comparative deceleration in the growth rate during second-generation reforms period.

5.19. Similarly, Chikmagalur Kodagu Gramin Bank, Pandyan Gramin Bank, Puri Gramya Bank, Tripura Gramin and Vidisha Bhopal Kshetriya Gramin Bank have witnessed positive growth rates. But these banks have noted a comparative deceleration in the growth rate of technology index during first-generation reforms period.

5.20 Ellaquai Dehati Bank, Himachal Grameen Bank, Jhabua Dhar Kshetriya Grameen Bank, Kisan Grameen Bank, Mahakaushal Kshetriya Grameen Bank and Rani Lakshmi Bai Kshetriya Grameen Bank have experienced negative technological change growth rates during first and second-generation reforms periods. Although, these banks have experienced negative growth rates, yet the extent of negative growth rates is found comparatively lesser than first-generation reforms period.

5.21 During first-generation reforms period, 8 banks have registered negative technological change index growth rate, whereas 33 banks have experienced negative growth rate during second-generation reforms period. In this scenario, it has been observed that the positive impact of technologies is more pronounced among various sample banks during first-generation reforms period (2.772 percent per annum) than second-generation reforms period.

5.22 The empirical findings related to percentage of RRBs with productivity progress (regress) and efficiency increase (decrease) states that (55.77 percent) banks have experienced TFP progress while (43.44 percent) banks have witnessed TFP regress during the period 1993-2007. We can see that the productivity progress has originated from technological progress (54.55 percent banks encountered technological progress) relative to efficiency increase (44.10 percent). Most of the productivity regress in banks can be attributed to the decline in technological regress (44.24 percent banks reported decline in technological regress) rather than technical efficiency decrease (41.12 percent). The efficiency increase (decrease), 42.24 percent (42.03 percent) is due to scale efficiency increase
(decrease) and 41.29 percent (38.74 percent) is a result of pure efficiency increase (decrease). It has been observed that improved scale of operation (42.24 percent) has favorably influenced the technical efficiency of banks than pure efficiency change (41.29 percent).

5.23 The comparative analysis of percentage changes of first generation reforms and second generation reforms period illustrate that 57.67 percent (42.33 percent) banks have observed productivity progress (regress) during the first-generation reforms period. Mainly, productivity progress has been realized due to advanced technologies (55 percent banks exhibited technological progress) rather than efficient use of these technologies (42.67 percent). If we look on the other side, most of the productivity regress in the banks can be attributed to the decline in technical efficiency (43.67 percent banks experienced deterioration in efficiency) rather than technological regress (42.67 percent). All those banks that experienced efficiency increase (decrease), 47.33 percent (36.67 percent) owe it mostly to scale efficiency increase (decrease) and 39.33 percent (42.33 percent) owe it to pure efficiency increase (decrease). We observed that an improved scale of operation (47.33 percent) has emerged to be the responsible factor of efficiency increase among sample banks as compared to pure efficiency change (39.33 percent).

5.24 Further the banks with productivity progress (regress) were less in percentage i.e. 54.44 percent (44.22 percent) during second-generation reforms period. The productivity progress that had primarily on account of technical progress (54.22 percent banks exhibited technical progress) rather than efficiency increase (45.11 percent). If we see on the other side, most of the productivity regress in sample banks may be attributed to decline in technological regress (45.33 percent banks experienced deterioration in technological regress) rather than technical efficiency (39.33 percent). Taking account of the banks that witnessed efficiency increase (decrease), 42.67 percent (36.22 percent) may be attributed to pure technical efficiency increase (decrease) and 38.67 percent (45.78 percent) to scale efficiency increase (decrease). We can say that improved management practices (42.67 percent) held responsible for the increase in
efficiency than improved scale of operation (36.67 percent) among sample RRBs.

The empirical findings related to categorization of sample RRBs on the basis of quartiles of productivity growth states that The ‘Apex Performers’ category of banks are considered as to be operating with high level of TFPCH growth, EFFCH and TECH index in respective sub-periods. Such banks have greater dependence on technological know-how to improve growth. There has been achievement in the resource deployment process.

Further, the banks falling in the category of ‘Middle Performers’ have the capacity to rise at a quicker rate by overcoming the distortions such as deficiency in the field of managerial skill and inappropriate scale of operation etc.

The banks that come in the set of ‘Low Performers’ are attaining less productivity. The major factor responsible for this is the incapability to obtain maximum possible returns from the provided resources. Therefore, sustainability of growth depends upon improvement in technical efficiency.

‘Pits Performers’ banks are extremely incompetent in using available resources in order to reap maximum benefits out of it. These banks need to attain more TFPCH profits for the future within the available resources.

The study thus concludes as follows

1. RRBs have experienced technical inefficiency due to pure technical inefficiency and scale technical inefficiency. The results indicate that a great portion of technical inefficiency is due to the choice of wrong scale of operations. Thus the results conclude that scale technical inefficiency is mainly responsible for technical inefficiency rather than pure technical inefficiency.

2. The empirical findings highlight that technical inefficiency has slowed down in first-generation reforms period as compared to second-generation reforms period. Thus first-generation reforms period has shown less impact on the performance of RRBs.
3. The empirical findings highlight that technical inefficiency of banks came out to be almost 21.5 percent. Thus the banks can curtail their input expenditure following the best practice banks and can produce the same level of outputs.

4. From the empirical findings it is concluded that managerial capabilities have contributed a lot in comparison to scale of operations in reducing wastages of resources in most of the study years.

5. Further, pure technical inefficiency has slowed down during second-generation reforms period. This, in turn inferred that degree of managerial incapabilities have declined during second sub-period as compared to first sub-period.

6. The results explain that temporal average scores of pure technical efficiency has shown upward trend than average scores of scale efficiency throughout the study period. No stable and consistent trend of average SE scores has been found.

7. It has been observed that level of management practices and scale of operation of banks have improved during second-sub period.

8. The empirical results further highlight that number of banks that experienced an improvement in averages of technical efficiency, pure technical efficiency and scale efficiency scores are more pronounced during second-generation reforms period as compared to first-generation reforms period. Therefore, a positive impact of reforms has been observed on the efficiency of banks during second-generation reforms period.

9. In case of temporal average minimum technical efficiency and scale efficiency scores, the empirical findings highlight that Arunachal Pradesh Rural Bank has been observed with minimum level of average efficiency score in comparison to other banks.

10. Similarly, in case of temporal average minimum pure technical efficiency scores, Jhabua Dhar Kshetriya Grameen Bank captured minimum level of average pure technical efficiency in comparison to other banks.
11. As far as best practice banks are concerned, Malwa Grameen Bank occupied first position as this bank appeared maximum times on the frontier as compared to other banks.

12. After analyzing the findings of the returns-to-scale, the results conclude that majority of the banks are operating at below their optimal level and experiencing increasing returns-to-scale. The implication of this result is that these banks could increase their technical efficiency by continuing to increase their size. The results suggest for the closure of sick banks, mergers of banks and modernization programs seem to be desirable for increasing the efficiency of banks.

13. The findings further conclude that large-sized banks have realized maximum level of scale economies as compared to other counter-parts during the study period.

14. The empirical findings conclude that strong frontier effect has emerged to be the major driver of total factor productivity gain rather a less catching up effect during entire study period. Similar results have been found during first-generation reforms period. But opposite results are observed during second-generation reforms period.

15. Further maximum number of RRBs have realized positive growth rate of total factor productivity, technological change and efficiency change during the entire period.

16. The empirical findings related to percentage of RRBs with productivity progress (regress) and efficiency increase (decrease) states that banks have experienced productivity progress which has originated mainly from technological progress relative to efficiency increase during the entire study period.

**Suggestions:**

In the light of above-mentioned empirical findings, the following suggestions have been put forward:

1. Inefficient or poor performer banks should be relocated and merged.
2. Further, it has been observed that managerial incapabilities are responsible for technical inefficiencies among RRBs in India. So it is required that:

- Separate institutions should be set up for training the staff of RRBs by sponsored banks.
- Adequate efforts should be there to achieve desired levels of excellence in staff competence for managing the affairs and business of banks.
- Generally it was observed that staff of RRBs is urban-oriented and they may not know the problems and conditions of rural areas. Lack of training facilities concerning these areas also affect the efficiency of RRBs. Therefore staff should be provided such type of training as they can realize the feeling of rural people.
- Various training programme should be initiated to sharpen the managerial skills.

3. It has been observed from the present study that scale inefficacies are more pronounced in technical inefficiencies among RRBs; therefore, various steps should be taken to bring them at the productive scale size.

4. The banks falling in the category of ‘Middle Performers’ have the capacity to rise at a quicker rate by overcoming the deficiency in the field of management skill and inappropriate scale of operation. Therefore technological improvements are required among these banks.

5. Further, the banks that come in the set of ‘Low Performers’ are attaining less productivity. Therefore, these banks should use provided resources efficiently to obtain maximum possible returns.

6. The empirical findings suggest ‘Pits performers’ banks to attain more total factor productivity change for the future within the available resources.

7. For increasing the productivity of RRBs, it is required that banks should concentrate efficient management, training of staff, computerization and networking of their activities.


**Scope for Further Research**

To analyze the efficiency and productivity of banks is of utmost importance for the economical stability of banks of every nation. As efficiency and productivity study of banks would be helpful in locating sources of inefficiencies and poor performance, it enables all the stakeholders to have a fresh look at their functioning and initiate suitable strategies and measures so as to achieve and improve upon their profitability and objectives. The present study has been specifically conducted based on efficiency and productivity growth of RRBs using non-parametric approach i.e., DEA technique. As it is observed that a very scant literature is available on the measures of efficiency and productivity growth of RRBs in India. Therefore, it is proposed to conduct various research works on the issues related to the efficiency and productivity of RRBs in India using both the parametric and non-parametric approaches. These studies would help in making RRBs in India a viable entity by focusing on various core issues such as acquisitions, mergers and re-capitalization.

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