NIPFP Working paper series

Assessing Public Expenditure Efficiency at Indian States

No. 225
19-Mar-2018
Ranjan Kumar Mohanty and N.R. Bhanumurthy

National Institute of Public Finance and Policy
New Delhi

Assessing Public Expenditure Efficiency at Indian States

Ranjan Kumar Mohanty[1] and N.R. Bhanumurthy[2] *

Abstract

In recent times, the issue of public expenditure efficiency has drawn the attention of both policymakers and researchers globally. Even in India, with the increased demands for Outcome-based Budgeting, the assessment of public expenditure efficiency becomes much more crucial. Towards this direction, by using outlays-outcome framework, the paper attempts to measure the efficiency of government expenditures on Social Sector, especially health and education, among the Indian States using various DEA approaches. Further, the paper also attempts to understand what drives the public expenditure efficiency among the States. For this, it looks at the role of economic growth as well as quality of governance. The results of input-oriented and output-oriented DEA approach finds a large variation in the efficiency of public spending as well as scope for resource saving among Indian States. The results suggest that States are spending their resources more efficiently on education than on health and overall social sector spending. Further, it also finds that both quality of governance and economic growth affects the efficiency of education, health, and social sector with governance to have larger effect compared to growth. Overall, the study suggests that focus on good governance could yield better outcomes from public spending.

Keywords: Public Expenditure, Education, Health, Data Envelopment Analysis, India.
JEL classification codes: H51, H52, I18, I21, C14, O53

1. Mohanty is an Economist at National Institute of Public Finance and Policy, New Delhi-110067, India. Email: ranjanmohanty85@gmail.com
2. Bhanumurthy is a Professor at National Institute of Public Finance and Policy, New Delhi-110067, India. Email: nrbmurthy@gmail.com
* The authors would like to thank Prof. Biresh Sahoo for his continuous support, motivation, insightful comments, and suggestions. The earlier version of the paper was presented at the 54th Annual Conference of the Indian Econometric Society (TIES), held on 7th to 9th March, 2017 at Shri Mata Vishnodevi University, Katra, Jammu. The authors would like to thank Prof. Arpita Ghose and the participants of the conference for their comments and suggestions. The authors would like to thank NIPFP Databank for providing necessary public fianance data. The remaining errors are of authors.

1. Introduction

The main objective of any public policy of any governments is to provide a host of public goods and services such as health, education, public infrastructure, public safety, etc., to their populations. However, macroeconomic constraints do limit governments' scope for increasing its public expenditure. That pushes the policy makers to get the most out of existing resources through enhancing the public spending efficiency. In the recent period, some studies have focussed on this issue.[1] These studies suggest that the spending activities of the government should generate the maximum potential benefits for the population to prevent the use of resources inefficiently.

Public expenditure is efficient when the government, using its given resources, produces a maximum possible benefit for the country's population. Ceteris paribus, Governments that produce more outputs while spending less on inputs can be viewed as more efficient than governments that produce fewer outputs and use more inputs. Public expenditure not being efficient would mean either that the expenditure outcome could be increased without spending more, or else that expenditure could be reduced without affecting the output. How is the efficiency of public spending measured in the literature? First, studies on gauging and enhancing efficiency in practical applications, focused country-specific and particular type of public spending. Second, measuring efficiency based on inputs of government spending but not on outputs. Third, assessments of the efficiency of public spending through outputs but not inputs. Finally, studies by using both inputs and outputs for calculating efficiency. This paper assesses the efficiency of government expenditure on education, health and social sector in 27 states of India from 2000 to 2015 by using mix of outputs and inputs.

Why does the analysis of public expenditure efficiency assume importance in India? Regional divergences in terms of both economic growth as well as the extent of human development among the Indian states are very well known. The public policy indeed focuses more to reduce such divergences. However, at present, the focus is more on the resource allocation (through equalization principle) on the assumption that resource allocation could address the issue of regional inequality. Despite such policy for a long time, the impact on the overall development outcomes appears to be negligible. Further, the existing difficulties associated with budget restrictions due to the enactment of FRBM act reinforced the need to improve public spending efficiency in India. The issue of assessing expenditure efficiency is the need of the hour to know whether some regions lag behind others due to lack of resources, or due to efficiency issues in using existing resources.

The literature suggests that the issue of measuring public sector efficiency is complex. Although efficiency evaluation can be carried out for several sectors by using DEA methods, this study focuses on the efficiency evaluation in education, health and social sector in the Indian states. As expenditures on health and education have direct impact

[1] See, Sutherland et al., 2009; Rajkumar and Swaroop, 2008; Herrera and Pang, 2005; Gupta et al., 2002; Eugene, 2008; Dutu and Sicari, 2016 and Afonso et al., 2010.

on welfare and growth of the economy, this study focuses on these expenditures. The economic theory suggests that the social sector expenditure especially education and health sectors are a vital source of human capital formation, which enhances economic growth.[2] Therefore, the efficient allocation of resources in such growth-promoting expenditures such as education, health, and social sector seems utmost importance. At the Central Government level, the total expenditures are nearly 19 percent of GDP, whereas at the State Governments level they spend between 12 to 55 per cent of their GDP in 2015-16.[3] Hence, small changes in the efficiency of public spending could have a significant impact on the overall budget as well as on GDP. While India has adopted Millennium Development Goals (MDGs) in September 2000, its progress has been inconsistent towards the achievement of MDGs even after passing of 15 years.[4] It has remained an unfinished agenda in most of the states. Against this background, exploiting efficiency gains in the overall social sector, education, and healthcare will be crucial to meet the new Sustainable Development Goals (SDG) targets, without putting the public finances on an unsustainable path. Since, most of the expenditures are made through Budgets, how well these resources are used becomes more relevant. Therefore, it has become more critical than ever to assess about the efficiency of public spending among Indian states.

The study contributes to the existing literature in the following ways**.** First, to our knowledge, this is the first attempt to measure the efficiency of the public spending among the Indian states. Therefore, it helps the policymaker while formulating various policy strategies. Second, it uses DEA to compute input-oriented, output-oriented and non-oriented efficiency scores in a given period and also changes in efficiency over time. Third, the study extends to assess what determines divergences in public expenditure inefficiencies. Finally, the results of the empirical analysis find that good governance plays the more vital role than economic growth in improving the efficiency of public spending.

This paper is organized as follows. The trends in social sector spending are presented in section 2. Section 3 provides a brief review of the literature on public expenditure efficiency. Section 4 discusses the dataset and lays out the methodology used in the paper. Section 5 presents and discusses the results of DEA analysis. An econometric analysis of efficiency, growth, and governance is presented in section 6. Section 7 summarizes the results and the policy implications.

[2] see Krueger and Lindahl, 2001; and Sianesi and Van Reenen, 2003.

[3] The expenditures on social sector at the Central Government level is more than eight percent of GDP, whereas at the State governments level they spend between 4 to 19 per cent of their GDP in 2015-16. Source: NIPFP Data Bank compiled from Finance Accounts of respective States and National Account Statistics, Central Statistics Office (CSO).

[4] India has been moving in the right direction in some areas like reducing poverty by half, gender parity in primary school enrolment, reduction in prevalence of some communicable diseases like HIV, malaria and tuberculosis, and access to safe drinking water. But it has been still in off track on some other areas like lagging behind the targets for primary school enrolment and completion, slow progress in the sanitation coverage, for reduction of hunger and maternal mortality.)Source: Millennium Development Goals: India Country Report 2015, Ministry of Statistics and Implementation, Government of India(.

2. Trends in Social Sector Spending

It is shown from figure-1 that social sector expenditure to total public expenditure among all states has increased by 16.6 per cent on average between 2002-03 and 2015-16.[5] At the individual state level, the expenditures surged over the period in all the states except in Kerala and Manipur. This ratio varies across states between the ranges of 30 to 50 per cent in 2015 (it was 23 to 48 per cent in 2002). At the percapita level, as shown in Figure 2, between 2002 and 2015 the annual average percapita social sector expenditure has increased in all the states. Further, percapita spending of social sector expenditure among most of the Special Category States found to be higher than in other states. Like social sector expenditure, the similar increasing trend in percapita spending is observed in both education and health among all the states (Figure 3 and Figure 4 in the appendix). Percapita spending in education is much higher (more than 3-4 times) than the per capita spending in health.

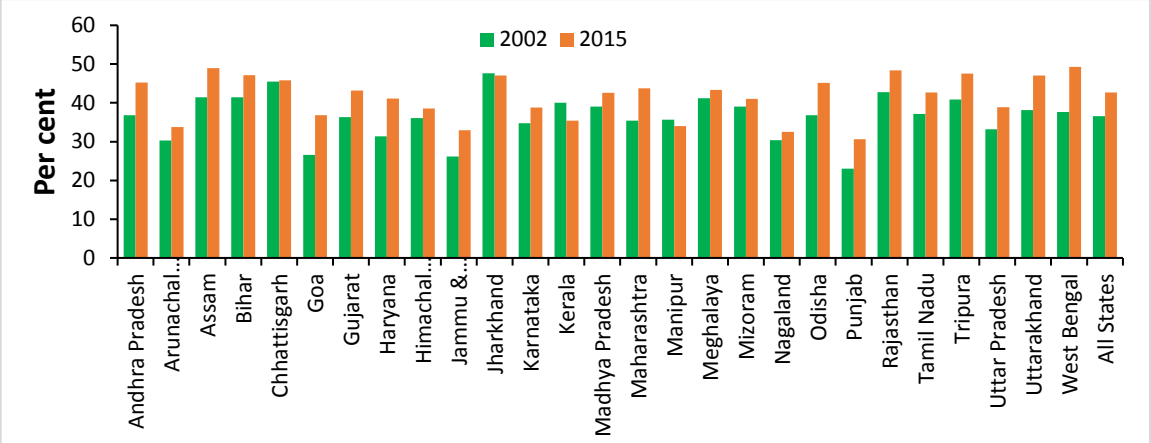
In terms of outcomes, in India, infant mortality rate (IMR)[6] has reduced from 63 in 2002 to 27 in 2015, and life expectancy rate has increased from nearly 63 years to more than 68 years during the same periods. Gross enrolment ratio (GER) of school education has also jumped up from 69 to more than 80, while GER at higher education has risen from 9 to 25 between 2002 and 2015 in India. At this juncture, one need to understand how far the social sector outcomes could be due to increase in public expenditures. Is expenditure alone sufficient enough to improve the social sector outcomes? Here, the issue of expenditure efficiency analysis becomes crucial from the policy perspective. Therefore, in this paper, we examine the efficiency of the social sector, education and health spending of Indian states.[7] In the next section, review of some relevant studies on this subject is presented.

[5] A fiscal year is considered from the month of April to March in India. Thus, the year 2002 refers to 2002-03. Throughout the paper, it has taken the average of last three years for the given public expenditure in the current period. For e.g., Public expenditure in 2002 implies the average of public spending from 2000 to 2002. The reasons for taking this average are explained in section 4.

[6] IMR is the number of deaths of children under one year of age per 1000 live births.

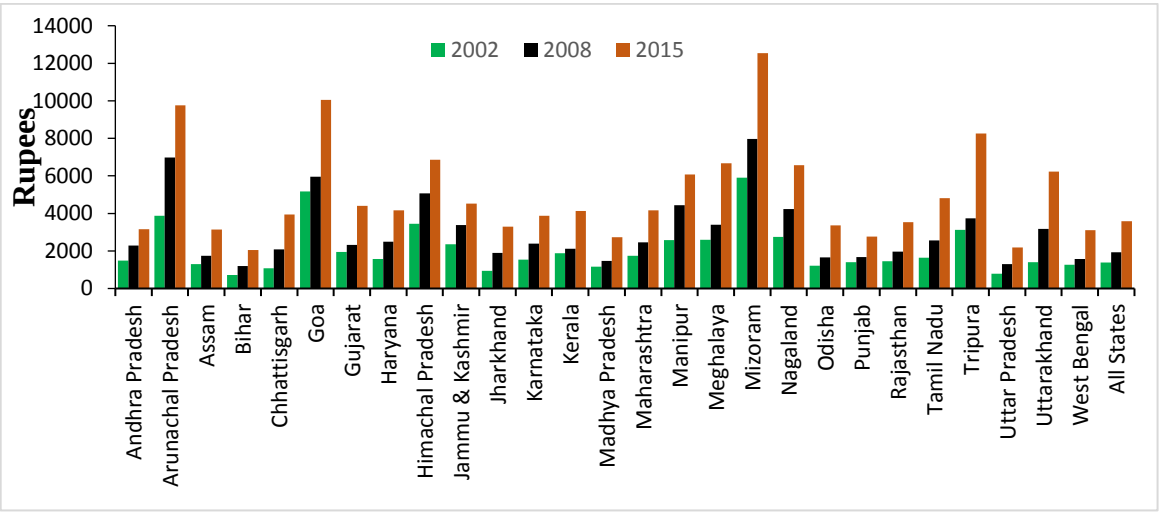
[7] 1. Social sector expenditure is calculated by adding all the expenditure under the budgetary heads of 'Social services' and 'Rural Development'. The budgetary heads of Social services includes, education, sports, art and culture; medical and public health, family welfare; water supply and sanitation; housing; urban development; welfare of Scheduled Castes (SC), Scheduled Tribes (ST) and Other Backward Castes (OBC); labour and labour welfare; and social security and welfare, nutrition, relief on account of natural calamities. 2. Education expenditure includes expenditure on 'Education, Sports, Arts and Culture' (budget head). 3. Health Expenditure includes expenditure on 'Medical and Public Health', and 'Family Welfare'. The above measurement of social sector, education and health expenditure are used throughout the paper.

Figure 1: Social Sector Expenditure in Indian States (as % of Total Expenditure, Annual Averages)



Source: State Finances: A study of Budget, Reserve Bank of India and NIPFP Data Bank compiled from Finance Accounts of respective states.

Figure 2: Average Annual Percapita Social Sector Expenditure in the Indian States



Source: State Finances: A study of Budget, Reserve Bank of India and NIPFP Data Bank compiled from Finance Accounts of respective states.

3. Review of Literature

In this section, findings of some relevant studies related to the analysis of public spending efficiency are presented. As it may be noted, while the studies are very few on this subject, these studies are mostly at the panel country level. These studies have followed either non-parametric or parametric approaches. One study by Gupta & Verhoeven (2001) looked at the efficiency of government expenditure on education and health in 37 countries in Africa during 1984–1995 using non-parametric approach and compared with other regions such as Asia and Western Hemisphere. The study finds that on average, African countries are less efficient in providing health and education services than the Asian

and the Western Hemisphere countries. The inefficiencies in Africa might be the result of relatively high government wages and the intra-sectoral allocation of government resources, but unrelated to the level of private spending. While a few studies have shown that increased public expenditure on education and healthcare is associated with improvements in both access to and attainment in schools, and reduces infant and child mortality (Gupta et al.,2002). Some studies have shown that there are differential outcomes on the nature of expenditure (see Eugene, 2008). Similar results were found by Herrera & Pang (2005), where its shows that efficiency depends on expenditure levels, wage bills, income inequality and public provision of services. Using DEA, Dutu & Sicari (2016) assessed the efficiency of health care, secondary education, and general public services in a sample of OECD countries for the year 2012. The study finds a wide dispersion in efficiency levels across OECD countries and suggested that improvements could be possible for both output and input efficiency. Two consecutive studies by Afonso & Aubyn (2005, 2006) show similar results with wide divergence in efficiency levels across OECD countries, especially in Education. These studies also find that efficiency gains can be improved through improvement in stock human capital and wealth. The results of Tobit and bootstrap procedure showed that inefficiency in education is strongly related to non-discretionary variables, i.e., family economic background and the education of parents. The efficiency levels could also depend on the size of public sector as shown by Afonso et al. (2005), suggesting that small share of public sector have better efficiency gains compared to large size of public sector. Further, Afonso et al. (2010) shows that public sector efficiency can also depend on other factors such as security of property rights, per capita GDP, the competence of civil servants, obesity, smoking habits, and the education level of people.

Joumard et al. (2010) found that the institutional framework like allocation of resources between in-patient and out-patient cares, the payment schemes and the existence of incentives for providers are likely to have a substantial impact on the efficiency (outcomes) of health-care expenditure. Using conditional nonparametric approach, Cordero et al. (2015) estimated efficiency measures for 132 Spanish primary care units. The empirical results showed that all the exogenous variables such as Percentage of the population above 65, Morbidity rate and Deprivation index, have a significant and adverse effect on efficiency estimates.

In the case of education expenditure Sutherland et al., (2010) measured the efficiency of the 30 OECD countries at the school level. The results demonstrated that differences in school outcomes exist between countries, albeit these are quite limited in general (around 10% of output expansion), while input savings are substantial (more than 15%) in some countries. Better outcomes from schools found to be highly dependent on the high-quality teaching resources. Using DEA method, Agasisti and Zoido (2015) derive efficiency measures for more than 8,600 schools in 30 countries. They suggested some school-level factors such as targeting the proportion of students below low proficiency levels, focusing on students' good attitudes, having a better quality of resources, etc., are found to be correlated with improving educational results (efficiency).

Few studies have highlighted the role of governance and economic growth. In the case of Russian Federation, Hauner (2007) found that efficiency gains in health care and social protection is larger than in education. The difference in these outcomes among regions is positively related to per capita incomes and the quality of governance, and negatively related to the share of federal transfers and the level of spending. Similar study was done by Rajkumar and Swaroop (2008) where it examines the relationship between public spending, governance, and outcomes. The study finds that the quality of governance plays a vital role in explaining the differences in the efficacy of public spending. To be more specific, public spending becomes more effective in increasing primary education attainment and reducing child mortality in countries with good governance, whereas, it has virtually no impact on health and education outcomes in poorly governed countries.[8]

It may be noted from the above review of existing literature that most of the studies that have undertaken the assessment of public expenditure efficiency focussed on advanced countries in the European region. The studies use a mix of parametric as well as non-parametric methods. Moreover, the conclusions are mixed with some studies suggesting that efficiency of the public expenditures depend on the type of expenditures (education, health, social protection, etc.). The studies on the determinants of public expenditure efficiency show that the outcomes depend largely on the governance parameters. But, there appears no such study in the case of India that is at present grappling with constraints on the expenditures at the same time huge demands for public social expenditures to cover the human development gaps. Within India, the issue becomes much more crucial at the state level as the demands, budget constraints, as well as absorptive capacities are quite diverse towards this direction, the present study tries to understand the extent of relationship between inputs and outcomes that determines the level of public expenditure efficiency. The next section presents the data and methodology used in the study.

4. Data and Methodology

4.1 The Data

The efficiency of public expenditure among 27 Indian states[9] is calculated for three different periods, i.e., 2002-03, 2008-09 and 2015-16. Primarily it has confined the analysis to the Millennium Development Goals (MDGs) period, (2000-2015). While measuring the efficiency of public spending in 2002-03, the analysis excludes three newly formed

[8] There are few more studies such as Ollivaud (2017) in the case of Indonesia, Hribernik & Kierzenkowski (2013) in the case of Slovenia and some OECD countries, and Clements (2002) for EU.

[9] These are Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, Uttarakhand, and West Bengal excluding other remaining two states, i.e., Telangana and Sikkim. Telangana is officially created on 2 June 2014, hence it is not included. Sikkim is excluded because of data inconsistencies where it was found that in some years the total expenditure as a share of GSDP is more than 100 per cent. As DEA methods are sensitive to measurement errors, statistical noise and outliers, which can distort efficiency scores, Sikkim is excluded from the whole analysis. Union Territories and Islands are not included due to low reporting and data availability.

states, namely, Chhattisgarh, Jharkhand, and Uttarakhand. However, for the later analysis, these states are included in the analysis. The analysis is focused on two major social sector expenditures namely education and health. Further, the analysis also covers overall social sector separately. As the analysis needs to link outlays to the outputs (outcomes), the considered variables are total education expenditure, health expenditure, social sector expenditure, total expenditure, gross state domestic product (GSDP), population, gross enrolment ratio for school education (6-17 years), gross enrolment ratio for higher education, infant mortality rate, life expectancy at birth, MDG Composite Performance index and Governance index. All public expenditure related variables are collected from the NIPFP Databank as well as 'State Finances: A study of Budget,' Reserve Bank of India. Data on GSDP (2004-05 base year) is obtained from National Accounts Statistics, Central Statistics Office (CSO). Mid-year Population figures are obtained from a report entitled as "Population Projections for India and States 2001-2026", Office of The Registrar General & Census Commissioner, Government of India. Data on education-related indicators such as Gross enrolments ratios are from Educational Statistics of EPWRF India Time Series, EPW Research Foundation, and on health-related indicators such as infant mortality rate and life expectancy are collected from Sample Registration System (SRS) Bulletins, Office of the Registrar General & Census Commissioner, Government of India. Finally, MDG Composite Performance index and Governance index are sourced from Chatterjee et al. (2015) and Public Affairs Centre (PAC) respectively.

For the analysis, as the relationship between outlays and outputs are not contemporaneous, here we have taken three year time averages for public spending while the outputs are for one year. For example, in health, we have considered Infant mortality rate and life expectancy rate as an output indicator. Current mortality patterns reflect health care in previous years, and life expectancy will be historically determined and would not be affected only by current health spending.

4.2 Data Envelopment Analysis Methodology

For measuring the efficiency of public spending, Data Envelopment Analysis (DEA) is applied. DEA, a non-parametric statistical technique, was developed by Charnes et al. (1978). It assumes the existence of a convex production frontier. Linear programming method is used to construct the frontier in the DEA approach. The terminology "envelopment" stems out from the fact that the production frontier envelops the set of observations. It has become very popular in empirical studies on efficiency since it can easily handle multiple inputs and outputs while constructing efficiency. It is less vulnerable to the misspecification problems that can affect econometric models. The advantage of this method is that no prior specification (potentially erroneous) functional relationship between production inputs and outputs is required.[10] The statistical inference and hypothesis testing are now possible with DEA and other nonparametric efficiency estimators (Simar and Wilson, 2007).

[10] Parametric techniques like Stochastic Frontier Analysis (SFA) postulate a functional form for the production function, which allows for the presence of both stochastic errors and inefficiency.

The drawback of DEA models is as follows. First, it assumes that all decision making units (DMU)[11] that are found to be on the frontier are efficient although they may have room for savings or better outcomes. Thus, to that extent, it may underestimate inefficiencies. Second, efficiency estimates are likely to be biased by the presence of outliers, measurement errors, and statistical noise. Third, when the DEA approach is applied to a large number of inputs and/or outputs relative to a limited number of DMU (small sample), the number of efficient units will be overestimated, implying smaller estimates of inefficiency (Dutu & Sicari, 2016).

Efficiency is basically a comparison between inputs used in a specific activity and produced outputs. A DMU is said to be efficient and operates on the frontier when it attains the maximum level of output or outputs with a given amount of inputs or resources, and the existing technology. When it produces less than what can be attained, the DMU is considered to be inefficient.

Figure 5: Example of an Efficiency Frontier

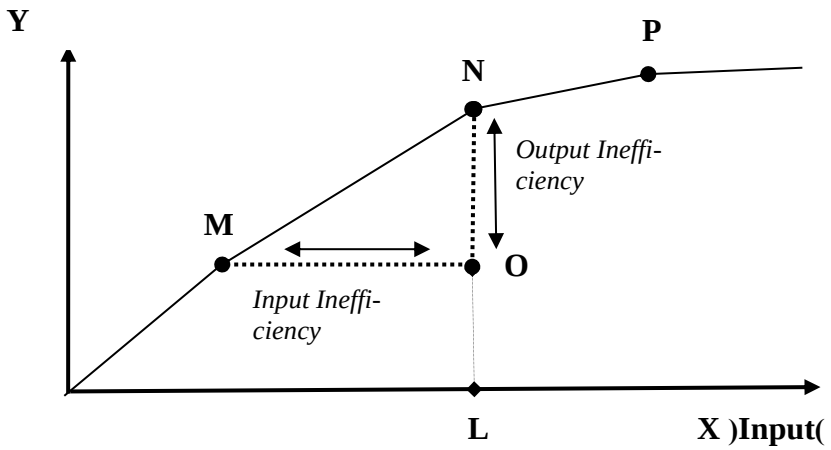


Figure 5 plots the inputs on the X-axis and the outputs on the Y-axis. It illustrates that M, N, and P (DMUs) are located on the efficiency frontier, and are therefore efficient. On the other hand, DMU "O" is inefficient. With the given level of input, it produces "OL" units of output. Production should increase by "ON" units if the possibility frontier were to be attained.[12] The deviations between observed values and an estimated frontier are attributed to inefficiency. The vertical distance from the efficiency frontier is called "output inefficiency," which shows to what extent output could be expanded while keeping inputs constant. Similarly, the horizontal distance from the frontier is measured as

[11] It can be a company, a government body, or a country or a state or an organisation etc.

[12] In fact, there are two ways to improve the performance of "O". One is to reduce its input to reach "M" on the frontier, and the other to increase its output to reach "N" on the frontier. As a result, DEA models will have two orientations: input-oriented and output-oriented.

"input inefficiency," means the extent to which inputs could be reduced without affecting output. DEA allows the calculation of technical efficiency[13] measures that can be either input or output oriented.[14] The input efficiency score of a given DMU indicates how much input quantities can be reduced without varying the output (Input oriented). Additionally, the output efficiency score of a given DMU would tell how much output quantities can be proportionally increased without changing the input quantities used (output oriented). These efficiency scores will be set between 0 and 1, and all the DMUs placed on the efficient frontier will be assigned the maximum score of 1.

The study has used a wide range of models in order to provide robustness checks. It has used three separate DEA methods, i.e., Input Oriented approach, Output Oriented approach, and Non-Oriented approach. The details of these DEA models are explained below.

4.2.1 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.

$$\rho^* = \min\rho$$

$$\textit{subject to}$$

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq \rho\, x_{iw} \qquad i=1,2,\ldots\ldots,m;$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_{rw} \qquad r=1,2,\ldots\ldots,s; \qquad (1)$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda_j \geq 0 \qquad j=1,2,\ldots\ldots,n.$$

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_w is efficient. If $\rho^* < 1$, then it is inefficient.

4.2.2 Output Oriented Approach

[13] The other measurements are allocative and productivity efficiency. Allocative efficiency means the ability of a decision unit to use inputs in optimal proportions, given their prices and the production set. Productivity efficiency implies both technical and allocative efficiency. In this paper, the term efficiency means technical efficiency.

[14] The two measures provide the same results under constant returns to scale but give different values under variable returns to scale. However, both input and output oriented approaches identify the same set of efficient/inefficient DMUs.

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):

$$\theta^* = \max \theta$$

subject to

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq x_{iw} \qquad i=1,2,.....m;$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq \theta\, y_{rw} \qquad r=1,2,....., s; \qquad (2)$$

$$\sum_{j=1}^{n} \lambda_j = 1$$

$$\lambda_j \geq 0 \qquad j = 1,2,....., n.$$

4.2.3 Non-Oriented Approach

Non-oriented models are used to test if a DMU under evaluation can simultaneously increase its output and reduce its inputs. Following Tone (2001), it can be defined by

$$\phi_w^{\min} = \min_{\lambda, s^-, s^+} \frac{1 - \frac{1}{m} \sum_{i=1}^{m} \frac{s_i^-}{x_{iw}}}{1 + \frac{1}{s} \sum_{r=1}^{s} \frac{s_r^+}{y_{rw}}} \qquad (3)$$

Subject to

$$x_{iw} = \sum_{j=1}^{n} x_{ij}\lambda_j + s_i^- \ (i = 1,2,....., m)$$

$$y_{rw} = \sum_{j=1}^{n} y_{rj}\lambda_j - s_r^+ \ (r = 1,2,....., s)$$

$$\lambda_j \geq 0\,(\forall j), s_i^- \geq 0(\forall i), s_r^+ \geq 0(\forall r).$$

Where, DMU_w is called efficient if $\phi_w^{\min}$ =1, and the slacks are $s_i^- = s_r^+ = 0$, i.e., no input excesses and no output shortfalls in an optimal solution. Here,

$$s_i^- = x_{iw} - \sum_{j=1}^{n} \lambda_j x_{ij} \qquad \textit{and } s_r^+ = \sum_{j=1}^{n} \lambda_j y_{rj} - \phi^{\min} y_{rw}$$

In the next section, the empirical results based on the above methods are presented and discussed.

5. Empirical Analysis

As discussed in the previous section, various DEA methods are used to measure the efficiency of public spending on education, health, and social sector. Variable Returns to Scale is assumed (proposed by Banker et al., 1984) in all of these DEA models. This paper focuses only on the total social sector expenditure and its two major components, i.e., education and health and the results are discussed below.

5.1 Education

The calculation of efficiency scores for education is undertaken using two outputs, i.e., Gross enrolment ratio for school education, Gross enrolment ratio for higher education, and two inputs such as education expenditure to GDP ratio and Non-education expenditure[15] to GDP ratio. As mentioned in the previous section, the data for education and non-education spending are averaged over three periods (2000-2002 for 2002, 2006-2008 for 2008 and 2013-2015 for 2015). The results of the efficiency scores for education through input-oriented, output-oriented and non-oriented approach are given in table 1 to table 3, respectively.

The results of input efficiency score (table 1) show that in 2015, seven states are labeled as efficient, Goa, Gujarat, Haryana, Himachal Pradesh, Maharashtra, Tamil Nadu and Tripura. Among these states, only Haryana, Maharashtra and Tamil Nadu are consistently efficient from 2002. These efficient states have achieved higher enrolment ratio using a smaller proportion of resources than the national average. Most of the North-Eastern states (except Tripura) are the poor performers in 2015 as these states are using a high share of public spending to achieve the given outcome.

In 2015, the input efficiency score of all states is 0.75 (0.81 in 2008 and 0.89 in 2002) meaning that, on average, they should be able to attain the same level of output using about 75 per cent of the inputs they are currently using. The least efficient state from an input perspective is Arunachal Pradesh (0.31). It means it can achieve the current outcome by using only 31 per cent of the current spending. Rest resources are used inefficiently. Our results of input oriented approach (figure 6) suggests that most of the Indian states could achieve the same level of output by reducing the current level of public spending and following the best practice (Punjab-4%, Kerala-12%, West Bengal-14%, Karnataka-20%, Jharkhand-28%, Uttarakhand-30%, Andhra Pradesh-33%, Rajasthan-35%, Madhya Pradesh-37%, Odisha-39%, Assam-42%, Chhattisgarh-43%, Uttar Pradesh-48%, Bihar-50%, Mizoram-57%, Meghalaya-59%, Jammu & Kashmir-60%, Manipur and Nagaland-66%, and Arunachal Pradesh-69%). The input inefficiency of education for the year 2002 and 2008 are given in the appendix section (Table A.1).

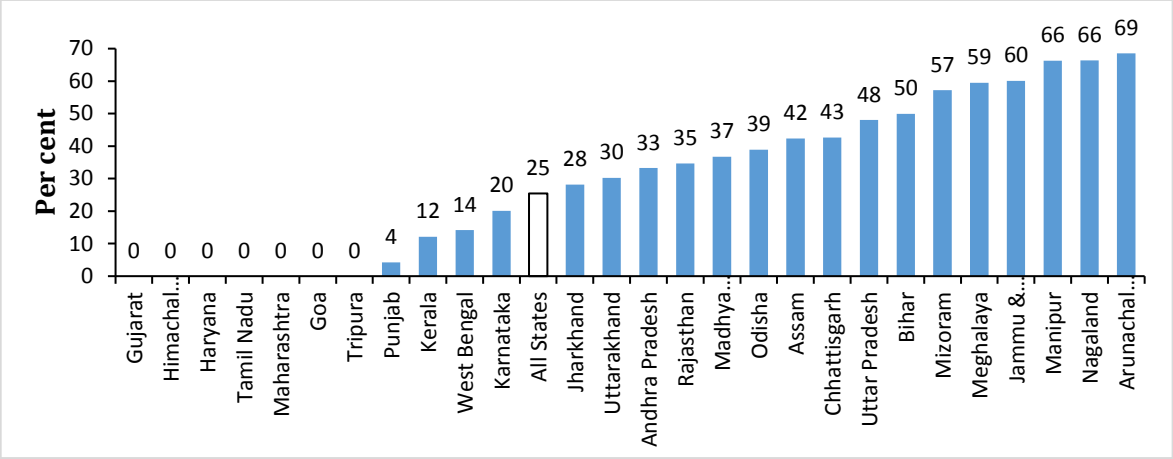
[15] It is total public expenditure less education expenditure. It is used as a proxy for rest of the factors like socio-economic conditions, family back ground etc., which affect the outcome of education sector.

Table 1: DEA Results for Education Efficiency in the Indian States, (Input Oriented)

	Input Oriented_2002			Input Oriented_2008				Input Oriented_2015		
States	**Eff.Score**	**Rank**	**Peer Group**	**States**	**Eff.Score**	**Rank**	**Peer Group**	**Eff.Score**	**Rank**	**Peer Group**
And	0.56	19	Har, Tam.	And	0.57	23	Guj, Har.	0.67	15	Har, Tam.
Aru	0.34	24	Har, Tam.	Aru	0.27	28	Guj, Tam.	0.31	28	Goa, Har, Tam.
Ass	0.84	13	Mah.	Ass	0.62	21	Mah.	0.58	19	Mah.
Bih	0.69	18	Har, Mah.	Bih	0.48	26	Mah.	0.50	22	Guj, Mah.
Goa	1.00	1	Goa.	Chh	0.89	12	Mad, Tam.	0.57	20	Goa, Har, Mah.
Guj	0.91	9	Har, Tam.	Goa	0.78	15	Guj, Har, Tam.	1.00	1	Goa.
Har	1.00	1	Har.	Guj	1.00	1	Guj.	1.00	1	Guj.
Him	1.00	1	Him.	Har	1.00	1	Har.	1.00	1	Har.
Jam	0.50	21	Har.	Him	0.99	9	Man, Miz, Tam.	1.00	1	Him.
Kar	0.87	12	Har, Mah, Tam.	Jam	0.49	25	Guj, Har, Tam.	0.40	25	Guj, Har.
Ker	0.93	7	Har, Mah, Tam.	Jha	0.74	17	Mah, Tam.	0.72	13	Guj.
Mad	0.80	15	Har, Tam.	Kar	1.00	1	Kar.	0.80	11	Har.
Mah	1.00	1	Mah.	Ker	0.90	11	Mah, Tam.	0.88	9	Goa, Him, Tam.
Man	1.00	1	Man.	Mad	1.00	1	Mad.	0.63	17	Guj, Har, Mah.
Meg	0.53	20	Har, Mah, Tam.	Mah	1.00	1	Mah.	1.00	1	Mah.
Miz	0.27	25	Har, Tam.	Man	1.00	1	Man.	0.34	26	Goa, Har, Tam.
Nag	0.46	22	Har.	Meg	0.73	19	Mad, Man, Tam.	0.41	24	Goa, Har, Mah.
Odi	0.69	17	Har, Mah.	Miz	1.00	1	Miz.	0.43	23	Goa, Him, Tri.
Pun	0.88	11	Har.	Nag	0.35	27	Guj.	0.34	27	Guj.
Raj	0.77	16	Har, Mah.	Odi	0.74	16	Guj, Mah.	0.61	18	Goa, Guj.
Tam	1.00	1	Tam.	Pun	0.94	10	Guj.	0.96	8	Goa, Har, Tam.
Tri	0.42	23	Har, Mah, Tam.	Raj	0.68	20	Guj, Mah.	0.65	16	Guj, Mah.
Upr	0.81	14	Har, Mah.	Tam	1.00	1	Tam.	1.00	1	Tam.
Wes	0.93	8	Har, Mah.	Tri	0.54	24	Mad, Tam.	1.00	1	Tri.
All States	0.89	10	Har, Mah.	Upr	0.58	22	Guj, Mah.	0.52	21	Guj, Har, Mah.
				Utt	0.73	18	Mah, Tam.	0.70	14	Mah, Tam.
				Wes	0.84	13	Guj, Mah.	0.86	10	Guj, Mah.
				All States	0.81	14	Guj, Mah.	0.75	12	Guj, Har, Mah.

Note: AND: Andhra Pradesh; ARU: Arunachal Pradesh; ASS: Assam; BIH: Bihar; CHH: Chhattisgarh; GOA: Goa; GUJ: Gujarat; HAR: Haryana; HIM: Himachal Pradesh; JAM: Jammu & Kashmir; JHA: Jharkhand; KAR: Karnataka; KER: Kerala; MAD: Madhya Pradesh; MAH: Maharashtra; MAN: Manipur; MEG: Meghalaya; MIZ: Mizoram; NAG: Nagaland; ODI; Odisha; PUN: Punjab; RAJ: Rajasthan; TAM: Tamil Nadu; TRI: Tripura; UPR: Uttar Pradesh; UTT: Uttarakhand; WES: West Bengal.

Figure 6: Input Inefficiency (Education, 2015)



Source: Authors estimation through DEA

Table 2 presents the output efficiency scores, which finds similar efficient states as in input oriented (as expected). However, it finds that in 2015, the bottom five states are Nagaland, Jammu & Kashmir, Uttar Pradesh, Jharkhand, and Bihar. The output efficient score of all states is 0.78. It implies that with the same inputs, all states on average are producing about 22 per cent fewer outputs that they should if they are efficient. For example, the output efficiency score of Bihar is 0.70, which implies that only 70 per cent of outputs are produced with the existing resources (30 per cent output can be enhanced).

Similarly most of the other states are also producing less output (figure-7) with the current level of public spending (Kerala-1%, Mizoram-3%, Punjab & Manipur-8%, Uttarakhand-13%, Arunachal Pradesh-15%, Chhattisgarh- 16%, West Bengal-17%, Karnataka-19%, Meghalaya-22%, Andhra Pradesh- 23%, Madhya Pradesh-25%, Odisha-26%, Rajasthan & Assam-28%, Bihar-30%, Jharkhand-31%, Uttar Pradesh & Jammu & Kashmir-34% and Nagaland-37%). The output inefficiency of education for the year 2002 and 2008 are given in the appendix section (Table A.1).

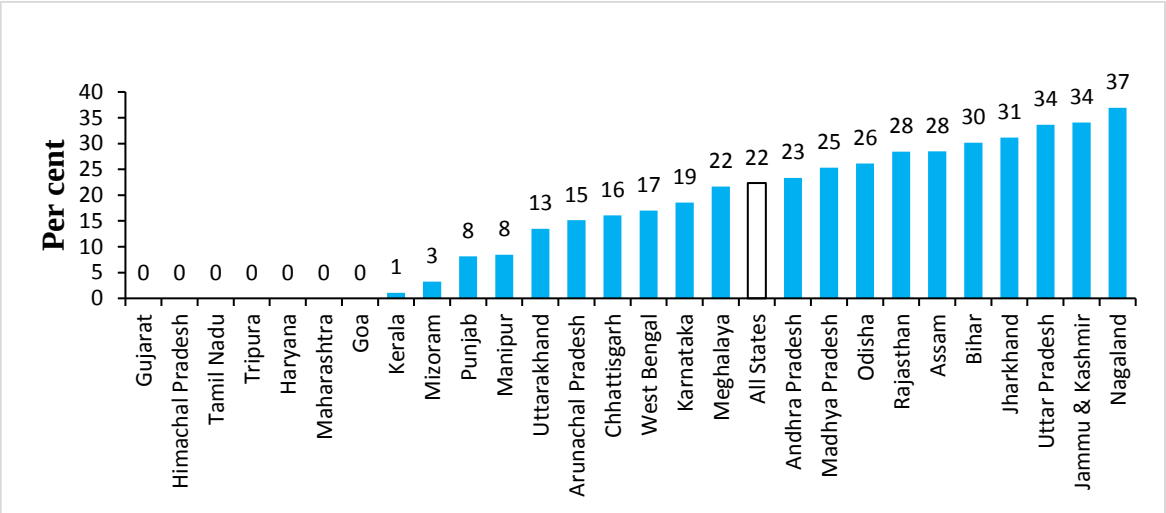
The non-oriented analysis (table 3) also shows that seven states namely Goa, Maharashtra, Tripura, Himachal Pradesh, Tamil Nadu, Haryana, and Gujarat are efficient in 2015-16, using their resources more efficiently. There is a massive potential among all the states (efficiency score 0.61) for a simultaneous increase in current outputs and reduction in inputs. Thus, by following their peer groups, many states can enhance their outcomes, and can use their resources more efficiently (efficiency scores of these states are: Nagaland-0.19%, Arunachal Pradesh-0.25%, Bihar-0.28%, Manipur, & Jammu & Kashmir-0.29%, Assam & Meghalaya-0.30%, Chhattisgarh-0.34%, Uttar Pradesh & Mizoram-0.40%, Jharkhand-0.42%, Odisha-0.43%, Madhya Pradesh-0.45%, Rajasthan-0.47%, Andhra Pradesh-0.53%, West Bengal-0.59%, Karnataka-0.64%, Uttarakhand-0.65%, Kerala-0.84%% and Punjab-0.90%).

Table 2: DEA Results for Education Efficiency in the Indian States, (Output Oriented)

	Output Oriented_2002			Output Oriented_2008				Output Oriented_2015		
States	**Eff.Score**	**Rank**	**Peer Group**	**States**	**Eff.Score**	**Rank**	**Peer Group**	**Eff.Score**	**Rank**	**Peer Group**
And	0.75	17	Goa, Him, Tam.	And	0.84	20	Kar, Miz, Tam.	0.77	19	Him, Tam.
Aru	0.78	13	Him, Man.	Aru	0.85	19	Man, Miz, Tam.	0.85	13	Him, Tam.
Ass	0.71	21	Him, Mah, Tam.	Ass	0.68	26	Mad, Man, Tam.	0.72	23	Goa, Tri.
Bih	0.57	24	Goa, Mah.	Bih	0.63	27	Mad, Man, Tam.	0.70	24	Goa, Tri.
Goa	1.00	1	Goa.	Chh	0.97	11	Mad, Tam.	0.84	14	Goa, Tri.
Guj	0.88	9	Goa, Him, Tam.	Goa	0.89	16	Kar, Miz, Tam.	1.00	1	Goa.
Har	1.00	1	Har.	Guj	1.00	1	Guj.	1.00	1	Guj.
Him	1.00	1	Him.	Har	1.00	1	Har.	1.00	1	Har.
Jam	0.65	23	Him, Tam.	Him	1.00	1	Man, Miz, Tam.	1.00	1	Him.
Kar	0.86	10	Goa, Him, Mah, Tam.	Jam	0.84	21	Kar, Miz, Tam.	0.66	27	Him, Tam.
Ker	0.94	7	Him, Tam.	Jha	0.87	17	Mad, Tam.	0.69	25	Goa, Tri.
Mad	0.75	18	Him, Tam.	Kar	1.00	1	Kar.	0.81	16	Goa, Him, Tam.
Mah	1.00	1	Mah.	Ker	0.95	12	Mah, Tam.	0.99	8	Goa, Him, Tam.
Man	1.00	1	Man.	Mad	1.00	1	Mad.	0.75	20	Goa, Him, Tri.
Meg	0.83	11	Goa, Him, Mah.	Mah	1.00	1	Mah.	1.00	1	Mah.
Miz	0.89	8	Man.	Man	1.00	1	Man.	0.92	11	Him, Tam.
Nag	0.42	25	Him, Tam.	Meg	0.98	10	Man, Miz, Tam.	0.78	17	Him, Tri.
Odi	0.74	20	Goa, Him, Mah, Tam.	Miz	1.00	1	Miz.	0.97	9	Him, Tri.
Pun	0.76	16	Goa, Har, Tam.	Nag	0.62	28	Kar, Miz, Tam.	0.63	28	Him, Tri.
Raj	0.75	19	Him, Mah, Tam.	Odi	0.83	23	Mad, Tam.	0.74	21	Goa, Him, Tri.
Tam	1.00	1	Tam.	Pun	0.91	15	Guj, Tam.	0.92	10	Goa, Har, Tam.
Tri	0.83	12	Him, Man.	Raj	0.84	22	Mad, Tam.	0.72	22	Goa, Him, Tri.
Upr	0.70	22	Him, Tam.	Tam	1.00	1	Tam.	1.00	1	Tam.
Wes	0.76	15	Him, Tam.	Tri	0.92	14	Mad, Man, Tam.	1.00	1	Tri.
All States	0.78	14	Goa, Him, Mah, Tam.	Upr	0.80	24	Mad, Man, Tam.	0.66	26	Him, Tam.
				Utt	0.93	13	Mad, Man, Tam.	0.87	12	Goa, Him, Tam.
				Wes	0.76	25	Mah, Tam.	0.83	15	Goa, Mah.
				All States	0.85	18	Mad, Tam.	0.78	18	Goa, Him, Tam.

Note: AND: Andhra Pradesh; ARU: Arunachal Pradesh; ASS: Assam; BIH: Bihar; CHH: Chhattisgarh; GOA: Goa; GUJ: Gujarat; HAR: Haryana; HIM: Himachal Pradesh; JAM: Jammu & Kashmir; JHA: Jharkhand; KAR: Karnataka; KER: Kerala; MAD: Madhya Pradesh; MAH: Maharashtra; MAN: Manipur; MEG: Meghalaya; MIZ: Mizoram; NAG: Nagaland; ODI; Odisha; PUN: Punjab; RAJ: Rajasthan; TAM: Tamil Nadu; TRI: Tripura; UPR: Uttar Pradesh; UTT: Uttarakhand; WES: West Bengal.

Figure 7: Output Inefficiency (Education, 2015)



Source: Authors estimation through DEA

Table 3: DEA Results for Education Efficiency in the Indian States, (Non- Oriented)

	Non-Oriented_2002			Non-Oriented_2008				Non-Oriented_2015		
States	Eff.Score	Rank	Peer Group	States	Eff.Score	Rank	Peer Group	Eff.Score	Rank	Peer Group
And	0.49	19	Tam.	And	0.45	21	Mah.	0.53	14	Tam.
Aru	0.22	24	Tam.	Aru	0.21	28	Mah, Tam.	0.25	27	Tam.
Ass	0.53	17	Mah.	Ass	0.33	25	Mah.	0.30	23	Tam.
Bih	0.39	20	Tam.	Bih	0.25	26	Mah.	0.28	26	Tam.
Goa	1.00	1	Goa.	Chh	0.71	10	Mad, Tam.	0.34	21	Tam.
Guj	0.79	8	Tam.	Goa	0.70	12	Mah.	1.00	1	Goa.
Har	1.00	1	Har.	Guj	1.00	1	Guj.	1.00	1	Guj.
Him	1.00	1	Him.	Har	1.00	1	Har.	1.00	1	Har.
Jam	0.26	22	Har.	Him	0.90	9	Man, Miz, Tam.	1.00	1	Him.
Kar	0.79	7	Tam.	Jam	0.37	24	Mah.	0.29	24	Tam.
Ker	0.73	10	Mah, Tam.	Jha	0.50	18	Mah, Tam.	0.42	18	Tam.
Mad	0.64	13	Tam.	Kar	1.00	1	Kar.	0.64	11	Tam.
Mah	1.00	1	Mah.	Ker	0.67	15	Mah, Tam.	0.84	9	Goa, Him, Tam.
Man	1.00	1	Man.	Mad	1.00	1	Mad.	0.45	16	Tam.
Meg	0.50	18	Mah, Tam.	Mah	1.00	1	Mah.	1.00	1	Mah.
Miz	0.24	23	Tam.	Man	1.00	1	Man.	0.29	25	Tam.
Nag	0.20	25	Tam.	Meg	0.70	11	Mad, Man, Tam.	0.30	22	Tam.
Odi	0.57	16	Tam.	Miz	1.00	1	Miz.	0.40	19	Goa, Him, Tri.
Pun	0.67	12	Har, Tam.	Nag	0.24	27	Mah.	0.19	28	Tam.
Raj	0.61	14	Tam.	Odi	0.48	19	Mah.	0.43	17	Tam.
Tam	1.00	1	Tam.	Pun	0.69	13	Guj, Mah.	0.90	8	Goa, Har, Tam.

Tri	0.28	21	Mah.	Raj	0.45	20	Mah.	0.47	15	Tam.
Upr	0.58	15	Tam.	Tam	1.00	1	Tam.	1.00	1	Tam.
Wes	0.71	11	Tam.	Tri	0.42	22	Mad, Tam.	1.00	1	Tri.
All States	0.73	9	Tam.	Upr	0.41	23	Mah.	0.40	20	Tam.
				Utt	0.56	17	Mah, Tam.	0.65	10	Tam.
				Wes	0.58	16	Mah.	0.59	13	Mah, Tam.
				All States	0.68	14	Mah.	0.61	12	Tam.

Note: AND: Andhra Pradesh; ARU: Arunachal Pradesh; ASS: Assam; BIH: Bihar; CHH: Chhattisgarh; GOA: Goa; GUJ: Gujarat; HAR: Haryana; HIM: Himachal Pradesh; JAM: Jammu & Kashmir; JHA: Jharkhand; KAR: Karnataka; KER: Kerala; MAD: Madhya Pradesh; MAH: Maharashtra; MAN: Manipur; MEG: Meghalaya; MIZ: Mizoram; NAG: Nagaland; ODI; Odisha; PUN: Punjab; RAJ: Rajasthan; TAM: Tamil Nadu; TRI: Tripura; UPR: Uttar Pradesh; UTT: Uttarakhand; WES: West Bengal.

Over the time from 2002 to 2015, the relative efficiency of education spending has improved significantly in a number of states (Goa, Gujarat, Punjab, Kerala, Andhra Pradesh, Tripura etc.,), deteriorated in some states (Karnataka, Uttar Pradesh, Madhya Pradesh, Rajasthan, Odisha, Assam, Meghalaya etc.), and remain unchanged in few of the states (Himachal Pradesh, Tamil Nadu, Haryana, and Maharashtra).

5.2 Health

In the case of Health, two outputs and two inputs are considered in the DEA set up. It takes two conventional measures of health attainment, namely, IMR and life expectancy[16] as outputs and health expenditure to GDP ratio and Non-health expenditure[17] to GDP ratio as two inputs for measuring health efficiency. The DEA techniques used in this paper imply that outputs are measured in such a way that "more is better." Here, the IMR refers to the (Number of children who died before 12 months)/(Number of born children)*1000. Therefore, we have calculated an "Infant Survival Rate" (ISR) as follows.

ISR[18] = (1000- IMR)/ IMR.

Finally, ISR and life expectancy are used as final outputs in the DEA approach. The data for health and non-health spending are averaged over three periods (2000-2002 for 2002, 2006-2008 for 2008 and 2013-2015 for 2015). The efficiency analysis for health is carried out for 20 states based on data availability.[19] The results of the efficiency scores

[16] Life expectancy has the advantage of being a very broad measure of population's health and is correlated with other indicators of health status. It refers to life expectancy at birth. IMR is another commonly used indicator for health status.

[17] It is total public expenditure less health expenditure. It is used as a proxy for rest of the factors like socio-economic environment, life style, family back ground etc., which does affect the outcome of health sector.

[18] It is directly interpretable as the ratio of children that survived the first year to the number of children that died; which increases with a better health status.

[19] Life expectancy data is available only for 17 states in 2002-03 and 2008-09. Therefore, the analysis is done for 17 states in 2002-03 and 2008-09, for 20 states in 2015-16.

for health sector through input-oriented, output-oriented and non-oriented approach are given in table 4 to table 6, respectively.

It is possible to observe from table 4 that three states would be labeled as the most efficient ones in the input-oriented approach: Kerala , Maharashtra, and Haryana. The lowest IMR (12) and highest life expectancy (more than 75) is found in Kerala, while Maharashtra and Haryana are among the lowest share of health spending to GDP with a better health outcome. Another set of five states are located at the bottom - Jammu & Kashmir, Uttar Pradesh, Himachal Pradesh, Bihar and Andhra Pradesh. In 2015, the input efficiency score of all states implies that on average the same level of output could be achieved by using about 71 per cent of the current inputs. Over the time the efficiency of health has declined from 0.90 to 0.71 from 2002 to 2015. Jammu and Kashmir is the least efficient state from an input perspective, which can maintain its current outcome using only 31 per cent of the current spending.

Table 4: DEA Results for Health Efficiency in the Indian States, (Input Oriented)

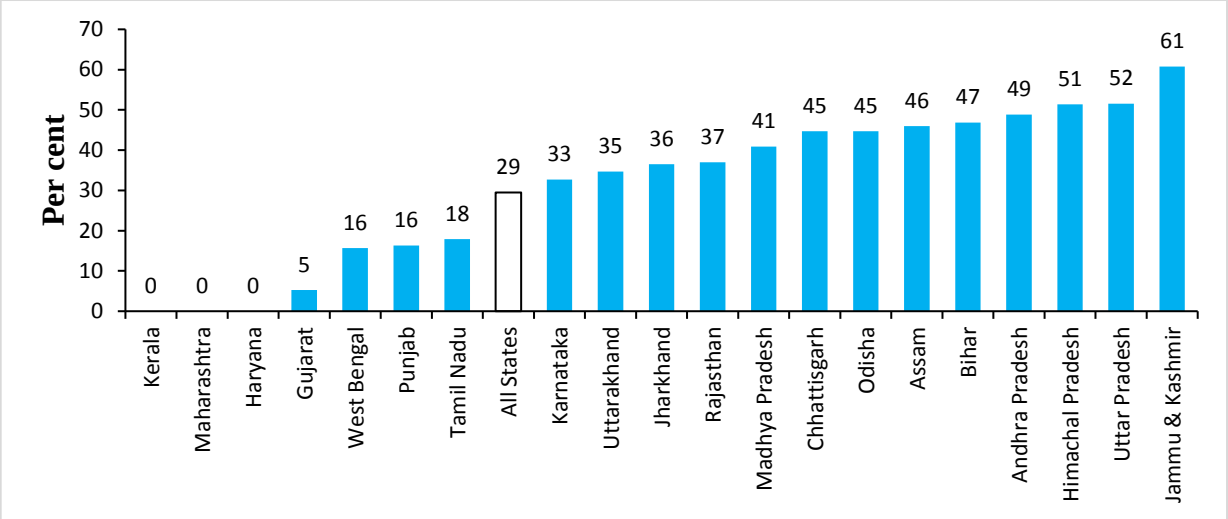
	Input Oriented_2002			Input Oriented_2008				Input Oriented_2015		
States	**Eff_score**	**Rank**	**Peer Group**	**Eff_score**	**Rank**	**Peer Group**	**States**	**Eff_score**	**Rank**	**Peer Group**
And	0.52	16	Har.	0.39	17	Mah.	And	0.51	18	Mah.
Ass	0.79	10	Har.	0.60	13	Mah.	Ass	0.54	16	Mah.
Bih	0.69	15	Har, Mah.	0.47	15	Mah.	Bih	0.53	17	Har.
Guj	0.78	13	Har, Mah.	0.98	4	Har, Mah.	Chh	0.55	14	Mah.
Har	1.00	1	Har.	1.00	1	Har.	Guj	0.95	4	Mah.
Him	0.50	17	Ker, Mah.	0.43	16	Ker, Mah.	Har	1.00	1	Har.
Jam	0.37	18	Mah.	0.30	18	Ker, Mah.	Him	0.49	19	Mah.
Kar	0.87	7	Har, Mah.	0.69	10	Mah.	Jam	0.39	21	Ker, Mah.
Ker	1.00	1	Ker.	1.00	1	Ker.	Jha	0.64	11	Har, Mah.
Mad	0.79	11	Har.	0.63	12	Mah.	Kar	0.67	9	Har, Mah.
Mah	1.00	1	Har, Mah.	1.00	1	Mah.	Ker	1.00	1	Ker.
Odi	0.69	14	Har.	0.72	9	Mah.	Mad	0.59	13	Mah.
Pun	0.82	8	Ker, Mah.	0.82	7	Har, Mah.	Mah	1.00	1	Mah.
Raj	0.78	12	Har.	0.68	11	Mah.	Odi	0.55	15	Mah.
Tam	0.97	4	Ker, Mah.	0.82	6	Ker, Mah.	Pun	0.84	6	Ker, Mah.
Upr	0.82	9	Har.	0.57	14	Mah.	Raj	0.63	12	Mah.
Wes	0.95	5	Har, Mah.	0.83	5	Mah.	Tam	0.82	7	Ker, Mah.
All States	0.90	6	Har.	0.78	8	Mah.	Upr	0.48	20	Mah.
							Utt	0.65	10	Mah.
							Wes	0.84	5	Mah.
							All States	0.71	8	Mah.

Note：AND：Andhra Pradesh; ASS：Assam; BIH：Bihar; CHH：Chhattisgarh; GUJ：Gujarat; HAR：Haryana; HIM：Himachal Pradesh; JAM：Jammu & Kashmir; JHA：Jharkhand; KAR：Karnataka; KER：Kerala; MAD：Madhya Pradesh; MAH：Maharashtra; ODI; Odisha; PUN：Punjab; RAJ：Rajasthan; TAM：Tamil Nadu; UPR：Uttar Pradesh; UTT：Uttarakhand; WES：West Bengal.

Following figure 8, it finds that most of the Indian states could achieve the same level of output by reducing the current level public spending, compared to the states on the frontier in 2015-16 (Gujarat-5%, West Bengal-16%, Punjab-16%, Tamil Nadu-18%, Karnataka-33%, Uttarakhand-35%, Jharkhand-36%, Rajasthan-37%, Madhya Pradesh-

41%, Chhattisgarh-45%, Odisha-45%, Assam-46%, Bihar-47%, Andhra Pradesh-49%, Himachal Pradesh-51%, Uttar Pradesh-52%, and Jammu & Kashmir-61%). The input inefficiency of health for the year 2002 and 2008 are given in the appendix section (Table A.1).

Figure 8: Input Inefficiency (Health, 2015)



Source: Authors estimation through DEA

The results of output-oriented approach (table 5) find that Kerala, Maharashtra, and Haryana are most efficient states, while Uttar Pradesh, Assam, Madhya Pradesh, Odisha, Chhattisgarh, and Bihar are least efficient states. The output efficient score of all states is 0.92. It implies that with the same inputs, all states on average are producing about eight per cent fewer outputs that they should if they are efficient. Figure 9 displays the output inefficiency of remaining states (for e.g. in 2015; Punjab-1%, Jammu & Kashmir-3%, Tamil Nadu, West Bengal and Himachal Pradesh-4%, Gujarat and Uttarakhand-5%, Karnataka-7%, Andhra Pradesh-8%, Bihar and Jharkhand-9%, Rajasthan-10%, Odisha-11%, Chhattisgarh-13%, Madhya Pradesh, Assam, and Uttar Pradesh-14%). The output inefficiency of education for the year 2002 and 2008 are given in the appendix section (Table A.1).

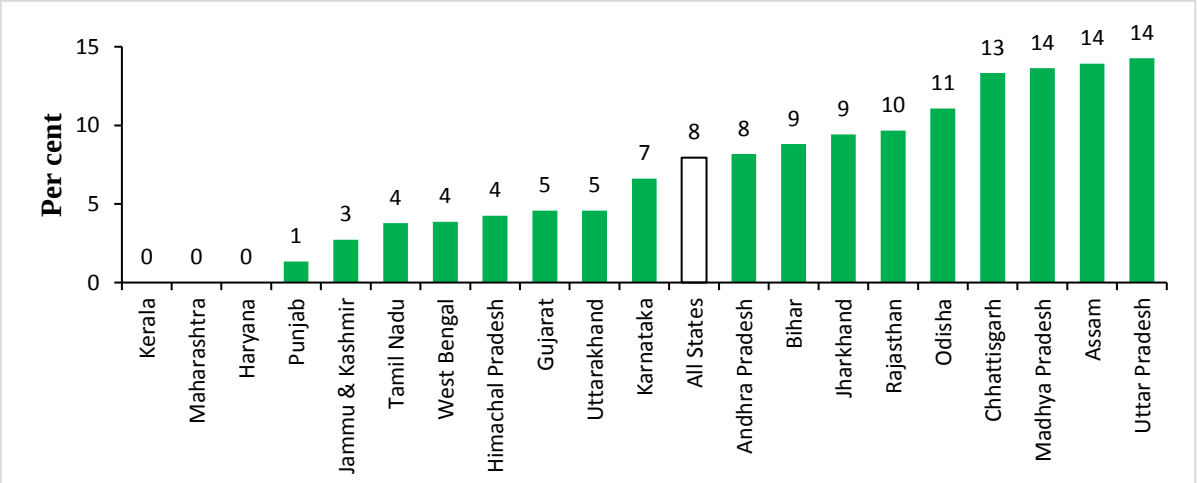
The non-oriented analysis (table 6) also shows the similar most efficient states and least efficient states adding Jammu & Kashmir in the bottom group. There is a vast potential among all the states (efficiency score 0.47) for a simultaneous increase in current outputs and reduction in inputs. Thus, many states by following their peer groups can enhance their health outcomes and can use their resources more efficiently. Over the time from 2002 to 2015, the relative efficiency of health spending among all states have improved regarding output and non-oriented approach and deteriorated in input-oriented approach.

Table 5: DEA Results for Health Efficiency in the Indian States, (Output Oriented)

	Output Oriented_2002			Output Oriented_2008			Output Oriented_2015			
States	Eff_score	Rank	Peer Group	Eff_score	Rank	Peer Group	States	Eff_score	Rank	Peer Group
And	0.88	12	Ker.	0.88	13	Ker.	And	0.92	13	Ker.
Ass	0.81	17	Har, Ker.	0.82	18	Ker.	Ass	0.86	20	Ker.
Bih	0.88	14	Ker.	0.87	14	Ker.	Bih	0.91	14	Ker, Mah.
Guj	0.96	4	Har, Ker.	0.96	5	Mah.	Chh	0.87	18	Ker.
Har	1.00	1	Har.	1.00	1	Har.	Guj	0.95	9	Ker, Mah.
Him	0.95	6	Ker.	0.94	8	Ker.	Har	1.00	1	Har.
Jam	0.92	9	Ker.	0.94	9	Ker.	Him	0.96	8	Ker.
Kar	0.91	10	Har, Ker.	0.92	10	Ker, Mah.	Jam	0.97	5	Ker.
Ker	1.00	1	Ker.	1.00	1	Ker.	Jha	0.91	15	Ker, Mah.
Mad	0.81	18	Ker.	0.83	17	Ker.	Kar	0.93	11	Ker, Mah.
Mah	1.00	1	Mah.	1.00	1	Mah.	Ker	1.00	1	Ker.
Odi	0.82	16	Ker.	0.86	15	Ker, Mah.	Mad	0.86	19	Ker, Mah.
Pun	0.95	5	Har, Ker.	0.98	4	Ker, Mah.	Mah	1.00	1	Mah.
Raj	0.88	13	Ker.	0.89	12	Ker.	Odi	0.89	17	Ker.
Tam	0.95	7	Har, Ker, Mah.	0.95	6	Ker, Mah.	Pun	0.99	4	Ker, Mah.
Upr	0.86	15	Har, Ker.	0.83	16	Ker.	Raj	0.90	16	Ker.
Wes	0.93	8	Ker, Mah.	0.94	7	Ker, Mah.	Tam	0.96	6	Ker, Mah.
All States	0.90	11	Har, Ker.	0.90	11	Ker, Mah.	Upr	0.86	21	Ker.
							Utt	0.95	10	Ker.
							Wes	0.96	7	Ker, Mah.
							All States	0.92	12	Ker, Mah.

Note: AND: Andhra Pradesh; ASS: Assam; BIH: Bihar; CHH: Chhattisgarh; GUJ: Gujarat; HAR: Haryana; HIM: Himachal Pradesh; JAM: Jammu & Kashmir; JHA: Jharkhand; KAR: Karnataka; KER: Kerala; MAD: Madhya Pradesh; MAH: Maharashtra; ODI; Odisha; PUN: Punjab; RAJ: Rajasthan; TAM: Tamil Nadu; UPR: Uttar Pradesh; UTT: Uttarakhand; WES: West Bengal.

Figure 9: Output Inefficiency (Health, 2015)



Source: Authors estimation through DEA

Table 6: DEA Results for Health Efficiency in the Indian States, (Non- Oriented)

	Non-Oriented_2002			Non-Oriented_2008			Non-Oriented_2015			
States	**Eff_score**	**Rank**	**Peer Group**	**Eff_score**	**Rank**	**Peer Group**	**States**	**Eff_score**	**Rank**	**Peer Group**
And	0.16	17	Ker.	0.20	16	Ker.	And	0.36	13	Mah.
Ass	0.22	12	Har, Ker.	0.22	13	Ker.	Ass	0.28	19	Mah.
Bih	0.22	11	Ker.	0.21	15	Ker.	Bih	0.34	16	Mah.
Guj	0.45	5	Har, Ker.	0.74	4	Mah.	Chh	0.34	15	Mah.
Har	1.00	1	Har.	1.00	1	Har.	Guj	0.64	7	Mah.
Him	0.16	15	Ker.	0.22	14	Ker.	Har	1.00	1	Har.
Jam	0.14	18	Ker.	0.13	18	Ker.	Him	0.37	12	Mah.
Kar	0.30	9	Har, Ker.	0.42	8	Ker, Mah.	Jam	0.28	20	Ker, Mah.
Ker	1.00	1	Ker.	1.00	1	Ker.	Jha	0.49	9	Mah.
Mad	0.18	14	Ker.	0.24	12	Ker.	Kar	0.56	8	Mah.
Mah	1.00	1	Mah.	1.00	1	Mah.	Ker	1.00	1	Ker.
Odi	0.16	16	Ker.	0.33	10	Ker, Mah.	Mad	0.33	18	Mah.
Pun	0.35	7	Har, Ker.	0.61	6	Ker, Mah.	Mah	1.00	1	Mah.
Raj	0.18	13	Ker.	0.26	11	Ker.	Odi	0.33	17	Mah.
Tam	0.50	4	Har, Ker.	0.70	5	Ker, Mah.	Pun	0.78	5	Ker, Mah.
Upr	0.26	10	Har, Ker.	0.19	17	Ker.	Raj	0.35	14	Mah.
Wes	0.35	6	Har, Ker.	0.57	7	Ker, Mah.	Tam	0.79	4	Ker, Mah.
All States	0.31	8	Har, Ker.	0.40	9	Ker, Mah.	Upr	0.27	21	Mah.
							Utt	0.45	11	Mah.
							Wes	0.69	6	Mah.
							All States	0.47	10	Mah.

Note: AND: Andhra Pradesh; ASS: Assam; BIH: Bihar; CHH: Chhattisgarh; GUJ: Gujarat; HAR: Haryana; HIM: Himachal Pradesh; JAM: Jammu & Kashmir; JHA: Jharkhand; KAR: Karnataka; KER: Kerala; MAD: Madhya Pradesh; MAH: Maharashtra; ODI; Odisha; PUN: Punjab; RAJ: Rajasthan; TAM: Tamil Nadu; UPR: Uttar Pradesh; UTT: Uttarakhand; WES: West Bengal.

5.3 Social Sector

Social sector spending is necessary and an essential source for human development. It is indispensable for the progress of an economy.[20] Therefore, the efficiency of this expenditure is calculated for 27 states in 2015.[21] It is a tedious task to find a suitable outcome, which represents overall social sectors in the DEA. Basically social sector spending

[20] India is a developing country and it needs to invest more resources in human development such as education, health, livelihood promotion and other basic services. Later it will improve the productivity of human resources for the future growth and development. There is also a wide disparity in the investment expenditure on human development among Indian states.

[21] It has not done any analysis for 2002 and 2008 because of the data unavailability of the outcome of social sector. Thus, for the policy perspective, we focus here only in the recent period 2015.

in India is meant for achieving most of the MDG targets.[22] Therefore, we have taken MDG Composite Performance Index calculated by Chatterjee et al., (2015)[23] as an output for social sector and two inputs such as social sector expenditure to GDP ratio and non-social sector expenditure[24] to GDP ratio. These expenditures are averaged over three periods from 2013-14 to 2015-16 for 2015-16. The estimated efficiency scores for social sector in the year 2015 are shown in table 7.

All the DEA analysis shows that Goa, Maharashtra, and Punjab are the most efficient states. The bottom five least efficient states as per input-oriented approach are five north-eastern states namely Arunachal Pradesh, Mizoram, Manipur, Nagaland, and Meghalaya, and as per output-oriented approach are Bihar, Jharkhand, Uttar Pradesh, Arunachal Pradesh and Madhya Pradesh. The input efficiency score of all states is 0.71 meaning that on average, all states can attain the same level of output by reducing 29 per cent less of current inputs. Similarly, the output efficient score of all states is 0.69. It implies that with the same inputs, all states on average are producing about 31 per cent fewer outputs that they should if they are efficient. The non-oriented analysis also shows that the efficiency score of all states is 0.58, implies that on average, they can utilize more than 40 per cent of their resources more efficiently in the form of a simultaneous increase in current outputs and reduction in inputs. Thus, in many states, there is a huge potential for improving efficiency by following their peer groups.

The input inefficiency among states are plotted on figure 10, which finds that Haryana, Gujarat, West Bengal, and Tamil Nadu-less or equal to 10 %, Kerala, Karnataka, Uttarakhand, Rajasthan, Jharkhand, and Madhya Pradesh- 15 to 40 %, Assam, Chhattisgarh, Odisha, Bihar, Himachal Pradesh, Andhra Pradesh, and Uttar Pradesh- 41 to 50 %, Tripura, Jammu & Kashmir, Meghalaya, Nagaland, Manipur, Mizoram, and Arunachal Pradesh- 60 to 75%, can save their current spending for the current output.

Similarly, figure 11 plots the output inefficiency scores, which displays that Kerala, Tamil Nadu, Gujarat, West Bengal, Tripura, Haryana, and Himachal Pradesh- 2 to 20%, Andhra Pradesh, Manipur, Karnataka, Jammu & Kashmir, Mizoram, Uttarakhand, Meghalaya, and Nagaland- 21 to 40%, Chhattisgarh, Rajasthan, Odisha, Assam, and

[22] The Eight Millennium Development Goals are: to eradicate extreme poverty and hunger; to achieve universal primary education; to promote gender equality and empower women; to reduce child mortality; to improve maternal health; to combat HIV/AIDS, malaria, and other diseases; to ensure environmental sustainability; and to develop a global partnership for development.

[23] it is a composite index constructed by using more than 19 indicators such as Poverty Headcount, Underweight children, Primary enrolment, Survival rate, Youth literacy, Gender parity in primary education, Gender parity in secondary education, Gender parity in tertiary Education, Women in wage employment, Under 5 mortality, Infant mortality, Maternal mortality, Measles immunization, Skilled birth attendance, Adult HIV prevalence, Malaria incidence, Tuberculosis prevalence, Improved drinking water, Improved sanitation, Forest cover etc.,)For details, see Chatterjee et al.; 2015(.

[24] It is total public expenditure less of social sector expenditure. Social sector expenditure is calculated by adding all the expenditure under the budgetary heads of 'Social services' and 'Rural Development'. Many poverty eradication programme, employment generation programme etc., is included under rural development. Therefore, we have added it with social service spending to get total social sector expenditure.

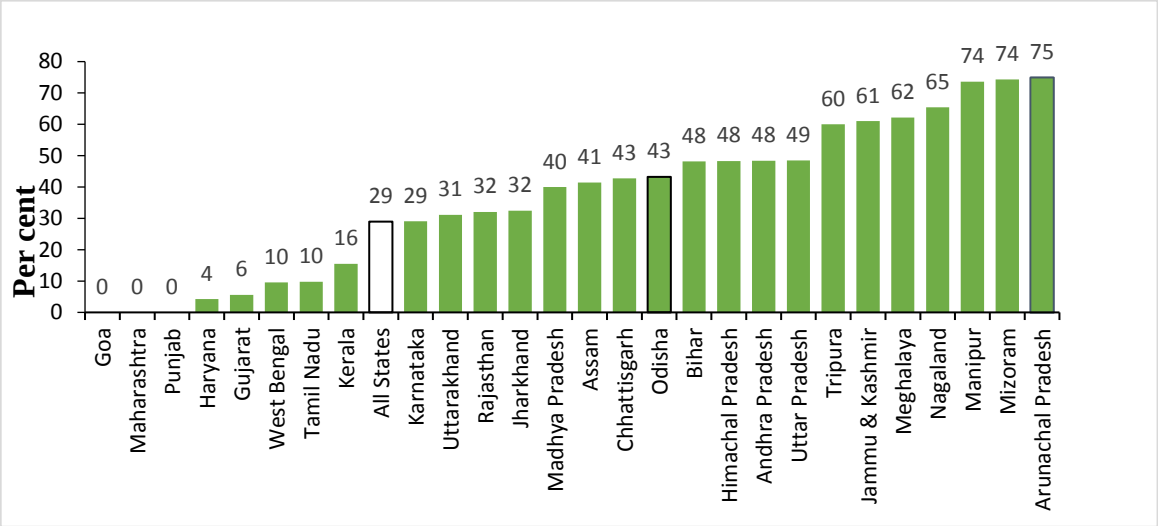
Madhya Pradesh- 41 to 50 %, Arunachal Pradesh, Uttar Pradesh, Jharkhand, and Bihar-51 to 62%, can enhance their current output with the existing resources.

Table 7: DEA Results for Social Sector Efficiency in the Indian States

	Input Oriented		Output Oriented		Non-Oriented		Peer Group
States	**Eff_score**	**Rank**	**Eff_score**	**Rank**	**Eff_score**	**Rank**	**Input/ Output & Non-oriented**
And	0.52	20	0.78	11	0.48	12	Mah/Goa
Aru	0.25	28	0.49	26	0.13	28	Mah, Pun/Goa
Ass	0.59	15	0.56	23	0.36	19	Mah/Goa
Bih	0.52	18	0.38	28	0.22	25	Mah/Goa
Chh	0.57	16	0.58	20	0.38	15	Mah/Goa
Goa	1.00	1	1.00	1	1.00	1	Goa/Goa
Guj	0.94	5	0.85	6	0.83	5	Mah, Pun/Goa, Mah
Har	0.96	4	0.81	9	0.81	7	Mah, Pun/Goa, Mah
Him	0.52	19	0.80	10	0.47	13	Goa, Mah, Pun/Goa.
Jam	0.39	23	0.74	14	0.31	21	Mah, Pun/Goa
Jha	0.68	13	0.42	27	0.32	20	Mah/Goa
Kar	0.71	10	0.75	13	0.60	9	Mah, Pun/Goa
Ker	0.84	8	0.98	4	0.82	6	Goa, Pun/Goa
Mad	0.60	14	0.53	24	0.38	17	Mah, Pun/Goa
Mah	1.00	1	1.00	1	1.00	1	Mah/Mah
Man	0.26	26	0.77	12	0.22	26	Mah, Pun/Goa
Meg	0.38	24	0.65	18	0.30	22	Mah, Pun/Goa
Miz	0.26	27	0.73	15	0.22	27	Mah, Pun/Goa
Nag	0.35	25	0.63	19	0.23	24	Mah, Pun/Goa
Odi	0.57	17	0.56	22	0.37	18	Mah/Goa
Pun	1.00	1	1.00	1	1.00	1	Pun/Pun
Raj	0.68	12	0.57	21	0.43	14	Mah/Goa
Tam	0.90	7	0.93	5	0.84	4	Goa, Mah/Goa,Mah
Tri	0.40	22	0.81	8	0.38	16	Mah/Goa
Upr	0.51	21	0.49	25	0.29	23	Mah, Pun/Goa
Utt	0.69	11	0.70	16	0.55	11	Mah/Goa
Wes	0.90	6	0.83	7	0.73	8	Mah/Goa,Mah
All States	0.71	9	0.69	17	0.58	10	Mah, Pun/Goa

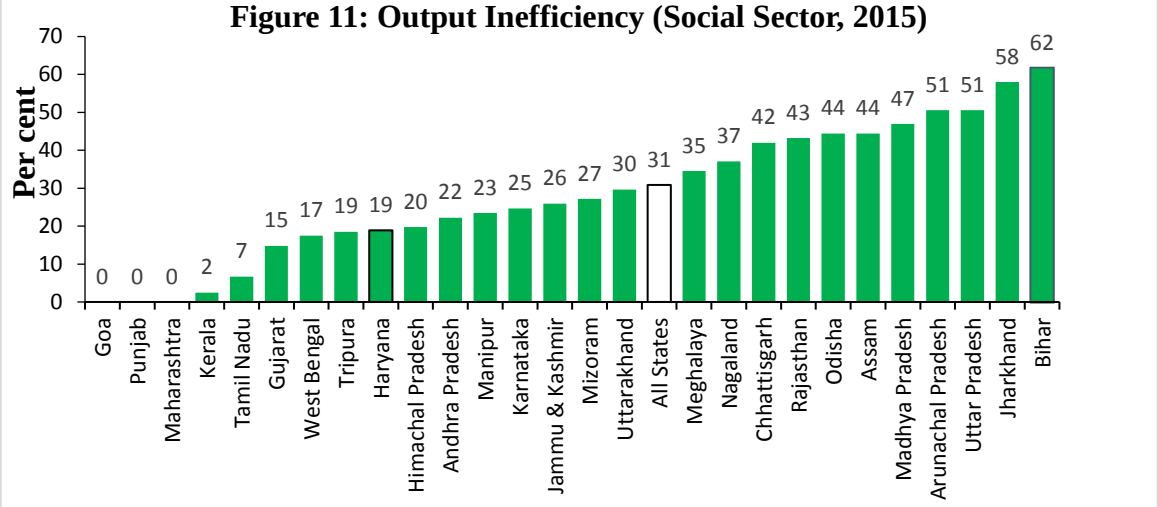
Note: AND: Andhra Pradesh; ARU: Arunachal Pradesh; ASS: Assam; BIH: Bihar; CHH: Chhattisgarh; GOA: Goa; GUJ: Gujarat; HAR: Haryana; HIM: Himachal Pradesh; JAM: Jammu & Kashmir; JHA: Jharkhand; KAR: Karnataka; KER: Kerala; MAD: Madhya Pradesh; MAH: Maharashtra; MAN: Manipur; MEG: Meghalaya; MIZ: Mizoram; NAG: Nagaland; ODI; Odisha; PUN: Punjab; RAJ: Rajasthan; TAM: Tamil Nadu; TRI: Tripura; UPR: Uttar Pradesh; UTT: Uttarakhand; WES: West Bengal.

Figure 10: Input Inefficiency (Social Sector, 2015)



Source: Authors estimation through DEA

Figure 11: Output Inefficiency (Social Sector, 2015)



Source: Authors estimation through DEA

5.4 Result Discussion of Applied DEA Methodology

Overall, a region-wise analysis of the performance of individual states finds that western states such as Maharashtra, Goa, and Gujarat are more efficient in public spending than the other regions. Most of the North-eastern regions excluding Tripura, and the eastern Indian states of Bihar, Jharkhand, and Odisha (excluding West Bengal) are less efficient in the given public spending. These states are "off-track" in a significant proportion of indicators of the MDGs. Among north Indian states Haryana, Punjab, and, some extent, Himachal Pradesh are more efficient than Uttar Pradesh, Rajasthan, and Jammu & Kashmir. Kerala and Tamil Nadu stand out to be more efficient in the south Indian regions than the other states such as Andhra Pradesh and Karnataka. In the central Indian states

of Madhya Pradesh and Chhattisgarh, the efficiency levels are just about average compared to other states for the given public spending.

It is found that many states (7 states) are efficient in public spending on education. Thus, states are spending their resources more efficiently on education than health and overall social sector public spending (3 states each). Goa, Maharashtra, and Punjab are most efficient in overall social spending. It also finds a substantial variation across the sectors among Indian states. For example, Himachal Pradesh is efficient in education spending, while it is not efficient in health and social sector spending. Although the public spending efficiency has improved over the period and ranking of some of the States have also improved, still there is a lot to do for the enhancement of the efficiency of public spending. The non-oriented approach also finds that there is a huge potential among Indian states for improving the efficiency of public spending. Some of the poor performing states such as Bihar, Uttar Pradesh, Jharkhand, Madhya Pradesh, etc., have to focus more on spending efficiency by following their peer groups and best practice. At this juncture, a crucial question is: what determines such divergences in public expenditure efficiencies across the states? This is the focus of next section.

6. What Determines Public Expenditure Efficiency?

As noted in the previous section, the level of efficiency across the states found to be diverse. One of the reasons for such diverse outcomes could be that public expenditure alone might not be sufficient to enhance efficiency. It may just be necessary conditions. There could be various other factors that might affect the efficiency of the social sector in addition to the public expenditure. The effectiveness of public spending could be determined by institutional capacity, extent of leakage in public spending, poor budget management, etc. Existing literature suggests that, in addition to public expenditures, human development outcomes also depend on the quality of governance (Bhanumurthy et al., 2016; Rajkumar & Swaroop, 2008). It means public spending becomes more effective in increasing development outcomes with the presence of good governance.

It is believed that higher economic growth/development is significantly correlated with better outputs of major service delivery like education, healthcare, etc. Rapid economic growth helps in bolstering revenues collection, which increases fiscal space of the economy. Improved resources with Governments motivate them to invest in human development – such as education, health, livelihood promotion, water, sanitation and other basic services, which latter would improve the productivity and efficiency of human resources. Thus, economic growth should be taken into account when assessing/enhancing the efficiency of government spending (see also Anand & Ravallion, 1993; Musgrove, 1996).

From the literature, two major factors that could influence the efficiency levels are size of the economic (economic growth) and the level of governance. Here, we carry out a simple econometric exercise to understand the linkage between level of public expenditure efficiency and quality governance and/or economic growth The analysis is carried out by taking the calculated efficiency score as dependent variable and economic growth

and governance index as independent variables.[25] The similar analysis is carried out separately for education, health, and social sector.

The following model is specified to examine the linkages between efficiency scores obtained from the estimated DEA method and economic growth and governance index.[26] The regression equation for the estimation is:[27]

$$EFF_i = \beta_0 + \beta_1 GOV_i + \beta_2 PSGDP_i + \beta_3 GOV_i * PSGDP_i + \mu_i \dots\dots\dots\dots (4)$$

Where,
EFF is the efficiency score of various public spending,
GOV is overall governance index,[28]
PSGDP is per capita State gross domestic product,
GOV* PSGDP is the interaction term of governance index and per capita state gross domestic product. Here 'i' is the number of States excluding Sikkim and Telangana. The interaction term has been taken to analyze the direct and indirect linkages of governance on the efficiency of public spending.
Table 8 depicts the impact of governance and per capita GSDP on the efficiency score, which is obtained by applying output-oriented approach[29], of Social sector, education and health sector.

The coefficients of governance and per capita GSDP are positive and statistically significant at one per cent level. However, the magnitude of the governance coefficient is more than the coefficient of per capita GSDP. It means governance has a larger impact compared to per capita GSDP for improving the efficiency of the social sector. The same analysis is done by using the interaction term of governance with per capita GSDP to analyze the indirect effect of governance (model 2).[30] The results find that the coefficient of interaction term is statistically significant and positive. It suggests that the efficiency of social sector improves with the presence of both better governance and with economic

[25]The empirical analysis has been done only for the recent year, i.e., 2015-16 due to its policy relevance. As past year DEA analysis is done only to track the trend of public expenditure efficiency.
[26]The PUBLIC AFFAIRS INDEX)PAI(is taken as the proxy for governance index for different states, which is estimated by Public Affairs Centre)PAC(, Bengaluru, Karnataka, India. Public Affairs Index)PAI(is a data driven platform to rank the 30 States of India from the lens of governance. PAI ranked the states of India on the basis of 10 broad themes, and focusing on 68 individual indicators. The broad themes are Economic Freedom, Essential Infrastructure, Fiscal Management, Support to Human Development, Transparency & Accountability, Social Protection, Environment, Women & Children, Delivery of Justice, and Crime, Law & Order.
[27] A robust OLS is used, which corrects standard errors for heteroscedasticity.
[28]The PAI score of 2016 is taken as the proxy of for governance index.
[29]The empirical analysis is carried out for the efficiency scores of output and non-oriented approach. The analysis for input oriented efficiency score isn't justified because of its properties (reducing inputs, i.e., cutting expenditure here). Because of the current expenditure as a share of GDP is already low compare to other developing countries.
[30]To avoid the multicollinearity problem, we have dropped the percapita GSDP from the OLS regression. We keep governance in the equation for testing both the direct and indirect effect of governance on the efficiency.

growth. Thus, both governance and economic growth matter for improving the efficiency of the social sector.

Table 8: Factors Affecting Public Spending Efficiency (output oriented): OLS Regression

	Social Sector		Education		Health	
Variables	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
GOV	2.5195** (7.32)	2.3809** (6.84)	1.3252** (3.83)	1.1929** (3.24)	0.1301 (0.71)	0.0013 (0.01)
PSGDP	1.60E-06** (6.69)		1.42e-06* (2.55)		1.43e-06** (3.45)	
GOV* PSGDP		3.16e-06** (6.70)		2.85e-06* (2.54)		2.87e-06** (3.23)
Constant	-0.6117** (-3.91)	-0.5429** (-3.44)	0.1101 (0.69)	0.1745 (1.06)	0.7919** (10.25)	0.8540** (10.13)
R-squared	0.7358	0.7349	0.5747	0.5773	0.5991	0.6038
F-statistics	98.94*	94.60**	23.50**	24.85**	13.06**	14.15**
N	28	28	28	28	21	21

Note: Figures in parenthesis are T statistics and * p<0.05, ** p<0.01

While analyzing the efficiency of the education sector, it also finds that governance, economic growth and an interaction term of governance with economic growth have positive and statistically significant on the efficiency of the education sector. Here, it also finds that the magnitude of the governance coefficient is more than the coefficient of economic growth. Similarly, in the case of efficiency of the health sector, it finds that the coefficient of governance is insignificant but economic growth affects the efficiency positively and significantly at one per cent level. However, the interaction term is significant explaining that although directly governance does not affect the efficiency, while the combination of both economic growth and governance will improve the efficiency of the health sector.

The similar analysis is carried out by taking the efficiency scores of non-oriented approach as the dependent variable and all other previously used variables as independent variables. The estimated results (table 9) are very similar to that of previously estimated (table 8). All variables like governance, economic growth and the interaction term of governance with economic growth have positive and statistically significant on the efficiency of the social sector and education sector. Governance has a more significant impact than economic growth both in social and education sector. In the health sector, only economic growth influences its efficiency. However, the overall efficiency of health sector improves with the presence of both economic growth and governance (interaction term significant).

Overall it finds that governance has a larger impact than economic growth on the efficiency of the education sector and social sector. However, it is the economic growth that plays a vital role in improving the efficiency of the health sector. Finally, good governance with high growth helps to improve the efficiency of education, health, and social sector. Therefore, not only economic size but also quality governance matter for improving the efficiency of social sector expenditure.

Table 9: Factors Affecting Public Spending Efficiency (Non-oriented): OLS regression

	Social Sector		Education		Health	
Variables	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
GOV	2.1188* (2.67)	1.8022* (2.25)	2.0899* (2.44)	1.7420*** (1.93)	0.4620 (0.38)	-0.2667 (-0.20)
PSGDP	3.32e-06** (5.54)		3.70e-06** (2.91)		7.59e-06* (2.53)	
GOV* PSGDP		6.69e-06** (5.36)		7.43e-06* (2.88)		1.55e-04* (2.63)
Constant	-0.7252* (-2.05)	-0.5722 (-1.62)	-0.6504 (-1.68)	-0.4818 (-1.20)	-0.1024 (-0.21)	0.2432 (0.46)
R-squared	0.4964	0.5013	0.4684	0.4727	0.5427	0.5538
F-statistics	30.94**	28.74**	14.93**	14.82**	9.25*	9.57*
N	28	28	28	28	21	21

Note: Figures in parenthesis are T statistics and * p<0.05, ** p<0.01, ***P<0.10

7. Summary and Conclusions

The achievement of MDGs has remained an unfinished agenda for most of the Indian states. At the same time, as most of the social sector programs are tailored as per the needs of the regions, extent of backwardness, and groups, the public expenditure pattern is largely focused on addressing the development gaps. However, what is intriguing is that the returns from such expenditures differ from region to region. To understand such divergences, focusing on assessing the efficiency of public expenditures becomes crucial. The study tries to quantify the efficiency of public expenditures on education, health and overall social sector expenditures in 27 major states in India. By considering the relevant data for three-time points, 2002-03, 2008-09 and 2015-16, and by using Data Envelopment Analysis (DEA), the study brings out some interesting results. The study tries to understand the overall outlay-output-outcome linkage in the social sector. In the literature, as there is no such study in the context of India, this study is exploratory in nature and tries to provide some leads on how to prioritise the public expenditures so that outcomes can be maximised.

In the DEA set up for education, Gross enrolment ratio for school education and higher education (two outputs), and public expenditure to GDP ratio and Non-education expenditure to GDP ratio (two inputs) are used as outputs and inputs respectively. The DEA results for input-oriented, output-oriented and non-oriented show some mixed results. The input-oriented approach finds most of the north-eastern states (except Tripura), while the output-oriented approach suggest Nagaland, Jammu & Kashmir, Uttar Pradesh, Jharkhand, and Bihar are most inefficient states in 2015. Overall, the states such as Goa, Gujarat, Haryana, Himachal Pradesh, Maharashtra, Tamil Nadu and Tripura are found to be efficient in 2015. In the Health case, two output namely ISR and life expectancy, and two inputs, i.e., health expenditure and Non-health expenditure to GDP ratio are considered in the DEA set up. It finds that three states namely Haryana, Maharashtra, and

Kerala are most efficient, while states such as Jammu and Kashmir, Uttar Pradesh, Himachal Pradesh, Bihar and Andhra Pradesh are found to be least efficient. Similarly while analyzing the social sectors, our results suggest that Goa, Maharashtra, and Punjab are the most efficient states. The bottom five least efficient states as per input-oriented approach are five north-eastern states namely Arunachal Pradesh, Mizoram, Manipur, Nagaland, and Meghalaya, and as per output-oriented approach are Bihar, Jharkhand, Uttar Pradesh, Arunachal Pradesh and Madhya Pradesh.

Overall, it shows that western states are more efficient in public spending than the other regions. Most of the north-east regions and the eastern Indian states are inefficient states in public spending. South Indian states are relatively better compared to Central Indian states. Further, many states are spending their resources more efficiently on education than compared to health and overall social sector public spending. From these results, one can conclude that there is enough space among the Indian states for improving the efficiency of public spending. Now what drives such divergences across the states in terms of efficiency? A simple econometric analysis finds that the extent of good governance has a positive and significant impact on the efficiency of public spending. Further, the results also show that the governance has a larger impact than economic growth on the efficiency of the education sector and social sector. Economic growth matters more for improving the efficiency in the health sector. The coefficient of the interaction term between governance and economic growth is positive and significant in all the models. Therefore, not only economic size but also quality of governance matter for improving the efficiency of social sector expenditure.

To sum up, the findings of this study suggest that there is wide variation in the public expenditure efficiency across the states. This variation could be due to the extent of good governance in the states as well as on the economic growth. It implies that higher budgetary allocations on social sector alone might not necessarily translate into an improvement in their social outcomes. While the analysis in the paper is exploratory in nature, it clearly suggests that public policy needs to focus equally on outcomes and not just on outlay-based polices. Further, the analysis suggests that quality of governance becomes more crucial in the outlays-outcomes framework and governments need to emphasise on this issue if one needs to reduce the development gaps.

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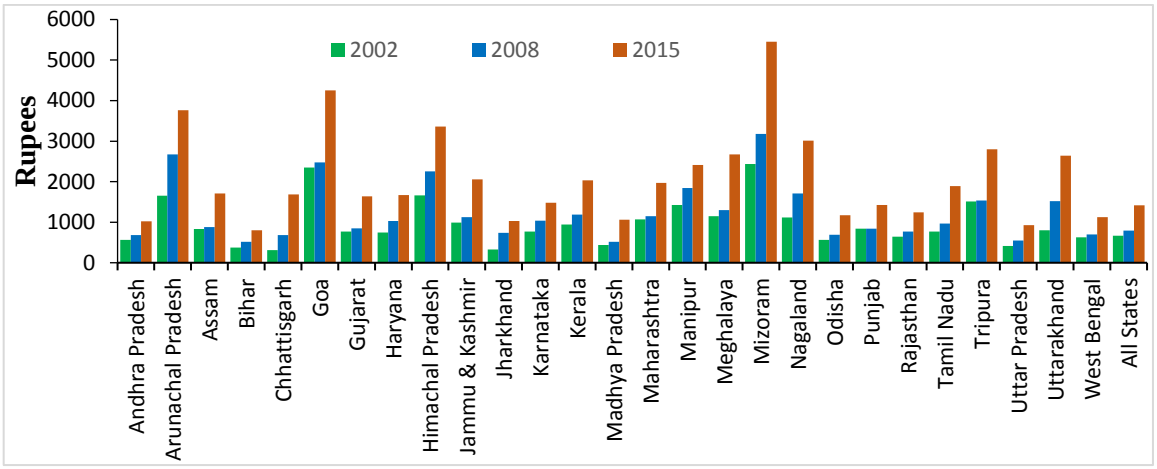
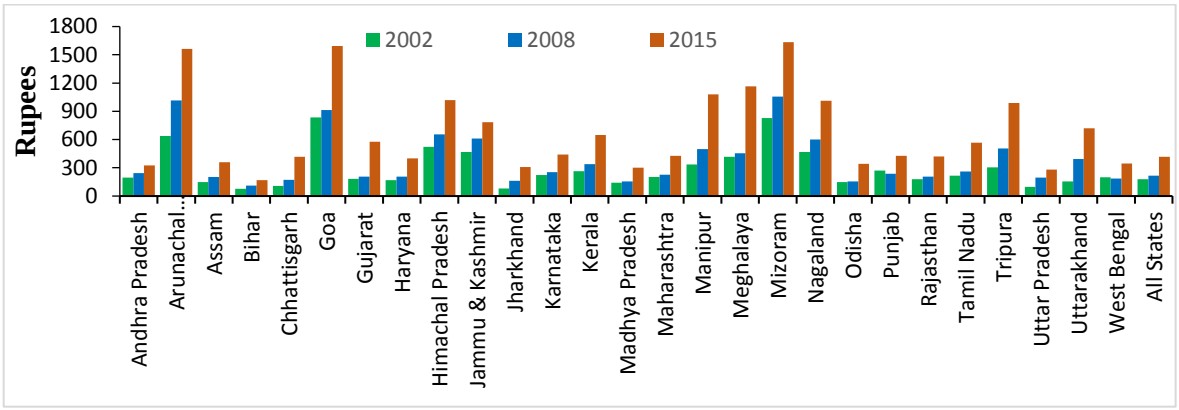
Appendix

Figure 3: Average Annual Percapita Total Education Expenditure in the Indian States



Source: State Finances: A study of Budget, Reserve Bank of India and NIPFP Data Bank compiled from Finance Accounts of respective states.

Figure 4: Average Annual Percapita Total Health Expenditure in the Indian States



Source: State Finances: A study of Budget, Reserve Bank of India and NIPFP Data Bank compiled from Finance Accounts of respective states.

Table A.1: Input and Output Inefficiency of Education and Helath (2002 & 2008)

	Education					Health			
States	**Input Inefficiency**		**Output Inefficiency**		**States**	**Input Inefficiency**		**Output Inefficiency**	
	2002	**2008**	**2002**	**2008**		**2002**	**2008**	**2002**	**2008**
Andhra Pradesh	44	43	25	16	Andhra Pradesh	48	61	12	12
Arunachal Pradesh	66	73	22	15	Assam	21	40	19	18
Assam	16	38	29	32	Bihar	31	53	12	13
Bihar	31	52	43	37	Gujarat	22	2	4	4
Chhattisgarh	-	11	-	3	Haryana	0	0	0	0
Goa	0	22	0	11	Himachal Pradesh	50	57	5	6
Gujarat	9	0	12	0	Jammu & Kashmir	63	70	8	6
Haryana	0	0	0	0	Karnataka	13	31	9	8
Himachal Pradesh	0	1	0	0	Kerala	0	0	0	0
Jammu & Kashmir	50	51	35	16	Madhya Pradesh	21	37	19	17
Jharkhand	-	26	-	13	Maharashtra	0	0	0	0
Karnataka	13	0	14	0	Odisha	31	28	18	14
Kerala	7	10	6	5	Punjab	18	18	5	2
Madhya Pradesh	20	0	25	0	Rajasthan	22	32	12	11
Maharashtra	0	0	0	0	Tamil Nadu	3	18	5	5
Manipur	0	0	0	0	Uttar Pradesh	18	43	14	17
Meghalaya	47	27	17	2	West Bengal	5	17	7	6
Mizoram	73	0	11	0	All States	10	22	10	10
Nagaland	54	65	58	38					
Odisha	31	26	26	17					
Punjab	12	6	24	9					
Rajasthan	23	32	25	16					
Tamil Nadu	0	0	0	0					
Tripura	58	46	17	8					
Uttar Pradesh	19	42	30	20					
Uttarakhand	-	27	-	7					
West Bengal	7	16	24	24					
All States	11	19	22	15					

Source: Authors estimation through DEA

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Ranjan Kumar Mohanty, is Economist, NIPFP
Email: ranjan.mohanty@ nipfp.org.in

N. R. Bhanumurthy, is Professor, NIPFP
Email: nr.bhanumurthy@ nipfp.org.in

National Institute of Public Finance and Policy,
18/2, Satsang Vihar Marg,
Special Institutional Area (Near JNU),
New Delhi 110067
Tel. No. 26569303, 26569780, 26569784
Fax: 91-11-26852548
www.nipfp.org.in