Artha Vijnana
Vol. LVIII, No. 1, March 2016, p. 71-93

Educational Development in Blocks of Paschim Medinipur District (West Bengal) between 2005-2006 and 2012-2013: Panel Data Analysis through Education Index

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Education is considered as a crucial factor in determining the level of social development of a region directly and the level of its economic development indirectly. Educational development being multi-faceted, this paper constructs a composite Education Index for the Blocks of Paschim Medinipur District (West Bengal, India) over the period 2005-2006 to 2012-2013. Education Index is observed to have high inter-block as well as high inter-temporal variations. These variations are explained by factors like social status of the people, urbanization, employment status and demographic structure in a panel data framework. Urbanization, social status of the people and demographic structure are statistically significant both partially and individually. Work Participation Rate is statistically significant partially but not individually.

I Introduction

Education is treated as one of the most important aspects of social development leading to human development in particular and economic development in general. It helps the human beings achieve one of the most important aspects of human life, viz., knowledge. Achievement of much desired knowledge is important not only for its own sake, it also as it acts as an instrument for the attainment of a decent standard of living and is an indirect instrument for the attainment of a long and healthy life. It is difficult to capture the achievement of knowledge by a single variable. It can be reflected by a number of partial achievements or ends like enrolment ratio, dropout rate (inversely), literacy rate, adult literacy rate, female literacy rate, literacy rate of the weaker sections, etc. and a number of instruments or means like availability and access to schools, teacher student ratio, child population teacher ratio, student school ratio, student classroom ratio, basic amenities available in the schools, etc. A large number of variables, means and ends may be identified to explain the present status of achievement of knowledge in a society. Attainment of knowledge is dependent on a number of factors like social status of the people, urbanization, employment status of the people, demographic structure, etc.

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Realising the importance of education, a number of policies have been followed in recent years at different layers of the Government of India. Educational development varies across blocks and also in different districts of India. Only a few studies are found at the regional level explaining variation in the attainment of education. Most of them are at the aggregate level based on one or two indicators of educational attainment explained by some aggregate socio-economic factors. In this paper we try to construct a suitable composite Education Index (EI) for the blocks of Paschim Medinipur District on the basis of all the important indicators of educational attainment. EI is expected to have high inter-block as well as inter-temporal variations. These variations are explained by a number of factors in both panel data and pooled data frameworks. We also try to assess the true importance or relative importance of different factors in explaining the variations of EI so as to make a clear policy on this social aspect of human life in the region.

II Objectives

In this paper we want to address the following objectives:

- To develop a suitable methodology for constructing an EI for the blocks of Paschim Medinipur District for the period 2005-2006 to 2012-2013 on the basis of reliable and available indicators of educational development.
- To analyse the nature of variation in EI across the blocks and over the studied period through a two-way ANOVA.
- To explain in a panel data framework the variation in EI across the blocks and over the studied period in terms of factors like demographic structure, social status of the people, urbanization and employment status, etc.

Before performing the panel data analysis we shall examine the nature of variation of different factors in terms of two-way ANOVA.

Then we shall do a pooled data analysis to examine the simple, partial, ortho-partial and relative importance of different factors in explaining the variation in EI across the blocks and over the period.

Finally, the panel data analysis will be used to assess the role of different factors in explaining separately the inter-block and the inter-temporal variations in EI.

III Description of the Studied Area

Paschim Medinipur, located in the southern part of West Bengal, has been carved from the erstwhile Medinipur district, then the largest district of India. It came into existence in the present form on 1st January, 2002. It is situated between 22^0 57' 10" and 21^0 36' 35" north latitude and between 88^0 12' 40" and 86^0 33' 50" east longitude. It is bounded by Bankura district on the north, Purba Medinipur district on the east and south-eastern, Hoogly on the east, and states of Orissa and

Jharkhand on the west and south-west. Located in the south-western part of West Bengal, Paschim Medinipur is one of the country's 250 most backward districts. Geographical area of the district is 9295.28 sq. km. It has four sub-divisions, viz. Kharagpur, Medinipur Sadar, Ghatal and Jhargram. As per the census 2011, population was 59.43 lakhs. With a population density of 636 inhabitants per sq. km., it is the fourteenth most densely populated district in India. Population growth rate was 14.44 per cent during 2001-2011. The overall sex ratio was 960 whereas it was 963 for the age group of 0-6 years. The district has the highest scheduled tribes population in the State. The work participation rate has risen from 41.0 (in 2001 Census) to 42.4 (in 2011 Census) and in this case it ranks second in the State. It has a literacy rate of 79.04 per cent (against the state average of 76.3 per cent) and a wide literacy gap of nearly 15 per cent has been observed between male and female population. All its twenty-nine blocks present a diversity in different aspects of EI. Given its demographic and socio-economic characteristics, the district presents a unique opportunity to understand the issues associated with the different aspects of EI. However, a block level study in terms of educational attainment in this district has hardly carried out.

IV Review of Literature

The United Nations Development Programme (UNDP) in its Human Development Reports (HDRs) introduces the concept of EI as a part of Human Development Index (HDI) calculated across countries for different years. Different countries and their constituent states also construct EI through National Human Development Reports and State Human Development Reports across states and districts respectively. But they fail to follow the UNDP methodology due to non-availability of data on the variables used by the UNDP across states and districts. They try to use one or two proxy variables and the index is not systematic. Some districts try to prepare District Human Development Reports to explain the nature of disparity in economic, educational and social aspects across blocks but they do not try to construct any index as such because of the non-availability of suitable data. Thus, there is no empirical literature on educational development index across blocks of Paschim Medinipur or other districts. Empirical literature on EI across districts in any state or across states in any country is also incomplete and has little analytical significance.

As already mentioned, UNDP in its HDRs calculates the educational attainment of different countries over years in terms of the methodology developed by its research group. It considers the combined primary and secondary enrolment ratio as the simple indicator of educational achievement of the children in the school going age and the simple adult literacy rate as the indicator of educational achievement of the adults. It combines the indexes of these two indicators through a weighted average with 1/3 weight to combined primary and secondary gross enrolment ratio and 2/3 weight to adult literacy. In the National Human Development Report of India (2003) only the general literacy rate was used for the calculation of educational attainment index because neither the enrolment ratios nor the adult literacy rates are available for the states. In the Human Development Report of West Bengal (2004) two indicators, viz., general literacy rate and percentage of children in the age group 6 to 14 years attending school were used for the calculation of educational attainment index by attaching 2/3 weight to general literacy rate index and 1/3 weight to attendance index because reliable data on the later variable are available and they are a true indicator of educational attainment. Thus, while the status of education of the people in any region can be measured by a number of variables, only those variables are used in the construction of Human Development Index which are easily and reliably available and which can directly or indirectly measure the attainment of knowledge. If we consider variables which directly or indirectly measure the attainment of knowledge, a large number of variables can be identified. National University of Educational Planning and Administration (NUEPA), New Delhi, through its District Information System for Education (DISE) and the Government of India (MHRD, Department of School Education and Literacy) have identified as many as 23 indicators for the calculation of Educational Development Index (EDI) separately for primary and upper primary levels of education and also a composite index for the entire elementary education based exclusively on the DISE data. However, this index has not been widely accepted because of it arbitrarily weighs different variables.

General literacy rate is a crude indicator of educational development. Enrolment ratio for the school going age is a better indicator and is used by UNDP. Expected years of schooling in place of gross enrolment ratio are a better indicator for the children and mean years of schooling in place of adult literacy rate are also an improved indicator for the adults. Therefore, from 2010 UNDP calculates EI by combining expected years of schooling and mean years of schooling. As the National Human Development Report of India (2003) has used only the general literacy rate for the calculation of educational attainment index, it fails to give a proper estimate of attainment of education. On the other hand, the Human Development Report of West Bengal (2004) has used two the indicators, viz., general literacy rate and percentage of children in the age group of 6 to 14 years attending a school for the calculation of educational attainment index by attaching 2/3 weight to general literacy rate index and 1/3 weight to enrolment index which leads to an overemphasis on the gross enrolment ratio. Hence, we used available secondary data for computing educational attainment index as per the UNDP methodology.

V Data and Methodology

In the present paper we use the UNDP methodology for calculation of EI across the blocks of Paschim Medinipur District. True, there are three reliable sources for data on variables in this context across the blocks of districts in India. They are Census of India for population related data, District Information System for

Education (DISE) for education related data and District Statistical Hand Books for general data. We use data from these three sources to apply the UNDP methodology to calculate EI and identify some factors for explaining the variations of EI across the blocks of Paschim Medinipur District. As DISE data are available from 2005-2006 to 2012-2013 we construct EI having 29×8 = 232 observations. Absolute enrolment figures given in the DISE data are of no use unless we have the number of potential children for primary. upper primary education in different blocks in the relevant years. On the other hand, the Census data provide information on general literacy in the age group six years and above and do not provide reliable data on adult literacy rate. Thus, at the first instance, the UNDP methodology of using the enrolment ratio and adult literacy rate for construction of EI seems not possible. But by using the DISE data and Census data we try to use the UNDP methodology.

By using Census data on rural population, literacy rates and age-wise distribution of the rural population we have calculated projected population in the age-group of 5 to 14 years and in the age group of 15 years and above. To calculate projected population, we have used the following log quadratic equation $LogY = a + b\,t + c\,t^2$, where Y stands for population in a particular block and t stands for time. a, b and c are calculated by using population for the block in the years 1991, 2001 and 2011. Population in any other year is then estimated by taking the antilog of the calculated value of $LogY$ for corresponding value of t. Enrolment ratio is then calculated as the ratio between the enrolment figures obtained from DISE and the projected population in the age group of 5 to 14 years. From it the number of children never attending school is subtracted and the subtracted value is subtracted from the projected literates for the said years to arrive at an estimate of adult literates. Adult literacy rate is calculated as the ratio between this and projected population in the age group of 15 years and above.

These two rates are combined for arriving at the EI by using the UNDP methodology. Before combining, they are normalized to the index values by using normative goalposts at 0 (0 per cent) and 1 (100 per cent), and not by using observed goalposts at observed minimum and observed maximum, to reflect the amount of actual achievement and the amount yet to be achieved. Then for the calculation of education index we have used 2/3 weight to adult literacy rate index and 1/3 weight to combined primary and secondary gross educational enrolment ratio index.

To explain the variability of EI across the blocks and over time a numbers of factors like demographic structure, social status of people, urbanization and occupational structure are considered. The status of demographic structure has been accounted by the size of family (FS). Ratio of schedule tribe population in total population (STR) has been included as an indicator of social status of the people in the region. Population density (PD) has been included as a proxy variable of urbanization. To define the employment status of people, we have considered ratio of work participation in total population (WPR). Lastly, population growth rate (PGR) has been included as a proxy variable of the status of demographic development. In this context the Census data are used mainly for total population, literacy rate and ST ratio, while the DISE data are used principally for enrolment and educational infrastructure (teachers, school, etc.) and District Statistical Hand Books for percentage of main and marginal workers and areas of different blocks.

A two-way ANOVA is used to explain the nature of variation in EI across the sample blocks and over time. As EI is dependent on a number of variables which have either inter-block or inter-temporal or both types of variation, EI is expected to have significant variation of both types. Two-way ANOVA for all hypothesized factors are done in the second step to have a first-hand judgment about whether a factor is responsible for inter-temporal variation, inter-block variation or both. If a factor is found to have a significant inter-block variation but an insignificant inter-temporal variation, then it cannot be responsible for inter-temporal variation of EI but this factor may or may not be responsible for inter-block variations of EI.

Given the structure of the data, factor analysis for explaining the variation in EI as reflected in two-way ANOVA is done through multiple regression both in panel and pooled data frameworks. In factor analysis through multiple regression, whether that is done in panel data framework or in pooled data framework, the importance of explanatory variables taken together is properly expressed by R^2 and significance is tested by a F-statistic. Significance of the individual variables is tested by t-statistic, though it fails to judge the relative importance of them – it helps having their marginal importance only. In panel data regression we have three types of R^2 – overall R^2, within R^2 and between R^2. In pooled regression, on the other hand, we have only an overall R^2 which is very close to the overall R^2 in panel regression. The advantage of pooled regression over panel regression is that the former has a larger degree of freedom. Here we shall perform pooled regression for another reason. In this regression we shall try to evaluate relative importance of individual factors in terms of their simple, partial and orthopartial correlations with EI.

While simple correlation between any factor and the EI measures the degree of linear association (strength and direction) between them, it fails to reflect the true importance of the factor because of the overlappingness of its explanatory power with that of other factors. It also fails to reflect the partial importance or the relative importance of the factor. Partial correlation, on the other hand, is used in the existing literature to judge the partial importance of the factor, but in effect it fails to do so leading to several confusions. It helps judging only the marginal importance of the factor. Orthopartial correlation as introduced by Mondal (Mondal 2008) gives true partial importance or correct partial correlation of the explanatory factor. Orthopartial correlation of any factor with EI measures the proportion of variability of EI explained by that part of the explanatory factor which is not linearly explained by other explanatory factors. On the other hand, partial correlation of the factor with EI measures the proportion of variability of that part of EI which is not linearly explained by other explanatory factors explained by that part of the explanatory factor which is not linearly explained by other explanatory factors. Thus, if X_1 and X_2 are two uncorrelated factors of Y and if the squared simple correlation of X_1 with Y is 0.90 and that of X_2 with Y is 0.09, the squared multiple correlation will be 0.99. True partial correlations of these two variables are 0.90 and 0.09 respectively as are given by their orthopartial correlations. Partial correlations of these variables, as are used in the existing literature, will be calculated at 0.989 (0.90 out of 0.91) and 0.90 (0.09 out of 0.10), and they fail to reflect their true partial importance. True relative importance of an explanatory variable can be obtained by averaging squared simple correlation and squared orthopartial correlation in case of two explanatory variables and by averaging squared simple correlation, a series of squared semi-orthopartial correlations and squared orthopartial correlation in case of more than two explanatory variables with proper choice of weights for them.

Finally, we have used Panel data regression to explain the role of different factors in explaining between-group or inter-block variation for all time periods taken together, within-group or inter-temporal variation and also overall variation in EI.

VI Results and Discussion

EI and Its Components

EI for the studied blocks is calculated on the basis of Enrolment Index (ERI) and Adult Literacy Index (ALI) over the studied period. These two indices are presented in Tables 1 and 2 respectively. Table 1 shows that in the year 2005-2006 ERI was the highest in Jamboni (0.972) followed by Daspur-II (0.870) and lowest in Kharagpur-I (0.299) preceded by Debra (0.577). It implies that Jamboni succeeded in attaining 97.2 per cent development in enrolment and Kharagpur-I succeeded in attaining only 29.9 per cent.

On the other hand, in 2012-2013 the ERI was the highest in Keshpur (1.000) followed by Sabong (0.876) and lowest in Kharagpur-I (0.496) preceded by Ghatal (0.656). It implies that Keshpur succeeded in attaining 100 per cent development in enrolment and Kharagpur-I succeeded in attaining only 49.6 per cent in enrolment. Binpur-II, Keshpur, Garbeta-I, Garbeta-II, Garbeta-III, etc., had high enrolment rates which may be partly due to strong and extensive Sarba Siksha Abhijan (SSA) in these blocks. Though Jamboni was in the top position in 2005-2006, it moved down to 17^{th} position in 2012-2013.

Table 1: Enrolment Index (ERI) for Blocks of Paschim Medinipur District in 2005-2006 and 2012-2013

Block	2005-2006			2012-2013		
	Enrolment rate	Enrolment index	Rank	Enrolment rate	Enrolment index	Rank
Jhargram	64.40	0.644	17	91.37	0.806	13
Binpur-I	62.80	0.628	21	88.67	0.782	19
Binpur-II	67.33	0.673	13	96.66	0.853	5
Jamboni	97.17	0.972	1	89.26	0.787	17
Nayagram	59.42	0.594	25	97.26	0.858	4
Sankrail	68.18	0.682	11	95.38	0.841	6
Gopiballavpur-I	60.58	0.606	24	89.35	0.788	16
Gopiballavpur-II	71.80	0.718	6	88.19	0.778	20
Salboni	68.56	0.686	10	95.30	0.841	7
Keshpur	67.18	0.672	14	113.37	1.000	1
Garbeta-I	61.47	0.615	23	94.10	0.830	9
Garbeta-II	63.88	0.639	18	89.65	0.791	15
Garbeta-III	65.54	0.655	16	95.12	0.839	8
Medinipur	58.72	0.587	27	92.49	0.816	11
Debra	57.67	0.577	28	78.14	0.689	27
Pingla	75.78	0.758	4	92.60	0.817	10
Keshiary	70.68	0.707	8	98.61	0.870	3
Dantan-I	63.78	0.638	19	84.47	0.745	24
Dantan-II	66.03	0.660	15	88.68	0.782	18
Narayangarh	62.73	0.627	22	90.65	0.800	14
Mohanpur	71.45	0.715	7	81.94	0.723	25
Sabong	86.08	0.861	3	99.30	0.876	2
Kharagpur-I	29.89	0.299	29	56.19	0.496	29
Kharagpur-II	59.12	0.591	26	88.04	0.777	21
Chandrakona-I	70.34	0.703	9	86.46	0.763	22
Chandrakona-II	67.33	0.673	12	91.89	0.810	12
Ghatal	62.89	0.629	20	74.33	0.656	28
Daspur-I	71.91	0.719	5	78.82	0.695	26
Daspur-II	87.00	0.870	2	84.56	0.746	23

Source: Government of India, DISE 2005-2006 to DISE 2012-2013.

Table 2 presents the indicator used for educational achievement of the adults and the Adult Literacy Index (ALI). From Table 2 indicates that in 2005-2006 ALI was the highest in Kharagpur-I (0.951), followed by Debra (0.792) and lowest in Jamboni (0.515) preceded by Nayagram (0.535).

On the other hand, in 2012-2013 the ALI was the highest in Daspur-II (0.838), followed by Daspur-I (0.837) and lowest in Nayagram (0.534) preceded by Gopiballavpur-I (0.575). In the year 2012-2013, Jhargram moved down to the 23rd place from the 19th place in 2005-2006, while Jamboni moved up to the 17th place from the 29th place in 2005-2006. Sabong improved its position to fourth place in 2012-2013 from the seventh place in 2005-2006. Similarly, Chandrakona-II improved its position to 12th place in 2012-2013 from 20th place in 2005-2006. Kharagpur-I moved down to 10th position in 2012-2013 from top position in 2005-2006. Salboni, Garbeta-II, Keshiary and Ghatal did not show any change in their relative positions in 2005-2006 and 2012-2013 though adult literacy rates had increased in these blocks in between these two years.

Table 2: Adult Literacy Index (ALI) for Blocks of Paschim Medinipur District, 2005-2006 and 2012-2013

Block	2005-2006			2012-2013		
	Adult literacy rate	Adult literacy index	Rank	Adult literacy rate	Adult literacy index	Rank
Jhargram	64.75	0.647	19	64.99	0.650	23
Binpur-I	61.86	0.619	23	62.62	0.626	25
Binpur-II	60.88	0.609	25	61.88	0.619	26
Jamboni	51.55	0.515	29	68.21	0.682	17
Nayagram	53.53	0.535	28	53.44	0.534	29
Sankrail	63.63	0.636	22	66.76	0.668	19
Gopiballavpur-I	55.88	0.559	27	57.54	0.575	28
Gopiballavpur-II	59.81	0.598	26	66.42	0.664	20
Salboni	64.97	0.650	18	67.06	0.671	18
Keshpur	65.40	0.654	16	66.26	0.663	21
Garbeta-I	66.75	0.668	14	62.83	0.628	24
Garbeta-II	67.58	0.676	13	71.02	0.710	13
Garbeta-III	63.85	0.638	21	65.55	0.655	22
Medinipur	61.06	0.611	24	61.42	0.614	27
Debra	79.17	0.792	2	81.62	0.816	3
Pingla	78.72	0.787	3	77.78	0.778	8
Keshiary	65.85	0.659	15	70.36	0.704	15
Dantan-I	65.18	0.652	17	69.34	0.693	16
Dantan-II	74.75	0.747	8	79.54	0.795	6
Narayangarh	71.81	0.718	10	73.67	0.737	11
Mohanpur	74.51	0.745	9	77.99	0.780	7
Sabong	75.78	0.758	7	81.11	0.811	4
Kharagpur-I	95.05	0.951	1	74.89	0.749	10
Kharagpur-II	69.20	0.692	12	70.88	0.709	14
Chandrakona-I	70.79	0.708	11	75.71	0.757	9
Chandrakona-II	64.65	0.646	20	71.91	0.719	12
Ghatal	76.83	0.768	5	80.29	0.803	5
Daspur-I	76.48	0.765	6	83.74	0.837	2
Daspur-II	78.01	0.780	4	83.78	0.838	1

Source: (i) Government of India, Census of India, 1991, 2001, 2011, (ii) Government of India, DISE-2005-2006 to DISE-2012-2013.

We now take a look at the overall position of the blocks on the basis of the composite EI (composite of ERI and ALI) over the studied period in Table 3. It shows that in 2005-2006 EI is the highest in Daspur-II (0.810), followed by Sabong (0.792) and the lowest in Nayagram (0.555) preceded by Gopiballavpur-II (0.585). It implies that Daspur-II has succeeded in attaining 81.00 per cent development in education and the remaining 19.00 per cent is yet to be achieved. The success is due to its achievement to the turn of 87.00 per cent in enrolment and 78.01 per cent in adult literacy. On the other hand, in the block Nayagram, the attainment in education is only 55.50 per cent and though the enrolment ratio is not very low (59.42 per cent), the ultimate attainment remains low for its low adult literacy rate at 53.53 per cent only. Sabong occupied the second position with EI at 0.792. Pingla and Gopiballavpur-I occupied the third and fourth positions with EI at 0.777 and 0.750 respectively. When we look at the position of the blocks with respect to EI for the year 2009-2010, it is observed that Sabong occupied the top position, followed by Daspur-II and Daspur-I. However, Kharagpur-I, which occupied the sixth position in 2005-2006, fell to the tenth position. Another noticeable change is that Jamboni had slipped to the 25th position in 2009-2010 from 13th position in 2005-2006. Medinipur, Gopiballavpur-I and Nayagram were the worst-performing blocks in 2009-2010. In the year 2012-2013, however, Sabong was most developed with EI (0.833) while Nayagram was the most underdeveloped block with EI (0.642). If we minutely compare EI and the dimension indices (ERI and ALI)) of different blocks in 2005-2006 and 2012-2013, we observe erratic behaviour of the indices. Sabong, which occupied the second place in 2005-2006, moved to the first place in 2012-2013, while Ghatal, which occupied the seventh place in 2005-2006, fell to the 12th place in 2012-2013.

Another noticeable change is that Kharagpur-I slipped to the 27th place in 2012-2013 from the sixth place in 2005-2006. Garbeta-III improved its place to 19th place in 2012-2013 from 23rd in 2005-2006. Garhbeta-I moved down to 24th place in 2012-2013 from the 20th place in 2005-2006. Interestingly enough, Keshpur had the worst-performing blocks on the basis of ALI but best-performing blocks on the basis of ERI. Hence, Keshpur is one of the best-performing blocks. This erratic behavior of EI was due to the erratic behavior of the basic indices (ERI and ALI). It is note-worthy that Jhargram, Binpur-I, Nayargam, Gopiballavpur-I, Garbeta-II, Narayangarh and Chandrakana-I did not show any change their relative positions in 2005-20106 and 2012-2013. If we look at the absolute value of EI, we observe that ten blocks in 2005-2006 and 2006-2007 each, 11 blocks in 2007-2008 and 2008-2009 each, 13 blocks in 2009-2010, 15 blocks in 2010-2011, 18 blocks in 2011-2012 and 20 blocks in 2012-2013 had absolute value of EI greater than 0.704 (average EI of all EI). It implies that EI for the district blocks improved over time. EI for all the blocks taken together is 0.704. This implies that the rural area has attained 70.4 per cent success in education and the remaining 29.6 per cent area has yet to achieve it. As mentioned earlier, the EI has both inter-block and inter-temporal variations. They can be explained by factors like demographic structure, social status of people, urbanization and employment status of the people in both pooled and panel data frameworks.

Table 3: Education Index (EI) and Relatives Rank for the Blocks of Paschim Medinipur District

Block	2005-2006	Rank	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	Rank
Jhargram	0.646	22	0.653	0.665	0.670	0.677	0.676	0.690	0.702	22
Binpur-I	0.622	26	0.635	0.651	0.651	0.652	0.655	0.669	0.678	26
Binpur-II	0.630	25	0.640	0.651	0.655	0.664	0.668	0.685	0.697	23
Jamboni	0.668	13	0.638	0.649	0.653	0.658	0.667	0.688	0.717	18
Nayagram	0.555	29	0.569	0.585	0.592	0.608	0.608	0.625	0.642	29
Sankrail	0.651	19	0.660	0.674	0.678	0.690	0.695	0.708	0.726	17
Gopiballavpur-I	0.574	28	0.585	0.596	0.605	0.610	0.617	0.630	0.646	28
Gopiballavpur-II	0.638	24	0.647	0.658	0.667	0.663	0.668	0.689	0.702	21
Salboni	0.662	15	0.671	0.683	0.691	0.698	0.701	0.713	0.727	16
Keshpur	0.660	16	0.672	0.683	0.694	0.726	0.735	0.756	0.775	6
Garbeta-I	0.650	20	0.660	0.672	0.682	0.689	0.690	0.695	0.696	24
Garbeta-II	0.663	14	0.675	0.691	0.697	0.699	0.707	0.723	0.737	14
Garbeta-III	0.644	23	0.652	0.663	0.665	0.680	0.687	0.706	0.717	19
Medinipur	0.603	27	0.614	0.625	0.63	0.645	0.649	0.668	0.681	25
Debra	0.720	8	0.724	0.734	0.740	0.747	0.752	0.763	0.774	7
Pingla	0.777	3	0.784	0.791	0.791	0.781	0.779	0.785	0.791	4
Keshiary	0.675	12	0.685	0.700	0.702	0.725	0.726	0.739	0.759	9
Dantan-I	0.647	21	0.652	0.658	0.662	0.680	0.684	0.696	0.711	20
Dantan-II	0.718	9	0.726	0.739	0.743	0.759	0.764	0.776	0.791	3
Narayangarh	0.688	11	0.695	0.705	0.711	0.724	0.728	0.742	0.758	11
Mohanpur	0.735	5	0.740	0.751	0.747	0.745	0.745	0.754	0.761	8
Sabong	0.792	2	0.801	0.807	0.813	0.809	0.810	0.823	0.833	1
Kharagpur-I	0.733	6	0.738	0.740	0.730	0.726	0.707	0.690	0.664	27
Kharagpur-II	0.658	17	0.668	0.682	0.684	0.696	0.702	0.716	0.731	15
Chandrakona-I	0.706	10	0.717	0.722	0.730	0.730	0.732	0.747	0.759	10
Chandrakona-II	0.655	18	0.669	0.682	0.690	0.696	0.706	0.728	0.750	13
Ghatal	0.722	7	0.731	0.737	0.742	0.734	0.735	0.745	0.754	12
Daspur-I	0.750	4	0.758	0.768	0.771	0.764	0.767	0.779	0.790	5
Daspur-II	0.810	1	0.810	0.817	0.816	0.800	0.796	0.802	0.807	2

Source: (i) Government of India, Census of India, 1991, 2001 and 2011, (ii) Government of India, DISE-2005-06 to DISE-2012-13.

Factors Affecting Educational Status

Educational status of a region as given by EI calculated above depends on a number of factors that represent its socio-economic status which may be a block, district, state or country. The factors may be classified under the following broad headings:

Demographic Structure

Demographic structure of any region is one of the basic elements that determines the level of attainment of education of its population. It includes the age distribution of population, family size, population growth rate, etc. Here we consider two such factors, viz., family size and population growth rate. By the U.S. Census Bureau's definition, family households consist of two or more individuals who are related by birth, marriage or adoption, although they may include other unrelated people. Family size is defined as the number of persons living together in one house and whose production, income and consumption of goods are related. Family size can affect the educational attainment of the members of its households. An increase in family size normally leads to the presence of more dependent members and less per capita income which negatively affects educational attainment by reducing investment in education. So, in this study we take the hypothesis of a negative impact of family size (FS) on EI. On the other hand, as for population growth, it reduces the extent of education that children receive. Kuznets (1973) argues that this negative impact is more acute in less-developed countries (LDCs). He shows that the effect of additional persons upon the stock of physical capital would not be hard to overcome by a reduction in consumption in order to increase the amount of investment. But one must also consider the additional investment in human capital through education that is required for additional people if the level of education is not to be lower than otherwise. Taking both the physical and human capital effects together, the overall impact of fast population growth would require a large diversion of consumption into saving if the society's productive level is not to be affected negatively. Thus, we hypothesize a negative relationship between population growth rate and EI.

Social Status of the People

Social status is the position or rank of a person or group of persons within the society. It can be determined in two ways. People can earn their social status by their own achievements, which is known as achieved status. Alternatively, they can be placed in the stratification system by their inherited position which is called ascribed status. Historically, STs are economically backward, poor, concentrated in low-skill occupations and primarily rural. According to the 2011 census, they constitute about 8.6 per cent of India's population. Their percentage shares in total population of this district were 14.87 in 2001 and 14.88 in 2011 which are far above the State average (5.50 per cent in 2001 and 5.8 per cent in 2011). STs are likely to have less human and physical capital than non-STs. Besides, STs earn lower returns to these assets than non-STs. Educational attainment of STs is expected to be less as compared with the people in other categories because of their lower asset endowment. Block-wise variation in STs and their literacy rate are relatively high as compared with the SC and OBC population in this district. This motivated us to consider the ST population separately in this study. We hypothesise a negative relationship between the ratio of STs and EI.

Urbanization

Urbanization implies an increase in percentage of population living in statutory towns, census towns, urban agglomerations and out growths with a high population density. The process of urbanization is often linked with industrialization and modernization as large numbers of people in urban areas are engaged in non-farm activities. Urbanization also leads to improvement of infrastructure and amenities such as *pucca* roads, electricity, taps, drainage system for disposal of waste water, etc., educational institutions, post offices, medical facilities, banks, etc. Population density is included here as a proxy variable of urbanization with the hypothesis that it influences EI directly.

Employment Status

The employment status of the people of an economy is reflected through their work participation rate. Higher work participation rate enhances investment in social sector like education and health. Higher work participation rate is expected to bring higher EI.

Empirical Methodology and Benchmark Results

We now turn to investigate the impact of Family Size (FS), ST Ratio (STR), Population Density (PD), Work Partition Rate (WPR) and Population Growth Rate (PGR) on EI for the concerned blocks for the studied period. We consider ordinary least squares (OLS) specifications and try to estimate the simple, partial, orthopartial and relative importance of different determining factors of EI.

Thus, our empirical specification is as follows

$$Y=\alpha+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\varepsilon_i$$

where Y indicates the EI, X_1 is FS, X_2 is STR, X_3 is PD, X_4 is WPR and X_5 is PGR. α is the intercept parameter and ε_i is the disturbance term. The coefficient of X_i, denoted by β_i, measures the amount of change in Y for one unit change in X_i, the values of all other explanatory variables remaining constant: the coefficient is thus known as the *partial regression coefficient*.

Table 4: Results for Two-way ANOVA of EI and Its Determinants

Source of Variation	EI	FS	STR	PD	WPR	PGR
Inter-block variation	2.10E-110	4.66E-83	0.00E+00	3.50E-256	4.57E-115	6.10E-81
Inter-temporal variation	1.30E-43	5.13E-65	9.99E-01	3.50E-57	6.43E-01	1.20E-06

Table 4 shows that EI has both significant inter-block and inter-temporal variations. Inter-block variation is more significant (Its significance is 2.1E-110) than inter-temporal variation (1.3E-43) of EI. Variations of EI can be explained through variations of factors like FS, STR, PD, WPR and PGR of the blocks. STR has high inter-block variation (0.00E+00) and a low inter-temporal variation (9.99E-01). Thus, STR may have a significant role in explaining inter-block variation in EI. Similarly, FS, PD, WPR and PGR have high inter-block variations and low inter-temporal variations. These factors may have a more significant role in explaining inter-temporal variations in EI in comparison with its role in inter-block variations. True roles of these factors cannot be determined from this table. So we conduct the pooled regressions and the results are shown in the table below.

From the results of pooled regression of Y (EI) on X_1 (FS), X_2 (STR), X_3 (PD), X_4 (WPR) and X_5 (PGR) shown in Table 5, we observe that the coefficient of determination, i.e., R^2 is 0.8019, which is statistically significant (level of significance = 2.40E-77). Here coefficients of all five factors, viz., FS, STR, PD, WPR and PGR are highly significant at less than one per cent level as are found from their t-values and p-values. PD and WPR are directly related to EI and FS, while STR and PGR are inversely related to EI. These t-values indicate squared correlations of the factors with EI [$r^2 = t^2/(t^2$ + degree of freedom)] and in the existing literature they are known as partial correlation of the factors.

Table 5: Results from Pooled Regression of EI on Its Determinants

Variable	Coef.	'T' Stat	'P' Value	Sq. partial correlation	Sq. simple correlation
Intercept	0.9951	19.63	9.77E-51		
FS	-0.0704	-7.72	3.80E-13	0.2086	0.0632
STR	-0.0030	-10.78	3.94E-22	0.3396	0.4502
PD	0.0001	7.47	1.72E-12	0.1981	0.5765
WPR	0.0021	7.20	9.06E-12	0.1864	0.0017
PGR	-0.0456	-4.91	1.71E-06	0.0966	0.0158
Variable	'T' Stat	'P' Value	Sq. Orthopartial Correlation	'T' Stat	'P' Value
FS	-3.94	1.08E-04	0.0522	-3.56	4.51E-04
STR	-13.72	1.03E-31	0.1019	-5.11	6.84E-07
PD	17.70	8.34E-45	0.0489	3.44	6.90E-04
WPR	-0.62	5.34E-01	0.0454	3.31	1.09E-03
PGR	1.92	5.61E-02	0.0212	-2.23	2.67E-02
R^2	Adj R^2	F-value	P-value		
0.8019	0.7975	183	2.40E-77		

Thus, STR is the most significant factor which explains partially about 34 per cent of the variability of Y, followed by FS which explains about 21 per cent of the variability of Y. PD is the third significant variable which explains about 20 per cent of the variability of Y. WPR is the fourth significant variable which explains about 19 per cent of the variability of Y. PGR is the least significant variable and explains only about 10 per cent of the variability of Y. However, these are not true partial correlations as explained by Mondal (Mondal 2008). For example, the partial correlation of STR at 0.3396 or approximately 0.34 implies that that part of STR which is not linearly explained by other four factors is able to explain 34 per cent of the variability of that part of EI which is not linearly explained by the other four factors. Here, other four factors explain 70 per cent of the variability of EI. Therefore, that part of STR which is not linearly explained by other four factors is able to explain 10.19 per cent (80.19 per cent - 70.00 per cent) of the variability of EI which is 34 per cent of 30 per cent (100 per cent - 70 per cent), the part of EI which is not linearly explained by other four factors. Thus, STR partially explains 10.19 per cent of the variability of EI or 34 per cent of the variability of that part of EI which is not linearly explained by the other four factors which is its true partial correlation named as orthopartial correlation by Mondal (Mondal 2008). Thus, partial correlation (henceforth, we shall call it pseudo partial correlation) of any variable actually overestimates true partial correlation or orthopartial correlation of the variable. Orthopartial correlations of the other four factors, i.e., X_1, X_3, X_4 and X_5 are 0.0522, 0.0489,0.0454 and0.0212 respectively (which are actually values of r-square (i) in the regression of Y on the residue of X_1 obtained from the regression of X_1 on X_2, X_3, X_4 and X_5; (ii) in the regression of Y on the residue of X_3 obtained from the regression of X_3 on X_1 ,X_2 ,X_4 and X_5; (iii) in the regression of Y on the residue of X_4 obtained from the regression of X_4 on X_1, X_2, X_3 and X_5, and (iv) in the regression of Y on the residue of X_5 on X_1 ,X_2 ,X_3 and X_4 respectively). Orthopartial correlations differ from their respective simple correlation due to overlapping among the variables or due to multicolinearity. In our case for variables X_1 (FS), X_2 (STR) and X_3 (PD) simple correlations are greater than orthopartial correlations. This is due to multicolinearity with no enhancement-synergism or due to positive overlapping. For variables X_4 (WPR) and X_5 (PGR), simple correlations are less than orthopartial correlations. This is due to multicolinearity with enhancement-synergism or due to negative overlapping. For the first three variables orthopartial correlations underestimate the relative importance whereas simple correlations overestimate them. For last two variables the situation is just opposite. Thus, neither simple correlations nor orthoparial correlations can properly estimate the relative importance of explanatory factors. Partial correlations generally overestimate, at least in comparison with orthoparial correlations, relative importance of the explanatory factors. Several attempts have been made in the literature to evaluate relative importance of the explanatory factors. With reference to one such attempt, we shall try to evaluate the relative importance of explanatory factors explaining the variability of EI.

True Relative Importance of Explanatory Factors

True relative importance of an explanatory variable can be obtained by averaging squared simple correlation and squared orthopartial correlation in case of two explanatory variables and by averaging squared simple correlation, a series of squared semi-orthopartial correlations and squared orthopartial correlation in case of more than two explanatory variables with proper choice of weights for them. This task is equivalent to the decomposition of explained variation of the dependent variable among the relevant explanatory variables. Feldman (2005) proposes the method of Proportional Marginal Variance Decomposition (PMVD) which has a particular implication for the choice of weights of simple, semi-orthopartial and orthopartial correlations of different explanatory variables. Here we shall apply this methodology to evaluate the relative importance of different explanatory variables. We shall proceed step by step to explain how the method actually works.

First we consider two most important explanatory factors (STR & PD) in Table 6.1. The squared simple correlations of STR (X_2) and PD (X_3) with EI (Y) are respectively $r_2^2 = 0.4502$ and $r_3^2 = 0.5765$ and they are statistically highly significant. Squared orthopartial correlations of STR and PD with EI (Y) are respectively 0.0139 and 0.1402 and they are statistically highly significant too. As $r_2^2+r_3^2= 1.0258 > R^2$ (0.5904), there exist multicolinearity with no enhancement synergism (because squared orthopartial correlations are less than squared simple correlations). Here we see that t-value of STR is negative (-ve) in simple, partial and orthopartial regressions and that for PD positive. Thus, it is a case of multicolinearity with neither enhancement-synergism nor change in sign. In this case the importance of an explanatory factor monotonically increases from its squared orthopartial correlation (minimum value) to squared simple correlation (maximum value) and its relative importance is a weighted average of the two with weights obtained from the PMVD principle. Automatically the relative importance of the factors becomes less than simple correlations and greater than orthopartial correlations. In the present case they are found to be 0.0532 and 0.5372 for X_2 and X_3 respectively.

Now we consider two explanatory factors (FS &STR) in Table 6.2. The squared simple correlations of FS (X_1) and STR (X_2) with EI (Y) are respectively $r_1^2 = 0.0632$ and $r_2^2 = 0.4502$ and they are statistically highly significant. Squared orthopartial correlations of FS and STR with EI (Y) are 0.2704 and 0.6575 respectively and they are statistically highly significant. As $r_1^2+r_2^2= 0.5135< R^2$ (0.7207), there exist multicolinearity with enhancement synergism (because, squared orthopartial correlations are greater than squared simple correlations). Here we see that t-values of both FS &STR are negative (-ve) in simple, partial and orthopartial regressions. Thus, it is a case of multicolinearity with enhancement-synergism but no change in sign. In this case the importance of an explanatory factor monotonically decreases from its squared orthopartial correlation (maximum value) to squared simple correlation (minimum value) and its relative importance is a weighted average of the two with weights obtained from the PMVD principle. Automatically, the relative importance of the factors becomes greater than simple correlations and less than orthopartial correlations. In the present case they are found to be 0.2101 and 0.5106 for X_1 and X_2 respectively.

We now consider the above three explanatory factors (FS, STR& PD) simultaneously in Table 6.3. We observe that the squared simple correlations of FS (X_1), STR (X_2) and PD (X_3) with EI (Y) are respectively $r_1^2 = 0.0632$, $r_2^2 = 0.4502$ and $r_3^2 = 0.5765$ and they are statistically highly significant. Squared orthopartial correlations of FS, STR and PD with EI (Y) are 0.1533, 0.0996 and 0.0231 respectively. FS and STR are statistically highly significant but PD is statistically significant at 5 per cent level of significance but not at 1 per cent level. Here we see that t-values of both FS and STR are negative (-ve) in simple, partial and orthopartial regressions and those for PD are positive. For the first variable, i.e., FS, the squared orthopartial correlation is greater than squared simple correlation which indicates enhancement-synergism. Actually, in case of three explanatory variables the explanatory power of a variable is expressed not only by these two correlations (simple and orthopartial) but also two semi-orthopartial correlations in between them. For the first variable the importance of the variable is observed to be enhanced from 0.0632 to 0.1533. It is further enhanced to 0.2704 at one of the two semi-orthopartial levels. That's why the relative importance of this factor is becomes 0.1746. For the other two variables, STR and PD, there exist slight enhancement-synergism at one of the two semi-orthopartial levels but the relative importance of them is found to lie in between their simple and orthopartial correlations at 0.4459 and 0.1233 respectively.

In this way, now we consider five explanatory factors (FS, STR, PD, WPR and PGR) simultaneously in Table 6.4. The squared simple correlations of FS (X_1), STR (X_2), PD (X_3), WPR (X4) and PGR (X5) with EI (Y) are respectively $r_1^2 = 0.0632$, $r_2^2 = 0.4502$, $r_3^2 = 0.5765$, r_4^2=0.0017 and r_5^2=0.0158. FS, STR and PD are statistically highly significant but PGR is statistically significant at 10 per cent level of significance. WPR is not statistically significant. Squared orthopartial correlations of FS, STR, PD, WPR and PGR with EI (Y) are respectively 0.0522, 0.1019, 0.0489 and 0.0212. FS, STR, PD and PGR are statistically highly significant and WPR is statistically significant at 5 per cent level of significance. This is the reason why we do not exclude PGR and WPR. Here we see that t-values of FS, STR and PGR are negative (-ve) in simple, partial and orthopartial regressions and those for PD and WPR are positive. For the fourth (WPR) and fifth (PGR) variables, the squared orthopartial correlations are greater than squared simple correlations which indicate enhancement-synergism. Enhancement-synergism may also arise at any semi-orthopartial level. Actually, in case of the first explanatory variable though the orthopartial correlation (0.0522) is less than simple correlation (0.0632), the relative importance of the variable is calculated to be 0.1325 with a significant negative t-value. This occurs because some semi-orthopartial correlations exceed its simple correlation value. In this way relative importance of the other four explanatory variables, STR, PD, WPR and PGR are calculated at 0.3590, 0.2351, 0.0443 and 0.0309 respectively. Thus, the multiple R^2 of 0.8019 that implies an explanatory power of 80.19 per cent is decomposed among the explanatory factors in the following way: 13.25 per cent of the variability of EI is explained by FS, 35.90 per cent by STR, 23.51 per cent by PD, 4.43 per cent by WPR and 3.09 per cent by PGR and all of them have t-values significant at less than 1 per cent level. We also observe that X_4 (PGR) and X_5 (WPR)) are *suppressor variables* because squared orthopartial correlations are greater than their squared simple correlations. This table fails to measure neither the within group (or the inter-temporal) explanatory power nor the between group explanatory power. So we construct a panel regression table in the next section.

Table 6.1: Results from Pooled Regression of EI on Its Two (STR, PD) Determinants

Variable	Coef.	'T' Stat	'P' Value	Sq. partial correlation	Sq. simple correlation	'T' Stat
Intercept	0.6388	44.54	9.07E-115			
STR	-0.0009	-2.79	5.78E-03	0.0328	0.4502	-13.72
PD	0.0001	8.85	2.37E-16	0.2550	0.5765	17.70

Variable	'P' Value	Sq. Orthopartial Correlation	'T' Stat	'P' Value	Relative importance	'T' Stat
Intercept						
STR	1.03E-31	0.0139	-1.80	7.32E-02	0.0532	-3.60
PD	8.34E-45	0.1402	6.12	3.92E-09	0.5372	16.34
R^2	Adj R^2	F-Value	P-Value			
0.5904	0.5869	165	4.09E-45			

Table 6.2: Results from Pooled Regression of EI on Its Two (FS, STR) Determinants

Variable	Coef.	'T' Stat	'P' Value	Sq. partial correlation	Sq. simple correlation	'T' Stat
Intercept	1.3468	34.04	1.44E-91			
FS	-0.1218	-14.89	1.60E-35	0.4919	0.0632	-3.94
STR	-0.0042	-23.22	4.20E-62	0.7018	0.4502	-13.72

Variable	'P' Value	Sq. orthopartial correlation	'T' Stat	'P' Value	Relative importance	'T' Stat
Intercept						
FS	1.08E-04	0.2704	-9.23	1.79E-17	0.2101	-7.82
STR	1.03E-31	0.6575	-21.01	2.01E-55	0.5106	-15.49
R^2	Adj R^2	F-Value	P-Value			
0.7207	0.7182	295	3.79E-64			

Table 6.3: Results from Pooled Regression of EI on Its Three (FS, STR, PD) Determinants

Variable	Coef.	'T' Stat	'P' Value	Sq. partial correlation	Sq. simple correlation	'T' Stat
Intercept	1.2024	24.26	4.34E-65			
FS	-0.1033	-11.68	5.13E-25	0.3744	0.0632	-3.94
STR	-0.0030	-9.42	5.38E-18	0.2800	0.4502	-13.72
PD	0.0001	4.53	9.38E-06	0.0827	0.5765	17.70

Variable	'P' Value	Sq. orthopartial correlation	'T' Stat	'P' Value	Relative importance	'T' Stat
Intercept						
FS	1.08E-04	0.1533	-6.45	6.37E-10	0.1746	-6.98
STR	1.03E-31	0.0996	-5.05	9.20E-07	0.4459	-13.60
PD	8.34E-45	0.0231	2.33	2.06E-02	0.1233	5.69
R^2	Adj R^2	F-Value	P-Value			
0.7438	0.7404	221	3.99E-67			

Table 6.4: Results from Pooled Regression of EI on Its Determinants

Variable	Coef.	'T' Stat	'P' Value	Sq. partial correlation	Sq. simple correlation	'T' Stat
Intercept	0.9951	19.63	9.77E-51			
FS	-0.0704	-7.72	3.80E-13	0.2086	0.0632	-3.94
STR	-0.003	-10.78	3.94E-22	0.3396	0.4502	-13.72
PD	0.0001	7.47	1.72E-12	0.1981	0.5765	17.7
WPR	0.0021	7.2	9.06E-12	0.1864	0.0017	-0.62
PGR	-0.0456	-4.91	1.71E-06	0.0966	0.0158	1.92

Variable	'P' Value	Sq. orthopartial correlation	'T' Stat	'P' Value	Relative importance	'T' Stat
Intercept						
FS	1.08E-04	0.0522	-3.56	4.51E-04	0.1325	-5.93
STR	1.03E-31	0.1019	-5.11	6.84E-07	0.3590	-11.35
PD	8.34E-45	0.0489	3.44	6.90E-04	0.2351	8.41
WPR	5.34E-01	0.0454	3.31	1.09E-03	0.0443	3.27
PGR	5.61E-02	0.0212	-2.23	2.67E-02	0.0309	-2.71
R^2	Adj R^2	F-Value	P-Value			
0.8019	0.7975	183	2.40E-77			

Table 7: Results from Panel Regression of EI on Its Determinants

EI	Coefficient	S.E.	Z	P>|Z|	Within R^2	Between R^2	Overall R^2
FS	-0.1089	0.0059	-18.51	0.0000	0.6330	0.0096	0.0632
STR	-0.0032	0.0006	-5.45	0.0000	0.0000	0.5248	0.4502
PD	0.0002	0.0000	9.61	0.0000	0.3671	0.6430	0.5765
WPR	-0.0010	0.0010	-1.08	0.2820	0.0069	0.0015	0.0017
PGR	-0.1374	0.0140	-9.84	0.0000	0.3821	0.0576	0.0158

Contd…

Table 7: Results from Panel Regression of EI on Its Determinants

EI	Coefficient	S.E.	Z	P>|Z|	Within R^2	Between R^2	Overall R^2
FS	-0.0688	0.0072	-0.58	0.0000			
STR	-0.0027	0.0007	-4.08	0.0000			
PD	0.0001	0.0000	4.99	0.0000	0.7440	0.7811	0.7724
WPR	0.0020	0.0005	3.87	0.0000			
PGR	-0.0987	0.0109	-9.03	0.0000			

In Table 7 we have analysed the importance of the five factors in terms of short panel regressions. It has two parts. In the first part we have analysed the individual importance and individual significance of the factors, and in the second part we have analysed the joint importance and individual partial significance of the factors. From the first part we observe that PD has the highest overall explanatory power (R^2= 0.5765), followed by STR (0.4502) and the WPR has the lowest overall R^2 (0.0017) preceded by PGR (0.0158). All the variables except WPR are highly statistically significant at less than one per cent level. Here we also observe that FS is the most significant factor (Z value is -18.51), the second significant factor is PGR (Z value is -9.84) and the third significant factor is PD (Z value is 9.61), followed by STR and WPR. Here, though FS is the most significant factor, it is only third in terms of overall explanatory power (given by overall R^2) and though PD has the highest overall R^2, it is only third in terms of significance. This happens because within R^2 for the variable FS is as high as 0.6330 in comparison with within R^2 of 0.3671 for PD. On the other extreme, WPR has least explanatory power given in terms of overall R^2 and it is also least significant given in terms of Z value. From the second part of Table we observe that in the short panel regression, the overall explanatory power (R^2) of the above mentioned five variables taken together is 77.24 per cent within group (here within block and basically inter-temporal) explanatory power (R^2) is 74.40 per cent and between groups (here between blocks) explanatory power is 78.11 per cent. PGR is partially the most significant factor (Z value is -9.03) in explaining the variability of EI, followed by PD with Z value at 4.99. The third partially significant factor is STR (Z value is -4.08), followed by WPR and FS.

In both pooled and panel data analysis, nearly 77 per cent (overall R^2 is 0.7724) to 80 per cent (multiple R^2 is 0.8019) of total variation (inter-temporal variation and between blocks variation) of Education Index (EI) is explained by the five factors, namely, FS, STR, PD, WPR and PGR. In both models EI is positively associated with PD and WPR, whereas it is negatively associated with STR, FS and PGR. All the factors are statistically highly significant as revealed by the t-statistic and Z-statistic. The positive association between EI and PD might be due to high population density in the census towns which is an indicator of urbanization. The spill over effect of urbanization leads to higher EI in those areas which in turn leads to the significant positive association between EI and PD. Higher work participation enhances the earning capacity of the households as well as their status, thereby enhancing their attitude towards education. It leads to higher enrolment of children in elementary education which is one of the important dimensions of EI. On the other hand, though the enrolment ratio of ST students in elementary education is relatively better as compared with students of other categories, their performance in terms of adult literacy among the ST population is extremely poor. Therefore, EI in the ST dominated areas is relatively less which establishes the negative relationship between these two dimension indicators (Enrolment Ratio and Adult Literacy Rate). Again it is argued that large family size is the outcome of illiteracy of the people reflected through their level of awareness about the importance of education. This might contribute to establish negative relationship between EI and FS. Like family size, higher growth rate is observed in the backward blocks (Nayagram, Gopiballavpur-I, Midnapur, Binpur-I, Binpur-II etc.) where the people are more illiterate and poor as compared with other blocks. Probably for this reason the PGR affects EI negatively in Paschim Medinipur District.

VII Conclusion

We have constructed a suitable composite Education Index (EI) by using UNDP methodology on the basis of all important indicators of educational attainment for the blocks of Paschim Medinipur District over the period 2005-2006 to 2012-2013. Among the blocks Sabong, Dsspur-II, Pingla are the top performers and Nayagram, Gopiballavpur-I, Midnapurare bottom performers in attainment of education. Most blocks have achieved improvement in respect of education over time. Both inter-block and inter-temporal variations of EI are significant though inter-block variations are more significant than inter-temporal variations. This both way variations of EI are significantly explained by socio-economic and demographic factors like FS, STR, PD, WPR and PGR. We have also tried to calculate the pseudo partial importance (through partial correlation), true or correct partial importance (through orthopartial correlation) and relative importance of the explanatory factors in the pooled regression framework and the pseudo partial importance (through partial correlation) of the explanatory factors in the panel regression framework. From the pooled regression results, it appears that STR is the most important factor with relative importance of 0.3590 out of 0.8019. This factor affects EI inversely. This means that general education policy fails to achieve inclusive education system, especially for people belonging to the backward categories. A special education policy with emphasis for people unable to access education facilities needs to be introduced. Awareness campaign regarding the importance of education, incentive payments and generation of employment opportunities may contribute to improve the situation. Pooled regression shows that PD is the second important factor with relative importance of 0.2351 out of 0.8019. It affects EI positively. There is no reason why an increase in PD can lead to an increase in EI. Here, PD basically represents urbanisation which implies an increase in educational facility and also a greater aptitude towards education. Blocks with higher PD contain a larger number of census towns situated near the urban areas. In these as well as nearby urban areas the civic facilities available are more, employment opportunity is greater, schools are more concentrated and basic facilities made available by the schools are also higher. This leads to a positive relationship between PD and EI. Its policy implication is that efforts should be made to extend the above mentioned facilities to the rural areas to improve the EI.

In panel regression also we observe that the above mentioned five factors are significant in explaining the variability of EI. The signs of their coefficients are the same as those obtained in pooled regression. From the significance of the individual coefficients nothing can be said about their relative importance because the significance here is based on pseudo partial correlations. What we can say is that they are jointly significant in explaining both across-block and within-block variations in EI. Thus, the policy implications mentioned above in the context of pooled regression also apply with respect to panel regression.

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