The Indian Economic Journal

JOURNAL OF THE INDIAN ECONOMIC ASSOCIATION

Volume - 2 • Special Issue • December 2023

INEQUALITY AND POVERTY

Interdependence of Banks Efficiency and Financial Inclusion in India: An Introspection into PMMY Scheme

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Abstract:

Of the various micro credit programmes of GOI, Prime Minister Mudra Yojana (PMMY) has wider acceptance due to its non-collateral, and easy access to loans, thus attracting many to opt for the scheme. No robust theoretical and empirical research was taken up since the inception of the scheme. The earlier studies have not investigated the assessment of the bank linkages PMMY Scheme which is an essential phenomenon for understanding financial inclusion. Therefore, identifying these gaps, the present study attempted to find out the technical efficiency of banks that provide Mudra loans to the small enterprises using the Data Envelopment analysis method (DEA).

This method generates the efficiency scores of the banks that relate to their performance using the DEA approach. Further these scores thus obtained are linked to the Mudra loan accounts by applying Panel Regression technique to examine the relation between banks efficiency and the performance of the scheme. The findings of the study reveal that public sector banks have higher efficiency scores nearing unity and are active in disbursing the mudra loans. In contrast, private sector banks have shown a dismal picture in providing loans. Finally, the bank's efficiency is found to be moderately related to the Number of Mudra loan accounts. These results provide a way forward to strengthen the performance of public sector banks in managing their resources and private sector banks need to be more aggressive in providing mudra loans while managing their efficiency.

Keywords: *PMMY, Loans, Efficiency, Mudra Accounts, Scores, DEA*

1. Introduction:

Since years, the continuous efforts, and initiatives on the financial inclusion in every policy agenda and discussion across the globe has brought positive changes in the lives of the citizens. Yet, there is still a lot that nations must perceive to sustain this initiative for its greater outreach. Global developments evidence that expansion of financial services to all the sections of society is necessary for achieving the goal of financial inclusion and attaining inclusive growth. Particularly, in the Indian context, financial inclusion is embedded in the credit policy over the decades that transformed the socio-economic status of the vulnerable groups. In this process, however, populations from remotest areas in different pockets of the nation are still left behind from formal financial services.

The Government of India, closely working with the RBI, the architect of financial programs, realized the urgency of scaling up funds and creating requisite infrastructure to stem the process of economic growth and bring the uncovered population under the formal financial system. Therefore, the concept of financial inclusion became a very crucial and challenging issue for the Indian economy. The reasons for slow progress of financial inclusion in India needs an introspection from supply side and demand side as well. In this context, the present study measures the impact of mudra loans on the technical efficiency of banks and other financial institutions.

Introducing various financial services, the (PMYY) launched by GOI in 2015, has caught special attention as it is designed to help the poor without any collateral.

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Under PMYY, the micro enterprises are provided finance and are concerned with the non-farming micro enterprises, with credit needs less than Rs.10 lakhs. Hence, the study tries to examine the progress of the PMYY scheme and its impact on the technical efficiency of banks and other financial institutions using the Data Envelopment Analysis method.

The paper is divided in two sections: Section 1 discusses the efficiency scores of banks that are constructed by employing Data Envelopment Analysis (DEA) approach. Section 2 examines the banks performance in doling out the mudra loans to the beneficiaries. In other words, the study tried to link banks technical efficiency scores with the PMMY accounts (mudra) using Panel Data Regression technique.

1.1 Research Gap:

The Financial inclusion literature has scant studies relating to the PMMY scheme and its linkage to the efficiency of the Banking Institutions. Past literature depict that financial institutions are worried of the increase in the NPA percentage resulting from these loans as there is no collateral. In this context, the study finds its relevance in introspecting the scheme and its impact on the efficiency of the Financial Institutions. Therefore, identifying the gap, the present study formulated the following objectives to address the issue.

1.2 Objectives of the study:

- To empirically assess the technical efficiency of the Public and Private sector banks through DEA approach
- To assess the linkage of Banks efficiency to the Mudra loans provided under the PMMY Scheme in addressing financial inclusion.

1.3 Hypothesis:

H1: Banks efficiency has a relationship with the number of Mudra Loan Accounts.

2. Literature Review

Tu D.Q. Le et al. (2021), studied the relationship between Fintech Credit and Bank Efficiency and observed that there is a two-way relationship between. There is a positive relation between the Fintech Credit on banks efficiency.

Rajiv Khosla and Ajay Khurana (2019) calculated the overall efficiency scores of Public Sector, Private Sector and Foreign Banks and stated that they have operated with more than 80 percent efficiency.

Singh Sikdar et al (2017), examined the demographic and physiological and psychological factors relating to financial inclusion in India

Gulati & Kumar (2016) studied the efficiency of Indian banks post 2008 subprime crisis by using DEA and observed the recovery from the crisis due to the differences in the public, private and foreign banks.

Ray (2016) applied DEA for evaluating the cost efficiency of 193 branches of public sector banks and recommended that the number of branches could be reduced.

Kavitha et al. (2016), evaluated the efficiency of banks by adapting DEA and found that public sector banks are more efficient when compared to the private sector banks that provide loans under the PMMY scheme.

Bhatia & Mahendru (2015) analyzed revenue efficiency of commercial banks in comparison to the others.

3. Methodology and Data Sources

To explore the technical efficiency of banks, the authors employed the DEA method and obtained the technical efficiency scores for all the selected banks (10 public sector banks and 10 Private sector banks). The obtained efficiency scores were further linked to the Mudra loan accounts to understand the relationship between the number of Mudra accounts with the efficiency of banks using Panel regression technique. This is mainly intended to introspect how banks performance strengthens the government schemes that are envisaged to improve financial inclusion.

The dataset consists of 20 banks of which 10 public sector and 10 private sector banks covering a period of 7 years-2015-2022. The tenure is taken as 7 years since the PMMY scheme was announced in the year 2015. The criterion for the selection of the input and output variables is not only based on access to data but also their greater relation to the bank's performance.

Secondary Data on the Input and Output variables are extracted from RBI website and individual bank websites. Number of Mudra loan accounts data are obtained from the PMMY database.

Section I: Data Envelopment Analysis:

The DEA was introduced by Charnes et al (1978) and based on Farell's (1957) seminal contribution. This is a linear programming technique that will help in converting multiple inputs and outputs into a Decision Making Unit (DMU).

DEA has been applied in various fields in the past years (Banker et al. 2014, Yang et al.,2018,Wanke et al. 2018).

The DEA model is as follows:

According to Charnes et al (1978), DEA model is defined as for any set of DMUs expressed as j = 1 to n with respect to inputs xi where i= inputs to produce outputs yr where r =outputs justifying the constant-returns-to-scale model. Another method was developed by Banker et al (1984) that talks about the variable-returns -to-scale (VRS) to estimate efficiency scores. The following equation is estimated in the present study emphasizing the VRS model:

$$EF_{j_0} = max_{u,v,u_0} \sum_{r=1}^{m} u_r y_{rj_0} - u_0$$

Subject to

$\sum_i^s v_i x_{ij_0} = 1, \ \forall i, j$

$\sum_r^m u_r y_{rj_0} - u_0 - \sum_i^s v_i x_{ij_0} \leq 0, \ \forall i, r, j$

$u_r, v_i \geq \varepsilon, \ \forall i, r$

u_0 is unconstrained in sign

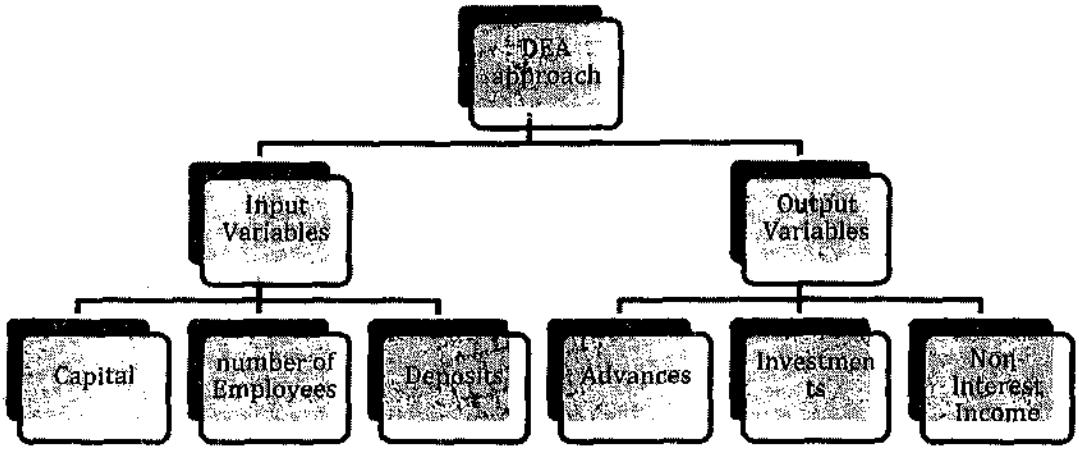
Table I: Variables considered in the study.

Input Variables	Definition	Data Sources
1 Capital (Rs Crs)	Is the asset portion which includes the government securities, cash and interest earning loans.	www.rbi.org.in
2 Number of Employees (Number)	Includes Officers, clerks, subordinates both Male and Female.	
3 Deposits (Rs Crs)	Includes Demand deposits like savings, current, fixed or term deposits.	
Output Variables		
1 Loans & Advances (Rs Crs)	Loans are long term finance provided to the individuals or companies which are repayable in a stipulated period carrying interest. Advances are short term financing provided by banks for covering working capital needs.	
2 Investments (Rs Crs)	Investments of banks in SLR and non SLR securities.	
3 Non-Interest Income (Rs Crs)	Includes service charges and transaction fees.	

Source: Authors Estimation

4. Conceptual framework:

Fig I: Technical Efficiency of Banking Institutions



Source: Authors Compilation

5.Empirical Results and Findings:

The selected banks have geographical spread across the country and differ in their size and performance over the years.

5.1Technical Efficiency results:

The dataset comprises twenty banks of various sizes. These banks are selected based on the number of mudra accounts provided to the small enterprises.

Table II: Technical efficiency results

BANKS	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Central Bank of India	0.8730	0.7650	0.8760	0.9950	0.9130	1.0000	1.0000
Bank of India	1.0000	0.9660	0.9850	0.8430	0.8120	0.9840	0.8840
Bank of Baroda	1.0000	1.0000	1.0000	1.0000	0.7740	1.0000	1.0000
Indian Bank	0.8710	0.9140	1.0000	1.0000	1.0000	1.0000	1.0000
Indian Overseas Bank	0.9080	1.0000	0.9270	0.8950	0.6870	1.0000	1.0000
Punjab National Bank	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Bank of Maharashtra	0.8830	1.0000	0.9260	0.8740	0.9410	1.0000	1.0000
Union Bank of India	0.9760	0.9940	1.0000	0.9700	0.8880	1.0000	1.0000
Uco Bank	0.8630	0.9360	0.7240	0.9550	0.7830	1.0000	1.0000
Canara Bank	1.0000	0.9810	0.9530	0.8500	0.9220	0.8540	0.9410
IndusInd Bank	0.9750	0.8280	1.0000	1.0000	1.0000	1.0000	1.0000
HDFC Bank	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Axis Bank	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Yes Bank	0.9480	0.9260	1.0000	1.0000	1.0000	1.0000	1.0000
Jammu and Kashmir Bank	1.0000	1.0000	0.9630	0.8790	0.9030	0.7780	0.9040
Kotak Mahindra Bank	0.5190	0.8950	0.8540	0.9190	0.7240	0.9750	1.0000
ICICI Bank	1.0000	1.0000	1.0000	1.0000	0.9210	0.9700	0.9370
IDBI Bank Limited	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Karnataka Bank	0.7280	0.7430	0.9650	0.7720	0.7910	0.9230	0.8990
DCB Bank	0.7620	0.7540	0.8050	0.8000	0.5580	0.9840	0.9500

Source: Authors Estimation

Banks which have a technical efficiency score 1 or almost 1 are considered to be efficient or efficiency is 100% and the banks having less than 1 or 0.95 are claimed to be inefficient and they need to reduce the inputs against the level of outputs. From the results obtained we find that 4 banks out of 20 are very efficient and another 6 are efficient and 10 banks are inefficient. 6 of the 10 private sector banks are efficient and 4 of the public sector banks are efficient. On the basis of the analysis, we can observe the efficiency changes in the public sector banks due to the mergers (Table 2).

Table III: Descriptive statistics of the technical efficiency scores obtained over 7 years (2015-2022) for the selected banks.

S.NO	BANKS	Mean	Median	Max	Min	Std.Dev
1	Central Bank of India	0.917	0.913	1	0.765	0.088
2	Bank of India	0.924	0.966	1	0.812	0.0769
3	Bank of Baroda	0.967	1	1	0.774	0.0854
4	Indian Bank	0.969	1	1	0.871	0.0539
5	Indian Overseas Bank	0.916	0.927	1	0.687	0.111
6	Punjab National Bank	1	1	1	1	0
7	Bank of Maharashtra	0.946	0.941	1	0.874	0.0552
8	Union Bank of India	0.975	0.994	1	0.888	0.040
9	[illegible] Bank	0.894	0.936	1	0.724	0.108
10	Canara Bank	0.928	0.941	1	0.85	0.0582
11	IndusInd Bank	0.971	1	1	0.828	0.0641
12	HDFC Bank	1	1	1	1	0
13	Axis Bank	1	1	1	1	0
14	Yes Bank	0.982	1	1	0.926	0.0313
15	Jammu and Kashmir Bank	0.918	0.904	1	0.778	0.0785
16	Kotak Mahindra Bank	0.840	0.895	1	0.519	0.168
17	ICICI Bank	0.975	1	1	0.921	0.0338
18	IDBI Bank Limited	1	1	1	1	0
19	Karnataka Bank	0.831	0.791	0.965	0.728	0.0952
20	DCB Bank	0.801	0.8	0.984	0.558	0.140

Source: Authors Estimation

The average score of all the banks over 7 years is found to be 93.81% which means that banks could have used 6.19% fewer resources to produce the same output. With the help of a set of input variables and output variables considered for technical efficiency evaluation of banks, public sector banks are showing higher average technical efficiency scores of 94.41% than private sector banks which is 93.22% (Table 3). Results show that public sector banks are providing more mudra loans in general and private sector banks are providing less mudra loans. Increase in technical efficiency of banks is moderately proportional to the number of mudra accounts. The banks with Overall Technical Efficiency score (OTE) score 1 and close to 1, are considered as most efficient and the resource utilization in these banks is optimal. In contrast, the other banks that have less scores are found to be technically inefficient due to low OTE scores. The inefficient banks can improve their scores by reducing the input levels or improve their efficiency by increasing the output for the same inputs.

It is also evident from the scores that trend observed is not consistent during the study period of 7 years as the scores were dwindling from the highest to lowest and vice versa. This is mainly observed in the

case of Kotak Mahindra Bank, Uco Bank, Karnataka Bank (Lowest to highest), Canara bank, Bank of India, ICICI Bank (Highest to lowest), Punjab National Bank, HDFC Bank, Axis Bank, IDBI Bank Limited are consistently showing a score of 1(Highest). This variation in their performances could be attributed to the mergers and acquisitions of banks and the covid-19 impact in the economy.

Section II: Panel Data Regression Analysis

The study further employs panel data regression models to ascertain the viability of the PMMY scheme in India.

Mainly the study intended to find out whether the banks technical efficiency has any positive influence in increasing the loan accounts thus capturing the attention of more customers. Panel regression attempts to check the statistically significant relationship between banks technical efficiency and mudra loan accounts after controlling for unobserved heterogeneity. We tried for both fixed effects and random effects models using the balanced panel data for the 2015-2022 period. The study discusses the results of the RE model since it is found to be the appropriate model, upon confirmation from the Hausman test.

Our empirical model follows estimable equation as:

$yit = \alpha i + \beta 0 + \mu t + \beta xit + \varepsilon it \quad (2)$

where *ai captures* the unobservable firm's specific effect which includes factors such as technical ability, size of the bank, or the asset position of the bank. The model also allows for the individual period effect μt.

In the above regression,

yit, = the dependent variable, Mudra loan accounts

Xit = *explanatory variable, where* $i = 1, 2.....$ banks (20) over $t = 1,2.....T$ time periods(7 years).

Table IV: Panel Regression Results

Dependent Variable- Mudra Loan Accounts		
Panel Data Regression Model Output -Random Effects		
Independent Variables	**Coefficient & t-value**	**(p value)**
TES (Technical Efficiency of Banks)	1.8701 (4.70)	0.00
CONST	3.5741 (9.24)	0.00
	R2: Within: 0.11 Between: 0.55 Overall: 0.28	

Source: Authors Estimation

Panel regression results show that banks technical efficiency is the major determinant of the PMMY scheme. The t-value of the technical efficiency of banks is significant at 5% level having p value of 0.00. Though there is a strong relation between Mudra loan accounts and technical efficiency of banks, the R2 is found to be lower which can be attributed to the dominance of cross section dimension of the data over the time dimension data. The greater the efficiency of banks, the higher the expansion of loan accounts. This implies that banks can play a vital role in supporting the vulnerable groups, expand their businesses and attain a sustainable livelihood thus ensuring a progressive overall economic development of the beneficiaries (Table 4). Further, we observed that banks that have scored greater than 0.95 have been considered as technically efficient and these banks have high relation to the mudra loan accounts. This further confirms that efficiency of the banks can scale up the operations of the PMMY scheme in terms of disbursal of the loans (Table 5).

Table V: Panel data Regression output of the banks with highest secured scores

Dependent Variable- Mudra Loan Accounts		
Panel Data Regression Model Output -Random Effects		
Independent Variables	Coefficient & t-value	**(p value)**
TES (Technical Efficiency of Banks)	8.416 (2.79)	0.00
CONST	-2.911 (-0.97)	0.33
	R2: Within: 0.07 Between: 0.36 Overall: 0.07	
	Sigma u: 0.50 Sigma e: 0.24 rho: 0.07	

Source: Authors Estimation

Conclusion

Overall, the paper provides the evidential facts of the technical efficiency of the selected private and public sector banks. The DEA approach evidenced that 10 (4 public and 6 private) out of 20 are proved to be efficient with the set criteria adopted in the study. Further, it is found that performance of banks is inconsistent over the study period. While a few banks have shown progression, a few others have shown retrogression. Therefore, it is suggested that efficient banks should strive for sustainable progress and the inefficient banks need to improve their scores by reducing their input levels for the set of outputs.

Further, the panel regression results confirm that technical efficiency of the banks is moderately related to the number of mudra loans provided under the PMMY scheme. The differences in the size, nature and composition, financial position etc. of the banks that are captured through the random effects model shows that banks operational capacity and potential drives the PMMY scheme. For further strengthening of the scheme, banks should optimally and judiciously use the inputs to achieve more outputs.

The primary objective of evaluating a bank's efficiency is to analyze how the public sector banks are performing in the market when compared to the private sector banks and find if there is any relation

with their efficiency in providing the mudra loans. Since 2015 when the PMMY scheme was announced, banks have been providing no collateral loans to the small enterprises. Banks being the business entities try to maximize their profits, however ignoring the limitations in the usage of the valuable inputs, they operate sometimes exceeding the stipulated ceilings in providing loans which in turn leads to increasing non-performing assets (NPAs).

To sum up, the paper throws light on the technical efficiency of Indian commercial banks and suggests that banks should strike a balance between mudra loan advancements and their efficiency. This could be achieved perhaps by multiplying the investments, disbursing more loans and advances and exploring avenues for increasing income of the banks with the judicious usage of existing levels of inputs. Moreover, the banks need to have a prudent and cautious policy approach in dealing with the financial resources in times of unforeseen events like Covid -19 and economic slowdown. The future prospects of the banks could be bright if the banks sustain the efficiency by maintaining the current level of inputs alongside the positive developments of the present monetary policy that is conducive in boosting the financial strength of the banks.

Implications

The present study expects the small enterprises to move forward in their businesses with a great rigor and motivation with the easy access of financial sources provided by the commercial banks under the PMMY scheme. To create this credit environment, the regulators need to monitor the bank's asset liability management.

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The Indian Economic Journal
(Under UGC CARE List - Group I)

REGISTERED WITH THE REGISTRAR
OF NEWSPAPER FOR INDIA
RNI Regn.No. 46913/87

SUPPORTED BY :

Indian Economic Association Trust for Research & Development

NABARD Mumbai

ISSN 0019-4662