

Evaluating the Efficiency of Public Expenditure across Indian States

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Abstract:

This study evaluates the efficiency of public expenditure across Indian states, focusing on how capital, revenue, and social sector expenditure impact economic performance, measured by Gross State Domestic Product (GSDP) and Per Capita GSDP. Using secondary data from EPWRF, RBI, and other sources covering 2001-2023, and applying Data Envelopment Analysis (DEA), the study identifies significant variations in efficiency. States like Maharashtra, Haryana, and Tamil Nadu demonstrate high efficiency, reflecting strong investments in infrastructure and social sectors. In contrast, states like Bihar, Madhya Pradesh, and Uttar Pradesh show lower efficiency due to governance challenges and inefficient resource allocation. The study recommends improving governance, resource allocation, and inter-state collaboration to enhance public expenditure efficiency and achieve sustainable economic growth across states.

Keywords:

Public Expenditure, Efficiency, Data Envelopment Analysis (DEA), GSDP, Per Capita GSDP, Capital Expenditure, Revenue Expenditure, Social Sector Expenditure, Indian States, Governance, Resource Allocation.

Introduction:

Public expenditure plays a pivotal role in shaping the economic landscape of any nation. In India, the efficient utilization of public funds is a crucial determinant for fostering sustainable economic growth, poverty reduction, and equitable development across its diverse regions. The Indian federal structure presents a unique challenge when it comes to evaluating public expenditure efficiency, as the variance in economic conditions, infrastructure, and administrative capabilities across states leads to different outcomes. Understanding the efficiency of public spending in Indian states is of significant interest to policymakers, researchers, and economists alike, as it can provide valuable insights into how resources can be better allocated to achieve desired socio-economic objectives.

The efficiency of public expenditure refers to the ability of government spending to generate the maximum possible outcome in terms of public welfare and development goals. In India, the central government and state governments share fiscal responsibilities, and each state has its own set of economic challenges and developmental priorities. Public expenditure in India covers a wide array of sectors such as education, healthcare, infrastructure, rural development, and social welfare. However, despite the large allocation of funds to these sectors, disparities in development outcomes persist across states. For instance, while some states exhibit high levels of social welfare and infrastructure development, others continue to face challenges in improving human development indicators, despite similar or even higher levels of expenditure (Das, 2014; Gupta & Sharma, 2017). Recent studies have attempted to quantify the efficiency of public expenditure in India using

various techniques such as Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). These methods assess how effectively resources are being converted into public goods and services across states. Research by Aiyar and Mody (2015) reveals that certain states like Kerala and Tamil Nadu exhibit higher efficiency in utilizing public funds for healthcare and education compared to other regions. On the other hand, states such as Uttar Pradesh and Bihar struggle to deliver quality services despite significant spending, due to inefficiencies in administration and resource allocation.

In evaluating efficiency, it is essential to consider both the quantity and quality of public services provided. Public expenditure does not merely involve the amount of money spent but also the effectiveness of that spending in achieving intended outcomes. For example, while health expenditure might be high in some states, the actual improvements in health indicators like life expectancy and infant mortality may not be proportionate to the amount spent (Chakraborty & Das, 2019). Additionally, administrative capacity, institutional quality, and political governance play critical roles in determining how efficiently public resources are utilized (Chaudhuri, 2012). The challenge of improving public expenditure efficiency in India is further compounded by the complexities of intergovernmental fiscal relations, where the distribution of financial resources between the central and state governments is often a contentious issue (Sharma, 2013). Given these challenges, it is crucial to assess the effectiveness of public expenditure across Indian states to not only ensure fiscal responsibility but also to address the growing disparities in development outcomes.

This paper aims to evaluate the efficiency of public expenditure across Indian states, examining factors that contribute to the variation in outcomes. Through a comprehensive analysis of public spending data, this study will highlight the key drivers of inefficiency and propose policy recommendations for improving the utilization of public funds in achieving developmental goals across the states.

The Trends of Capital Expenditure chart reveals significant variation across Indian states in allocating capital expenditure as a percentage of total public expenditure. States like Maharashtra and Tamil Nadu allocate a larger share—around 20.5% and 21.7% in 2022, respectively—indicating a strong emphasis on infrastructure development and long-term economic growth. Conversely, Uttar Pradesh and Bihar allocate significantly lower percentages (around 12.1% and 13.3%), which could limit their capacity for sustained growth and infrastructure improvement.

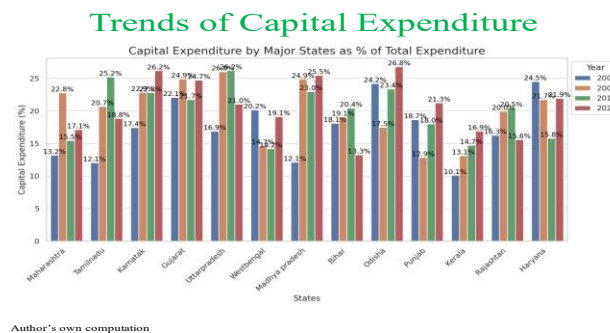


Figure 1

Over time, some states, such as Maharashtra, have shown a gradual increase in capital expenditure, reflecting a growing focus on long-term investment. In contrast, states like Rajasthan and Gujarat have seen relatively stable or slightly declining trends, potentially signaling a shift in fiscal priorities. States like Haryana and Gujarat stand out in 2022 with higher-than-average capital expenditure, indicating their focus on development initiatives to spur economic growth.

Overall, states that allocate a larger portion of their budgets to capital expenditure, such as Maharashtra and Tamil Nadu, are likely positioning themselves for stronger long-term growth. On the other hand, those with lower allocations, like Uttar Pradesh and Bihar, may need to re-evaluate their spending strategies to enhance infrastructure investment.

The Trends of Revenue Expenditure graph highlights the significant variation in the proportion of total expenditure allocated to revenue expenditure across major Indian states. Revenue expenditure, which covers operational costs such as salaries, subsidies, and public welfare programs, forms a substantial part of state budgets.

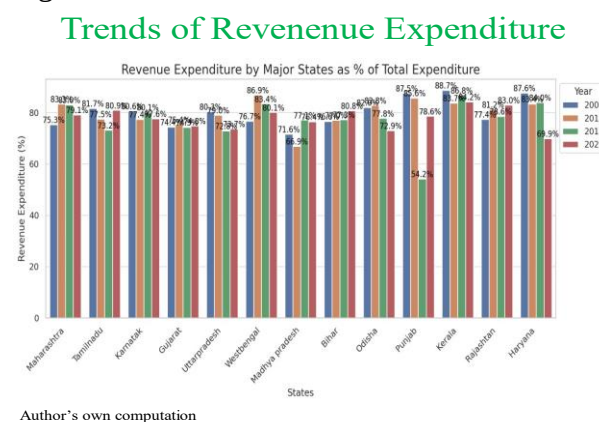


Figure 2

States like Maharashtra, Tamil Nadu, and Karnataka consistently allocate a high percentage of their total expenditure to revenue expenditure, with figures around 73-80%. This reflects a strong focus on day-to-day operational costs, which are essential for maintaining public services but can limit resources available for capital investment in long-term growth.

Conversely, Punjab stands out with a much lower allocation of 54.2% in 2022. This could indicate a relatively lower reliance on operational spending compared to other states, or it may reflect fiscal challenges in managing operational costs efficiently.

Over time, there has been a general increase in the share of revenue expenditure across most states, as seen in Uttar Pradesh and Bihar, where allocations are consistently above 70%. This may signal growing fiscal pressures related to governance and welfare programs, particularly in populous states that require large-scale public services.

States like Haryana and West Bengal exhibit the highest revenue expenditure in 2022, with figures close to 87%. Such high allocations may suggest that these states prioritize public welfare programs and social support systems, potentially at the expense of capital or development spending.

The Trends of Social Sector Expenditure chart provides insights into how Indian states allocate their resources to social sectors such as education, healthcare, and welfare programs. These sectors are crucial for human development and quality of life, with higher allocations reflecting a commitment to addressing social needs.

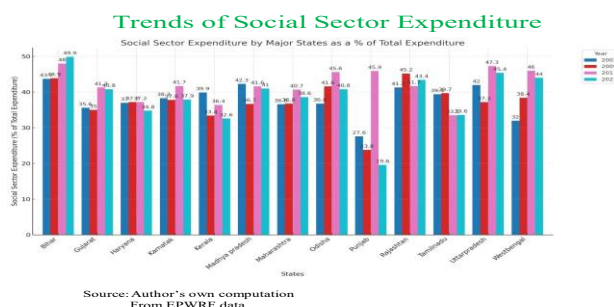


Figure 3

In 2023, Bihar and Gujarat exhibit the highest shares of social sector expenditure, with figures close to 48% and 45%, respectively. This suggests that these states prioritize human development initiatives, likely focusing on education, health, and welfare, which are essential for improving quality of life and reducing poverty.

Conversely, Punjab shows a significantly lower allocation of 19.6% in 2023, indicating that the state may place less emphasis on social sector spending relative to other categories. This lower allocation could suggest a focus on economic development or operational spending at the expense of direct investments in social welfare.

Looking at the trends over time, Bihar and Gujarat have consistently maintained high social sector expenditure levels, with Bihar's share remaining at the top throughout the period from 2001 to 2023. Meanwhile, states like Maharashtra and West Bengal show steady increases in their social sector expenditure, reflecting a growing emphasis on social welfare programs over the years.

States such as Tamil Nadu and Uttar Pradesh show moderate increases in social sector expenditure over time, with figures around 40-45% in 2023. These states appear to have a balanced approach to addressing both economic growth and social development needs.

1.1 Reviews of literature:

The relationship between public expenditure and its impact on economic growth, poverty alleviation, and human development in India has been extensively studied over the years, with a wealth of findings shaping the discourse on public spending and governance. The earliest research that provides valuable insights comes from **Bhat & Jain (2004)**, who analyzed public expenditure on health at the state level and concluded that Indian states allocate only about 0.43% of their SGDP to health and medical care, making the goal of spending 2-3% of GDP on health highly ambitious. Their findings also highlight that public healthcare expenditure's elasticity with respect to SGDP is relatively low, indicating insufficient responsiveness to economic growth in the health sector. **Choudhury & Nath (2012)** examined public expenditure on health, revealing that public spending on health in India increased marginally from 0.9% of GDP in 2004-05 to 1.1% in 2010-11, yet disparities in health spending across states remain a concern, with poorer-performing states showing slower growth in their own health expenditures compared to better-performing states. This finding resonates with **De et al. (2008)**, who focused on public expenditure on education in India. They revealed that the share of education spending as a percentage of GDP had stagnated since the early 2000s, falling far short of the recommended 6%. Despite increased funding for elementary education, challenges such as low retention rates and poor learning outcomes persist, especially in less developed states. Moving into the 2010s, **Sasmal & Samal (2014)** explored the impact of public expenditure on economic growth and poverty alleviation across developing countries like India. Their research found that regions with a larger proportion of public spending allocated to infrastructure development—such as roads, power, transportation, and communication—tended to exhibit higher per capita income and lower poverty rates, underlining the importance of infrastructure in fostering economic growth. This insight was further supported by **Marjit, Samal & Samal (2020)**, who found that capital expenditure and public spending on infrastructure had significant positive effects on economic growth in Indian states. In contrast, they noted that increased revenue expenditure, often used for distributive purposes, had a negative impact on per capita income. Their study emphasized the political dynamics behind such expenditure, particularly the political motivations behind revenue expenditure. In parallel, **Chhibber & Nooruddin (2004)** studied the impact of party systems on public expenditure and found that Indian states with two-party systems delivered more public goods, such as electricity and development expenditures, compared to states with multiparty systems, which tended to focus on distributing club goods like government jobs. This finding shed light on how political structures influence the allocation and effectiveness of public spending. By 2013, **Dash & Raja** examined how political determinants affect the size and composition of public expenditure, discovering that coalition governments and left-oriented parties significantly influenced public expenditure in Indian states, driving higher spending, particularly on current expenditure. These findings were echoed by **Winer et al. (2021)**, who explored political competitiveness in Indian states. Their research indicated that higher-income states, where there was more electoral competitiveness, saw a reduction in the privateness of public budgets, leading to more public goods and less focus on redistributive policies. In contrast, lower-income states showed a weaker or even opposite trend, where economic growth sometimes increased the "privateness" of public expenditure, focusing more on redistribution and

loyalty to core supporters. The importance of governance in determining the efficiency of public expenditure was highlighted in **Mohanty & Bhanumurthy (2018)**, who identified significant variations in public expenditure efficiency across Indian states. Western states like Maharashtra, Goa, and Gujarat were more efficient, while northeastern and eastern states like Bihar, Jharkhand, and Odisha exhibited lower efficiency. They concluded that good governance had a more substantial impact on improving efficiency in education and social sectors, while economic growth played a more critical role in enhancing efficiency in the health sector. This notion was further explored by **Sethi & Kaur (2014)**, who conducted a study on the convergence of public expenditure across Indian states. While they found no significant reduction in regional disparities regarding overall per capita expenditure, their study revealed that states had exhibited signs of temporal convergence in social and community services, especially in the education, sports, and cultural sectors. Their study also found a convergence in Human Development Index (HDI) values, though divergence in per capita income remained. The growing recognition of the inefficiency in public expenditure in sectors like health and education led to the research of **Gupta & Ranjan (2019)**, who focused on public expenditure for non-communicable diseases (NCDI) in India. They found that public expenditure on NCDI remained low, with only 0.5% of GDP allocated to it, and significant gaps in the spending-to-health outcomes ratio were found in economically vulnerable states, highlighting the need for increased domestic funding and targeted resource allocation. **Vergne (2006)** added to the discussion by investigating how electoral cycles affect the allocation of public expenditure. His research demonstrated that during election years, governments tend to redirect spending towards visible current expenditures, such as wages and subsidies, while reducing capital expenditures. This electoral impact on public spending distribution has continued despite the increasing political maturity of countries. In 2020, **Mohanty & Bhanumurthy** further investigated public expenditure efficiency, emphasizing that governance played a larger role in improving efficiency in the education and social sectors, while economic growth and factors like mothers' schooling significantly enhanced health sector efficiency. This study reinforced the notion that governance and policy quality are critical to improving the effectiveness of public expenditure across states. Taken together, these studies offer a comprehensive picture of the complex relationship between public expenditure, governance, political economy, and development outcomes in India. However, significant gaps remain in understanding how different types of public expenditure—particularly capital, revenue, and social sector expenditure—combine to impact both economic and human development outcomes in Indian states. Moreover, while there is recognition of the role of governance in improving expenditure efficiency, there is a need for more empirical analysis using advanced techniques like Data Envelopment Analysis (DEA) to better quantify these relationships and offer targeted policy recommendations.

1.2 Research Gap

The most significant research gap in the existing literature on public expenditure efficiency across Indian states lies in the lack of comprehensive studies that integrate different forms of expenditure—capital, revenue, and social sector expenditure—into a unified framework to assess their combined impact on both economic and social outcomes. While several studies have focused on individual sectors like infrastructure, education, or health, there is limited research using modern efficiency measurement techniques like Data Envelopment Analysis (DEA) to evaluate how these expenditure types collectively contribute to state-level economic growth (GSDP and Per Capita GSDP) and human development (e.g., poverty reduction, literacy, health outcomes). Additionally,

despite insights from studies on governance, political determinants, and fiscal policies, there remains a gap in understanding how governance quality and electoral competitiveness interact with public expenditure efficiency at the state level. Furthermore, while the convergence of expenditure across states has been explored, there is insufficient research on whether policy interventions can lead to greater efficiency, especially in the context of underperforming states with lower per capita income and significant social sector challenges. This gap underscores the need for a detailed, multi-dimensional analysis of public expenditure efficiency using DEA, which can provide actionable insights for policy improvement across Indian states.

1.3 Research Objective:

1.3.1 Assess the efficiency of public expenditure across Indian states, focusing on how different types of expenditure impact economic performance.

1.3.2 Identify patterns of efficiency in relation to fiscal policies and resource allocation among Indian states.

1.4 Data Source and methodology:

The present study relies entirely on secondary data obtained from sources such as EPWRF, RBI state finance reports, Handbooks of Indian statistics, and RBI publications. The study covers data from 1993 to 2023. The variables analyzed include GSDP at constant prices, Per capita GSDP at constant price, total expenditure, Capital expenditure, Revenue expenditure, social sector expenditure all expressed in crores. The GDP data at constant prices is based on the 2011-12 base year. All data series have been converted into logarithmic form for analysis.

1.4.1 Model Specification:

To evaluate the **efficiency of public expenditure**, this study applies the **Data Envelopment Analysis (DEA)**, a non-parametric method that allows for the evaluation of efficiency by comparing multiple decision-making units (in this case, Indian states). The DEA model will be specified as follows:

Input Variables:

Capital Expenditure (CAP): Represents the state's investment in infrastructure and long-term development projects.

Revenue Expenditure (REV): Includes spending on the operational costs of governance, administration, and ongoing welfare programs.

Social Sector Expenditure (SSE): Focuses on spending in education, health, and social welfare sectors.

Output Variables:

Gross State Domestic Product (GSDP): Reflects the overall economic output and productivity of each state.

Per Capita GSDP: A measure of economic output on a per-person basis, serving as an indicator of the state's economic prosperity and efficiency in resource utilization.

1.4.1 DEA Model Framework:

Data Envelopment Analysis (DEA) is a technique used to evaluate the efficiency of public spending. Introduced by Charnes et al. (1978), DEA is a non-parametric statistical method based on the assumption of a convex production frontier. To construct this frontier, the approach employs linear programming. One of the key benefits of DEA is its ability to manage multiple inputs and

outputs while determining efficiency, making it widely adopted in empirical efficiency studies. Unlike econometric models, which can be affected by misspecification problems, DEA does not require any predetermined functional relationship between inputs and outputs, thus avoiding potential errors. Moreover, recent developments in DEA have enabled statistical inference and hypothesis testing alongside other nonparametric efficiency estimators (Simar and Wilson, 2007).

The DEA models have certain limitations. First, they assume that all decision-making units (DMUs) on the frontier are efficient, even though they might still have potential for improvements or better outcomes. As a result, this could lead to an underestimation of inefficiencies. Second, efficiency estimates may be skewed due to the influence of outliers, measurement errors, and statistical noise. Lastly, when applying the DEA method with a large number of inputs or outputs relative to a small sample of DMUs, the number of efficient units tends to be overestimated, which in turn results in smaller estimates of inefficiency (Dutu & Sicari, 2016).

Efficiency involves comparing the inputs used in an activity to the outputs produced. A DMU is deemed efficient if it operates on the frontier, meaning it achieves the maximum output with a given set of resources or inputs and available technology. If the DMU produces less than what is attainable, it is considered inefficient.

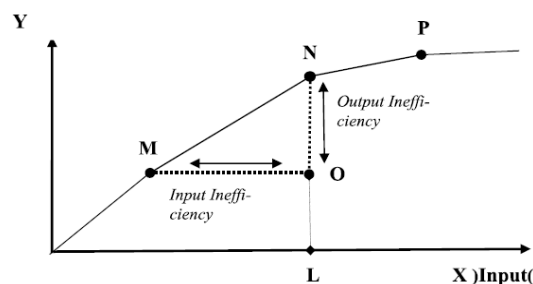


Figure-4

Figure 5 displays inputs on the X-axis and outputs on the Y-axis. It shows that M, N, and P (DMUs) lie on the efficiency frontier, making them efficient. Conversely, DMU "O" is inefficient. With the current level of input, DMU "O" produces "OL" units of output, but production could increase by "ON" units if the potential frontier were reached. The differences between the observed values and the estimated frontier are considered inefficiency. The vertical distance from the efficiency frontier is referred to as "output inefficiency," indicating how much the output could be increased while keeping the inputs constant. Likewise, the horizontal distance from the frontier is calculated as.

"Input inefficiency" refers to the degree to which inputs can be reduced without impacting the output. DEA enables the calculation of technical efficiency, which can be either input-oriented or output-oriented. The input efficiency score for a particular DMU shows how much the input quantities can be minimized without changing the output (input-oriented). On the other hand, the output efficiency score reveals how much the output quantities can be increased proportionally without altering the input quantities (output-oriented). These efficiency scores are assigned values between 0 and 1, with DMUs that lie on the efficient frontier receiving the highest score of 1.

1.4.2 Input Oriented Approach

It is used to test if a DMU under evaluation can reduce its inputs while keeping the outputs at their current levels. Following Banker et al. (1984), it can be presented in the following manner.

$$\begin{aligned} \rho^* &= \min \rho \\ \text{subject to} \\ \sum_{j=1}^n \lambda_j x_{ij} &\leq \rho x_{iw}, & i=1, 2, \dots, m; \\ \sum_{j=1}^n \lambda_j y_{rj} &\geq y_{rw}, & r=1, 2, \dots, s; \\ \sum_{j=1}^n \lambda_j &= 1 \\ \lambda_j &\geq 0, & j=1, 2, \dots, n. \end{aligned} \quad (1)$$

Where, DMU_w represents one of the n DMUs under evaluation, and x_{iw} and y_{rw} are the i th input and r th output for DMU_w respectively. ρ^* represents the efficiency score of DMU_w . If $\rho^* = 1$, then the DMU is efficient. If $\rho^* < 1$, then it is inefficient.

1.4.3 Output Oriented Approach

The Output-oriented models are used to evaluate whether a DMU can increase its outputs while keeping the inputs at their current levels. It can be expressed as (Banker et al., 1984):

$$\begin{aligned} \theta^* &= \max \theta \\ \text{subject to} \\ \sum_{j=1}^n \lambda_j x_{ij} &\leq x_{iw}, & i=1, 2, \dots, m \\ \sum_{j=1}^n \lambda_j y_{rj} &\geq \theta y_{rw}, & r=1, 2, \dots, s \\ \sum_{j=1}^n \lambda_j &= 1 \\ \lambda_j &\geq 0, j=1, 2, \dots, n. \end{aligned} \quad (2)$$

$GDP = F(\text{Capital Expenditure, Revenue Expenditure, Social Expenditure})$

$\text{Per Capita GSDP} = F(\text{Capital Expenditure, Revenue Expenditure, Social Expenditure})$

The input variables are capital expenditure to GSDP ratio, Revenue expenditure to GSDP ratio and social expenditure to GSDP ratio and outcome variables are GSDP and Per Capita GSDP

1.5 Analysis & Discussion:

The results of the Data Envelopment Analysis (DEA), using an input-oriented approach with Gross State Domestic Product (GSDP) as the output, provide a clear picture of the efficiency with which Indian states utilize their public expenditure over the four distinct periods: P1 (1993-2001), P2 (2001-2009), P3 (2009-2017), and P4 (2017-2023). States like Maharashtra, Haryana, Karnataka, and Tamil Nadu consistently rank high with efficiency scores of 1.00 or close to it, indicating their effective use of public expenditure to stimulate economic growth. Maharashtra stands out with a perfect efficiency score across all periods, which can be attributed to its robust infrastructure development, industrial growth, and strategic investments in sectors such as manufacturing and services, which have driven significant improvements in GSDP. The state has implemented progressive fiscal policies and public resource management strategies that optimize the use of both capital and social sector expenditure. Similarly, Haryana and Karnataka have focused on industrialization, infrastructure development, and human capital investments, maintaining high scores across the periods. Tamil Nadu's consistent focus on both industrial and social sector development has helped it maintain a competitive edge in terms of economic performance, justifying its high efficiency scores and rankings.

Table-1

Summary statistics of all Variables					
Metric	CAPITAL_...	REVENUE_...	SOCIAL_E...	GSDP	PER_CAPI...
Mean	0.55	0.63	0.58	17.61	10.68
Median	0.55	0.63	0.58	17.66	10.65
Maximum	0.64	0.70	0.66	19.23	12.10
Minimum	0.43	0.55	0.47	16.12	8.79
Std. Dev.	0.06	0.04	0.05	0.76	0.91
Skewness	-0.22	-0.03	-0.18	0.02	-0.10
Kurtosis	1.87	1.86	2.08	2.40	1.91
Jarque-Bera	3.20	2.84	2.09	0.78	2.64
Probability	0.20	0.24	0.35	0.68	0.27
Sum	28.44	32.63	30.13	915.59	559.19
Sum Sq. Dev.	0.16	0.08	0.12	29.18	41.80
Observations	52	52	52	52	52

Source: Author's own estimation

The summary statistics reveal key insights into the data distribution for the variables in this study. The average efficiency scores for capital expenditure, revenue expenditure, and social sector expenditure are moderate, around 0.55, 0.63, and 0.58, respectively, indicating a balanced but varying level of public expenditure efficiency across states. The GSDP and Per Capita GSDP show greater variability, with GSDP ranging from 16.12 to 19.23, and Per Capita GSDP from 8.79 to 12.10, reflecting economic disparities among the states. The standard deviations suggest moderate variability in capital expenditure efficiency (0.06) and higher variability in GSDP and Per Capita GSDP (0.76 and 0.91, respectively). The skewness values close to zero indicate that the distributions are fairly symmetric, while the kurtosis values, below 3, suggest relatively flat distributions. The Jarque-Bera test confirms that most variables, including GSDP, do not significantly deviate from normality, indicating that the data is largely well-behaved.

The results of the Data Envelopment Analysis (DEA), using an input-oriented approach with Gross State Domestic Product (GSDP) as the output, provide a clear picture of the efficiency with which Indian states utilize their public expenditure over the four distinct periods: P1 (1993-2001), P2 (2001-2009), P3 (2009-2017), and P4 (2017-2023). States like Maharashtra, Haryana, Karnataka, and Tamil Nadu consistently rank high with efficiency scores of 1.00 or close to it, indicating their effective use of public expenditure to stimulate economic growth. Maharashtra stands out with a perfect efficiency score across all periods, which can be attributed to its robust infrastructure development, industrial growth, and strategic investments in sectors such as manufacturing and services, which have driven significant improvements in GSDP. The state has implemented progressive fiscal policies and public resource management strategies that optimize the use of both capital and social sector expenditure. Similarly, Haryana and Karnataka have focused on industrialization, infrastructure development, and human capital investments, maintaining high scores across the periods. Tamil Nadu's consistent focus on both industrial and social sector development has helped it maintain a competitive edge in terms of economic performance,

justifying its high efficiency scores and rankings.

Table-2

DEA for Input Oriented Approach GSDP as Output								
States	P1	R1	P2	R2	P3	R3	P4	R4
Bihar	0.94	13	0.89	13	0.84	13	0.83	13
Gujarat	0.95	12	0.98	4	0.97	3	0.99	2
Haryana	1.00	3	1.00	2	1.00	2	0.97	3
Karnatak	1.00	5	0.98	3	0.95	4	0.96	4
Kerala	1.00	2	0.96	6	0.90	8	0.89	9
Madhya Pradesh	0.96	10	0.93	12	0.88	12	0.87	11
Maharashtra	1.00	1	1.00	1	1.00	1	1.00	1
Odisha	0.98	7	0.93	11	0.89	11	0.87	12
Punjab	0.97	9	0.95	7	0.90	9	0.90	7
Rajasthan	0.98	6	0.95	8	0.90	10	0.88	10
Tamil Nadu	1.00	4	0.97	5	0.95	5	0.96	5
Uttar Pradesh	0.97	8	0.94	10	0.91	6	0.91	6
West Bengal	0.96	11	0.94	9	0.91	7	0.89	8

Source: Author's own estimation

In contrast, states like **Bihar**, **Madhya Pradesh**, and **West Bengal** show lower efficiency scores, particularly in the earlier periods. **Bihar**, for instance, recorded a significantly low score of **0.84** in **P1**, ranking **13**, indicating inefficient use of public resources. This can be attributed to limited industrial development, inadequate infrastructure, and the inefficient allocation of social sector expenditure. Despite improvements in later periods, **Bihar's** historical challenges in governance and resource mobilization have constrained its ability to efficiently utilize public expenditure. **Madhya Pradesh** and **West Bengal** face similar challenges, such as inefficient public sector management, a relatively weaker industrial base, and lower levels of private investment, which hinder their economic growth relative to their public expenditure. While these states have made some progress in recent years, the gap in efficiency compared to the more prosperous states remains evident, as their rankings are still lower in later periods.

On the other hand, states like **Gujarat**, although generally efficient, experience fluctuations in their efficiency scores over time. **Gujarat's** high efficiency scores in **P2** and **P3** can be attributed to its strong emphasis on industrialization, infrastructure development, and the promotion of business-friendly policies, which have significantly contributed to its **GSDP** growth. However, the slight decline in **P4** suggests that the state may be facing challenges in sustaining these efficiency levels, possibly due to increased social sector expenditure or shifts in governance priorities that have affected public resource allocation. Similarly, states such as **Punjab**, **Rajasthan**, and **Odisha** exhibit moderate efficiency, with scores ranging from **0.89** to **0.98**. While these states have made progress, they continue to face structural challenges that limit their efficiency, such as reliance on subsidies, inefficient public sector management, and limited diversification in their economies. These factors contribute to their lower rankings compared to the top-performing states.

In summary, the variation in efficiency scores across Indian states is largely due to differences in governance, infrastructure development, economic diversification, and the effectiveness of public expenditure in addressing key sectors such as industry, social welfare, and education. States with high efficiency scores have effectively leveraged public resources to drive growth, while those with lower scores face challenges in optimizing resource allocation, leading to lower productivity and economic outcomes.

Table-3

DEA for Input-Oriented Approach Per capita GSDP as Output								
States	P1	R1	P2	R2	P3	R3	P4	R4
Bihar	0.82	13	0.81	13	0.80	13	0.81	13
Gujarat	0.90	10	0.98	4	1.00	1	1.00	1
Haryana	1.00	2	1.00	2	1.00	2	1.00	2
Karnatak	0.96	5	0.96	6	0.98	3	0.99	3
Kerala	1.00	1	1.00	1	0.98	4	0.99	4
Madhya Pradesh	0.90	9	0.89	11	0.88	11	0.88	11
Maharashtra	0.95	6	0.97	5	0.97	5	0.94	7
Odisha	0.90	11	0.92	8	0.92	8	0.90	10
Punjab	0.98	3	1.00	3	0.97	6	0.95	6
Rajasthan	0.93	7	0.91	10	0.90	9	0.93	8
Tamil Nadu	0.97	4	0.95	7	0.97	7	0.98	5
Uttar Pradesh	0.85	12	0.84	12	0.84	12	0.82	12
West Bengal	0.91	8	0.92	9	0.90	10	0.92	9

Source: Author's own estimation

The results from the **Data Envelopment Analysis (DEA)** using an **input-oriented approach** with **Per Capita GSDP** as the output reveal considerable variations in the efficiency of public expenditure across Indian states over four periods: **P1 (1993-2001)**, **P2 (2001-2009)**, **P3 (2009-2017)**, and **P4 (2017-2023)**. States such as **Haryana** and **Kerala** consistently score **1.00**, maintaining top ranks (R1 and R2) in all periods. These states achieve high efficiency scores due to their strategic investments in human capital, infrastructure, and social sectors, which have significantly improved their economic and social outcomes. **Haryana**, for instance, has consistently prioritized industrial development and infrastructure, which has translated into higher **Per Capita GSDP**. **Kerala**, while also showing high efficiency, has focused heavily on social sector investments, particularly in education and healthcare, leading to improved human development outcomes, which have in turn supported higher **Per Capita GSDP**.

Gujarat also shows a strong performance, with efficiency scores of 0.90 in P1 and rising to 1.00 in P3 and P4, reflecting the state's focus on industrialization, business-friendly policies, and robust infrastructure development, which has significantly boosted Per Capita GSDP. The state's improvement in later periods is largely due to its continued efforts to attract investments and enhance economic productivity, positioning it at the top in P3 and P4 (R1).

On the other hand, states such as Bihar, Madhya Pradesh, and Uttar Pradesh show consistently low efficiency scores and ranks, particularly in P1, P2, and P3, with Bihar scoring 0.82 in P1 and ranking 13, and Uttar Pradesh scoring 0.85 in P1 and ranking 12. These states face significant challenges in leveraging public expenditure for economic growth, primarily due to limited industrial base, poor infrastructure, and ineffective public sector management. Bihar, in particular, has struggled with governance issues and low levels of investment in human capital, which has impeded improvements in Per Capita GSDP despite its high levels of public spending. Similarly, Madhya Pradesh and Uttar Pradesh have not been able to fully utilize their public expenditure to achieve higher Per Capita GSDP, primarily due to inefficient resource allocation and slow development in key sectors such as education, health, and infrastructure.

States like Maharashtra, Punjab, Tamil Nadu, and Rajasthan exhibit moderate performance, with scores ranging from 0.90 to 0.98 across the periods. These states show steady improvement but still face challenges in optimizing public expenditure. Maharashtra, for instance, while generally efficient, shows a slight decrease in P4 (R7), which could be attributed to a shift in priorities towards more operational expenditures or challenges in sustaining high growth rates in the face of increasing population pressures. Similarly, Punjab and Rajasthan continue to face structural issues such as fiscal deficits and inefficiencies in their social sector expenditure, which hinder them from reaching the top ranks despite improvements over time.

In conclusion, the variation in Per Capita GSDP efficiency scores across states is largely driven by differences in governance, infrastructure development, industrialization, and the effective allocation of public expenditure. States like Haryana and Kerala benefit from a balanced approach to both economic growth and human development, while states like Bihar and Uttar Pradesh face significant challenges that hinder their productivity. The results emphasize the need for targeted reforms in less efficient states to enhance public expenditure utilization and improve economic outcomes.

1.6 Summary of Finding:

The findings from the Data Envelopment Analysis (DEA), using an input-oriented approach with GSDP and Per Capita GSDP as output variables, reveal significant differences in the efficiency of public expenditure across Indian states. States such as Maharashtra, Haryana, Karnataka, and Kerala consistently show high efficiency in utilizing their public expenditure to generate economic output. Maharashtra stands out for maintaining a perfect efficiency score of 1.00 across all periods, reflecting its robust infrastructure development and industrial growth. Similarly, Haryana and Karnataka demonstrate sustained high performance, with Haryana's focus on industrial development and Karnataka's emphasis on both industrial and human capital investments contributing to their high rankings. Kerala, while also maintaining high efficiency, stands out for its substantial investments in social sectors such as education and healthcare, leading to improved human development outcomes that have supported higher Per Capita GSDP. In contrast, states like Bihar, Madhya Pradesh, and Uttar Pradesh exhibit low efficiency scores throughout the periods, particularly in the earlier years. Bihar's low efficiency, particularly in P1, can be attributed to governance challenges, a weak industrial base, and poor infrastructure. Similarly, Madhya Pradesh and Uttar Pradesh show limited improvements, with their relatively inefficient allocation of resources hindering significant economic growth, despite some progress in later years. Gujarat

demonstrates a marked improvement in efficiency from P2 onward, driven by its strategic focus on industrialization, infrastructure, and a business-friendly environment, resulting in high Per Capita GSDP and GSDP. Other states such as Punjab, Rajasthan, and Tamil Nadu show moderate efficiency, with scores indicating stable but suboptimal use of resources in driving economic and social outcomes. These findings underscore the importance of effective resource allocation, governance, and policy reforms, particularly in states with lower efficiency, to enhance the effectiveness of public expenditure and improve economic and social outcomes across India.

1.7 Conclusion & Policy Recommendation:

This study aimed to evaluate the efficiency of public expenditure across Indian states using Data Envelopment Analysis (DEA), with GSDP and Per Capita GSDP as output variables. The findings reveal significant variation in efficiency levels across states, with Maharashtra, Haryana, Karnataka, and Kerala consistently demonstrating high efficiency in utilizing public expenditure to generate economic growth and improve human development outcomes. These states' focus on industrial development, infrastructure, and human capital investment has played a crucial role in driving their high performance. In contrast, states like Bihar, Madhya Pradesh, and Uttar Pradesh continue to show low efficiency scores, primarily due to challenges in governance, inadequate infrastructure, and inefficient resource allocation. Despite some improvements over time, these states have not been able to fully optimize their public expenditure, limiting their potential for economic growth. The study underscores the need for targeted policy interventions to enhance resource utilization, particularly in less efficient states.

Policy Recommendations

Based on the findings of this study, several policy recommendations can be made to improve the efficiency of public expenditure across Indian states. First, states with lower efficiency scores, such as Bihar, Madhya Pradesh, and Uttar Pradesh, should focus on improving governance and strengthening institutional capacity to better manage public resources. Enhancing the effectiveness of public expenditure through better resource allocation, particularly in infrastructure and human development sectors, should be a priority. Second, there is a need for increased investment in infrastructure and industrial development in less efficient states, similar to the strategies employed by states like Maharashtra and Gujarat, which have seen substantial growth through such investments. Third, states like Kerala, which have excelled in social sector investments, should continue to prioritize human development, ensuring that social welfare policies remain aligned with economic objectives. Lastly, fostering collaboration between states with high efficiency and those lagging behind could facilitate the exchange of best practices, ensuring that all states move toward a more efficient use of public expenditure, thereby boosting overall national economic performance.

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