

Financial Inclusion In India: Role of Public and Private Sector Banks



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A b s t r a c t

The research examines the role of Indian banks in financial inclusion. Among the sixteen inefficient banks under CCR model, six are also efficient under variable return scale assumption based on Banker Charnes Cooper (BCC) model. Despite these banks' good performance as per their financial statement, they are not so in financial inclusion. For that, the inefficient banks should minimise their input level for the given output. Results indicate that schedule commercial banks in India are utilizing 94.87 per cent of resources to produce desired outputs with respect to financial inclusion. The results further reveal that selected public sector banks operate at 97.48 per cent and private sector banks operate at 92.26 per cent level of efficiency. Their input could be reduced by 2.52 per cent for public sector banks and 7.74 per cent for private sector banks for the same level of output.

Key Words: Financial Inclusion, Data Envelopment Analysis, Public Sector banks, Private Sector banks

JEL Classification: G21, G29.

Without presence of bank branches, there can be no banking access for people. Public sector banks (PSBs) started their journey since before nationalization of banks in 1969. Banks have been nationalized in two phases one in 1969 and another in 1980. Rest of the banks those who are not nationalized termed as old private sector banks (Pvt. SBs). From 1993 again RBI started granting license to Pvt. SBs for expansion of branches in rural areas as well as minimization of population per branch. In the present market these Pvt. SBs captured a major share of banking market which is now called as new Pvt. SBs. Their growth rate of number of branches, number of bank employees, bank deposits and bank credits was much impressive than the PSBs. All these PSBs and Pvt. SBs are playing a major role towards financial inclusion in India by expanding their branches.

Financial inclusion provides formal financial services with improved range, availability and quality for those who are financially excluded. The banks or formal financial institutions provide variety of financial services to their customers, like deposits, withdrawals, loans, payment services, remittance facility and insurance products to low-income and poor households and their business entities. Regulator started its journey of financial inclusion by nationalization of banks. While institutional innovations in rural credit delivery system were introduced, the Indian government realized that the banking system had yet to reach a wide section of population in both rural and urban areas. Financial institutions play their own role in increasing access to households, especially in rural areas (Mahadeva, 2008). To enhance financial inclusion, improvements in geographic penetration of bank branches and credit availability should get the policy priority (Chakravarty and Pal, 2013). Largest number of people to provide banking service has become a top priority for the RBI.

Without a sound and efficiently functioning banking system, economy cannot function smoothly and efficiently. Performance of any institution is often evaluated in terms of its efficiency in the use of its resources (Saha and Ravisankar, 2000). According to Raina (2014) schedule commercial banks (SCBs) are enabling financial inclusion and promoting inclusive growth. When banking system fails, the whole of a nations' payments system is in jeopardy. Only efficient banks can enlarge their business in the form of deposit and credit and reach the customer. From the point of view of customers, only efficient banks can offer better services due to their reasonable operational cost and only then the regulator can achieve the target of financial inclusion. The efficient banks are better able to compete

because of their lower operational costs. Rangarajan and Mampilly (1972), Tyagarajan (1975) and Subrahmanyam (1993) have examined various issues relating to performance of Indian banks. Dhar (2012) analyses the performance of few selected Indian Banks in the area of financial inclusion. In the present analysis in respect of financial inclusion in Indian context researchers have studied in detail whether there is any disparity between PSBs and Pvt. SBs towards financial inclusion in India and which bank group is advance position than the other group and also which banks are comparatively in better position among the sample banks.

LITERATURE REVIEW

Here, we have surveyed the literature of banks role in financial inclusion and DEA application to acknowledge that the DEA has been used as an efficiency measurement tool as well as to measure efficiency of banking sector with bank service provision. Charnes et al. (1978) in their seminal work of the methodological development of the technique DEA demonstrated its utility in their secondary analysis of Program Follow-Through evaluation data - a federally funded intervention aimed at improved education of disadvantaged students in U.S. This technique has been used widely to measure efficiency both in public and private sector. Boufounou (1995) has presented a model for a Greek Bank to assist its management in establishing branch goals, planning new locations and evaluating performance. His study has built an appropriate example to support management decision-making in evaluating branch performance of a bank. A representative sample of 62 branches of all sizes of Commercial Bank of Greece network was chosen for the purposes of this analysis. He analyses Volume of Deposits attracted by each branch. Mahadeva (2009) has stated that most commercial banks in rural areas only exist to fulfil the governments or RBI's norms, rather than to actually engage in promoting rural business.

Jain (2015) investigates financial inclusion progress in India and highlights achievement of Banking Sector in this area. The study reveals that execution of financial inclusion will require an approach in totality on part of banks in creating awareness about financial products, education, and advice on money management, debt counseling, savings and affordable credit. Further, Pathania et al. (2016) have investigated case of four commercial banks to deliberate upon the current quality parameters undertaken by these banks for financial inclusion of rural population thereby finding the gaps that need to be addressed as part of innovative financial inclusion.

Yue (1992) has demonstrated the use of DEA to find out the relative efficiencies of 60 commercial banks in Missouri for the period 1984 to 1990. Two alternative models of DEA have been used for evaluation: CCR model and the additive DEA model followed by window analysis of the efficiencies obtained. Burgstaller (2013) in his studies considered total funds, fixed assets and total costs as inputs and outputs produced comprise total loans, other earning assets and non-interest income to measure efficiency in regional banking market through DEA. Valadkhani and Moffat (2009) have measured the technical and pure technical efficiencies of 10 major financial institutions in Botswana during 2001-2006 using DEA. Angelidis and Lyroutdi (2006) have investigated productivity of 100 large Italian banks during 2001-2002 by using DEA. They employed DEA to find Malmquist indices of total productivity change which is then put to use in examining productivity change of the financial institutions of the most recent member of European Union countries.

Feroze (2012) has employed DEA to assess efficiency of District Cooperative Banks (DCBs) in Kerala during 2005-2009. The empirical results revealed that level of efficiency in DCBs was 74 % and magnitude of inefficiency was 26 per cent. 6 DCBs obtained efficiency score equal to 1 and formed efficiency frontier. Sinha and Jain (2015) in their study uses owned funds, deposits, borrowings and employee cost as inputs, and advances, investments and other income as outputs to measure potential gains from merger of SBI with its associates.

Das and Ghosh (2006) have examined the performance of commercial banks during post reform period 1992-2002 in India. Medium sized PSBs have found performing at higher level of technical efficiency. To arrive at this, they chose inputs and output variables based on three approaches namely intermediation approach, value added approach and production approach. The variation in technical efficiencies was then observed in relation with ownership, bank size, CAR, NPA and quality of management. Kumar and Gulati (2008), evaluate extent of overall technical efficiency (OTE), pure technical efficiency (PTE), and scale efficiency (SE) in Indian PSBs using cross-sectional data for 27 banks in the year 2004-05. Besides this, an attempt has been made to explain impact of environmental factors (like market share, asset quality, exposure to off-balance sheet activities, size, and profitability) on the OTE of the PSBs. To realize the research objectives, a two-stage DEA framework has been applied in which the estimates of OTE, PTE, and SE

for individual PSBs have been obtained by CCR and BCC models in the first stage; and in second stage logistic regression analysis has been used to work out the relationship between OTE and environmental factors.

Using DEA, Maity and Sahu (2017) measure performance of SBI and associates for 2011-2016 with three output variables (deposits, advance and total income) and four input variables (branches, ATMs, assets and gross NPA). Bhattacharyya et al. (1997), have measured and endeavoured to explain performance of Indian commercial banks during early phase of the government's liberalization program and to accomplish this task they have used DEA to calculate efficiency of service provision for individual banks of public, private and foreign owned, for a period of six years from 1986 to 1991, and have used stochastic frontier analysis (SFA) to attribute variation in calculated efficiencies to a set of temporal and government regulatory policy variables. They have found publicly-owned banks to have been the most efficient, in utilizing resources to disposal services. Saha and Ravisankar (2000) suggest that in Indian context DEA could be a suitable approach towards measuring efficiency of banks. Among the variables deposits and advances etc. are output variables and number of branch and number of staffs etc. are input variables. In their analysis an attempt was made to quantify relative efficiency in the form of a total weighted output by total weighted input. The weights have been obtained using DEA for each bank by solving a linear objective function. Results of the analysis indicate that, except few exceptions, PSBs have in general improved their efficiency scores over the years 1992 to 1995. In spite of this there are few banks like United Bank of India, UCO Bank, Central Bank of India and Syndicate Bank continued to be at the lower end of relative efficiency scales.

The above studies show that there have been widely used of DEA applications to measure efficiency of financial institutions or banks by considering different parameters as input variables and output variables. If we see the past literatures, we found that most of the earlier studies based on economic perspective to measure performance rather than based on deposit mobilization and credit disbursement. Though few studies have considered deposits and advance as output variables and number of branches as input variable, but no past studies has been made to measure the efficiency of banks with respect to financial inclusion by considering only deposits and credits as output variables.

The literature reviews have not found concrete empirical study to measure banks efficiency in respect of financial

inclusion only. This research gap motivates us to work on our set of objectives. The objective of financial inclusion is to mobilize deposit and disbursement of credit through opening of deposit accounts and credit accounts respectively. And as such we have considered only deposits and credits as output. To measure efficiency in the form of financial inclusion perspective we have considered both these financial inclusion parameters of deposits and credit as out-put variables.

OBJECTIVE OF THE STUDY

The main objective of this study is to examine the comparative role of public sector banks and private sector banks in financial inclusion in India and assess efficiency. The following objectives have been framed to accomplish the aim of the present study:

1. To examine the comparative role of PSBs and Pvt. SBs in financial inclusion in India.
2. To assess the efficiency of Indian Banks in terms of financial inclusion.

HYPOTHESES OF THE STUDY

To study the above objective we set the below hypotheses.

Hypothesis - I

Null Hypothesis (H₀): There is no significant difference between PSBs and Pvt. SBs in respect of financial inclusion in India.

Alternative Hypothesis (H₁): H₀ is not true.

Hypothesis - II

Null Hypothesis (H₀): There is no significant difference of efficiency in terms of financial inclusion between PSBs and Pvt. SBs.

Alternative Hypothesis (H₁): H₀ is not true.

DATA AND METHODOLOGY

The present study is based on twenty largest banks (based on total income and assets value as on March, 2015) which cover 70.83 % of market share. Annual data from April, 2001 to March, 2016 has been collected from various annual reports of RBI. To examine the comparative role of PSBs and Pvt. SBs we consider eight financial inclusion parameters of average population per branch, average population per ATM, deposit to GDP, credit to GDP, deposit per capita, credit per capita, C-D ratio and assets per office. To measure the efficiency of India banks we have select

deposits and credits are our two output variables and number of branches and assets are our input variables.

In the first part, the study analyses significant differences between PSBs and Pvt. SBs with the various financial inclusion parameters by using t-test. After analysing the same, in the second part researchers have applied DEA (both CCR and BCC) model to measure the efficiency of the selected banks with respect to financial inclusion. DEA is defined as a nonparametric method for efficiency measurement of a decision making unit (DMU) by comparing it to other homogenous unit with multiple inputs and multiple outputs. We intend to apply the technique of DEA for measures of OTE, PTE and SE for individual PSBs and Pvt. SBs. The measure of efficiency provided by CCR model is known as OTE under constant return scale (CRS) assumptions and the measure of efficiency provided by BCC model is known as PTE under variable return scale (VRS) assumptions. Also, the SE can be derived by the ratio of OTE to PTE. SE does not indicate whether the DMU in question is operating in the area of increasing returns to scale (IRS) or decreasing returns to scale (DRS). Scores are 1 for efficient DMUs and lower for relatively inefficient ones. MaxDEA 5.2 has been used to measure the performance of banks through DEA.

ANALYSIS AND FINDINGS

Comparative Role of PSBs and Pvt. SBs in Financial Inclusion

To study and analyse comparative role of PSBs and Pvt. SBs on financial inclusion in India researchers have used the key indicators of availability of banking service and usage of banking service. The indicators are APPB (branch expansions), average population per ATM (expansion of ATMs), deposit to GDP ratio, credit to GDP ratio, deposits per capita (deposit mobilization), credit per capita (credit penetration), C-D ratio and assets per branch. All of these indicators are important parameters for measuring financial inclusion (Beck et al., 2007; Kunt et al., 2011; Kumar, 2013; and Jalaludeen, 2014). So, we have considered all these indicators to compare role towards financial inclusion by the two groups of PSBs and Pvt. SBs. Fisher's t-test has been applied to test any significant difference between the financial inclusion parameters of PSBs and Pvt. SBs. Table 1 presents comparison of parameters for financial inclusion between PSBs and Pvt. SBs.

Table 1: Comparison of Financial Inclusion parameters between PSBs and Pvt. SBs in India

Parameters	Bank Group	N	Average	CAGR	CV	t - Value	Sig.
Average Population per Branch	PSBs	15	30777.33	(3.03)	16.96	5.30	0.000*
	Pvt. SBs.	15	235318.61	(12.99)	63.50		
Average Population per ATM	PSBs	6	20471.16	(17.63)	40.38	2.58	0.015**
	Pvt. SBs.	6	34740.85	(13.63)	30.92		
Deposits as % of GDP	PSBs	15	0.38	2.48	14.78	16.22	0.000*
	Pvt. SBs.	15	0.11	9.11	29.32		
Credit as % of GDP	PSBs	15	0.27	5.94	27.21	8.70	0.000*
	Pvt. SBs.	15	0.09	10.14	36.31		
Deposits per capita	PSBs	15	20142.99	13.95	60.14	4.26	0.000*
	Pvt. SBs.	15	6076.94	21.33	67.89		
Credit per capita	PSBs	15	15099.34	17.79	67.36	3.53	0.001*
	Pvt. SBs.	15	5160.32	22.47	75.46		
Credit-Deposits Ratio	PSBs	15	0.70	3.38	15.61	3.06	0.002*
	Pvt. SBs.	15	0.81	0.94	9.75		
Assets per Office	PSBs	15	693.06	11.03	44.05	6.72	0.000*
	Pvt. SBs.	15	1333.51	3.54	15.53		

Source: Researcher's calculation

* Significant at 1 per cent level of significance and ** Significant at 5 per cent level of significance

Regarding branch expansion, average population per branch (APPB) in respect of PSBs has been significantly declined from 35,307 in March 2002 to 22,941 in March 2016. In respect of Pvt. SBs the same has also been significantly declined from 493,433 in March 2002 to 70,338 in March 2016. Regarding ATM expansion, average population per ATM in respect of PSBs and Pvt. SBs has been declined from 31,716 in March 2011 to 12,023 in March 2016 and 55,280 in March 2011 to 26,563 in March 2016 respectively.

Deposits to GDP of PSBs have increased from 0.3258 in March 2002 to 0.4589 in March 2016 and of Pvt. SBs have increased from 0.0499 in March 2002 to 0.1694 in March 2016. During the same period credit to GDP of PSBs have increased from 0.1626 to 0.3645 and in respect of Pvt. SBs it have been increased from 0.0401 in March 2002 to 0.1550 in March 2016.

Regarding deposit penetration, deposits per capita of Pvt. SBs have • 978 in March 2002 which further increased to • 14,655 in March 2016 and deposits per capita of PSBs have • 6,383 in March 2002 and further it has increased to • 39,704 in March 2016. Regarding credit penetration, credit per capita of PSBs have been increased from • 3,185 in March

2002 to • 31,537 in March 2016 and of Pvt. SBs it have been increased from • 785 in March 2002 to • 13,410 in March 2016.

Table 1 shows that there is a significant difference in APPB, deposits to GDP, credit to GDP, deposit per capita, credit per capita, C-D ratio, asset per office by PSBs and Pvt. SBs at 1 % level of significance. It means the APPB, deposits to GDP, credit to GDP, deposit per capita, credit per capita, C-D ratio, assets per office in PSBs and Pvt. SBs were having significant differences at 1 % level in India. The table 1 also shows that there is a significant difference in average population per ATM by PSBs and Pvt. SBs at 5 % level of significance. It means the average population per ATM of PSBs and Pvt. SBs were having significant differences at 5 % level.

It is found from t-test that mean differences with unequal variance of financial inclusion parameters between the two bank groups are significant. Based on the findings the null hypothesis is disproved. Accordingly, there is significant difference between PSBs and Pvt. SBs on financial inclusion in India and positive growth of branch and ATM expansion, deposit mobilization and credit penetration does bring financial Inclusion.

Performance measures of PSBs and Pvt. SBs

According to t - test researchers conclude that whether there is significant difference between groups or not. However, it is not clear which individual bank is more efficient and which one is less efficient or which group is comparatively better than other. To measure individual efficiency of bank DEA efficiency measurement has been applied. The application of DEA can be found in several services and industries since its inception in 1978. In public sector and private sector, this technique has been used widely to measure the efficiency. In a recent study by Maity and Sahu (2017) used DEA model to measure the performance of SBI and Associates banks of two different periods. From financial inclusion perspective as the banks main target is to collection of deposit by opening deposit accounts and disburse of credit or advance from the collected deposit by opening credit accounts. And that is the reason in most of the earlier studies these two variables have been selected as financial inclusion indicators (Mahadeva, 2008; Kodan and Chhikara, 2011; Shafi and Medabesh, 2012; Kunt and Klapper, 2013; Kumar, 2013; Chakravarty and Pal, 2013; and Fungacova and Weill, 2015). In this regards in Indian perspective number of branches of a bank is playing a major role towards financial inclusion (Kodan et al., 2011; and Das and Guha, 2015). Total assets of bank is also depends upon branch size or number of branches. On the basis of review of literatures, in present analysis number of branches and total value of assets (Kumar, 2012) are two input variables.

In 1977 the PEP Committee proposed a system of assessment of relative performance of banks on four major aspects, viz. productivity, social objectives (spatial), social objectives (sectoral) and profitability, in all 19 indicators

were proposed. Bhattacharyya et al. (1997) in their analysis to measures performance of different bank groups under DEA model, include advances, investment and deposits as output variables and two types of expenses i.e., operating expenses and interest expenses as input variables. Sathye (2003) in his analysis used interest expenses, non-interest expenses, deposits and staff members as input variables and interest income, non-interest income and net loans as output variables to measures the performance of banks.

The selection of inputs has been determined on the basis that the efficiency measurement is focused on internal control and productivity of banks. In practice, the banks use various levels of different inputs resources to serve the customers in the form of deposits and credits. Accordingly in Indian context researchers have sets number of branch and total assets size as input variables. The output variables considered here are the deposits and credits of individual selected banks which measures financial inclusion. Here we have measure efficiency level in terms of financial inclusion rather than profitability, so deposits and credit outstanding are our two output variables. To analyse efficiency we need to find optimum level of output with the given input or optimum level of input to get the given output.

The different selected banks from PSBs and Pvt. SBs represent here DMUs in DEA efficiency measurement. As recommended by Golany and Roll (1989) and Drake and Howcroft (1994), DMUs number should be at least twice the total number of input and output factors. Here, DMUs number is twenty (selected twenty banks) i.e., more than twice the number (i.e., eight) of input and output factors in this analysis. Therefore, in the present analysis, the proposed DEA model has high construct validity.

Table 2: Correlation among the Input and Output Factors

Factors	Assets	Branch	Deposits	Credit
Assets	1			
Branch	0.9304	1		
Deposits	0.9917	0.9588	1	
Credit	0.9985	0.9354	0.9943	1

Source: Researcher's calculation

To increase validity in present analysis, the researchers examine the assumptions of "isotonicity" relationship (Golany and Roll, 1989) by the correlation among selected input and output factors. The isotonicity relationship

express a rise in any input should not results in a loss in any output. The correlation matrix results as presented in Table 2 does not violet the isotonicity assumptions.

Table 3: DEA results of PSBs and Pvt. SBs under CCR model and BCC model

Srl. No.	Banks (DMUs)	OTE Score (CRS)	OTIE Score (%)	PTE Score (VRS)	PTIE Score (%)	SE Score	SIE Score (%)	RTS
1	State Bank of India	0.9325	6.75	1.0000	0.00	0.9325	6.75	DRS
2	Bank of Baroda	0.9678	3.22	1.0000	0.00	0.9678	3.22	DRS
3	Bank of India	0.9729	2.71	0.9984	0.16	0.9744	2.56	DRS
4	Punjab National Bank	0.9627	3.73	0.9915	0.85	0.9709	2.91	DRS
5	Canara Bank	0.9880	1.20	1.0000	0.00	0.9880	1.20	DRS
6	Union Bank of India	0.9840	1.60	0.9949	0.51	0.9891	1.09	DRS
7	IDBI Ltd.	1.0000	0.00	1.0000	0.00	1.0000	0.00	CRS
8	Central Bank of India	0.9816	1.84	0.9950	0.50	0.9866	1.34	DRS
9	Syndicate Bank	0.9978	0.22	1.0000	0.00	0.9978	0.22	DRS
10	Indian Overseas Bank	0.9602	3.98	0.9665	3.35	0.9935	0.65	DRS
11	ICICI Bank Ltd.	0.7902	20.98	1.0000	0.00	0.7902	20.98	DRS
12	HDFC Bank Ltd.	0.8530	14.70	0.8868	11.32	0.9619	3.81	DRS
13	Axis Bank Ltd.	0.8441	15.59	0.8719	12.81	0.9681	3.19	DRS
14	YES Bank	1.0000	0.00	1.0000	0.00	1.0000	0.00	CRS
15	Indusind Bank Ltd.	0.8645	13.55	0.9066	9.34	0.9536	4.64	IRS
16	Kotak Mahindra Bank Ltd.	0.9416	5.84	0.9943	0.57	0.9470	5.30	IRS
17	The Federal Bank Ltd.	0.9470	5.30	0.9476	5.24	0.9993	0.07	DRS
18	The Jammu & Kashmir Bank Ltd.	1.0000	0.00	1.0000	0.00	1.0000	0.00	CRS
19	The South Indian Bank Ltd.	1.0000	0.00	1.0000	0.00	1.0000	0.00	CRS
20	The Karur Vysya Bank Ltd.	0.9856	1.44	1.0000	0.00	0.9856	1.44	IRS
	Average	0.9487	5.1320	0.9777	2.2328	0.9703	2.9677	

In the present study two input variables and two output variables have been used to evaluate efficiency levels of banks. Branch (number of branches) is one input variable, "as the additional branches attract more total customer for the bank as a whole (Berger et al., 1997). Another input variable is Assets (Total assets), as value of assets signify the branch size (Kumar, 2012). The two output variables are Deposit and Advance which are the financial inclusion parameters. The overall efficiency of a DMU equals to its technical efficiency if and only if this DMU is operating at the most productive scale size, and thus, its SE is 1. Alternatively, if the SE is less than 1, the DMU will be operating either at DRS if a proportional increase of all input levels produces a less than proportional increase in output levels or IRS at the converse case.

Table 3 summarizes the DEA results. The input-oriented efficiency scores of twenty selected banks obtained from

CCR and BCC models have been presented in the table along with the magnitude of overall technical inefficiency (OTIE). The score measures "By how much can input quantities be proportionally decreased without changing the output quantities produced?" (Kumar and Gulati, 2008). The results indicate that the selected Indian banking industry has been characterized with lower asymmetry between banks as regards their OTE (in percentage terms) which ranges between 79.02 % and 100 %. The average of OTE scores turned out to be 0.949 for 10 PSBs and 10 Pvt. SBs as presented in descriptive statistics Table 4. This suggests that average PSBs and Pvt. SBs, if producing its outputs on the efficient frontier instead of its current (virtual) location, would need only 94.87 per cent (PSBs with 97.48 % and Pvt. SBs with 92.26 %) of the inputs currently being used. The connotation of this finding is that the magnitude of OTIE in selected Indian public sector and private sector banking

industry is to the tune of 5.13 %. This suggests that, by adopting best practice technology, PSBs and Pvt. SBs can, on an average, reduce their inputs of branch and assets by at least 5.13 per cent (PSBs with 2.52 % and Pvt. SBs with 7.74 %) and still generate the identical level of outputs. However, the potential reduction in inputs from adopting best practices varies from bank to bank. Alternatively, PSBs have the scope of producing 1.03 times (i.e., $1/0.975$) and Pvt. SBs have the scope of producing 1.08 times (i.e., $1/0.923$) and overall of the twenty banks have the scope of producing 1.05 times (i.e., $1/0.949$) as much as outputs from the same level of inputs. The selected bank with OTE score equal to 1 is considered to be most efficient amongst the banks

included in the analysis. The bank with OTE score less than 1 is deemed to be relatively less efficient or inefficient. Of the 20 selected banks, 4 banks have been found technically efficient since they have OTE score of 1. These four banks together define the ideal practice or efficient frontier and, thus, form the reference set for inefficient banks (Kumar and Gulati, 2008). The efficient four banks in the selected twenty Indian banks are IDBI Bank Ltd., The Jammu & Kashmir Bank Ltd., The South Indian Bank Ltd., and YES Bank. The remaining 16 banks have OTE score less than 1 which means that they are technically less efficient or inefficient. The four overall efficient banks have the equal PTE and TE with scores 1 and thus presenting CRS.

Table 4: Descriptive Statistics of OTE scores for PSBs and Pvt. SBs

Statistics	All Banks	Efficient Banks	Inefficient Banks
N (PSBs)	10	1	9
AOTE (PSBs)	0.9748	1.0000	0.9720
N (Pvt. SBs)	10	3	7
AOTE (Pvt. SBs)	0.9226	1.0000	0.8894
N (PSBs & Pvt. SBs)	20	4	16
AOTE (PSBs & Pvt. SBs)	0.9487	1.0000	0.9359
SD	0.0616	0	0.0627
Minimum	0.7902	1.0000	0.7902
1st Quartile	0.9371	1.0000	0.8985
Median	0.9703	1.0000	0.9615
3rd Quartile	0.9929	1.0000	0.9828
Maximum	1.0000	1.0000	0.9978
AOTIE (%)	5.1320	0	6.4150

Source: Authors' calculations

In particular, six DMUs (i.e., Bank of Baroda, Canara Bank, ICICI Bank Ltd., State Bank of India, Syndicate Bank and The Karur Vysya Bank Ltd.) have the PTE scores equal to 1 while their SE scores are less than 1. A DMU may be scale inefficient if it exceeds the most productive scale size (thus experiencing DRS), or if it is smaller than the most productive scale size (thus having not taken the full advantage of IRS). Indeed, most of the inefficient banks present the DRS that can decrease their scales to possible improve their efficiencies. Only three inefficient banks (i.e., Indusind Bank Ltd., Kotak Mahindra Bank Ltd., and The Karur Vysya Bank Ltd.) present IRS that can increase the scales to effectively improve their efficiencies. In particular, eleven scale inefficient banks (i.e., State Bank of India, Bank of Baroda, Bank of India, Punjab National Bank, Canara

Bank, Union Bank of India, Central Bank of India, Syndicate Bank, ICICI Bank Ltd., Kotak Mahindra Bank Ltd., and The Karur Vysya Bank Ltd.) have their PTE scores higher than SE scores, respectively. This implies that overall inefficiency is primarily due to the SE.

These inefficient banks can improve their efficiency by reducing inputs or increase the proportionate output. OTE scores among the inefficient banks range from 0.7902 for ICICI Bank Ltd. to 0.9978 for Syndicate Bank. This finding implies that ICICI Bank Ltd., and Syndicate Bank can potentially reduce their current input levels by 20.98 % and 0.22 %, respectively while leaving their output levels unchanged or increase the output level by 1.266 times (i.e., $1/0.7902$) and 1.002 times (i.e., $1/0.9978$) respectively while

leaving their input levels unchanged. Alternatively, the same interpretation of rest inefficient banks can be extended with OTE scores for the sample banks. On the whole, this study observes that OTIE levels ranged from 0.22 % to 20.98 % among inefficient PSBs.

Classification of Inefficient Banks

Though, according to analysis 16 banks are less efficient or inefficient among the 20 selected banks. But all these less efficient or inefficient banks are not in the same position. There may be little bit inefficient (nearer to efficient) or most inefficient. To classify them this study uses quartile values

of OTE scores obtained from the CCR model. By applying the quartile values researchers classified them into 4 categories viz., most inefficient (Category I), below average (Category II), above average (Category III), and marginally inefficient (Category IV). The banks of category I are worst performer in the sample banks in collection of deposits and disbursement of credit. Again the banks of category IV are operating at a high level of operating efficiency in the sample banks in collection of deposits and disbursement of credit even though they are not fully efficient. Table 5 shows the results of classification of inefficient banks.

Table 5: Classification of Inefficient PSBs and Pvt. SBs

Category I	Category II	Category III	Category IV
Indusind Bank Ltd. (17)	Indian Overseas Bank (13)	Central Bank of India (9)	Syndicate Bank (5)
HDFC Bank Ltd. (18)	The Federal Bank Ltd. (14)	Bank of India (10)	Canara Bank (6)
Axis Bank Ltd. (19)	Kotak Mahindra Bank Ltd. (15)	Bank of Baroda (11)	The Karur Vysya Bank Ltd. (7)
ICICI Bank Ltd. (20)	State Bank of India (16)	Punjab National Bank (12)	Union Bank of India (8)

Note: Figures in the brackets are rank
Source: Authors' calculations

The OTE score below the value of first quartile (table 4) have been included in the most inefficient category and the OTE score above the value of third quartile but less than 1 included in the marginally inefficient category. The OTE score above the value of first quartile but less than median included in the below average category and the OTE score above the value of median but less than third quartile included in the average category. Accordingly there is significant difference among the inefficient banks.

The banks attaining OTE and PTE scores equal to 1 are known as 'globally efficient' and 'locally efficient' banks, respectively (Kumar and Gulati, 2008). Table 3 also presents the PTE and SE scores. It has been observed that 10 banks acquired the status of 'locally efficient' banks because they attained PTE score equal to 1. Among them 4 banks have acquired the status of 'globally efficient' banks and lie on efficient frontier under CRS assumption. The rest 6

banks, namely, State Bank of India, Bank of Baroda, Canara Bank, Syndicate Bank, ICICI Bank Ltd., and The Karur Vysya Bank Ltd., attained PTE score equal to 1 and lie on the efficient frontier under VRS assumption. These six banks became efficient under VRS assumption but have not been found to be efficient under CRS assumption, this study can conclude that the OTIE in these banks are not caused by poor input utilization (i.e., managerial inefficiency) rather caused by operations of the banks with inappropriate scale size.

It has been further noticed that out of the remaining ten banks (having PTE<1) five banks have PTE score less than SE score (i.e., Indian Overseas Bank, HDFC Bank Ltd., Axis Bank Ltd., Indusind Bank Ltd., and The Federal Bank Ltd.). This indicates that the inefficiency in resource utilization (i.e., OTIE) in these five banks is primarily attributed to the managerial inefficiency rather than to the SE

Table 6: Descriptive statistics of OTE, PTE and SE scores for PSBs and Pvt. SBs

Statistics	OTE	PTE	SE
N (PSBs)	10	10	10
Average efficiency (PSBs)	0.9748	0.9946	0.9801
N (Pvt. SBs)	10	10	10
Average efficiency (Pvt. SBs)	0.9226	0.9607	0.9606
N (PSBs & Pvt. SBs)	20	20	20
Average efficiency (PSBs & Pvt. SBs)	0.9487	0.9777	0.9703
SD	0.0616	0.0411	0.0468
Minimum	0.7902	0.8719	0.7902
1st Quartile	0.9371	0.9790	0.9649
Median	0.9703	0.9992	0.9861
3rd Quartile	0.9929	1.0000	0.9986
Maximum	1.0000	1.0000	1.0000
Average inefficiency (%)	5.1320	2.2328	2.9677

Source: Authors' calculations

From the analysis researchers observed that OTIE in the PSBs and Pvt. SBs is due to both PTIE (i.e., poor input utilisation) and SIE (i.e., failure to operate at most productive scale size). Table 6 shows that APTE for the twenty banks has been observed to be 0.9777 which implies that 2.2 % points of 5.1 % of OTIE is due to managerial inefficiency and the rest i.e., 2.9 % is due to scale size. Also, higher mean and lower Standard deviation (SD) of the PTE scores compared to SE scores indicate that a lower portion of OTIE is due to PTIE (Kumar and Gulati, 2008).

SUMMARY OF THE FINDINGS

Fisher's T - test clearly indicates that the position of financial inclusion of PSBs and Pvt. SBs is significantly different to each other. Significant difference has been found between PSBs and Pvt. SBs in respect of population per branch, population per ATM, deposit to GDP, credit to GDP, deposit per capita, credit per capita, C-D ratio and assets per office.

While comparing their performance by applying DEA with the two financial parameters of deposit penetration and credit penetration as output variables and two input variables as number of branches and bank total assets this study finds that, among the selected twenty banks, four banks (i.e., IDBI Bank Ltd., The Jammu & Kashmir Bank Ltd., The South Indian Bank Ltd., and YES Bank) have been globally efficient and six banks have been locally efficient (i.e., State Bank of India, Bank of Baroda, Canara Bank, Syndicate Bank, ICICI Bank Ltd., and The Karur Vysya Bank Ltd.). The assumptions of "isotonicity" relationship of

the selected input and output variables also found appropriate to run the DEA. According to the analysis for globally efficient banks score value is 1 both under CCR model (CRS assumption) and BCC model (VRS assumption). Contrary locally efficient banks score value is 1 only under BCC model (VRS assumption) and OTIE in these banks are not caused by poor input utilization rather caused by operations of banks with inappropriate scale size. Also this study conclude that on the basis of Average overall technical efficiency (AOTE) or Average overall technical inefficiency (AOTIE) score, there is significant difference of efficiency between the two groups and PSBs group comparatively little better position than Pvt. SB group towards playing their role in financial inclusion. This result is consistent with the results of Bhattacharyya et al. (1997) that only two of 28 PSBs are found to be efficient in final year of the sample period (1986-1991) and PSBs is most efficient and privately-owned banks is least efficient (Dhar, 2012). Sathye (2003) shows that the mean efficiency score of Indian banks compares well with the world mean efficiency score and efficiency of Pvt. SBs as a group is paradoxically lower than that of PSBs and foreign banks in India. Kumar and Gulati (2008) in their analysis also found 7 banks were efficient out of 27 PSBs for the study period of 2004-2005.

CONCLUSION

As per the results from the analysis we find that though there is a significant difference between PSBs and Pvt. SBs, they both have played tremendous role in financial inclusion in

India. PSBs hold a major percentage due to their long presence in the market, but growth rate of Pvt. SBs compare to PSBs much superior throughout the period under study. The idea behind financial inclusion is not new, since 2005 many new policies have been framed to make financial service base stronger for all the unbanked. The results of higher growth in both the groups found may be due to various initiatives considered in the recent past. The lower scores for Pvt. SBs could be because these banks are in the expansion phase and could have higher number of branches and higher amount of fixed assets employed which have yet to start generating returns. To fulfil the several government initiatives, PSBs are also holding a prime role comparative to Pvt. SBs. Further the focus of PSBs is more on account opening, while Pvt. SBs is focusing on account opening with deposit amount.

Mean efficiency score found 0.885 as estimated by Kumar and Gulati (2008) for the study period of 2004-2005 of Indian PSBs with efficiency scores of inefficient banks ranges from 0.632 to 0.974. The efficiency estimated by Sathye (2003) have been found 0.83 and 0.62 (mean efficiency) under two model for the period of study 1997-1998, compare well with the score estimated by Bhattacharya et al. (1997) for study period of 1986-1991 with efficiency scores ranged from 0.79 to 0.80 in the years 1986 through 1991. In the study of Saha and Ravishankar (2000) where efficiency scores have been estimated only for 25 PSBs, the estimates ranged from 0.58 to 0.74 in 1995 and mean score was 0.69. In present study mean efficiency scores of PSBs is 0.97 and of Pvt. SBs is 0.92 and they compare well of the previous studies. These indicate that banks are improving their efficiency level.

Though, there have been widely used of DEA applications to measures the efficiency of financial institutions, DEA has few limitations. Sample size and input-output selection could affect DEA efficiency. In the present research we have considered only two input factors and two output factors in DEA. The other factors as input viz. number of automated teller machines, number of employees, non-performing assets and as output, total income, profit etc. are not considered here. Further study may be conducted with other input and output factors also. The study is also based on twenty largest banks and performance is based on among them only. Further study may be conducted with all SCBs or within different groups of banks. Despite these limitations, this research can be used as the model by other researchers, banks, government, financial regulators and policy makers to escalate financial inclusion policy.

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