

# Unlocking financial inclusion: Indian banks' efficiency in Pradhan Mantri Jan-Dhan Yojana explored through DEA

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## Abstract

**Purpose** – Financial inclusion is a prerequisite for inclusive development. In 2014, the Indian Government introduced the Pradhan Mantri Jan-Dhan Yojana (PMJDY) with a similar objective. The study aims to analyse the effectiveness of banks in the implementation of financial inclusion policy, i.e. PMJDY.

**Design/methodology/approach** – To evaluate the effectiveness of Indian banks, the study used the data over a seven-year period, from 2014–2015 to 2020–2021. Data are analysed by using the data envelopment analysis technique.

**Findings** – The study discovered that public sector banks performed better than private sector banks (PVBs) in terms of boosting financial inclusion under the PMJDY scheme. In terms of implementing the PMJDY programme, the State Bank of India rated first.

**Practical implications** – Results recommended that policymakers set goals for banks. In order to encourage consumers to utilise their accounts, banks ought to introduce supplementary financial products and implement incentive programs.

**Originality/value** – The study is the first of its kind to measure the performance of Indian banks in the implementation of the PMJDY scheme.

**Keywords** PMJDY, Financial inclusion, Data envelopment analysis, Banks efficiency

**Paper type** Research paper

## 1. Introduction

Financial inclusion is described as easy and affordable access to basic banking facilities. However, a considerable segment of the world's population lacks access to such fundamental financial services, particularly in emerging nations plagued by poverty. For better economic growth, a large percentage of people's participation in the formal financial system is required (Maity, 2017). The banking sector has a primary role in the growth and economic development of a society (Joseph and Varghese, 2014). The banking sector plays a prime role in providing a formal financial platform to the common people (Maity and Sahu, 2018; Ravikumar, 2013). Banks promote a culture of savings among individuals and perform various other activities that contribute to financial inclusion (Rao, 2013). Some such activities provide easy and affordable access to services like savings and short-term credit for weaker social groups (Agarwala et al., 2022). Such reasonably priced opportunities can help strengthen the standing of these groups in society and allow them to become more fully integrated into society.

Consequently, the Indian Government, the Reserve Bank of India (RBI) and the banking sector have collaborated to create inclusive growth. Nationalisation of banks, the formation of



regional rural banks (RRBs), an emphasis on priority sector lending, the provision of “no-frills” accounts, initiatives to promote self-help groups and other governmental employment, housing and insurance programmes are significant examples (Chakrabarty, 2011; Kumar, 2013). Subsequently, from time to time, banks have to utilise the resources economically to meet their financial and social objectives. Banks allow individuals to save their money by opening an account, provide debit and credit facilities, earn interest on their savings, facilitate easy payment and remittance, provide insurance options and facilitate various government payments like subsidies, direct transfers (Maity and Sahu, 2018), etc. Banks have been acclaimed as a significant contributor to promoting inclusive growth and reducing the vulnerability of the poor and excluded (Chakrabarty, 2011). However, India (followed by China) accounts for the second largest unbanked population, with around 190 million people still having no access to formal financial services (Demirguc-Kunt *et al.*, 2018). Only a formal financial setup can uplift the financial status of these unbanked masses (Ananth and Oncu, 2013). The Pradhan Mantri Jan-Dhan Yojana (PMJDY) was introduced in India to help disadvantaged populations by providing them access to basic banking services. Through partnerships with India’s financial institutions, the PMJDY aims to provide financial products and services to the underprivileged at very low cost.

The PMJDY lets people who don’t have bank accounts use the formal financial system to save money and borrow money. As per the PMJDY database, around 47,83,96,632 beneficiaries have been banked under the PMJDY scheme as of December 2022, holding about ₹ 1,80,85,690.85 lakhs in the accounts of the beneficiaries.

Financial institutions serve as links between the providers and the beneficiaries of finance. Hence, the benefits of the schemes can be realised only when the partner institutions make adequate use of the required economic and financial resources to yield effective results. Such institutions need to function in a way that would help attain the social objectives along with the financial objectives. For instance, the PMJDY financial inclusion programme required the setting up of branches, ATM facilities, new employees, extending overdraft facilities, etc. to expand its reach to the population of unbanked individuals (Shetty and Deokar, 2014). As a consequence, queries arise regarding how well the financial institutions have operated and utilised the resources most advantageously to reach the “last mile beneficiary”. The banking sector in India encompasses various types of institutions, such as public sector banks (PSBs), private sector banks (PVBs), RRBs, foreign banks and small finance banks (SFBs). However, it is largely dominated by PSBs and PVBs, which carry out the major banking activities and are the major drivers of financial inclusion initiatives. The PSBs and PVBs together hold around 90% of banking activities relating to credits and deposits, followed by foreign banks (5%), RRBs (4%) and SFBs (1%). The present article examines how efficiently the PSBs and PVBs have employed their resources towards enhancing their financial inclusion through the PMJDY.

The organisation of this paper is as follows: Section 2 comprises a thorough literature review; Section 3 discusses the principal methodological stages; Section 4 describes the findings and analysis; Section 5 presents the discussion; Section 6 presents concluding remarks and policy implications and Section 7 presents the study’s limitations and prospective scope.

## 2. Literature review

### 2.1 Financial inclusion through PMJDY scheme

Access to accounts that carry low costs and the presence of banks in the vicinity of the individuals enable greater financial inclusion (Allen *et al.*, 2012; Chakrabarty, 2011; Kumar, 2013). Agarwal *et al.* (2016) point out that opening a bank account under the PMJDY scheme can encourage the habit of saving, provide a formal avenue and block gaps by directly transferring credit to the beneficiaries’ accounts. Paramasivan and Kamaraj (2015) report that in the first year of the scheme (i.e. September 2014 to March 2015), PSBs showed the highest

participation in the PMJDY scheme. However, [Anand and Ramesh \(2016\)](#) found that PMJDY successfully opened several accounts in rural and urban areas, but people could not maintain balances in their accounts, as 43.12% of accounts had a zero balance. [Sinha and Azad \(2018\)](#) examined the question of whether PMJDY can achieve financial inclusion for this purpose; various indicators were used, such as bank account, average deposits, overdraft, pension, insurance, credit deposit ratio and access to credit. The study found that the PMJDY has successfully gotten people to open bank accounts, but there is no comprehensive policy that the government has put in place to achieve true financial inclusion. [Sharma et al. \(2018\)](#) assessed one of the financial inclusion policies, “PMJDY.” They observed that Andaman and Nicobar, Puducherry and Chandigarh have emerged as the top three states in terms of financial inclusion under the policy.

In a study, [Singh and Naik \(2018\)](#) examined the success of PMJDY in six Gram Panchayats of Gubbi. The study revealed that individuals belonging to the female gender, small and marginalised farming communities and those residing in rural areas with no formal educational background established fresh accounts. There was widespread ignorance of these financial schemes, but banks, SHGs and BCs played an increasingly crucial role in creating PMJDY accounts. In a study, [Behera \(2021\)](#) examined the impact of financial inclusion on the economic growth of Odisha by using correlation and regression. The results indicate that the implementation of PMJDY has led to an improvement in the financial inclusion index (FII) across all districts of Odisha. Moreover, the financial inclusion dimension, encompassing factors such as availability and usage, exerts a positive and statistically significant influence on the economic growth of the region. [Singh et al. \(2021\)](#) evaluated the impact of the PMJDY plan by constructing FIIs for Indian states from 2011 to 2016 and studying the results. According to the study, the majority of Indian states have poor financial inclusion. [Qazi \(2020\)](#) studied the role of financial institutions in implementing and promoting the PMJDY scheme. The study found that the financial institutions were promoting PMJDY.

## 2.2 Measuring banks efficiency

The banking industry is very important to other businesses because it gives them the money they need to be successful in both the short and long term. Consequently, if it is not well managed, other industries will also perish. As banking reforms evolved, concerns about banks’ financial efficiency gained enormous importance ([Paul and Das, 2015](#); [Kaur and Gupta, 2015](#)). However, in order to stay in business in a market that is becoming more and more competitive, banks must meet not only their financial goals but also their social banking goals, such as making sure everyone has access to financial services ([Sahu et al., 2020](#)). Researchers have looked at the research on how well banks help reach the goal of financial inclusion. [Maity and Sahu \(2020\)](#) looked into how well PSBs helped spread financial inclusion before and during the PMJDY programme. The data envelopment analysis (DEA) methodology is utilised to assess the efficacy of financial institutions in promoting financial inclusion. The study employed financial inclusion’s supply-side factors as input variables and demand-side aspects as output variables. The results indicated that banks’ efficiency increased following the implementation of the PMJDY scheme. [Maity and Sahu \(2018\)](#) evaluated the financial inclusion role of Indian banks. The researchers employed the DEA model [both Charnes, Cooper and Rhodes (CCR) and Banker, Charnes and Cooper (BCC)] to assess the financial inclusion effectiveness of selected institutions. Deposits and credits are the output variables, whereas branch count and asset value are the input variables. The data revealed that certain PSBs work at a 97.48% efficiency rate, whereas PVBs run at a 92.26% efficiency rate. In a study, [Maity and Sahu \(2021a\)](#) evaluated the effectiveness of three bank groups (PSBs, PVBs and foreign banks) in India, with data extending from 2009–2010 to 2018–2019. In this study, the DEA was used to analyse financial inclusion efficiency in terms of both income and supply. The analysis found that, on average, foreign banks outperform PSBs and PVBs in terms of

efficiency. [Agarwala et al. \(2022\)](#) analysed the performance of PSBs in terms of their participation in achieving the aim of financial and social inclusion in India via the PMJDY and Pradhan Mantri Mudra Yojana (PMMY). A DEA was performed to determine the performance from 2015–2016 to 2018–2019. The study revealed that PSBs perform better under the PMMY system than under the PMJDY scheme. [Kundu and Banerjee \(2021\)](#) employed non-radial DEA with slack-based measures to get bank efficiency ratings for both efficiency paradigms. PVBs operate more efficiently than PSBs. However, PSBs are more effective at implementing policies. Older and larger PSBs fared better in both scenarios.

The DEA application can be found in several services and industries, both in the public and private sectors, since it was applied by [Charnes et al. \(1978\)](#). The present study involves a systematic review of the literature on the application of DEA as a tool for evaluating efficiency. The aim is to validate the use of DEA in this context. [Kumar and Gulati \(2010\)](#) evaluated the performance of 27 PSBs in India using a two-stage performance evaluation technique. The DEA was used to analyse data from 2006–2007. The findings show that in the Indian PSBs, efficiency does not equate to effectiveness. [Maity \(2020\)](#) measured the technical efficiency of banks in India. The research was conducted over a ten-year period, from March 2009 to March 2018. PVBs, on average, run significantly more efficiently than PSBs, according to the DEA's findings. [Kumar and Dhingra \(2016\)](#) investigated the efficiency of PSBs using DEA and the CCR and BCC models. The study employs an output intermediation approach. The study considered the number of branches, deposits and operational expenses as input variables, while loan and advances, as well as non-interest revenue, were regarded as output variables. As per the research findings, the CCR model (overall technical efficiency (OTE)) indicates that only two banks exhibit a relatively high level of efficiency, whereas the BCC model suggests that nine banks demonstrate a relatively high level of efficiency (pure technical efficiency (PTE)). [Yadav et al. \(2021\)](#) analysed and compared the performance of Indian states using the multi-dimensional FII as an input and real gross state domestic product as an outcome. The study used output-oriented DEA models. [Tamam et al. \(2019\)](#) assessed the relative efficiency of banks in India by employing the DEA model. According to the study, only 9 out of 38 banks were technically efficient in the fiscal year 2016–2017. [Zhao et al. \(2008\)](#) measured total factor productivity using panel data from 1992 to 2004. The data were examined using the Malmquist Index based on DEA. According to the investigation, technological progress has led to a steady increase in output over time. [Sathye and Sathye \(2017\)](#) determined whether ATMs improve the technical efficiency of Indian banks. The study indicated that the number of ATMs had a detrimental effect on the technical efficiency of the bootstrap DEA and that the expected outcomes would not be achieved without the automation of ATM-related tasks. [Puri et al. \(2017\)](#) emphasise the approach of multi-component DEA. [Maity and Sahu \(2023\)](#) found that ATMs and bank branches are the significant drivers of financial inclusion. [Gulati and Kumar \(2017\)](#) decomposed network DEA into two stages: intermediation and operational efficiency. A differentiation was observed in the effectiveness of PSBs and PVBs, where the former exhibited greater efficiency at the intermediate stage, while the latter displayed higher efficiency at the operating stage.

### 2.3 Research gap

This review of the literature shows that many studies have been done to figure out how well financial institutions work. Research like this tends to analyse how well banks are doing financially. However, there isn't much we can do to gauge effectiveness from a financial inclusion perspective. In addition, no study has been identified that evaluates the effectiveness of banks in implementing the PMJDY scheme, a financial inclusion programme. In light of this research gap, the present study seeks to evaluate the effectiveness of PSBs and PVBs in accomplishing the PMJDY scheme's financial inclusion objective.

### 3. Data and methodology

#### 3.1 Sample design

The study assessed the efficiency of commercial banks over a span of seven years, ranging from 2014–2015 to 2020–2021 (just after the launch of the PMJDY scheme in 2014). The study is focused on PSBs and PVBs to check the efficiency of banks in implementing the PMJDY scheme. This analysis considers all 12 PSBs until March 2021. Before 2019, there were 18 PSBs. The study examines core banks, including those that have undergone mergers, as a unified entity in order to provide recommendations to the newly formed bank regarding appropriate measures to take. In this study, researchers focused on 13 of the 21 PVBs operating in India by March 2021. The remaining PVBs were excluded from consideration as a result of the unavailability of data pertaining to output variables. The present study adheres to the convention that the minimum quantity of decision-making units (DMUs) ought to be three times larger than the aggregate of the number of inputs and outputs (Cooper *et al.*, 2011). The number of DMUs is 25, exceeding the product of the total inputs and outputs by a factor of three ( $4 \times 3 = 12$ ).

The current investigation uses secondary data to figure out how well the PMJDY initiative helps banks improve financial inclusion. The collection of secondary data is sourced from various reputable entities, such as the Ministry of Finance (PMJDY), India Stat, the Economics and Politics Weekly Research Foundation and the RBI publications.

#### 3.2 Selection of variable for measuring the efficiency of banks

The selection of inputs has been determined on the basis that the efficiency measurement is focused on the internal control and productivity of banks (Sealey and Lindley, 1977). Financial institutions make use of a wide variety of inputs to meet the needs of their consumers. According to Smith (1997), the input and output in the DEA model should be kept limited to get accurate results. The choice of the variables depends on the relevancy and availability of the data (Maity, 2020). The study's input and output variables had been chosen after a thorough literature evaluation and consideration of current research aims. The output variables considered here are the number of beneficiaries under the PMJDY scheme and deposits under the scheme (Agarwala *et al.*, 2022; Demircuc-Kunt *et al.*, 2018). The input variables considered here are the number of bank employees and the number of bank branches (Agarwala *et al.*, 2022).

#### 3.3 Statistical and econometric tests used

In a study relating to efficiency in the internal management of institutions, Farrell (1957) distinguishes three distinct levels of efficiency in the internal management of institutions: allocating efficiency, economic efficiency and technical efficiency. The DEA is a non-parametric method utilised for assessing the effectiveness or efficiency of DMUs, which could be an organisation or a governmental entity. The concept of efficiency can be expressed as the proportion of a given output to the corresponding inputs. The computation of this ratio is relatively simple in cases where the DMU employs a solitary input to generate a solitary output, specifically, efficiency (single output/single input).

Nevertheless, the utilisation of a solitary input and output is deemed unfeasible due to the requirement of multiple inputs to generate multiple outputs, thereby rendering the assessment of efficiency a challenging task. Consequently, it is imperative to establish an output-to-input ratio that accounts for all inputs and outputs. The DEA is a widely used methodology for evaluating the relative efficiency of DMUs that employ multiple inputs to produce multiple outputs. The DEA method proposed by Charnes *et al.* (1979) and Banker *et al.* (1984) has been used to determine the efficiency of DMUs with numerous inputs and outputs. STATA 13.0 has been used to conduct DEA to measure the efficiency of banks. The efficiency scores of the commercial banks in achieving the goals of the PMJDY scheme have been computed for the period 2014–2015 to 2020–2021.

The OTE of commercial banks (i.e. DMUs) has been analysed using the Charnes, Cooper and Rhodes (CCR) model under the constant returns to scale (CRS) assumption. Additionally,

PTE has been assessed under the variable returns to scale (VRS) assumption using the BCC model. The ratio of OTE to PTE provides the commercial banks' scale efficiency. When the OTE is equivalent to one, it can be inferred that the DMUs, specifically the commercial banks, are efficient under the CRS assumption as per the CCR model. In addition, a PTE equal to one demonstrates that these DMUs are efficient when the VRS assumption is used with the BCC model. The current research is focused on the output-oriented model. Output-oriented models aim to maximise the outputs produced by DMUs while utilising a given level of inputs.

Let's say there are "n" DMUs, and each one has "m" inputs and "s" outputs. Using the following model, we got the relative efficiency score of a test DMU o ("o" stands for a focal DMU):

$$\max \frac{\sum_{r=1}^s v_r y_{ro}}{\sum_{i=1}^m u_i x_{io}}$$

$$\max \frac{\sum_{r=1}^s v_r y_{ro}}{\sum_{i=1}^m u_i x_{io}} \leq 1; (j = 1, 2, \dots, n);$$

$$u_i, v_r \geq 0.$$

Here,  $i = 1, 2, \dots, m$ ;  $r = 1, 2, \dots, s$ ;  $y_{rj}$  represents the output "r" produced by DMU j;  $x_{ij}$  denotes the input "i" used by DMU j,  $v_r$  is the amount of weight of the output r and  $u_i$  is the weight of the input j. Each DMU's relative efficiency score is converted into a linear programming problem for evaluation.

$$\max \sum_{r=1}^s v_r y_{ro}$$

$$\sum_{r=1}^s v_r y_{rj} - \sum_{i=1}^m u_i x_{ij} \leq 0; (j = 1, 2, \dots, n);$$

$$\sum_{i=1}^m u_i x_{ij} = 1;$$

$$u_i, v_r \geq 0$$

Furthermore, descriptive statistics such as frequency, mean, percentage, standard deviation, skewness, kurtosis and rank are used to analyse the results of secondary data. Pearson's coefficient of correlation is used to check the assumption of "isotonicity" relations (Golany and Roll, 1989) among selected input and output variables. Further, to compare the efficiency of Indian banks (PSBs and PVBs), the Mann-Whitney U test was used with the help of SPSS version 25 software.

#### 4. Analysis and findings

##### 4.1 Descriptive statistics and assumptions of the isotonicity

Table 1 shows the descriptive statistics (means, minimum, maximum, SD, etc.) of all the input and output variables for the year 2021. The section starts with descriptive statistics (see Table 1) to reflect on the nature of the data set. The high standard deviation in some of the variables indicates a high dispersion range in the data series, i.e. an unstable data set, and the

**Table 1.** Descriptive analysis

	No. of bank employees	No. of bank branches	Deposits under PMJDY (in lac)	No. of beneficiaries under PMJDY
Mean	50,045.48	4,809.64	4,69,610.77	1,38,49,950.88
Minimum	4,332.00	447.00	203.54	11,849.00
Maximum	2,45,652.00	24,948.00	36,83,439.92	12,85,17,334.00
Std.	53843.406	5364.011	834149.0698	27198758.85
Deviation				
Skewness	2.176	2.457	2.827	3.466
Kurtosis	6.326	7.661	9.037	13.734

**Source(s):** Authors' calculations

minimum and maximum values of some variables in the data series carry extreme values, which indicate the different size and scale at which the banks are operating.

Before going for analysing the data, the assumptions of the “isotonicity” relationship should be examined among the input and output variables (Golany and Roll, 1989). The isotonicity assumptions are met by the data, as evidenced by the Pearson correlation values ranging from 0.802 to 0.988, as shown in Table 2.

#### 4.2 Efficiency of PSBs and PVBs in the implementation of the PMJDY scheme

The aim of this research is to evaluate the efficiency of commercial banks in executing the PMJDY scheme. To achieve this objective, the technical efficiency of commercial banks is assessed through the application of DEA. This study examines the technical efficiency within the context of both CCR and BCC models over the time span of 2014–2015 to 2020–2021. The OTE and PTE analysis scores of selected Indian PSBs and PVBs for the 2014–2015 to 2020–2021 are produced in Table 3 and Table 4, respectively. Table 3 provides a comprehensive overview of the OTE levels for both PSBs and PVBs from 2014–2015 to 2020–2021. Notably, the State Bank of India (SBI) consistently demonstrated the highest OTE among PSBs, maintaining a perfect score of 1.000 throughout the period. Additionally, among PSBs, five banks, such as PNB (0.962), IND (0.949), BOB (0.899), BOM (0.888) and CBI (0.830), show higher mean OTE, suggesting relatively better operational performance compared to their peers. In contrast, the PVBs, on average, exhibit lower OTE levels, with J&K standing out as a performer in this category. The YES bank consistently shows the lowest OTE among PVBs. The OTE mean score for PSBs lies in the range 0.528–0.790 (0.528 in 2014–2015; 0.777 in 2015–16; 0.692 in 2016–2017; 0.762 in 2017–2018; 0.790 in 2018–2019; 0.786 in 2019–2020; 0.668 in 2020–2021). The OTE mean score for PVBs lies in the range 0.096–0.149 (0.096 in 2014–2015; 0.149 in 2015–2016; 0.126 in 2016–2017; 0.110 in 2017–2018; 0.111 in 2018–2019; 0.098 in 2019–2020 and 0.097 in

**Table 2.** Correlation between the variables

	No. of bank employees	No. of bank branches	Deposits under PMJDY (in lac)	No. of beneficiaries under PMJDY
No. of bank employees	1			
No. of bank branches	0.92**	1		
Deposits under PMJDY (in lac)	0.802**	0.917**	1	
No. of beneficiaries under PMJDY	0.822**	0.920**	0.988**	1

**Note(s):** \*\* Means significant at 1 percent level of significance  
**Source(s):** Authors' calculations

**Table 3.** OTE level of commercial banks

Type of banks	DMUs Code	DMUs	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	Mean of DMUs	
PSBs	BOB	Bank of Baroda	0.837	0.775	0.777	0.908	0.997	1.000	1.000	0.899	
	BOI	Bank of India	0.771	0.853	0.893	1.000	1.000	0.994	0.840	0.907	
	BOM	Bank of Maharashtra	0.707	0.796	0.813	1.000	0.979	1.000	0.921	0.888	
	CAN	Canara Bank	0.649	0.472	0.324	0.333	0.323	0.320	0.308	0.390	
	CBI	Central Bank of India	0.929	0.779	0.656	0.866	0.931	0.907	0.741	0.830	
	IND	Indian bank	1.000	1.000	0.963	0.957	1.000	1.000	0.723	0.949	
	IOB	Indian Overseas bank	0.511	0.429	0.333	0.392	0.413	0.417	0.375	0.410	
	PAB	Punjab and Sind Bank	1.000	0.571	0.428	0.366	0.459	0.400	0.271	0.499	
	PNB	Punjab National Bank	1.000	1.000	1.000	1.000	1.000	1.000	0.733	0.962	
	SBI	State Bank of India	1.000	1.000	1.000	1.000	1.000	1.000	0.883	0.983	
	UCO	UCO Bank	1.000	1.000	0.582	0.711	0.761	0.783	0.761	0.800	
	UBI	Union Bank of India	0.828	0.651	0.537	0.605	0.616	0.612	0.464	0.616	
	PVBs	AXIS	Axis Bank Limited	0.086	0.073	0.063	0.054	0.043	0.035	0.033	0.055
		CUB	City Union Bank Limited	0.091	0.059	0.044	0.040	0.035	0.031	0.025	0.046
		FBL	Federal Bank Limited	0.235	0.148	0.131	0.120	0.122	0.118	0.114	0.141
		HDFC	HDFC bank Limited	0.316	0.163	0.144	0.122	0.144	0.117	0.113	0.160
ICICI		ICICI Bank limited	0.262	0.231	0.175	0.187	0.196	0.162	0.146	0.194	
IDBI		IDBI Bank limited	0.292	0.205	0.159	0.122	0.124	0.098	0.089	0.156	
IBL		Indusind Bank Limited	0.096	0.107	0.109	0.071	0.061	0.043	0.039	0.075	
J&K		Jammu & Kashmir Bank	0.772	0.617	0.560	0.482	0.510	0.500	0.515	0.565	
KVB		Karur Vysya Bank	0.087	0.075	0.057	0.060	0.059	0.053	0.043	0.062	
KMB		Kotak Mahindra Bank	0.076	0.046	0.031	0.027	0.022	0.018	0.016	0.034	
RBL		RBL BANK	0.229	0.160	0.095	0.077	0.065	0.049	0.040	0.102	
SIB	South Indian Bank	0.073	0.047	0.067	0.066	0.055	0.049	0.080	0.062		
YES	Yes Bank	0.008	0.005	0.004	0.003	0.002	0.002	0.002	0.004		
Mean of the year			0.514	0.451	0.398	0.423	0.437	0.428	0.371		
Mean of the PSBs			0.853	0.777	0.692	0.762	0.790	0.786	0.668		
Mean of the PVBs			0.202	0.149	0.126	0.110	0.111	0.098	0.097		

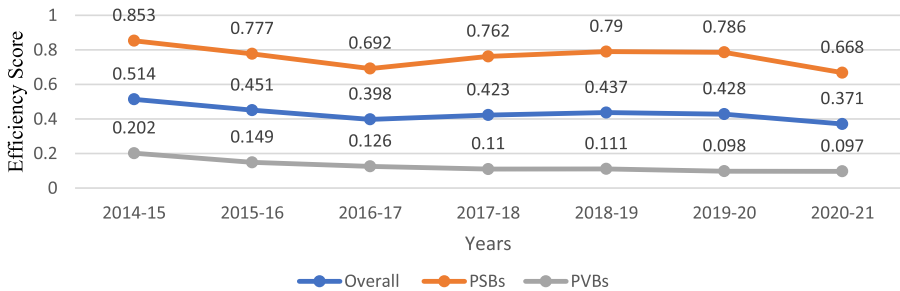
**Source(s):** Authors' calculations

**Table 4.** PTE level of commercial banks

Type of banks	DMUs	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	Mean of DMUs
PSBs	BOB	0.841	0.778	0.791	0.923	1.000	1.000	1.000	0.905
	BOI	0.790	0.861	0.923	1.000	1.000	1.000	0.873	0.921
	BOM	0.820	0.925	1.000	1.000	1.000	1.000	1.000	0.964
	CAN	0.651	0.481	0.327	0.338	0.325	0.320	0.318	0.394
	CBI	0.964	0.783	0.702	0.869	0.934	0.917	0.757	0.847
	IND	1.000	1.000	1.000	1.000	1.000	1.000	0.734	0.962
	IOB	0.535	0.444	0.374	0.392	0.416	0.419	0.388	0.424
	PAB	1.000	0.918	0.428	0.366	0.459	0.468	0.297	0.562
	PNB	1.000	1.000	1.000	1.000	1.000	1.000	0.789	0.970
	SBI	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	UCO	1.000	1.000	0.651	0.712	0.773	0.786	0.791	0.816
	UBI	0.839	0.665	0.554	0.609	0.621	0.622	0.464	0.625
	PVBs	AXIS	0.087	0.073	0.065	0.056	0.043	0.036	0.033
CUB		0.091	0.059	0.044	0.040	0.035	0.031	0.025	0.046
FBL		0.242	0.149	0.131	0.120	0.122	0.118	0.114	0.142
HDFC		0.329	0.166	0.149	0.126	0.145	0.132	0.117	0.166
ICICI		0.278	0.239	0.182	0.196	0.200	0.168	0.151	0.202
IDBI		0.332	0.229	0.162	0.122	0.125	0.100	0.093	0.166
IBL		0.096	0.107	0.109	0.071	0.061	0.043	0.039	0.075
J&K		0.949	0.757	0.781	0.718	0.697	0.533	0.774	0.744
KVB		0.087	0.075	0.057	0.060	0.059	0.053	0.043	0.062
KMB		0.076	0.046	0.031	0.027	0.022	0.018	0.016	0.034
RBL		0.229	0.160	0.095	0.077	0.065	0.049	0.040	0.102
SIB		0.073	0.047	0.067	0.066	0.056	0.049	0.080	0.063
YES		0.008	0.005	0.004	0.003	0.002	0.002	0.002	0.004
Mean of the year		0.533	0.479	0.425	0.436	0.446	0.435	0.398	
Mean of the PSBs		0.870	0.821	0.729	0.767	0.794	0.794	0.701	
Mean of the PVBs		0.221	0.163	0.144	0.129	0.126	0.102	0.117	

Source(s): Authors' calculations

2020–2021). Overall, Table 3 suggests that, as a group, PSBs tend to have higher operational efficiency compared to PVBs. The mean of the OTE for all banks (PSBs and PVBs combined) shows a slight decreasing trend over the years, dropping from 0.514 in 2014–2015 to 0.371 in 2020–2021 (Figure 1).



Source(s): Authors' preparation

**Figure 1.** Mean efficiency scores (OTE)

Table 4 provides an overview of the PTE levels for both PSBs and PVBs across the fiscal years from 2014–2015 to 2020–2021. Notably, SBI emerged as the standout performer among all banks, maintaining a perfect PTE score of 1.000 consistently throughout the entire period. PNB also showcases strong and consistent performance with a PTE score of 1.000 in most years. Further, it can be observed that IND, BOB, BOM and CBI also show higher mean PTE, suggesting a relatively better operational performance compared to their peers.

Among PVBs, J&K Bank stands out as the top performer, consistently demonstrating higher PTE levels compared to its counterparts. The mean of the PTE for all banks (PSBs and PVBs combined) shows a slight decreasing trend over the years, dropping from 0.533 in 2014–2015 to 0.398 in 2020–2021 (Figure 2). Overall, the Table 3 and Table 4 suggest that SBI, PNB, BOM, BOI and BOB consistently exhibit superior efficiency in utilising resources to generate outputs, making them notable entities in terms of PTE and OTE over the specified timeframe.

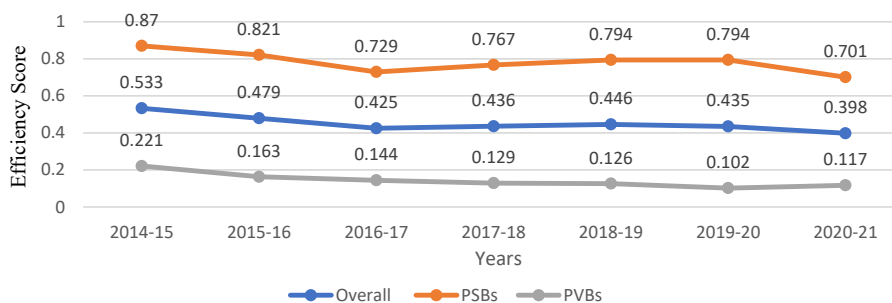
#### 4.3 Ranking PSBs and PVBs

Further, to find the best-performing bank in the implementation of the PMJDY scheme, a rank is given to commercial banks based on their overall efficiency score for the last seven years (Table 5). According to the overall efficiency rank of PSBs for promoting the PMJDY scheme, SBI ranks first, followed by IND PNB, BOM, BOI and BOB. Further in PVBs, J&K ranks nine and performs well in comparison to all other PVBs for promoting the PMJDY scheme, while the YES Bank has been found to be the worst performer.

#### 4.4 Classification of PSBs and PVBs

Banks are categorised using the CCR model since it is more suited for the grouping of similar organisations than the BCC model (Maity and Sahu, 2019; Pai et al., 2020). Banks are classified into four categories; the first one is efficient banks with scores equal to 1. There are three additional categories: “below average” for scores lower than Quartile 1, “average” for scores between Quartile 1 and Quartile 3 and “marginally inefficient” for values higher than Quartile 3. Below-average banks haven’t used their resources properly. Their resource management may need to be improved. Management should focus on banks’ weaknesses and create a strategy to fix them so they can function efficiently to accomplish the PMJDY scheme’s financial inclusion aim.

Table 6 presents a summary of efficient banks categorised by years. Throughout the study period, it was evident that an average of 4 PSBs consistently fell under the category of efficient banks. Additionally, there are 1–5 banks that can be considered slightly inefficient. There was not a single PVB bank that was either very efficient or slightly inefficient. Finally, it is evident from Table 6 that 6 to 7 banks are classified as below-average inefficient banks, and all of them are associated with PVBs.



Source(s): Authors' preparation

Figure 2. Mean efficiency scores (PTE)

**Table 5.** Rank based on the efficiency of PSBs and PVBs for promoting PMJDY

Bank types	DMU	Sum of ranks for 7 years	Overall ranks
PSBs	BOB	34	6
	BOI	33	5
	BOM	32	4
	CAN	88	13
	CBI	47	8
	IND	22	2
	IOB	84	12
	PAB	73	11
	PNB	30	3
	SBI	12	1
	UCO	42	7
	UBI	64	9
	PVBs	AXIS	152
CUB		157	23
FBL		116	17
HDFC		108	15
ICICI		100	14
IDBI		111	16
IBL		136	19
J&K		67	10
KVB		141	20
KMB		167	24
RBL		130	18
SIB		145	21
YES		175	25

Source(s): Authors' calculations

**Table 6.** Summary of efficient banks under OTE (2014–2015 to 2020–2021)

Year	DMUs	Number of DMUs			
		Efficient	Slightly inefficient	Average inefficient	Below-average inefficient
2014–2015	PSBs	1	5	6	NIL
	PVBs	NIL	NIL	6	7
2015–2016	PSBs	4	2	6	NIL
	PVBs	NIL	NIL	7	6
2016–2017	PSBs	2	4	6	NIL
	PVBs	NIL	NIL	7	6
2017–2018	PSBs	4	2	6	NIL
	PVBs	NIL	NIL	7	6
2018–2019	PSBs	4	2	6	NIL
	PVBs	NIL	NIL	7	6
2019–2020	PSBs	5	1	6	NIL
	PVBs	NIL	NIL	6	7
2020–2021	PSBs	1	5	6	NIL
	PVBs	NIL	NIL	6	7

Source(s): Authors' calculations

#### 4.5 Comparison of PSBs and PVBs

Further, to compare the efficiency of commercial banks, the OTE mean score of PSBs and PVBs for 7 years is analysed using the Mann–Whitney U test. The null hypothesis is that there is no significant difference in efficiency ranks between the PSBs and PVBs. Results of the Mann–Whitney U test can be seen in Table 7. Table 7 indicates that the U value is 4.000, which

**Table 7.** Mann–Whitney U test

Type of banks	N	Mean rank	Sum of ranks	U Value	P Value
PSBs	12	19.17	230.00	4.000	0.000
PVBs	13	7.31	95.00		

**Source(s):** Authors' calculations

is significant as the  $p$  value is less than 0.005. Thus, it rejected the null hypothesis. Further, the mean rank of PSBs and PVBs was 19.17 and 7.31, respectively. The mean rank value indicates that PSBs are performing well in implementing the PMJDY scheme in comparison to PVBs.

## 5. Results and discussions

The findings of the current study offer insight into the effectiveness of Indian banks in accomplishing the Indian Government's objective of financial inclusion under the PMJDY scheme. Based on our findings, it appears that relatively few Indian banks have effectively promoted the aims of the PMJDY scheme, suggesting that there is more work to be done. The investigation sought to explore three objectives. The primary aim of the research was to ascertain the efficacy pattern of Indian PSBs and PVBs since the inception of the PMJDY initiative. As per the findings, the initial years of the PMJDY initiative witnessed a decline in the technical efficiency of both PSBs and PVBs. However, subsequently, PSBs exhibited a noteworthy recovery and have since then sustained a relatively stable performance. However, the performance of banks declined in 2020–2021. Nevertheless, the success of PVBs remains suboptimal and did not exhibit any improvement over the course of the study. PVBs are typically profit-driven and are therefore unwilling to actively participate in social government programmes such as PMJDY. Although the decline is not significant, it can be argued that PVBs have endeavoured to sustain a steady performance. The performance trend of all DMUs exhibited an identical pattern, characterised by a decline in 2016–2017, followed by a relatively stable trend thereafter. The early fall may have been caused by the inability of banks to communicate with and persuade the targeted community of the benefits of the PMJDY programme. Also, potentially low PMJDY account balances and low bank efficiency ratings might be the result of poor banking practices within the target demographic (Agarwala *et al.*, 2022).

The study employs the efficiency scores to perform a comparative analysis through the use of the Mann–Whitney U test, which revealed a significant difference between the efficiency levels of PSBs and PVBs. PSBs have been more effective than PVBs at helping people get access to financial services. This may be due to the fact that PSBs are more likely to implement government social development policies (Kundu and Banerjee, 2021). PVBs, on the other hand, mostly work in cities and are less likely to build branches in rural areas where most people have low incomes (Agarwal and Dwived, 2017). This explains why the PVBs performed so poorly. Banks such as YES, CUB and KMB must make the appropriate efforts to decrease their deficits and achieve their goals.

In reviewing the study timeframe, it's apparent that an average of four PSBs consistently aligns with the classification of efficient banks. Moreover, a few banks can be regarded as somewhat inefficient. None of the PVB banks exhibit distinct efficiency or inefficiency. It's evident that 6 to 7 banks fall into the category of below-average inefficient banks, and notably, all of them are linked to PVBs. This meant that specific actions need to be taken to make PVB more efficient, especially those that aren't doing as well as they should be, in order to achieve the objective of the scheme.

## 6. Conclusion and policy implication

To address India's desire for financial inclusion, the PMJDY program was undertaken. The majority of responsibility for the success of this program lies with the PSBs and PVBs.

Consequently, it is essential to analyse the efficiency of these banks. Using the DEA model, the current study examined the efficiency of 25 banks participating in the PMJDY initiative. According to the research analysis, PSBs outperformed PVBs in increasing financial inclusion under PMJDY. The SBI bank ranked first in the implementation of the PMJDY scheme.

On multiple occasions, Indian PSBs have been praised for their passionate engagement in social welfare programs (Maity and Sahu, 2021b). The present results confirm this, demonstrating that PSBs are more effective than PVBs in achieving the government's financial inclusion target. PVBs are typically profit-driven, resulting in a lack of excitement and poor implementation of initiatives such as PMJDY. To attain the aim of financial inclusion, it is thus suggested based on the findings that the PVBs adopt the same strategy as efficient banks such as SBI and PNB. The PVBs make the most efficient use of existing resources, such as bank branches and employees, to achieve their financial inclusion objectives. Banks have the ability to efficiently allocate their resources towards achieving the objective of financial inclusion through the PMJDY scheme. Policymakers should set targets for banks for working to achieve the financial inclusion objective under the PMJDY scheme.

To ensure holistic development, especially for those belonging to the bottom of the income pyramid, it is incredibly important for all banks to participate actively in programmes like PMJDY (Agarwala *et al.*, 2022). If we want to keep the economy going, we need a banking system that can handle transactions quickly and reliably so that money and other services may continue to flow without any hiccups. Poor banking practices among the target demographic may have contributed to fewer deposits in PMJDY accounts, thereby decreasing the banks' efficiency ratings (Agarwala *et al.*, 2022). Therefore, policymakers may choose to consider introducing incentives on an initial transaction volume in order to increase account usage. Financial products like health or other general insurance might be offered as incentives to savers that are consistent account holders. Also, the PMJDY insurance plans that are already functioning should have more coverage. To lower the opportunity costs of having a bank account, a large network of access points might be put up. These implementations from the study might help make more people financially included.

## 7. Limitation and future scope

This research significantly enhances the current knowledge base by shedding light on the performance of Indian PSBs and PVBs in attaining the objectives of the PMJDY initiative, as well as weaknesses that must be addressed. The current study exclusively examined PSBs and PVBs, leaving the performance of other financial institutions, such as RRBs, cooperative banks and small financing banks, indeterminate. These might be investigated in future studies. Additionally, research can be carried out to analyse the success of alternative financial programmes. Further research is required to examine the impact of the COVID-19 pandemic on the effectiveness of financial institutions. An analysis of the efficiency of Indian banks pre- and post-pandemic would provide a more comprehensive understanding of their operational effectiveness.

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