Do Expenditure on Education Cause Economic Growth in Long-run? – An Empirical Study on Odisha

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Abstract: *This paper is an attempt to evaluate the relationship between government expenditure on education and economic growth in Odisha using annual data over the period 25 years i.e. 1990-91 to 2014-15. In order to assess the relation between these two variables, a range of tests has been conducted. Starting from unit root test which has been conducted to check the stationarity, Johansen cointegration test which has been conducted to check long run association, then Granger Causality Test to check the direction of causation and finally a Vector Error Correction Model for assessing the short-run causal relationship. The result of the study confirms that long-term causality is running from educational expenditure to economic growth in Odisha.*

Keywords: *Economic growth, Expenditure on education, Causality analysis, Stationarity, Johansen Cointegration, Granger causality, VECM.*

I. INTRODUCTION

The development of a nation is primarily determined by the endowed natural resources and the attribute of the human resources, which depends on the level of knowledge, skills and attitudes of the citizens; these parameters are determined by the status of school education and higher education. For development of knowledge, the act of education is crucial.

The generalisation, that investment in human capital promotes economic growth is major issue since the time of Adam Smith (Kiker,1968), who emphasised the priority of investing in human skills. Schultz (1961) and Denison (1962) argued that education directly contributes to the growth of national income by enhancing the skills and productive capabilities of the labour force. These works led them to find that a considerable proportion of the rate of growth of output in the United States was due to investment in education. Hence, policy-makers in India, after independence, have placed importance on the provision of basic social services like education, health and nutrition to all sections of society, mainly the poor. Given the large base of poor in India, this policy induced substantial increase in social expenditure.

The mobilisation of human resources and its development is the process by which knowledge, skills, and capacities of all the people are increased. The expenditure incurred on the development of human resources is seen as a form of investment in human beings and is known in the field of economics of education as investment in human capital" (Schultz, 1961).

II. REVIEW OF LITERATURE

Jorgenson and Fraumeni (1992) measured the impact of investment in education on U.S. economic growth. The study uses data on output, input and productivity of sources of economic growth, educational as well as non-educational sector for a period from 1948 to 1986. The major findings of the study conclude that, the appropriate value of investment in education is given by its impact on the individual's lifetime labour income, the relevant concept of labour income must not be limited to market activities alone since many of the benefits of education accrue in the form of enhanced value for non- market activities.

Czynski and Zeira (2003) examined the factors influencing the extent & composition of expenditure on education in Israel and analysed the relation between various demographic, economic & political explanatory variables. The study is based on Secondary data from for a period of 1962-98 and different variables like; Population size, age distribution, distribution of student population in to ethnic group, per capita GDP, relative price of education, distribution of income across the population, return on education, overall budgetary pressure are used to analyse the data. The study adopts the methodology with Correlation, regression analysis and cointegration test to test and analyse the data. Major findings of the study show Per capita GDP positively affects educational expenditure, distribution of income doesn't affect public spending on education & distribution of income does affect private spending on education, spending on education was not correlated with the party in government.

Musila and Belasi (2004) investigated the relationship between government education expenditure per worker & economic growth in Uganda. The study uses Secondary time series data for the period 1965-1999 for variable like Logarithm of Real GDP, gross fixed capital information, govt education expenditure per worker of

employment and uses Cointegration test and error correction model to analyse the data. The findings of the study depict that, capital and labour input are some of the key variable that seems to affect the long run growth performance of the country, the average education expenditure per worker is positively correlated with economic growth.

Chakrabati and Jogelkar (2006) examined the patterns and changes in the allocation of government funds for higher education over the period 1980-81 to 1999-2001. Data for two decades were collected from 15 major states of India. Different variables related to economy, demography and policy has been interpreted and analysed. The study also incorporates a basic panel fixed model and a generalised least square estimate. The result of the study shows state with higher per capita income was found to spend more on education, income elasticity at each level of education is found to be less than one, grants from centre induces a positive significant impact of public expenditure on education both at aggregate level and individual level.

Al-Yousi et al. (2008) examined the nature and direction of the relationship between educational expenditure as a proxy of human capital and economic growth. The study uses Secondary time series data for a period 1977- 2004 and Real per capita GDP, ration of government educational expenditure to GDP as variables. The study incorporates Unit root test, Cointegration test, Ganger causality test with an error correction framework in the analysis of data. The findings of the study conclude that, the causality between Educational expenditure and economic growth is a bidirectional one, results are country specific and vary with the proxies.

Ray et al. (2011) evaluated the association between economic growth and expenditure in India. The study uses Secondary data which has been collected over a period of 1962 to 2010. Real GDP is used as a proxy of economic growth with expenditure on education. For the analysis and data testing the study uses Unit root test, Cointegration test and Error correction model. The findings of the study show Economic growth & educational expenditure are cointegrated indicating the existence of long run equilibrium relationship, the Ganger Causality test results confirms that there doesn't exist any causality in short-run between economic growth and education & vice versa.

Objective of the Study

- To assess the relationship between economic growth and education expenditure in Odisha.

III. METHODOLOGY, DATA & VARIABLES

Methodology

The growth model for the study takes the form: GSDP=f (EDU) …………………(1)

Where GSDP is Gross State Domestic Product and EDU is expenditure on education respectively.

GSDP is used as explained and expenditure on education EDU as the only explanatory variable.

The association between growth (measured in GSDP) and expenditure on education (EDU) in Odisha can be evaluate using the following model in linear form:

$$\textbf{ln GSDP t} = \boldsymbol{\alpha} + \boldsymbol{\beta} \textbf{ ln EDUt} + \boldsymbol{\varepsilon} \textbf{ t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{ (1.1)}$$

Where,

α and $\beta > 0$

GSDP t and EDU t show the Gross State Domestic Product and educational expenditure of government at a particular time. while εt stands for the "noise" or error term; α and β represent the slope and coefficient of regression. β indicates how a unit change in the independent variable (educational expenditure) can affects the dependent variable (gross district domestic product). To cater other things that may influence GSDP the error εt is incorporated in the equation.

a) Unit Root Test

In time series data, a number of statistical issues can control the estimation of parameters. The situation of spurious regression can also be found between two unrelated variables i.e. high R square in Ordinary Least Squares (OLS) estimation because of the non-stationarity of series.

A series is said to be stationary if the joint probability of the same doesn't change over the time i.e. mean and variance remain constant over time or mean and variance are time-invariant. simply implies that the mean [(E(Yt)] and the variance [Var(Yt)] of Y remain constant over time for all t. In other word,

$$\textbf{F(Yt)} = \textbf{F(Yt + k)}$$

Where, F is joint probability

Y is say, for an example GDP here

t is the time period

and k is the change in time period.

To test the stationary of series, the most often used test is Augmented Dickey Fuller (ADF) Test. The following equation in this study checks for the unit root of time series data used in the model:

$$\Delta y = \beta_1 + \beta_1 t + \delta y_{t-1} + \sum \alpha \Delta y_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots \text{ (2)}$$

Where,

εt is white noise error term in the model of stationarity test, with null hypothesis that variable has unit root.

The null hypothesis and alternative hypothesis for the existence of unit root in variable yt is Ho: $\delta = 0$ versus H1: $\delta < 0$. Rejection of the null hypothesis denotes stationarity in the variables.

Once the stationarity of series is assured, the further process before applying Johansen's (1988) co-integration test is to identify the maximum number of lags that can be used in estimation process.

b) Testing for Co-integration (Johansen approach)

The motive behind Cointegration test is, knowing the order of integration is crucial for building up any econometric model and to draw inferences. And to check for some theories which suggest that certain variables should be cointegrated showing long-run relationship. This test may be regarded as a long run equilibrium relationship among the variables.

The purpose is to determine in a bivariate framework whether or not expenditure on education (EDU) and (GSDP) variables have association in long-run. Engle and Granger (1987) introduced the concept of cointegration, where economic variables might reach a long-run equilibrium that reflects a stable relationship among them.

The approach which is used in this study to test for cointegration is called the Johansen cointegration approach. The Johansen approach can determine the number of cointegrated vectors for any given number of non-stationary variables of the same order.

c) The Granger Causality Test

Testing of causality among variables is one of the most crucial and yet one of the difficult issue in economics. The basic idea of Granger causality test can be; if the prediction of one-time series is improved by incorporating the knowledge of second time series then, the later said to have a causal influence on the first. Historically, Granger (1969) and Sim (1972) were the ones who formalized the application of causality in economics.

The null hypothesis (H0) is what we test in this case, that the X variable does not Granger cause variable Y and variable Y does not Granger cause variable X.

In summary, one variable (Xt) is said to granger cause another variable (Yt) if the lagged values of Xt can predict Yt and vice-versa.

The Granger method involves the estimation of the following equations:

If causation runs from EDU to GSDP,

$$ln\ GSDP_t = \Sigma\ \alpha_i\ lnGSDP\ t_{-i} + \beta_j\ lnEDU_{t-j\ +}\ \lambda_1 t + u_{1t} \qquad .... (3)$$

If causation runs from GSDP to EDU, it takes the form:

$$ln\ EDUEXP_t = \Sigma\ \gamma_i\ lnEDUt_{-i} + \delta_j\ lnGSDP\ _{t-j\ +}\ \lambda_2 t + u_{2t} \qquad ....(3.1)$$

d) VECM and Short-Term Causality Test

Error correction mechanism was first introduced by Sargan (1984), later adopted, and modified by Engle and Granger (1987). The foremost advantage of VECM is that it has noble interpretation with long-term and short-term equations. Error correction mechanism examines the short-run behaviour of an economic variable with its long-run behaviour. A vector error correction model is a restricted VAR that has cointegration restrictions built in to the specification. So, it is designed for use with non-stationarity series that are known to be cointegrated. The VEC specification restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationship. The cointegration term is known as the error correction term which shows the speed of divergence or convergence towards the equilibrium in long-run and the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. In case if there exist no cointegration between variables, only short run causality would be tested with the help of VAR model.

e) Research Hypothesis

H0: there exists no long run relationship between GDP and EDU in Odisha.

H1: there exists long run relationship between GDP and EDU in Odisha.

Data Variable and Data Sources

The two main variables considered in this study are economic growth, which is represented by real GSDP (Gross State Domestic Product) of Odisha and EDU (Total expenditure on education) of Government.

Information on both Elementary Educational expenditure and State domestic product has been collected over a period of 15 years i.e. from 1990-91 to 2014-15 for Odisha.

All required data for the time period are obtained from the respective sources like educational expenditure is collected from *Handbook of Statistics on state govt. finance, published by Reserve Bank of India* and *Odisha Primary Education Programme Authority(OPEPA).* GSDP is taken from *Odisha Economic Survey 2014-15 published by Directorate of Economic and Statistics, Bhubaneswar.*

IV. RESULTS AND DISCUSSION

(I) Unit Root Test

The study anticipates a VAR model in which it is desirable that the variables may be non-stationary at level but, after first or second difference they should become stationary. This study uses Augmented Dickey Fuller (ADF) test to examine whether the series got unit root or not. The variables are taken in the natural log form and tested at level, at first difference and at second difference. And in each stage variables are tested for three criteria: only intercept, intercept with trend, no trend no intercept.

Hypothesis for ADF test are:

H0: variable got unit root or not stationary

H1: variable is stationary

With the following assumption, the null hypothesis i.e. variable got unit root is rejected

i. Absolute value of test statistics should be more than critical value at 5% level of significance.

ii. P- Value should be significant at 5% level.

Table No. 01: ADF test at level

Variable	GSDP			EDU		
ADF model	Intercept	Intercept with trend	No trend and intercept	Intercept	Intercept with trend	No trend and intercept
Test statistics	0.428	-1.782	5.788	0.271	-1.374	5.946
p-value	0.673	0.089	0.000	0.789	0.184	0.000
5% critical value	-3.000	-3.600	-1.950	-3.000	-3.600	-1.950

Source: Calculated by Author using STATA 13

Table No. 01 shows the result of ADF test at level. Analysing GSDP, the test statistics at three different models; intercept, intercept with trend, no trend and intercept are; 0.428, -1.782 & 5.788 respectively which are less than the 5% critical value (except no trend & intercept).

Analysing EDU, the test statistics at three different models; intercept, intercept with trend, no trend and intercept are; 0.271, -1.374, & 5.946 respectively which are less than the 5% critical value (except no trend & intercept).

The results indicate that the null hypothesis cannot be rejected which means variables got unit root or are non-stationary at level.

Table No. 02: ADF test at first difference

Variable	GSDP			EDU		
ADF model	Intercept	Intercept with trend	No trend and intercept	Intercept	Intercept with trend	No trend and intercept
Test statistics	-5.554	-5.730	-2.783	-3.144	-3.123	-1.688
p-value	0.000	0.000	0.011	0.005	0.005	0.105
5% critical value	-3.000	-3.600	-1.950	-3.000	-3.600	-1.950

Source: Calculated by Author using STATA 13

Table No. 02 shows the result of ADF test at first difference. Analysing GSDP, the test statistics at three different models; intercept, intercept with trend, no trend & intercept are; -5.544, -5.730 and -2.783 respectively which are more than the 5% critical value.

Analysing EDU, the test statistics at three different models; intercept, intercept with trend, no trend & intercept are; -3.144, -3.123, and -1.688 respectively which are less than the 5% critical value (except intercept) The results indicate that the null hypothesis cannot be rejected which means variables still got unit root or are non-stationary at first difference.

Table No. 03: ADF test at second difference

Variable	GSDP			EDU		
ADF model	Intercept	Intercept with trend	No trend and intercept	Intercept	Intercept with trend	No trend and intercept
Test statistics	-10.564	-10.326	-10.836	-5.227	-5.141	-5.349
p-value	0.000	0.000	0.000	0.000	0.000	0.000
5% critical value	-3.000	-3.600	-1.950	-3.000	-3.600	-1.950

Source: Calculated by Author using STATA 13

Table No. 03 shows the result of ADF test at second difference. Analysing GSDP, the test statistics at three different models; intercept, intercept with trend, no trend & intercept are; -10.564, -10.326 and -10.836 respectively which are more than the 5% critical value.

Analysing EDU, the test statistics at three different models; intercept, intercept with trend, no trend & intercept are; -5.227, -5.141 and -5.349 respectively which are more than the 5% critical value.

The p-value for all the model of GSDP as well as EDU are less than 5 % level, which shows the significance of the model.

The results indicate that the null hypothesis is rejected which means variables still got no unit root or are stationary at second difference which is desirable for further test of VAR or VECM.

(II) Johansen Co-integration Test

The mission is to determine in a bivariate framework whether or not expenditure on education (EDUEXP) and (GSDP) variables have association in long-run and the pre-condition is the variables are having unit roots at level and no unit root at first or second difference. The variables are taken with their natural log with the following hypothesis.

Hypothesis for Johansen Co-integration test is:
H0: There is no co-integration among variables
H1: There is cointegration among variables

Table No. 04: Johansen Co-integration Test

	Trace statistics			Max eigen value statistics		
Maximum rank	Eigen value	Trace statsistics	5% critical value	Eigen value	max statsistics	5% critical value
0	-	38.8023	15.41	-	37.1484	14.07
1	0.87303	1.6539*	3.76	0.87303	1.6539*	3.76
2	0.08779	-	-	0.8779	-	-

Source: Calculated by Author using STATA 13

In Table No. 04 The trace statistics and maximum eigen value statistics suggest that null hypothesis can be rejected i.e. GSDP and EDU are cointegrated and have no long-run association.

The value of trace statistics 38.8023 and max statistics 37.1484 are more than the 5% critical value at maximum rank zero and 1.6539 for both trace statistics and max statistics which is less than 5% critical value at maximum rank 1. So, the model suggests that null hypothesis can be rejected meaning variables are cointegrated with each other i.e. GSDP and EDU have long run association.

(III) Granger Causality Test

The granger causality test helps in determine the directional causality i.e. whether the one variable with lags jointly can cause the other variable or not. This test will also help in determine one of the two hypotheses of the study i.e. whether there is bi-directional causality between variables or not.

Hypothesis for Granger Causality test are:
H0: all the GSDP lagged variable does not cause EDU
H0: all the EDU lagged variable does not cause GSDP

Table No. 05: Granger Causality Test

Null	Equation	excluded	Chi 2	P-value	Decision
EDU does not Granger cause GSDP	LnGSDP	EDU	15.754	0.008	Reject
		ALL	15.754	0.008	
GSDP does not Granger cause EDU	lnEDU	GSDP	32.763	0.000	Reject
		ALL	32.763	0.000	

Source: Calculated by Author using STATA 13

As shown in the above Table No. 05 the null hypothesis is rejected as the p-values are less than the 5% level. The results suggest that there is bi-directional causality between GSDP and EDU. i.e. causality runs from EDU to GSDP as well as from GSDP to EDU.

(IV) Vector Error Correction Model (VECM)

We have already seen our two variable GSDP and EDU are cointegrated so it is clear that there is long run association between variable. Therefore, to check short run causality and the speed of convergence or divergence towards equilibrium the study tests the Vector Error Correction Model.

Table No. 06: VECM estimation for GSDP AND EDU

Variables		Statistics		
	Independent variable	Coefficient	Standard error	p-value
Dependent variable	Ce 1 L1	**-.0573964**	.243739	0.814
	EDU L1	-.0130109	.115066	0.910

= GSDP	EDU L2	-.0586639	.1369286	0.668
	EDU L3	-.1874557	.1198328	0.118
	EDU L4	-.1583167	.117433	0.178
Dependent variable = EDU	**Independent variable**	**Coefficient**	**Standard error**	**p-value**
	Ce 1 L1	**.9746606**	.4440117	0.028
	GSDP L1	.4440117	.6987905	0.195
	GSDP L2	-.9371199	.6346489	0.140
	GSDP L3	-1.167209	.6203342	0.060
	GSDP L4	.562933	.6064213	0.353

Source: Calculated by Author using STATA 13

Table No. 06 shows coefficient of error correction term, standard error, and p-value of variables at different lag. As shown above the p-values for all the variables are more than 5% level which shows the insignificancy off model. And the negative sign of error correction term of GSDP as independent variable shows there exist a long run causality and at a speed of 5.73 % it is going to be converge towards equilibrium in future. And the positive error correction term confirms there is no long-run causality running from GSDP to EDU.

(V) Post Estimation- Testing of Linear Hypothesis (Short-run Causality)

This test examines whether there is any short run causality running from variables by testing the linear hypothesis i.e. coefficient with all lags in specific equation are zero.

H0: There is no short-run causality running from EDU (with all lags) to GSDP

CHI^2	6.77
P-value	0.1486

Null hypothesis cannot be rejected as p value is more than 5% value.

Hence the test confirms that only long run causality is running from EDU to GSDP and no short run causality is running in the same direction.

H0: There is no short-run causality running from GSDP (with all lags) to EDU

CHI^2	11.30
P-value	0.0234

Null hypothesis is rejected as p value is less than 5% level.

Hence, the test confirms that only short-run causality is running from GSDP to EDU and no long-run causality is running in the same direction.

(VI) Testing of Hypothesis:

H0: there exists no long run relationship between GDP and EDU in Odisha.

H0 is rejected as Johansen Cointegration Model proved that variables cointegrated, which means there is long run relation between GSDP and EDU.

V. CONCLUSION

The Granger Causality test in a VAR framework confirms that both variables are causing each other and the relation is bi-directional i.e. causality can run from economic growth to educational expenditure and vice versa. But, there is no short run causality running from educational expenditure to GSDP rather there exist long term causality. Czynski and Zeira (2003) in their study found GDP positively affects educational expenditure and the result also shows the short-term causality is running from GSDP to educational expenditure.

The result of the study shows that expenditure on education sector can give fruitful result to the economy by boosting the economic growth. And to make the economy more dynamic and more competitive government must invest in infrastructure related to education as it creates the quality of education and this investment will alternatively help in promoting economic growth in long-term.

Also, in order to keep pace with the Global knowledge explosion and technological advancement the share of education expenditure in GDP and the share of expenditure on Research and Development in GDP should be increased to the Global averages in the various levels of education.

VI. REFERENCES

[1] Busemeyer, & Marius. (2007). Determinants of Public Education Spending in 21 OECD Democracies. Journal of European Public Policy, Vol. 14, No. 4, pp 582-610.

[2] Chakrabati Anindita, J. R. (2006). Determinants of expenditure on education- An empirical analysis using state level data. Economic and Political Weekly, vol. 41, No. 15(Apr. 15-21, 2006), pp. 1465-1472.

[3] Chandra. (2010). Does Government Expenditure on Education Promote Economic Growth? An Econometric Analysis. Jamia Millia Islamia, Paper No. 25480.

[4] Chowdhury, S., & Bose, P. (2004, July-August). Expenditure on Education in India: A Short Note. Social Scientist, 32, 85-89.

[5] Conard, D. (2011). The level specific effect of education in economic growth: Evidence from four caribean countries. The journal of developing areas, 45, 279-290.

[6]   Czynski, M. S., & Zeira, J. (2003). What determines educational expenditure in Israel. Israel Economic Review, 11-33.

[7]   Denison, E. F. (1962). The source of econopmic frowth in the United States and the alternatives before us. New York committee for Economic Development, 308.

[8]   Hanuschek, A, E., & Dennis D, K. (2000). Schooling, Labor Force Quality and the Growth of the Nations. American Economic Review, 1184-1208.

[9]   Husssein Fazal. (2004). An Anlysis of public expenditure on education in Pkistan. The Pkistan Development Review, Vol.42, NO. 4, PP. 771-780.

[10]   Jogrension, D., & Fraumeni, B. (1992). Investment in education and U.S. economic growth. The Scandinavian Journal of Economics, 94, s51-s70.

[11]   Johansen. (1988). Statistical Analysis of Cointegrating Vectors. Journal of Economic Dynamics and Control, vol.12, 231-54.

[12]   Khalifa, Y. (2008). Education expenditure and economic growth: some empirical evidence from the GCC countries. The journal of developing areas, 42, No. 1, 69-80.

[13]   Kiker, B. (1968). Human Capital: In Retrospect, Esseys in Economics, No. 16,. USA: University of Southern California.

[14]   Kolhatkar, M. (1988). Education Expenditure in India in Relation to National Income (1980-88): Trends and Implications. Journal of Education and Social Change, Vol.2, No.2, pp.104-127.

[15]   Monteils , M. (2002). Education and Economic growth: Endogenius growth theory test, The french case. Historical Social Research, 27, No. 4, 93-107.

[16]   Mukharjee , A., & Sikdar, S. (2012). Public Expenditure in India by the Union Government and Roadmap for the future. India Infrastructure Report.

[17]   Musila, J. W., & Belasi, W. (2004). The impact of education expenditure on economic growth in Uganda: Evidence from time series data. The Journal of developing areas, 38, No. 1, 123-133.

[18]   Quan, N., & Beck , J. (1987). Public education expenditure an dstate economic growth: north east and sun belt region. Southern Economic Journal, 54, No. 2, 361-376.

[19]   Ray, S., Pal, M. K., & Ray, I. A. (2011). Assesing causal relaionship between education and economic growth in India. Vidyasgar University Journal of Economics, Vol XVI.

[20]   Scultz, T. w. (1961). Investment in Human capital. The American Economic Review, 51(01), 1-17.

[21]   Yogish. (2006). Education and Economic Development. Indian Journal of Social Development, vol.6 , 255-270.