Economic Affairs, Vol. 64, No. 2, pp. 377-385, June 2019
DOI: 10.30954/0424-2513.2.2019.13

Infrastructural Development and Enrollment in Elementary Education in Odisha

Himani Majhi* and Minati Mallick

Department of Economics, North Orissa University, Baripada, Mayurbhanj, 757003, Odisha, India

*Corresponding author: minuminati@rediffmail.com

ABSTRACT

The role education plays in socio-economic progress of a country cannot be undermined as minimum educational attainment has a direct and positive bearing on efficiency in resource allocation leading to higher income and an equitable distribution of such income thereby reduces inequality. (Tilak1978, Psacharapolous and Woodhall, 1995). An attempt has been made in this paper to construct a composite infrastructure index for primary education level and also tries to find out the role infrastructure plays in promoting the enrolment in primary schools in the state of Odisha.

Secondary data relating to population, number of schools, gross enrolment ratio, availability of infrastructural facilities for the year 2015-16 have been collected from Census Reports, Government of India, Directorate of Elementary Education, Directorate of Mass Education, Government of Odisha and the District Information System for Education data (DISE) published by National University of Educational Planning and Administration, New Delhi. The study covers entire 30 districts of Odisha.

The physical infrastructure index for primary schools of Odisha is constructed using the technique of Principal Component Analysis on the basis of which the districts are ranked. The impact of school infrastructure facilities on the gross enrolment in primary schools is studied by using multiple linear regression model.

The result shows that the physical infrastructure does play a significant role in promoting enrolment in primary education level. The classroom related factors though positively influence the enrolment but not significantly. This might be the reason behind districts like Mayurbhanj and Kandhamal having low infrastructure index but high enrolment. However, increase in enrolment is not enough for educational attainment. Care need be taken to employ more trained teachers so that quality of education can be improved and the objective of human capital formation can be fulfilled.

Highlights

- Physical infrastructure does play a significant role in promoting enrolment in primary education level.
- The classroom related factors positively influence the enrolment but not significantly.

Keywords: Infrastructure, Enrolment, Principal Component Analysis, Education, Development

The role of education in overall social and economic progress cannot be undermined as minimum educational attainment has a direct and positive bearing on efficiency in resource allocation leading to higher income and an equitable distribution of such income thereby reduces inequality. (Tilak1978, Psacharapolous and Woodhall, 1995). It is widely realised that the societies with a higher percentage of literates have higher levels of development while primary education takes the lead as the return is highest in primary education followed by secondary and then university education. In India, the social rate of return is 29.3 per cent in primary education compared to 10.8 per cent in the University level education (Tilak, 1994).

Prominent in the Millennium Development Goals (1990-2015) was "Achieve universal primary education: Ensure that boys and girls alike complete primary schooling". The emphasis on universal primary education without gender discrimination needs no elaboration.

The right to education has been enshrined as a fundamental right in the Constitution of India which states that: "the State shall provide free and compulsory education to all children aged six to fourteen years in such a manner as the state may, by law, determine". Right of Children to Free and Compulsory Education (RTE) Act, 2009 ensures this. As a result the literacy rate in India has been constantly rising, improving from 64.8 per cent in 2001 census to 74.04 per cent in 2011 (census data). Both the central and the state governments have been paying increasing attention to the need of "education for all."

Infrastructure is an important tool for facilitating quality education in elementary education system. Expenditure incurred towards the development of school facilities leads to improvement in attendance especially among poor children (Angrist and Lavy 1999) and girls. It produces non- trivial benefits in school enrolment rates. (Lokshin and Yemtsov 2005), (Behrman and Wolfe 1987; Jalan and Ravillion 2003). Increase in number of schools and improvement in pupil–teacher ratio (PTR) increase accessibility and in turn, improve the knowledge and capabilities of children in schools. This leads to greater education enrolment and rise in literacy (Deolaikar 1997).

Realizing the importance of infrastructure, both the central and the state governments have undertaken several schemes to improve physical infrastructure of government schools. Availability of physical infrastructures not only improves the quantity but also ensures quality in elementary education. According to the Right to Education Act (RTE) 2009, every school should have an all indicator classroom, teacher, toilets for boys and girls, safe and adequate drinking water, and a playground, a kitchen for the mid-day-meal, boundary wall, electricity and computer. In fact, these are the basic facilities that a school should have. Sarva Shiksha Abhiyan (SSA) is one of the flagship programs of Government of India, which has been implemented in all the 30 districts of Odisha since 2001 in order to achieve universal elementary education of satisfactory quality with a focus on education for life. The cost of the programme is shared by the Centre and the State in the ratio of 65:35. The programme supports infrastructure development, for example construction of new school buildings and class rooms, toilets, drinking water facility, free supply of school uniforms for girls and supply of text books. With this backdrop, an attempt has been made in this paper to construct a composite infrastructure index for primary education level and also tries to find out the role infrastructure plays in promoting the enrolment in primary schools in the state of Odisha. The paper is organised in the following manner. Section-II presents data and methodology of the analysis. Results and discussion are given in Section-III. Section-IV highlights the main findings of study and suggestions for policy options are contained in the Concluding Section.

Data and Methodology

Secondary data relating to population, number of schools, gross enrolment ratio, availability of infrastructural facilities for the year 2015-16 have been collected from Census Reports, Government of India, Directorate of Elementary Education, Directorate of Mass Education, Government of Odisha and the District Information System for Education data (DISE) published by National University of Educational Planning and Administration, New Delhi. The study covers entire 30 districts of Odisha.

The physical infrastructure index for primary schools of Odisha is constructed using the technique of Principal Component Analysis on the basis of which the districts are ranked**.** The infrastructure indicators considered here include Single Classroom Schools (X_1) Single Teacher Schools (X_2) Playground Facility (X_3), Boundary Wall (X_4), Girls Toilet (X_5), Boys Toilet (X_6), Drinking Water facility (X_7), Kitchen Shed (X_8), Electricity (X_9) and Computer facilities (X_{10}), Pupil Teacher Ratio (X_{11}), Student Classroom Ratio (X_{12}), and Average Teachers per School (X_{13}). These are the basic facilities a school should have. It encourages enrolment and provides a healthy atmosphere to the pupils.

Number of Schools is the most important infrastructure for the development of education system so also low Pupil Teacher Ratio (PTR) is. For each class there should be a class room so that both teacher and students can carry out the classroom process comfortably. Single teacher handling all the classes , carrying out official works mid -day meal arrangements and many more tasks like this is always overburdened and it is difficult to achieve the targeted goals. Therefore the average number of

teacher per school is also considered to study the impact on enrolment. Similarly availability of toilet facilities especially for girls and drinking water is highly imperative for promotion of enrolment. The availability of kitchen shed, electricity, blackboards are also necessary. For attracting girls to the school in more numbers presence of female teacher is highly felt and government is trying its best to appoint more female teachers especially at primary school level.

School infrastructure index is constructed following the method of factor analysis. The districts are ranked accordingly.

$$I_{it} = \Sigma W_{jt} X_{jit}$$

Where, I_{it} is the school infrastructure index of the i^{th} district in t^{th} point of time (2015-16), W_{jt} measures j^{th} component of school infrastructure for t^{th} time and X_{jit} is the value of the j^{th} component of infrastructure for the i^{th} district at t^{th} time period. W_{jt} is estimated with the help of principal component analysis in order to arrive at a common infrastructure index for school infrastructure in the states of Odisha.

After computing the composite index of school infrastructure, the simple statistical variations tests i.e., computed values of Standard Deviation (S.D) and Mean (X) are applied to these composite indices. Then by using these two values, all the districts of state Odisha are classified into three groups i.e., Highly Developed, Developed, Backward and Highly Backward. The groups are categories by using the following cut off points.

Highly Developed	First Group ≥ Mean + S.D
Developed	Mean + S.D ≤ Second Group ≥ Mean
Backward	Mean ≤ Third Group ≤ Mean – S.D
Highly Backward	Fourth Group ≤ Mean – S.D

The impact of school infrastructure facilities on the gross enrolment in primary schools is studied by using multiple linear regression model.

$$Y = a + \beta_1 f_1 + \beta_2 f_2 + \varepsilon$$

Where,

Y = Gross Primary Enrolment

f_1 = Factor Score 1

f_2 = Factor Score 2

Factor1 > X_3, X_4, X_5, X_6, X_7, X_9 and X_{10}(Basic amenities)

Factor 2>X_1, X_2, X_8, X_{11}, X_{12}, X_{13}(Teaching facilities)

RESULTS AND DISCUSSION

Gross Enrolment Ratio across Districts

District wise Gross Enrolment Ratio at primary level in Odisha is shown in the table 1. A cursory glance at the table shows that Mayurbhanj has highest GER of 154.66 per cent followed by Kandhamal (121.20%) and Nuapada (118.77%). The bottom three districts are Nayagarh (96.58%), Deogarh (97.24 %) and Cuttack (95.60%).

The top three districts are tribal dominated districts and provision of infrastructural facilities through special schemes has encouraged enrolment significantly. The mid day meal is acting as an attracting force in the tribal belt. Also in the districts of Mayurbhanj and Kandhamal the ST enrolment is higher as compared to that in other districts which is quite natural as the percentage of ST population is higher in these districts.

Composite Infrastructure Index (Primary School level)

According to the Right to Education Act (RTE), 2009, "every school should have an all indicator classroom, teacher, toilets for boys and girls, safe and adequate drinking water, a playground, a kitchen shed, boundary wall, electricity, computer, pupil teacher ratio, student classroom ratio, and average teachers per School". In fact, these are the basic minimum facilities that a school should have.

An attempt is made here to compute a composite infrastructure index at elementary education level for all the 30 districts of Odisha through Principal component analysis. The correlation matrix of the indicators is presented in Table 2.

Its shows that there is a strong correlation between X_3 and X_4, $X_3$and X_6, X_3 and X_7, X_3 and X_9, X_3 and X_{10}, X_4 and X_5, X_4 and X_5, X_4 and X_6, X_4 and X_9, X_4 and X_{10}, X_5 and X_6, X_5 and X_7, X_5 and X_9, X_5 and X_{10}, X_6 and X_7, X_6 and X_9, X_6 and X_{10}, X_9 and X_{10}, Moderate correlation between X_1 and X_2, X_3 and X_8, X_3 and $X_{8,}$ X_3 and X_{13}, X_4 and X_{13}, X_5 and X_{11}, X_5 and X_{11}, X_5 and X_{12}, X_5 and X_{13}, X_{11} and X_{12}. Other indicators are having weak correlation. In order to overcome this problem of multicolinearity the factor analysis

Table 1: Gross Enrolment Ratio across the Different Districts of Odisha (2015-16)

Sl. No.	District	Gross Enrolment Ratio	SC Enrolment Ratio	ST Enrolment Ratio	OBC Enrolment Ratio
1	Anugul	105.73	22.1	22	41.8
2	Balesore	105.29	24.2	20.2	37.3
3	Bargarh	103.94	24.1	22.3	47.5
4	Bhadrak	111.37	26.1	4.9	44.8
5	Bolangir	109.93	19.3	25.4	49.7
6	Boudh	99.78	26.9	13.9	56
7	Cuttack	95.60	21.9	7.9	40.9
8	Deogarh	97.24	17.6	44.2	35.8
9	Denkanal	99.10	22.4	22.7	43.4
10	Gajapati	111.79	6.2	69.3	19
11	Ganjam	102.73	24.2	6	57.2
12	Jagatsingpur	108.31	25.4	2.4	46.4
13	Jajpur	113.63	26	14.9	38
14	Jharsuguda	104.86	19.7	32.6	26.1
15	Kalahandi	111.85	19.9	33.3	43.6
16	Kandhamal	121.20	19.2	61.4	14.6
17	Kendrapara	106.49	24.9	2.1	53.4
18	Keonjhar	106.95	10.4	60	24.8
19	Khordha	106.66	15.3	11.6	32.2
20	Koraput	107.64	16.1	58.8	13.3
21	Malkangiri	115.00	20.5	68.4	4.6
22	Mayurbhanj	154.66	6.6	71.1	17.6
23	Nabarangapur	105.71	14	63.9	18.1
24	Nayagarh	96.58	16.9	9.3	64
25	Nuapada	118.77	14.4	40.2	42.6
26	Puri	104.22	23.7	1.1	57.4
27	Rayagada	112.79	15.4	66.7	12.3
28	Sambalpur	104.65	20.6	42.1	24.3
29	Sonepur	99.16	28.8	12.1	52.6
30	Sundargarh	107.25	10.5	59.6	11.9

Source: DISE Data.

Table 2: Correlation Matrix

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13
X1	1.000												
X2	.622	1.000											
X3	.357	.214	1.000										
X4	.437	.271	.956	1.000									
X5	.562	.352	.855	.909	1.000								
X6	.526	.348	.909	.975	.951	1.000							
X7	.487	.290	.916	.983	.930	.993	1.000						
X8	.478	.371	.641	.766	.750	.798	.790	1.000					
X9	.325	.193	.933	.913	.822	.891	.899	.540	1.000				
X10	.424	.287	.926	.872	.805	.852	.851	.484	.928	1.000			
X11	.221	.224	.744	.768	.593	.699	.731	.511	.780	.675	1.000		
X12	.292	.203	.717	.704	.693	.666	.659	.566	.701	.654	.628	1.000	
X13	.322	.110	.605	.584	.640	.643	.619	.329	.668	.651	.163	.280	1.000

Source: Calculated by author.

Table 3: Total Variance Explained

Component	Initial Eigen values		
	Total	% of Variance	Cumulative %
1	8.867	68.209	68.209
2	1.421	10.930	79.139
3	.985	7.578	86.717
4	.612	4.707	91.424
5	.419	3.225	94.648
6	.326	2.507	97.155
7	.146	1.119	98.275
8	.110	.849	99.124
9	.046	.352	99.476
10	.037	.284	99.760
11	.022	.170	99.931
12	.007	.050	99.981
13	.002	.019	100.000

Extraction Method: Principal Component Analysis.

Table 4: Communalities

	Initial	Extraction
X1	1.000	.798
X2	1.000	.771
X3	1.000	.940
X4	1.000	.968
X5	1.000	.893
X6	1.000	.966
X7	1.000	.956
X8	1.000	.635
X9	1.000	.933
X10	1.000	.838
X11	1.000	.606
X12	1.000	.573
X13	1.000	.411

Extraction Method: Principal Component Analysis; Source: Computed by Author.

is run for the thirteen variables considered. It is possible to do so as the value of KMO statistics is greater than 0.5 i.e. 0.850 and the Bartlett's Test of Sphericity is significant.

The table 3 shows that the Eigen values of component 1 and component 2 are 8.867 and 1.421 respectively which are significant. For other components, it is not significant. There are two factors resulting from the analysis explaining a total of 79.139 percent of the variations in the entire data. The percentage of variation explained by first and second factor is 68.209 and 10.930 respectively after the Varimax is performed.

The table 5 shows the rotated factor loadings which are the correlations between the variables and the factors. Considering 0.70 as the cut-off point in this rotated component matrix two factors are obtained comprising of variables as follows:

- Factor 1 >X_3,X_4, X_5, X_6, X_7, X_9 and X_{10} named as basic amenities.
- Factor 2>X_1, X_2,X_8, X_{11}, X_{12}, X_{13} named as classroom related concerns or teaching facilities.

Table 6 represents the composite infrastructure index at primary school level across 30 districts of Odisha. On the basis of the index values, the districts are ranked. A cursory glance at the table

Table 5: Rotated Component Matrix

	Component	
	1	2
X_1	.241	.860
X_2	.060	.876
X_3	.958	.148
X_4	.949	.260
X_5	.851	.411
X_6	.909	.373
X_7	.926	.315
X_8	.624	.496
X_9	.962	.090
X_{10}	.894	.196
X_{11}	.775	.075
X_{12}	.743	.145
X_{13}	.627	.134

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization.

Table 6: Composite Infrastructure Index across Districts of Odisha

Sl. No.	District	Composite Value of school Infrastructure	Rank	Sl. No	District	Composite Value of school Infrastructure	Rank
1	Ganjam	152.41	1	16	Anugul	60.4	16
2	Balasore	109.12	2	17	Jagatsingpur	58.43	17
3	Keonjhar	102.53	3	18	Dhenkanal	56.17	18
4	Koraput	92.72	4	19	Mayurbhanj	53.7	19
5	Cuttack	89.99	5	20	Gajapati	53.25	20
6	Rayagada	87.43	6	21	Sambalpur	32.68	21
7	Kalahandi	87.25	7	22	Baudh	29.66	22
8	Bolangir	83.24	8	23	Jharsuguda	26.87	23
9	Jajpur	82.35	9	24	Kendrapara	21.56	24
10	Sundargarh	77.62	10	25	Bhadrak	19.91	25
11	Kandhamal	75.32	11	26	Malkangiri	13.27	26
12	Puri	72.79	12	27	Nayagarh	11.94	27
13	Khurda	71.91	13	28	Subamapur	8.14	28
14	Baragarh	64.57	14	29	Nuapada	5.76	29
15	Nabarangpur	64.15	15	30	Deogarh	4.76	30

Source: DISE, Data; Note: Composite Index is calculated by the communalities and physical school infrastructure values.

reveals that the district of Ganjam tops the list with an index value of 152.41 followed by Balasore (109.12) and Keonjhar with 102.53. Khurda district which includes Bhubaneswar city has the highest literacy of 80.19 but so far as infrastructure index is considered it ranks 13 in the list. Last positions are occupied by districts like Subamapur (8.14) Nuapada (5.76), Deogarh (4.76).

The districts are grouped into four categories as highly developed, developed, backward and highly backward as shown in Table 7. Ganjam, Balasore and Keonjhar, have highly developed infrastructure base while majority fourteen districts are known to be developed. Kendrapara, Bhadrak, Malkangiri, Nayagarh, Subarnapur, Nuapada, and Deogarh districts are not having good infrastructure facilities at primary level.

Impact of School Infrastructure on School Enrolment

The impact of school infrastructure and the gross enrolment at primary level in all the 30 districts of Odisha is studied by running regression. The factor scores for two factors are used as independent

Table 7: Classification of Districts on the Basis of Infrastructure Index

Sl. No.	Level of Development	District
I	Highly Developed	Ganjam, Balasore andKeonjhar
II	Developed	Koraput, Cuttack, Rayagada, Kalahandi, Bolangir, Jajpur, Sundargarh, Kandhamal, Puri, Khurda, Baragarh, Nabarangpur, Anugul and Jagatsingpur
III	Backward	Dhenkanal, Mayurbhanj, Gajapati, Sambalpur, Baudh and Jharsuguda
IV	Highly Backward	Kendrapara, Bhadrak, Malkangiri, Nayagarh, Subamapur, Nuapada and Deogarh

Source: Authors Calculation.

Table 8: The Regression Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.782[a]	.611	.582	58591.09348	1.770

Source: Computed by Author.

Table 9: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	158883.527	10697.221		14.853	.000
	REGR factor Score 1 for analysis 1	69142.097	10880.099	.763	6.355	.000
	REGR factor Score 2 for analysis 1	15667.741	10880.093	.173	1.440	.161

a. Dependent Variable: total primary enrolment; Source: Computed by Author.

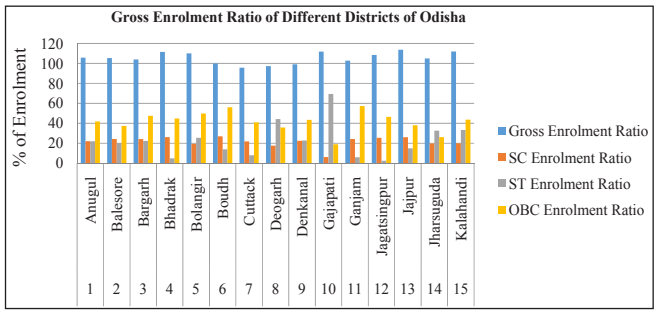

Fig-1.a

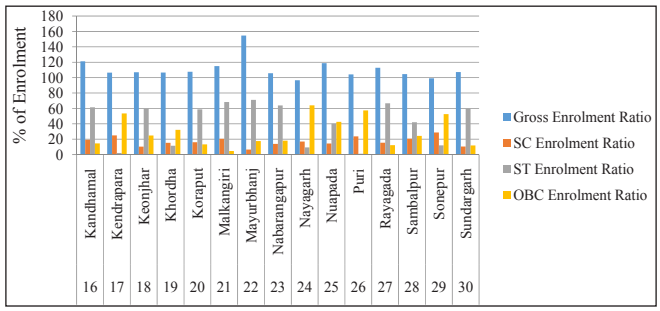

Fig-1.b

Figs. 1.a and 1.b shows the category wise Gross enrolment ratio across 30 districts of the state of Odisha

variables instead of actual variables and the gross enrolment as the dependent variable.

The regression results as shown in the Table 8 indicate that 61.10 per cent of the variations in gross enrolment in primary schools of Odisha are explained by these two factors. The Durbin-Watson Statistic d<2 i.e. 1.770 indicates no autocorrelation or positive serial correlation between total primary enrolment and factor score 1 and factor score 2. The coefficient of the first factor is significant while that for the second factor is not significant even though it has a positive impact on the gross enrolment as it is indicated in table 9. Again the first factor is the most important one as its standardised coefficient is as high as 0.763 as compared to the coefficient of the second factor.

Findings

Following are the major findings of the study:

- It is observed that in 24 districts out of 30 district of Odisha the GER is more than 100 percent. Tribal dominated districts like

Mayurbhanj and Kandhamal are having good picture so far as the GER is concerned.

- There are two principal components explaining a total variance of 79 .139. The initial eigen values of component 1 is 8.86 and component 2 is 1.421. Percentages of variance 68.209 and 10.930 respectively.
- The Durbin-Watson Statistic 1.770 indicates no autocorrelation between total primary enrolment and factor score 1 and factor score 2 of school infrastructure.
- On the basis of the composite infrastructure index computed, Ganjam tops the list with an index value of 152.41 followed Balasore (109.12) and Keonjhar with 102.53. Khurda district which includes Bhubaneswar city has the highest literacy of 80.19 but so far as infrastructure index is considered it ranks 13 in the list. Last positions are occupied by districts like Nuapada (5.76), and Deogarh (4.76). Accordingly the districts are grouped into four categories as developed, highly developed, backward and highly backward.
- The regression results show that 61.10 per cent of the variations in gross enrolment in primary schools of Odisha are explained by the factors. This clearly indicates that infrastructure is an important requirement in promoting education.
- The result shows that the physical infrastructure does play a significant role in promoting enrolment in primary education level. The classroom related factors though positively influence the enrolment but not significantly. This might be the reason behind districts like Mayurbhanj and Kandhamal have low infrastructure index but high enrolment.

CONCLUSION

Education imparts knowledge and skills and shapes values and attitudes and is vital for progress of a civil society. It is universally recognized as an important investment in building human capital that affects growth in two ways, first human capital levels act as a driver of technological innovation. Secondly human capital stocks determine the speed of absorption of technology. In education, primary education is most important as it is the base of nation building.

The Constitution of India, the National Policies on Education and the Five-Year Plans have laid much emphasis on the role of education in development. The 93rd constitutional amendment made education a fundamental right. The National Policy on Education, 1986 (modified in 1992) envisaged free and compulsory education for all children up to the age of 14 years before the onset of 21st century 'Sarva Siksha Abhiyan' has put emphasis on enrolment and attendance (through the mid-day meal scheme) in India.

Provision of infrastructure not only improves the quantity but also helps in enhancing quality. Quantity and quality combined together can enrich the human resource of a nation.

The Government should not shift the responsibility of primary education to private management. What is needed at the moment is that the central Government must intervene to provide infrastructure facilities to all primary schools with a monitoring mechanism through the Panchayati Raj Institutions to ensure Quality Education for All. (QEFL)The additional resource required for the purpose may be mobilised through additional education cess. Both quality and quantity of the primary education can be improved by implementing existing programme more systematically. A small step in the direction may achieve huge development in future.

The emphasis from the government has to be on primary education. During post-independence, an attempt has been made to provide free, compulsory education to all children up to the elementary stages. It is observed that there has been improvement in the condition of primary education in the country, state and district. However, it is not enough. High drop-out is still a problem to be taken care of. Enhancing quality of education in rural areas is the need of the hour.

REFERENCES

Blaug, M. 1965. The Rate of Return on Investment in Education, in Blaug, M(ed), Economics of Education ELBS,UK.

Tilak, J.B.G. 1978. Poverty, Inequality and Education, Social change, June 1978, pp.25-28.

Colclough and Christopher. 1982. The Impact of Primary Schooling on economic Development, A Review of the Evidence. *World Development*, **10**(3).

Ahluwalia, I.J. 1984. Industrial Growth and Stagnation: Infrastructure Constraints. New Delhi: Oxford University Press.

Joshi, B.M. 1990. Infrastructures and Economic Development in India. Ashish Publishing House, New Delhi-110026, PP-25.

Pattnaik, B.K. 1994. Coordinating Health Care and Primary Education. Yojana, December 31, pp 14-16.

Angrist, J. and V. Lavy. 1999. Using Maimonides Rule to Estimate the Effect of Class Size on Scholastic Achievement. *Quarterly Journal of Economics*, **114**(2): 533–75.

Roy, Allen, Kamaiah, B. and Rao M.G. 2000. Educational Expenditure of Large States, *Economic and Political Weekly*, April 22, p-14.

Ushadevi, M.D. 2001. Poverty Database in Education Strategies for Monitoring Poverty Reducation, *Economic and Political Weekly*, July 2001.

Kaual, Rekha. 2001. Accessing Primary Education-Going beyond the Class Room, *Economic Political Weekly*, Jan 13, 2001.

Singh, Shailendra and Kala Seetharam Sridhar. 2002. Govt. and Private Schools Trends in Enrolment and Retention, Economic and Political Weekly, October 12, 2002.

Brenneman, A., and M. Kerf. 2002. Infrastructure and Poverty Linkages: A Literature Review, Mimeograph, Washington, DC: The World Bank.

Bagchi, K.K. and Sarkar, Satyen. 2003. Development of Social Sector in West Bengal: A Study in Inter-District Disparity, *Indian Journal of Regional Science*, **35**(2): 115-130.

Ali, I. and E.M. Pernia. 2003. Infrastructure and Poverty Reduction: What is the Connection? ERD Policy" Brief 13, pp. 1–13. Metro Manila, Philippines Metro Manila, Philippines: Asian Development Bank.

Baltagi, B.H. 2005. Econometric Analysis of Panel Data, Third edition. Chichester: John Wiley & Sons.

Rajan, R.G. *et al.* 2013. Report of the Committee for Evolving a Composite Development Index of States, New *Delhi:* Government of India.