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Education and Economic Growth in NER States of India: *A Panel Cointegration Analysis*

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I. Introduction

The impact of human capital on economic growth is well-established in the economic literature. In neoclassical economics, the early work of Solow (1956) showed that economic growth could not only be explained by capital and labour increase. His aim was to determine the contributions of the factors of production (capital and labour) and the increase in technical progress to the growth rate as a whole. Mankiw, Romer and Weil (1992) (MRW thereafter), extended Solow's (1956) model by incorporating an explicit process of human capital accumulation. They showed that an augmented Solow growth model, when solved for the steady-state per capita income level, ends up to an equation that includes physical and human capital as the basic determinants of growth. During the last three decades new growth theories or endogenous growth theories, accept education as one of the primary components of human capital and the effect of education on the economies has been pointed out, (Lucas 1988), (Romer 1990), etc. The purpose of this study is firstly, to examine the relationship between the levels of education and economic growth and secondly to estimate the effects of each level of education on the growth of the Greek economy over the period 1960-2009. The application of MRW (1992) model and a VAR analysis were used. During this period, a number of structural and functional reforms and adjustments, in both economy and education, were materialised, with varying success (Tsamadias and Prontzas, 2012). Three major events took place influencing the Greek economy and education: a. The association-for-entry agreement with the European Economic Community (EEC) (November, 1962). b. The accession to the European Economic Community. The induction agreement came into force in January 1981. c. The accession to the European Monetary Union (EMU) and the adoption of the new Eurocurrency (1 January, 2001). The fact that different schooling levels of education may have different effects on growth has been addressed in a small set of recent papers. The motivation for this study comes from the necessity of identifying the potential impact of the different schooling levels on economic growth, in the period that an educational expansion took place especially in secondary and mainly in higher education. The results may improve the decisions of policymakers about education and its contribution to economic growth.

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Education has been regarded as one of the leading determinants of economic growth since the time of Adam Smith. Over time, many economic growth theories and models (such as Romer, 1990 and Lucas, 1988) have developed relating education and economic growth. The belief, that education promotes growth has led governments of many developing countries to invest in the education sector. Even the theoretical literature also provides a backing for such a policy (Pissarides, 2000). However, the empirical literature has failed to establish a robust relationship between education expenditures and growth. India has been no exception. According to the economic theory, we will expect a positive causal relationship to exist between the two. But different empirical papers investigating for the relationship for India have come up with different results. Some scholars say that India's major success in the software industry in the last decade is largely due to the major investments made in the technical education in 1950s and 60s (See Chandra, 2010). However, thus far, no robust empirical relation could be established between the two.

Considering the non-stationarity of many economic time series, there are some past empirical papers to investigate the relationships between education expenditure and economic growth applying the conventional cointegration techniques, such as the Engle–Granger or the Johansen approach which are restricted to a high availability of long time series of economic data. However, an increasing number of recent studies have been chosen panel data methodology to analysis for improving several of the shortcomings of individual time series methods, which is fully expressed in the information of the data and solves many problems of the individual time series. Besides, the methodology of panel data also has caused that the focus of methodology analysis has shifted from individual state to country in recent years for expenditure studies.

The aim of this paper is to discuss the relationship between economic growth and education expenditures. As to the methodology, considering the Public finance data often including shorter time period, hence, this paper will apply the Pedroni's panel cointegration(see Pedroni, 1999, 2000) to examine the relationships among economic growth and components of social sector expenditure variables from eight(8) states. Theory based on this method suggests that *T* observations of a time series of an individual country over all *N* countries so that in effect *N*T* observations are available for estimation. Viewing in this light, this can be regarded as good evidence to support higher robustness of the estimation process.

The remaining part of the paper is structured as follows: Section II presents the brief literature review of the relationship between economic growth and education expenditures. Section III discusses theoretical framework and econometric model. Section IV consists of methodology and estimation techniques. Section V presents data and empirical results. Finally, section VI summarizes our findings and suggestions are made for further research.

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II. Literature Review

According to the existing literature, there is a large amount of evidence that human capital has a significant impact on economic growth. Although a few empirical studies focus on the impact of different education levels on economic growth. The main studies that have examined the impact of the educational levels on economic growth are presented below:

Liu and Armer (1993) found that both primary and junior-high achievement variables add explanatory power to economic growth in Taiwan, but senior-high and college education did not exert any significant effects on growth. Tallman and Wang (1994) showed that higher education has a greater positive impact on growth in relation to primary and secondary education for the case of Taiwan. Mingat and Tan (1996) for a sample of 113 countries found that higher education has a positive statistically significant impact only in the group of developed countries, while the primary has a positive effect in less developed and secondary a positive effect in developing.

Gemmell (1996) for OECD countries concluded that primary education most affects the less developed countries, while secondary and higher education the developed ones. Mc Mahon (1998) examined the effect of the three levels of education on economic growth for a sample of Asian countries and concluded that primary and secondary level have a significantly positive effect on economic growth, while higher is negative. Abbas (2001) for the countries of Pakistan and Sri Lanka showed that the primary has a negative effect on economic growth, while secondary and higher education have a positive and statistically significant impact on economic growth in both countries.

Petrakis (2002) found that the growth effects of education depend on the level of development; low-income countries benefit from primary and secondary education while high-income developed countries benefit from higher education. Self and Grabowski (2004) for the case of India showed that except higher education the primary and secondary education had a strong causal impact on economic growth.

Villa (2005) investigated the effect of the three levels of education on economic growth for Italy and found that the higher and secondary education has a positive effect on economic growth, while the primary has no significant effect. Gyimah, Paddison and Mitiku (2006) found that all levels of education have a positive and statistically significant impact on the growth of per-capita income in African countries. Lin (2006) for the case of Taiwan found that primary, secondary and tertiary, have a positive impact on economic growth. Chi (2008) showed that in China, higher education has a positive and larger impact on GDP growth than primary and secondary education.

Pereira (2009) showed that in Portugal primary and secondary education have a positive impact on GDP, while higher has a small negative effect. Loening, Bhaskara and Singh (2010) for the case of Guatemala found that primary education is more important than secondary and tertiary education. Shaihani, et al. (2011) for the case of

Malaysia concluded that in the short run only secondary education has a positive and statistically significant coefficient, while the primary and tertiary exhibit negative and statistically significant results. On the contrary only the higher education has a positive and statistically significant effect in the long run. In the case of Greece, Asteriou and Agiomirgianakis (2001) used the Lucas (1988) model and showed that the growth of enrolment rates in primary, secondary and higher education positively affected the GDP in Greece for the period 1960-1994.

A Review of the literature on India

A M Nalla Gounden in his 1967 paper showed that education expenditures are not very attractive forms of investment and its rate of return was very low compared to that of physical capital. However, 1967 was too early to judge it. The study further suggested diversion of resources in favour of physical capital. Ansari and Singh (1997) use annual time series data from 1951 to 1987 to study the relationship between public spending on education and growth. They found that there is no long run relationship between the two.

Bosworth, Collins and Virmani (2007) test that what are the major contributors to India's economic growth and conclude that education's contribution has been negligible.

Pradhan (2009) investigates the causality between public education spending and economic growth in India during 1951 to 2001. The empirical investigation has been carried out by Error Correction Modeling. The findings suggest that there is unidirectional causality between education and economic growth in the Indian economy. The direction of causality is from economic growth to education spending and not vice versa.

Chandra (2010) has tested for a causal relationship between education investments and economic growth for India for the time period 1951-2009 using linear and non-linear Granger causality methods. He found that there is bi-directional causality between education spending and GDP for India. Thus, it can be seen that overall, the empirical evidence regarding this relationship for India too is quite mixed.

The present study examines the long run relationship between social expenditures and economic growth in NER states. The paper seeks to examine the long run impact of expenditures in social sector such as education health and social security/welfare along with fiscal deficit/surplus on economic growth in case of eight NER states including Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. Such social expenditures enhance productivity by providing infrastructure, education, health and harmonizing private and social interests. Estimation techniques used in this paper are Dickey and Fuller (1979) unit root test to examine the properties of time series data for individual states as well as IPS panel unit root test for panel of 8 NER states. Johansen and Juselius Cointegration test analyze the long run relationship between the variables.

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III. Theoretical Framework and Econometric Model

The study focuses on the link between various components of social expenditures and economic growth in Asian developing countries. The study also measures the impact of fiscal deficit on economic growth. The objective of this study is to examine the impact of three main components of government expenditures namely expenditure on education, health and social welfare and also the impact of fiscal deficit/surplus on economic growth in long run. The theoretical framework for this empirical study is set as follows:

If *EG*[1] represents economic growth, *EDN* is expenditures on education as a percentage share of aggregate expenditure, then we can reasonably expect the following relationship:

$$EG = f\ (EDN) \qquad (1)$$

Expressing the variables in natural logarithms the base regressions are:

$$lnEG\ =\ \beta o +\ \beta_1\ lnEDN +\ \varepsilon_1 \qquad (2)$$

Where $\beta 1$ is the elasticity and ε_1 is the stochastic error term with standard properties.

There is a general consensus that rising educational expenditures would enhance economic growth though human capital formation. Improved health conditions contribute positively to economic growth in many ways. Production loses due to worker's illnesses would be greatly reduced as health care facilities are widely made available to them. Better health may also enhance the quality of work and labour productivity (Khan, and Ahmed, 1999). It is also likely to increase student enrolments at various levels and make students more receptive to new ideas and learning. However, many economists tend to argue that the benefits from healthcare spending may not be fully realized if the population growth rate exceeds the social 'optimum' which is likely to happen when the rising birth rates outs-trip the falling death rates. The impact of social security welfare expenditures on economic growth is rather controversial and theoretically indeterminate. If these expenditures are largely confining to the "Poverty group", they should ideally enhance the growth rate by improving both the quality and quantity of labour forces.

Inclusion of fiscal deficit into the analysis may bring some important changes. For example, changes in growth are cause rather, strongly by changes in social welfare spending weakly by health expenditure. Budget deficit has not been caused by any of three social indicators (Khan, and Ahmed, 1999). Their empirical analyses, with fiscal deficit, brought some significant changes into results, fails to represent any definite

[1] EG is the year on year(y-o-y) growth rate of Net State Domestic Product of States (NSDP). It is calculated by the formula $EG_t = \left(\frac{Y_t - Y_{t-1}}{Y_t}\right) \times 100$, where Y_t is the Net Domestic Product of the year t.

shape due to lack of uniformity in the results. The well-known belief that excessive social expenditures in country like Japan caused persistent fiscal deficits received only a weak support from the analysis.

Fisher (1991) attempts a straightforward econometric study examining the relationship between macroeconomic performance and long run economic growth. In this study, Fisher picks up fiscal deficit, inflation rate and external debt outstanding as indicators measuring the macroeconomic performance and executes cross-section regressions on 73 developing countries during the period of 1972 to 1985. The results of this study clearly indicate that high economic growth has a negative relationship to the fiscal deficit, inflation rate and external debt outstanding. The extent that fiscal budget is considered as a tool to achieve social and economic development describes by the World Bank, and several other international bodies have advocated targeting public spending either through broad or narrow targeting strategies. It is believed that public spending can meet equity objectives with limited resources through targeting. Broad targeting is about subsidizing directly or indirectly services or commodities consumed mostly by the poor.

Baldacci, et.al (2003) concludes that fiscal policy has to be tailored to country-specific conditions to foster growth. That is, uniform approach to fiscal policy in which all countries are counselled to reduce their deficits under all circumstances is not appropriate. Although fiscal policy works differently in low income countries than in OECD countries, fiscal adjustment can also spur growth in the former. Given that a reduction of 1 percentage point in the ratio of the fiscal deficit to GDP led to an average increase in per capita growth of at least one fourth of a percentage point in the countries under consideration, it is possible that a reduction in the average deficit in low-income countries from about 4 per cent of GDP to 2 per cent of GDP could boost per capita growth by about half to 1 percentage point a year in fiscally vulnerable countries. Expenditure composition also plays an important role in promoting economic growth: fiscal adjustment that reduces unproductive expenditures and protects expenditures in social sector has proved to be more sustainable and more likely to result in faster growth.

IV. Methodology And Estimation Techniques

For testing for cointegration of the macroeconomic and housing market variables, a panel cointegration test of Pedroni (see Pedroni, 2000) for heterogeneous panels with multiple regressors is used in this paper. Pedroni (2004) considers the following time series panel regression:

$$y_{it} = \alpha_i + \delta_i t + x_{it}\gamma_i + e_{it} \qquad (3)$$

where y_{it} and x_{it} are the observable variables with dimension of (N*T) × 1 and (N*T) × m, α_i are individual fixed effect and $\delta_i t$ are individual time trends to be country-specific deterministic trend effects. The vector of slope coefficients, γ_i , is also allowed to vary by countries, and e_{it} is an error term. The null hypothesis of Pedroni's test is no cointegration, and the test allows for unbalanced panels, including heterogeneity in both

the long-term cointegration vectors. Pedroni (1999) derives the asymptotic distributions and computes critical values for panel cointegration tests. There are seven panel cointegration statistics, first part is based on the within dimension approach, including the panel *v* statistic, the Panel *rho* Statistic, the Panel *PP* Statistic and the Panel *ADF* Statistic; the second part is based on the between-dimension approach, including the Group *rho* Statistic, the Group *PP* Statistic and the Group *ADF* Statistic. The panel *v* statistic is related to a one-sided test where large positive values reject the null hypothesis of no cointegration. Kao (1999) offered two types of test to examine panel cointegration, which includes the Dickey Fuller (DF) and the augmented Dickey Fuller (ADF) tests. Besides, another one uses the Fisher type test to aggregate the p values of the individual Johansen maximum likelihood cointegration test statistics (see Maddala and Kim, 1998, and Maddala and Wu, 1999). C

Because the OLS which is used to estimate the panel cointegration vectors is a biased and inconsistent estimator, hence, the Panel Dynamic Ordinary Least Squares (DOLS) estimator is introduced by Pedroni (2000), Phillips and Moon(1999), which is allowed to take serial correlation and endogeneity of the regressors into the conventional OLS estimator. The model of the DOLS is as the following:

$$y_{it} = \alpha_i + x_{it}\beta_i + u_{it}^{*} \quad (4)$$

$$x_{it} = x_{it-1} + v_{it} \quad (5)$$

With the regressors y_{it} is the economic growth(*EG*) of state *i*, x_{it} is 2×1 vector of government expenditure on education(*EDN*), government expenditure on health and social welfare(*HSW*) of state *i* at time *t*, and being integrated of order 1, then cointegrated with slopes β_i. We also employ the panel FMOLS (Fully Modified OLS) tests estimator from Pedroni (2000). FMOLS is popular in conventional time series econometrics, in order to eliminate endogencity in the regressors and serial correlation in the errors.

V. Data and Empirical Results

A. Data

The annual data used in this research cover the period from 2000 to 2014 for the following eight states of North-Eastern Region: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The time series data of the study were taken from various issues of RBI's *State Finances*: A Study of Budgets.

B. Results of Time series Unit Root and Cointegration Tests

As a preliminary step to cointegration analysis, the stationarity of each of the variables was tested using augmented Dickey Fuller (ADF) tests. Table I gives a summary of the results of ADF unit root test for the variables selected for study. The performance of the augmented Dickey Fuller test depends crucially on a correct choice of deterministic components such as constant and trend terms and the inclusion of enough lagged terms to assure that the error terms behave like white noise. This test

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clearly shows that all variables except education expenditure of Meghalaya were non stationary both at level and first difference of the variable. This non stationarity of the variable at first difference is due to the presence of two outlier[1] values at the data point at 2013 and 2014. If these two values are smoothen by replacing them by trend values, and then we observe that the variable is stationary at first difference. This shows that the variables are stationary at the first difference. This implies that combination of one or more of these series may exhibit long run relationship. We therefore further proceed to co integration test.

TABLE I
ADF UNIT ROOT FOR TIME SERIES DATA

Level	***EG***		***EDN***	
States	***c***	***ct***	***c***	***ct***
Arunachal Pradesh	-5.799*	-5.419*	-6.979*	-6.448*
Assam	-2.372	-5.186*	-3.980**	-3.639***
Manipur	-5.642*	-4.773**	-4.666*	-5.055*
Meghalaya	-0.342	-3.945**	0.876	3.688
Mizoram	-3.563**	-3.945**	-2.012	-2.455
Nagaland	-3.392**	-4.402**	0.359	-3.824**
Sikkim	-3.405**	-3.302	-2.233	-4.291**
Tripura	-4.878*	-4.689*	-1.846	-2.450
Difference	***d(EG)***		***d(EDN)***	
Arunachal Pradesh	-8.214*	-7.749*	-7.316*	-6.483*
Assam	-3.241**	-2.912	-5.797*	-9.756*
Manipur	-3.550**	-3.338	-5.953*	-5.594*
Meghalaya	-2.916***	-2.440	1.766	0.143
Mizoram	-3.058**	-2.96	-3.857**	-4.264**
Nagaland	-6.414*	-6.502*	-3.534**	-4.178**
Sikkim	-5.486*	-5.253*	-5.397*	-5.022*
Tripura	-7.720*	-7.801*	-5.029*	-4.799**

Note: c and ct stands for including constant and constant and trend
(, ***) indicate rejection of null hypothesis of no co integration at 1% (5%, 10%) level of significance.*

Johansen and Juselius (1990) developed multivariate co integration methodology for the variables employed, as they fulfil common properties of integration. By using this, we have to test the existence of stable relationship between variables under investigation. These results are concisely represented in Table II. In the maximum eigen-value statistics, and trace statistics both scrutinize the null hypothesis of no-cointegration versus alternative of co integration. These informative statistics suggests the existence of long run relationship among all variables for the analysis of each state in the sample except Nagaland, by rejecting null hypothesis of no-cointegration against

[1] Extremely larger value as compare to other values.

the presence of Cointegration of the variables. Evidence of cointegration (i.e. long-term equilibrium relationship) between variables will rule out the possibility of Granger non-causality and will imply that there must be at least one way of Granger causality, either unidirectional or bidirectional (Granger, 1986, 1988).

C. Results of the Panel Unit-Root Tests

It has been suggested that one feasible way to increase power when testing for a unit root is to use panel data. The incentive behind this is to use more observations and exploit the cross-state variations of the data in estimation, which can have higher test power than standard unit root tests based on individual time series.

TABLE II

J-J COINTEGRATION TEST FOR TIME SERIES VARIABLES

States	Trace statistics			λ-max statistics		
	r=0	*r≤1*	*r≤2*	*r=0*	*r≤1*	*r≤2*
Arunachal Pradesh	44.928*	15.287	6.100**	29.640*	9.186	6.100**
Assam	51.556*	22.395*	3.786	29.160*	18.609*	3.786
Manipur	50.638*	26.022*	3.46**	24.615*	22.075*	3.946**
Meghalaya	35.221**	12.769	1.352	22.452**	11.417	1.352
Mizoram	38.486*	18.480**	4.559**	20.006	13.920	4.559**
Nagaland	15.087	3.077	0.032	12.009	3.045	0.032
Sikkim	51.496*	14.250	1.534	37.245*	12.716	1.534
Tripura	28.55*	5.974	0.015	22.980**	5.959	0.015

*(**, ***) indicate rejection of null hypothesis of no co integration at 1% (5%, 10%) level of significance.

Table III reports the findings from four alternative methods, namely, LLC, IPS (see Levin, Lin and Chu, 2002, Breitung, 2000 and Im, Pesaran and Shin, 2003), ADF-Fisher chi-square and PP- Fisher chi-square tests. All of these four tests were described in Hadri(2000) who assumes a null hypothesis of joint stationarity against the null that all series are non-stationary. Under cross-sectional independence, each of these statistics is distributed as standard normal as both *N* and *T* increasing.

Table III presents the results of the panel unit root tests with intercept and trend, the results of these four tests show that all variables are stationary at the 5% significance level at level and the first difference of the variables. Then, we can assume all variables follow I (1) processes because almost all statistics confirmed that the variables are I(1).

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TABLE III
PANEL UNIT ROOT TEST RESULTS

Variables	LLC	IPS	ADF-Fisher χ^2	PP-Fisher χ^2
EG	-4.990*	-3.905*	49.756*	50.227*
d(EG)	-12.361*	-9.794*	96.982*	135.67*
EDN	-8.226*	-6.330*	70.288*	98.12*
d(EDN)	-13.453*	-10.746*	107.134*	155.827*

*(**, ***) indicate rejection of null hypothesis of no co integration at 1% (5%, 10%) level of significance.

D. The Results of Panel Cointegration Test

According to the results of Table IV, we confirm all variables are I(1), then we use (6) to start the long-run analysis, that is to use panel cointegration tests examining the relationship among the four variables. Besides, considering the analysis of sensitivity and robustness, we employ three kinds of panel cointegration test that is Pedroni's (see Pedroni, 2004), Kao's (see Kao, 1999) and Johansen's Fisher panel cointegration tests.

$$EG_{it} = \alpha_i + \beta_{2i} EDN_{it} \qquad (6)$$

For starting to discuss the long-run relationship, we have calculated the Kao's tests for the homogeneous panel, where the null hypothesis is the absence of cointegration.

Table IV reports the results of Kao's residual panel cointegration tests, which rejected the null hypothesis of no cointegration for the economic growth and other variables at the 1% significance level, so that there is existence of cointegration.

Table V shows the results of all these panel conitegration tests when the dependent variable is *EG* (Economic Growth).There are two parts in Table V, the first four test statistics are computed by the "within" dimension (panel statistics). If the null is rejected, then economic growth are cointegrated with other variables. The last three test statistics are computed by the "between" dimension (group statistics). In Table V, most of the estimate results of the Pedroni's heterogenous panel cointegration tests indicate that the null of no cointegration can be rejected at the 5% significant level. This displays that the changes of economic growth in these 8 states are connected with other expenditure component variables. However, the results in Table V are in consistent; some statistics are significant, but there are some exceptional results, such as the panel v statistic and group *rho*-statistic. Because the data applied in this paper are panel data, the varied results can be caused by the different relationships between economic growth and other expenditure components in these 8 states.

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TABLE IV
KAO'S RESIDUAL COINTEGRATION TEST RESULTS

	t-statistics	Prob
ADF stat	0.801403	0.2124

Notes: The ADF is the residual-based ADF statistic (see [42]). The null hypothesis is no cointegration.
* Indicate that the estimated parameters are significant at the 1% level.

TABLE V
PEDORNI'S RESIDUAL COINTEGRATION TEST RESULTS

Types of statistics	t-statistics	Prob
Within group		
Panel v-statistic	-1.737396	0.9588
Panel rho-statistic	-4.749244*	0.0000
Panel PP-statistic	-6.72433*	0.0000
Panel ADF-statistic	-3.31280*	0.0000
Between group		
Group rho statistic	-2.68666*	0.0036
Group PP statistic	-9.54872*	0.0000
Group ADF statistic	-5.16378*	0.0000

Notes: The null hypothesis is that the variables are not cointegrated. Under the null hypothesis, all the statistics are distributed as normal distributions. The variance ratio test is right-sided, while the others are left-sided. ** and *** indicate that the estimated parameters are rejects the null hypothesis of no cointegration at the 5% and 1% levels. Newey-West bandwidth selection using Bartlett Kemel Cross Method Statistic Prob.

The result of the Johansen's Fisher panel cointegration test summarizes in Table VI, are fairly conclusive: Fisher's tests, no matter with the Trace test statistics or Max-eigen test statistics, support the presence of a cointegrated relation among the four variables at the 1% significant level. We can conclude from those results of panel cointegration tests, there is a panel long-run equilibrium relationship among the economic growth and other expenditure component move together in the long run.

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TABLE VI
FISHIER-TYPE TEST RESULTS

Model	Fisher's Chi-square Test			
	Trace stat	Prob	λ-max stat	Prob
None*	63.31	0.0000	42.30	0.0004
At most 1*	49.93	0.0002	43.93	0.0002

Notes: Asymptotic *p*-values are computed using a Chi-square distribution.

* indicate that the test statistics are significant at the 1% level. Fisher's test applies regardless of the dependent variable.

The panel cointegration analysis of long-run cointegrating relationships is modern time series analysis. Therefore, considering various forms of the residual-based panel Fully Modified OLS (FMOLS) and Dynamic OLS (DOLS) (see Pedroni, 2000, Kao and Chiang, 2000 and Mark and Sul, 2003); show that it generally outperforms single-equation estimation techniques.

Table VII presents the estimates of the cointegration vectors and t-statistics for (6). We conclude some points from the results. First, the average cointegration coefficient of health and social welfare expenditure in the 8 states is 1.16 and it is significant at the 1% level, which means that a 1% increase in social welfare expenditure leads on average to a 1.16% increase of economic growth in the long run. The average cointegration coefficient of the long-term education expenditure is 0.286 and is not significant at the 5% significant level, hence meaning that there is no significant impact of education on economic growth in the long run.

Secondly, let us focus on the coefficients of Education expenditure and Expenditure on health and social welfare for individual states. The coefficient of expenditure on health and social welfare in Assam, Mizoram, Sikkim and Tripura are significant and are found to be expected signs. This indicates that the expenditure on health and social welfare has positive significant impacts on economic growth in the four states of NER- Assam, Mizoram, Sikkim and Tripura. On the other hand in the other states- Arunachal Pradesh, Manipur, Meghalaya and Nagaland, there is no significant impact of expenditure on health and social welfare on economic growth.

Regarding education expenditure, there is significant impact of it on economic growth in Mizoram and Sikkim. The sign of coefficient in Sikkim is positive, that is expected sign, but in Mizoram the sign is negative. This indicates that the education expenditure has positive impact on growth in Sikkim and negative impact on Mizoram.

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On the other hand the relationship between education and growth on the remaining six NER states including Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland and Tripura is in significant indicating no relation between the variables

TABLE VII
RESULTS OF DYNAMIC OLS AND FMOLS

States	FM-OLS	DOLS
	lnEDN	*lnEDN*
Arunachal Pradesh	0.2069 (0.2091)	7.216 (1.0550)
Assam	-0.0325 (-0.2969)	0.0315 (0.1830)
Manipur	0.7362** (2.2905)	-3.0309 (-0.9558)
Meghalaya	1.8666* (5.2098)	0.7311 (0.4223)
Mizoram	0.41060 (0.9588)	-1.1366* (5.8495)
Nagaland	0.1805 (0.8279)	0.5462 (1.1232)
Sikkim	1.2271* (4.3230)	0.3595** (3.2984)
Tripura	0.4913* (4.6763)	0.2287 (1.7935)
Panel Group	0.3957* (3.6902)	0.2866 (1.0220)

*(**, ***) indicate rejection of null hypothesis of no co integration at 1% (5%, 10%) level of significance.

As we now know, the DOLS estimate performs better than the FMOLS method. Table VII also presents the results of FMOLS, which show that there is a positive effect of education expenditure on economic growth at the 1% significance level. As for the size of these two coefficients, a 1% increase in education expenditure raises economic growth 0.396%. However, the panel long-term health and social welfare expenditure is 0.148, which is not significant at the 5% significance level.

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VI. Conclusion

This paper employs the panel cointegration tests to analyse the long run relationships between expenditure component variables and economic growth, using data of 8 states from 2000 to 2014, and the panel DOLS are applied to deal with the problem of serial correlation and endogeneity of the regressors. Our main findings are as follows:

First, the results of panel unit root test indicate that economic growth, Education expenditure and expenditure on health and social welfare are stationary at the first difference. The results of the panel cointegration tests support that there is a panel long-run equilibrium relationship among the economic growth, Education expenditure and expenditure on health and social welfare move together in the long run.

Second, the average cointegration coefficient of health and social welfare expenditure in the 8 states is 1.16 and it is significant at the 1% level, which means that a 1% increase in social welfare expenditure leads on average to a 1.16% increase of economic growth in the long run. The average cointegration coefficient of the long-term education expenditure is 0.286 and is not significant at the 5% significant level, hence meaning that there is no significant impact of education on economic growth in the long run.

Finally, in the lights of the results in different states of NER, let us focus on the coefficients of Education expenditure and Expenditure on health and social welfare for individual states. The coefficient of expenditure on health and social welfare in Assam, Mizoram, Sikkim and Tripura are significant and are found to be expected signs. This indicates that the expenditure on health and social welfare has positive significant impacts on economic growth in the four states of NER- Assam, Mizoram, Sikkim and Tripura. On the other hand in the other states- Arunachal Pradesh, Manipur, Meghalaya and Nagaland, there is no significant impact of expenditure on health and social welfare on economic growth.

Regarding education expenditure, there is significant impact of it on economic growth in Mizoram and Sikkim. The sign of coefficient in Sikkim is positive, that is expected sign, but in Mizoram the sign is negative. This indicates that the education expenditure has positive impact on growth in Sikkim and negative impact on Mizoram.

On the other hand the relationship between education and economic growth on the remaining six NER states including Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland and Tripura is in significant indicating no causal relationship between education and economic growth.

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