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The efficiency of literacy rates in India: A Stochastic Frontier Analysis

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## ABSTRACT

The present study attempts to identify the level of significance between the literacy rate of different states in India and various factors influencing the literacy scores like poverty, child marriage, reserved category and population. The study identifies the factors that influence the literacy scores based on the level of significance. In this study, it is identified that population and schools are the highly influencing factors with 1% significance. Reserved category has 5% level of significance. Poverty and child marriage have significance level of 10% thus, it doesn't affect the literacy score compared to other factors. Hence, the present study aimed at analysing the progress and disparities in literacy rate of different states of India and in particular analysing the trends and the driving factors behind such low literacy scores. It also examined how well education systems are able to produce literacy among their population.

Keywords: literacy rate, factors, progress, disparities, stochastic frontier, efficiency, production.

## INTRODUCTION

As per Census 2011, the literacy rate at all India level is 72.98% and the literacy rate for females and males are 64.63% and 80.9% respectively (Census 2011, Government of India). During the last decade, the highest improvement in literacy rate was observed among rural females (24%). In 2011, among the State/ Union Territories, the male and female literacy rate is highest in Kerala (male: 96.1%, female: 92.1%) and lowest in Bihar (male: 71.2%, female: 51.5%). The gap in literacy rates of males and females is low in the States of Meghalaya, Kerala and Mizoram (less than 5 percentage points) and high in the States of Rajasthan, Jharkhand, Dadra & Nagar Haveli, Jammu & Kashmir, Uttar Pradesh, and Chhattisgarh (20 percentage points or above) with Rajasthan being the highest. At all India level, the adult (15 + years) literacy rate is 69.3% and that among males is 78.8% and females is 59.3%. Rural – Urban gap existed in Adult literacy rate for both males and females are 11.4% and 23.5% respectively. Literacy is the first and foremost step towards improving quality of life, awareness level and also level of skill of people in the society. Better literacy and educational level definitely have a positive impact on the health as well as other sectors. Hence, the study was made to analyse the factors driving literacy and the factors that hampered and hindered the literacy scores and suggestions to improve the literacy rate of state and nation.

## METHODOLOGY AND MODELS

The Stochastic Frontier Analysis (SFA) technique is used in modelling the functional relationships and estimation of cost efficiency and the potential. The approach recognises the production function and represents the technically maximum feasible output level. Stochastic Frontier uses standard production methodology hence it is parametric technique. A number of functional forms are used in model functions like the Cobb-Douglas form, Quadratic, Normalised quadratic and Translog function. The model can be represented as,

$$y = f(x_i; \beta) \cdot \exp\{v_i - u_i\}$$

where  $y$  is a scalar output,  $x$  is input  $v_i$  is random error term,  $u_i$  is technical inefficiency and  $\beta$  is a vector of parameters.

## DATA

The secondary data for the study was taken from multiple sources like District Information System for Education (DISE), National University of Educational Planning and Administration, Office of the Registrar General and Census Commissioner, India, NSSO, Bureau of Applied Economics and Statistics, Government of India. Poverty, Reserved Category, Availability of schools, Loans and child marriages are the major factors concerning illiteracy. Corresponding data were obtained from Government Census for the years 1991, 2001 and 2011.

## ANALYSIS OF DATA

The main feature taken into account for this model is that even socio-economic factors influence degree of technical efficiency in producing literacy. This paper aims in investigating how well the factors like population, caste, schools, child marriage and poverty influence the literacy rates of any nation. The analysis of the data is presented in Table 2. The value of  $t$  decides if a variable is significant or not. The absolute value of  $t$  for various factors is displayed in Table 2. Population and schools have 1% level of significance that plays major part in influencing the literacy rate. Reserved category is identified to have 5% significance level. The poverty and child marriage have 10% level of significance. Therefore, this model shows that population is not statistically significant in influencing literacy. The average technical efficiency is 0.91 indicating that these factors on average can increase the literacy score by 9%.

Table 1. Summary Statistics of the Data

Input	Range	Maximum	Minimum	Mean	Standard deviation
Schools	1071119	48	1071167	67438.03	181
Poverty	32.2	1.00	39.93	18.53	11.76
Child marriage	28.4	3.2	31.6	13.776	7.7739
Reserved category people	2813437	0	2813437	349880.0	553722.687
Population of a state	228888381.0	228959599.0	71218.0	37047661.4	49081090.0

Table 2.MLE estimates

Variable	Parameter (r)	Coefficient	Standard error	t ratio
Constant	beta 0	4.42	0.19	22.81
Poverty	beta 1	0.01	0.02	0.22
Population	beta 2	0.07	0.02	4.00
Caste	beta 3	-0.07	0.03	-2.52
Child marriage	beta 4	-0.01	0.01	-1.59
Schools	beta 5	-0.09	0.02	-6.08

Table 3. Technical efficiency

estimates

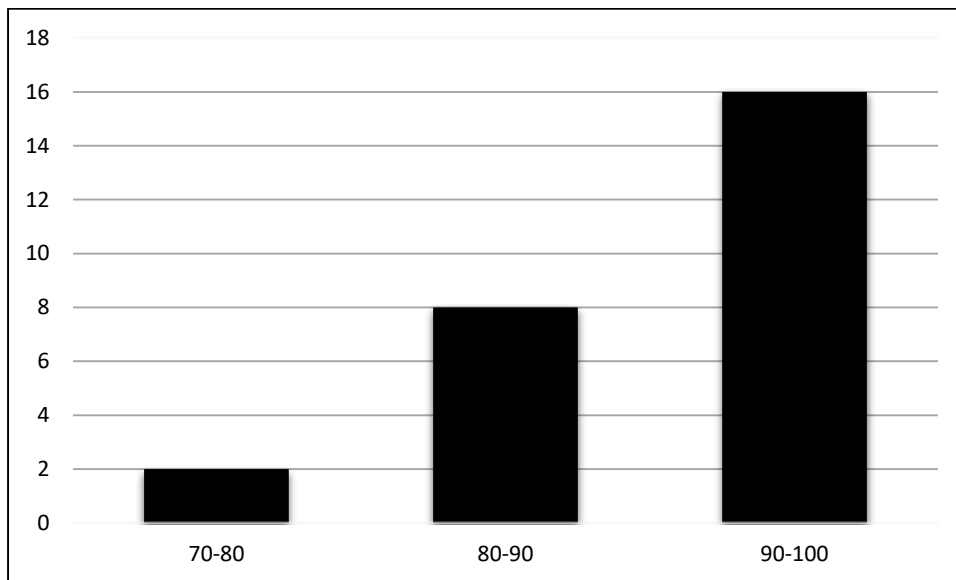
Firm	Efficiency estimates
1	0.91
2	0.73
3	0.90
4	0.76
5	0.90
6	0.89
7	0.92
8	0.90
9	0.93
10	0.83
11	0.85
12	0.93
13	0.98
14	0.94
15	0.99
16	0.85
17	0.88
18	0.97
19	0.91
20	0.89
21	0.97
22	0.96
23	0.95
24	0.95
25	0.89
26	1.00

Mean efficiency = 0.91

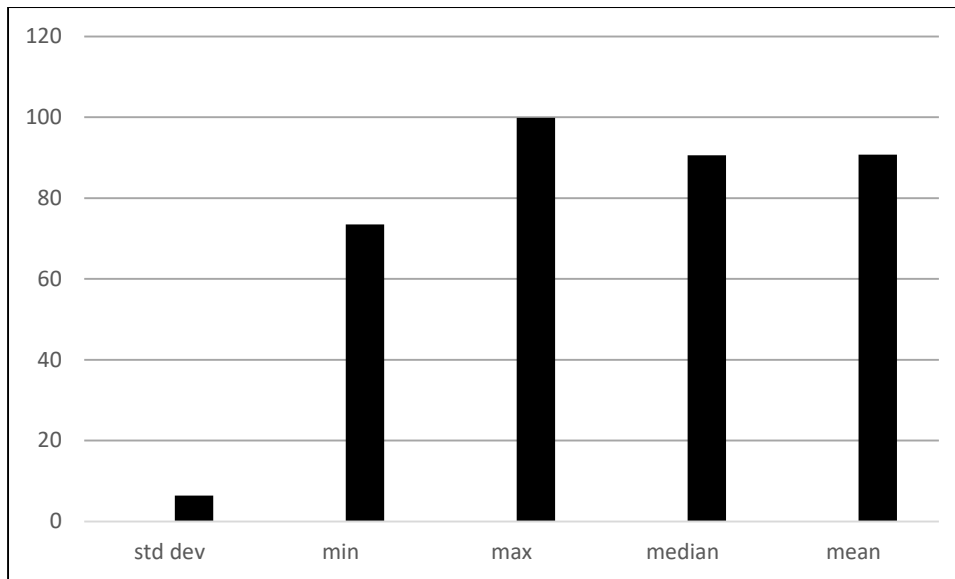
Table 4. Parameters of the data

Standard deviation	6.37
Minimum	73
Maximum	100
Median	91
Mean	91

Graph 1: Distribution of efficiency



Graph 2: Parameters of the data analysed



## RESULTS

The top factors affecting literacy are found to be inefficient and non-maximisation of potential of schools and population. Improvisation of these factors will boost up the literacy rate drastically as, they are ranging in 1% significance. Reserved category is observed in 5% level of significance. Poverty and child marriage range only 10% level of significance; that sparsely affect the literacy rate. From the mean efficiency 0.9, it indicates that improvisation of the factors leads to 9% increase in literacy rates. Enrolled students dropped out of school due to various reasons like unavailability of proper teaching staff, unavailability of proper sanitation and basic facilities, domestic works, traditional hindrances and poverty. Thus, it is not important to have enormous number of schools but to have a required number of schools with efficient usage (Berger, Toma, 1994).

## CONCLUSION

Literacy can be defined as "the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts". In simpler contexts, it is the ability of a person to read, write and understand one's own name in at least one language. At the national or a bigger community level, in a participative and people's democracy like India, a literate population or literate workforce is required to build a nation with strong social, economic and political foundations. Literacy is an important starting point that brings awareness in people to work towards a better living and higher standard of living. It helps them to break free from the terrible and dark horrors of ignorance, avoid getting manipulated, and being left out of the mainstream. At an individual level, the increased confidence of every newly literate person to achieve the impossible bears heart-warming testimony to the power of literacy.

Hence, the study aimed at analysing the progress and disparities in literacy rate of different states of India and in particular analysing the trends and the driving factors behind such low literacy scores. It was found that population and schools have significance level of 1% largely influencing the literacy score. The factors that has significance level of 10% are child marriage and poverty. Reserved category is identified to exist in 5% significance, that has

comparatively less influence over the literacy scores. Dropout rates is the strongest of all factors in non-utilisation of all schools. Thus, government and people must work together and bring up an integrated approach that would uplift people from the hands of poverty, traditional hindrances and ignorance and importantly take measures to improve quality and quantity of education and make more citizens enrol in schools and at least acquire basic primary education.

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