An Econometric Analysis of Literacy Rates in Different States of India and Factors Stimulating Them

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Abstract:

Literacy in India has continued to be the prime concern of governments since independence drawing substantial attention from policy makers, researchers and activists. Level of literacy is a crucial influencer of the socio- economic development of any country. Researchers have been using various econometric techniques to analyze the impact of various social and economic determinants of literacy rate in India. The scope of this paper is to visualize the influence of some of these determinants on literacy rates of Indian states using a linear regression model. The prime focus of the present study is to achieve cognizance regarding government policies of providing educational facilities free of cost to children. It is an attempt to comprehend that the provision of free educational facilities has no role in augmenting the literacy rate inspite of the former's sole aim of increasing the level of literacy in the country.

Keywords: Econometrics, Free Education, Literacy Rate, Mid Day Meal Scheme

Introduction:

"**H**e, who opens a school door, closes a prison." Victor Hugo rightly said that those who elicit the virtue of knowledge never pave a way towards unscrupulous and immoral activities. Though education imparted in schools is not the ultimate reservoir of knowledge but it is definitely the root of wisdom and prudence. Basic or elementary level of education is a must to live a self-sustaining and complacent life. Higher levels of education augment the academic knowledge of the individual and boost the growth of society as a whole. Even though the significance of attaining higher education cannot be neglected, elementary level of education has received keen attention by the government authorities in many countries. This is mainly because the child's lifetime opportunities of psychological, physical and mental growth rely on this level of education. A reliable gauge of elementary school education is the level of literacy and the literacy rate. The ability to understand and convey basic message in any language is defined as literacy. In simpler words, it is defined as the ability to read and write and the percentage of people who acquire this ability in a certain population is called literacy rate. National Statistical Organization (NSO) defines literacy rate as the percentage of literate persons among persons of age 7 years and above.

In order to raise the level of literacy in India, governments are bound to prompt parents and guardians to send their children to schools. People belonging to down- trodden families always lay secondary emphasis on education and it is the ultimate responsibility of the government to arouse the need of schooling among them and bring the country out of the vicious cycle of illiteracy. Government of India launched the National Programme of Nutritional Support to Primary Education (NPNSPE) in 1995 which is popularly known as Mid- Day Meal Scheme today. The primary concern of the government was to abate hunger among students and to facilitate healthy growth. Deprivations from basic necessities pave a way towards anxiety disorders; hence this was an attempt to provide nutrition to all the primary school students of India. Additionally government tried to foster social egalitarianism and gender equality by making all the children sit together and eat. It is important to note that the idea of providing nutritional meals to students at schools dates back to 1920's. In 1925, a school lunch programme was initiated in Madras. Before 1995, many states and union territories tried to improve nutritional level of students by utilizing their own resources and international funds. This programme offered 3 kilograms of food to children in primary schools. A major development took place in 2001 which transformed the nature of the programme; Supreme

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Court passed an order that all states will provide cooked mid- day meals to primary schools' students for a minimum of 200 days an year. The meal was standardized to have a minimum content of 300 calories and 8 to 12 grams of protein.

The second major event in the history of Indian education system was the enforcement of Right to Education (RTE) Act or The Right of Children to Free and Compulsory Education Act. The law was enforced on April 1, 2010 under Article 21A of the Indian Constitution. The law was passed to transcend the inabilities of parents to afford education at primary level. It made education free for all the students between the ages of 6 and 14 years. During this elementary educational span of 8 years, no child can be detained or expelled from the school. The schools were asked to make special provisions for trainings of dropouts to bring them at par with the students of their academic level. Furthermore, in order to surpass the shortcoming of lack of resources, availability of textbooks, stationery, uniforms and other educational paraphernalia was made free of cost. Stipends, reimbursements and scholarships were also provided based on certain criteria so that poverty- stricken parents do not take their children to work and allow them to attend schools.

Now the question arises that whether the availability of free education and free educational paraphernalia along with provision of scholarships and stipends factually augment the level of literacy or not. The aim of all these efforts by the government was to increase the literacy rate by diminishing the dropout rate and increasing the enrolment and retention rates. The rise of this skepticism is due to the fact that few reports have shown that the repercussions of such programmes are not as satisfactory as were prophesied earlier and, in fact, negative to some extent. It has also been proved in many of the past researches that children from poor families get enrolled only for the sake of having a fulfilling meal with no urge to study. Aggravating this, the 100 per cent passing rule or the no detention policy build careless attitude among students. Worth of something that is achieved without any efforts is never recognized; in this scenario, worth of freely provided education is not acknowledged fully. With no or less formal provision of free education after the primary level, the incentive to get higher educati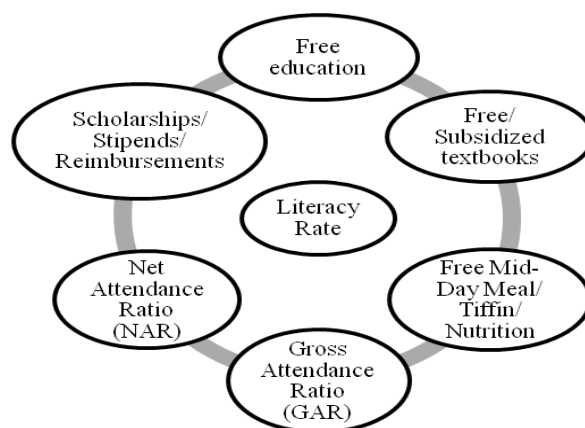on plummets leading to diminishing enrolment rates at the secondary and higher secondary levels. The foremost duty of the teachers has become supervising and distributing the meals, staying vigilant towards the hygiene conditions and keeping a check on cook's practices; thereby shifting the core essence of their work to such non- teaching activities.

This paper focuses on the impact of such incentives provided by governments on the literacy rates for different regions in India. The variables taken into consideration in this study are percentage of students of age 3 to 35 currently attending education at pre- primary and above level and received free education, free/ subsidized textbooks, mid- day meal/ tiffin/ nutrition and scholarships/ stipends/ reimbursements. Along with these variables, attendance ratios have also been included with an aim to study the effect of these ratios on the literacy rates. The previously mentioned variables influence attendance ratios, which in turn affect literacy rates. However the given analysis focuses on the sole influence of the attendance ratios on the level of literacy for different regions so as to understand in what extent and how significantly the Gross Attendance Ratio (GAR) and Net Attendance Ratio (NAR) at primary and upper primary/ middle level affect literacy rates. NSO defines NAR and GAR as follows:

"For each level of education, NAR is the ratio of the number of persons in the official age-group attending a particular level of education to the number persons in that age- group."

"For each level of education, GAR is the ratio of the number of persons attending in the level of education to the number persons in the corresponding official age group."

Figure 1.

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Materials and Methods:

In order to carry out the econometric analysis which is required to find out how different factors affect literacy rate in the country, secondary data source of 'Key Indicators of Household Social Consumption on Education in India' has been used. This document was prepared on the basis of primary data collected through the survey conducted by National Statistical Organization (NSO) in India as a part of NSS 75th round. The time period appertaining to this report was from July 2017 to June 2018. The survey had been conducted by NSO with an aim to develop empirical information about various indicators on education like level of education, attendance, incentives received by students, expenditure on education etc.

The Key Indicator document provided cross-sectional data during the specified period for different regions of India. The values pertaining to these variables are given separately for rural and urban regions except for the separate figures of rural Delhi. The data is given for the following states and union territories only:

   i.   Andhra Pradesh
   ii.   Assam
   iii.   Bihar
   iv.   Chhattisgarh
   v.   Delhi
   vi.   Gujarat
   vii.   Haryana
   viii.   Himachal Pradesh
   ix.   Jammu & Kashmir
   x.   Jharkhand
   xi.   Karnataka
   xii.   Kerala
   xiii.   Madhya Pradesh
   xiv.   Maharashtra
   xv.   Odisha
   xvi.   Punjab
   xvii.   Rajasthan
   xviii.   Tamil Nadu
   xix.   Telangana
   xx.   Uttarakhand
   xxi.   Uttar Pradesh
   xxii.   West Bengal

The sample size is given as the sum of 22 urban observations and 21 rural observations of the given states and union territories. Thus the sample size is 43 (i.e. 22+21). The regression analysis has been done using Microsoft Excel, 2013 and R- 3.6.2.

The following assumptions were stated before specifying the model:

1. The model has been assumed to be linear in parameters leading to the analysis of a linear regression model and is subject to unintentional error.
2. The parameters are estimated according to the method of Ordinary Least Squares (OLS).
3. It is assumed that all the assumptions of Classical Linear Regression Model (CLRM) have been followed.

The multiple linear regression model fitted to the given data is specified as follows:

$$LR = \beta_1 + \beta_2\,FE + \beta_3\,SSR + \beta_4\,FT + \beta_5\,MDM + \beta_6\,GAR + \beta_7\,NAR + \mu$$

Where

   i. β_1 is an intercept coefficient,
   ii. $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ are the partial slope coefficients of explanatory variables FE, SSR, FT, MDM, GAR and NAR respectively and
   iii. μ is the random error term.

The abbreviations used for the variables are given in Table 1.

Table 1. Variables and their Abbreviations

Serial No.	Variables	Abbreviations
1.	Literacy Rate (in per cent) among persons of 7 years and above	LR
2.	Percentage of students of age 3 to 35 currently attending education at pre- primary level and above level and received Free Education	FE
3.	Percentage of students of age 3 to 35 currently attending education at pre- primary level and above level and received Scholarships/ Stipends/ Reimbursements	SSR
4.	Percentage of students of age 3 to 35 currently attending education at pre- primary level and above level and received Free/ Subsidized Textbooks	FT
5.	Percentage of students of age 3 to 35 currently attending	MDM

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	education at pre- primary level and above level and received Mid- Day Meal/ Tiffin/ Nutrition	
6.	Gross Attendance Ratio at primary and upper- primary/ middle level	**GAR**
7.	**Net Attendance Ratio at primary and upper- primary/ middle level**	**NAR**

However there are certain limitations to this model which are discussed below:

1. The model is susceptible to some error of measurement or factuality misinterpretation because the data used is purely secondary. Moreover different variables are measured for different levels of education and age groups. For example, literacy rate has been measured for the age group of 7 and above whereas percentage of students currently attending education at pre-primary level and above level and received free education is measured for the age group of 3-35 years. Due to unavailability of more precise empirical data, this consideration has been ignored.

2. The data for all the states and union territories was not provided in the source document. However information regarding 20 states and 2 union territories (i.e. Delhi and Jammu & Kashmir) has been considered as a wieldy representative of all the states and union territories in the country. It is noteworthy that Jammu and Kashmir was not considered as a union territory during the period for which the survey has been conducted.

3. Since the data is cross- sectional in nature, problem of heteroscedasticity may prevail. This is because India is a highly diversified nation with magnificent differences in population per unit square of land, types of communities in different places, number of governmental educational institutes, level of infrastructure etc.

Results and Discussions:

The summary output has been presented in the following tables:

Table 2. Regression Results

	Coefficients	Standard Error	t Stat	P-value
Intercept	-40.591864	29.72381783	-1.365634261	0.180526186
FE	0.031816088	0.197027386	0.16148053 4	0.872617812
SSR	-0.01175047	0.09181124	-0.127985092	0.898873061
FT	-0.03013882 5	0.202209524	-0.149047506	0.882347978
MDM	-0.345957137	0.265657129	-1.302269351	0.201094788
GAR	0.025974197	0.390782249	0.0664671 88	0.947373647
NAR	1.459757954	0.434069008	3.362962836	0.001840271

Table 3. Regression Statistics

Multiple R	0.792035569
R Square	0.627320343
Adjusted R Square	0.565207067
Standard Error	6.025063222
Observations	43

Table 4. ANOVA Table

	Df	SS	MS	F
Regression	6	2199.780772	366.6301286	10.09961769
Residual	36	1306.849926	36.30138683	
Total	42	3506.630698		

Since the t- statistics and their corresponding p- values are given in Table 2, the significance of partial regression coefficients was tested under the null hypothesis that each of them is individually zero, that is, the individual variables have no effect on LR. Such a null hypothesis was tested against the alternative hypothesis that each population coefficient is different from zero which implies that each individual variable affects the LR. Thus the test was two- tailed since these variables can affect LR in a positive or a negative manner. The degrees of freedom were 36 which were obtained by subtracting number of parameters estimated (i.e.7) from the number of observations (i.e.43). Using t test of

significance, it was found that each partial regression, except that of NAR, was statistically insignificant implying that variables under consideration (except NAR) do not affect LR. It is surprising to know that even the coefficient of GAR was statistically insignificant. The difference in GAR and NAR is the prevailing differences in perspectives while calculating the ratios. GAR considers all the students attending a particular level of education while NAR takes into account students attending a particular level of education in the official age-group. The partial coefficient of NAR was statistically significantly different from zero at 1 percent level of significance proving that NAR highly influences LR. Partial regression coefficient of NAR, being positive implies a positive relationship between them. Technically, other things remaining constant, if NAR increases by one unit, LR increases *on an average* by 1.46 percentage points.

In order to evaluate whether all the variables collectively have an impact on LR, joint F- test was used. The null hypothesis that all partial regression coefficients are simultaneously equal to zero implying that the variables do not affect LR collectively stood against alternative hypothesis that all partial regression coefficients are different from zero. The numerator degrees of freedom were 6 (=7-1) and denominator degrees of freedom were 36 (=43-7). F statistic was provided in Table 4. The test of overall significance of the estimated multiple regression rejected the null hypothesis that the impact of all explanatory variables is simultaneously equal to zero. Evidently all the explanatory variables collectively have an impact on LR. Surprisingly most of the independent variables were not having an impact on dependent variable individually, but all of them collectively influence the latter significantly.

The model shows a strong linear fit with R^2 of 0.627. This means that around 63 percent of the variation in literacy rate has been explained by the model. Adjusted R^2 of about 0.565 is quite fair for a cross- section sample of a diversified country like India.

Conclusion:

The present analysis tried to examine how different factors influence literacy rate in India. A multiple linear regression model has been used with 43 observations based on empirical information provided by National Statistical Organization (NSO) for the period of July 2017- June 2018. Six determinants have been used as regressors to probe their significance in determining literacy rates of rural and urban regions of Indian states and union territories. The results reveal that availability of free education and free educational paraphernalia has no substantial effect on literacy rate. Government's expenditure on providing education free of cost is veritably a wasteful expenditure. It may be the case that these provisions act as stimulators for children to attend schools but do not stimulate them to learn. The Net Attendance Ratio (NAR) has a positive and statistically significant impact on average literacy rate. Consequently the efforts of children to attend schools and their positive attitude towards studying and learning are the key determinants of literacy rate. Notwithstanding the truth that the urge to fetch education comes from the core desire of people to study and learn, governments should not stay carefree regarding the matters of literacy. Policy makers should lay emphasis on making people aware of the indubitable importance of education. Even if free education is provided, parents will not be encouraged to send their children to schools until and unless they are enlightened with the fact that schooling is an ultimate boon for their children. Children need to be tackled in a sedate way and efforts should be made to make them recognize the fruit education bears.

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