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Education Expenditure and Economic Growth: A Causal Analysis for India

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Abstract: ***Education is one of the important determinant factors of economic growth. No country can achieve sustainable economic growth without substantial investment in education. It improves the quality of lives and leads to broad social benefits to individuals and society. This paper focuses on the long-run relationship and causality between government expenditure in education and economic growth in Indian economy. Time series data are used for the period 1951 to 2013 obtained from authorized sources. The improved econometric methodologies; unit root and co integration test, Granger Causality test, and Error Correction Modelling approach are applied. The stationarity of the data have been examined by using Augmented Dickey-Fuller (ADF) test. Results from Augmented Dickey-Fuller test show that both government expenditure in education and economic growth are non stationary at the level but found stationary at the first differences, indicating that they are integrated of order one. Johansen maximum likelihood method is applied for testing long run relationship of the data. Both Eigen value and trace tests leads to the same results; there is one co integrating relation at the 0.05 level of significance between government expenditure in education and economic growth. The VECM Granger Causality test reveals that there is unidirectional causality running from government expenditure in education to economic growth. It means government expenditure in education lead to economic growth overall period of time. This study has proves that human capital such as education variable plays an important role in influencing economic growth in India.***

Keywords: ***Education expenditure, Economic growth, Unit Root, Co integration, Error Correction Modelling, Granger Causality.***
JEL Classification Codes: C22, E62, H52, I21.

I. INTRODUCTION

It is widely accepted that education is an important determinant factor of economic growth. Prominent classical and neoclassical economists such as Adam Smith, Lucas and Solow emphasized the contribution of education in developing their economic growth theories and models. The main theoretical approaches of modeling the linkages between education and economic performance are the growth models of Robert Solow (1957) and model of Romer (1990). Apart from the theoretical aspects, numerous empirical studies have focused on the issue of education and economic development.

Expenditure on education is supposed to bring into the economic system the externalities and other indirect effects such as higher education attainment and achievement of children, better individual health and lower number of birth which subsequently cause higher productivity in terms of increased earnings, more participation in the labour force; all these coupled with lower population growth and better health of population tend to positively influence higher economic growth (Michaelowa, 2000).

II. REVIEW OF LITERATURE

In the empirical literature, relationship between public spending an economic growth has found much attention of economists and researchers in public economics and finance.

Chandra Abhijeet (2011) made an attempt to explore the causal relationship between government spending on education and economic growth in respect of India employing a Granger Causality test. The study observed that the causation between education expenditure to economic growth is bi-directional. The results of the study also showed that direction of causation from education expenditure to economic growth is not immediate to take place, rather it can be said that the investment in education is expected to affect economic growth after some period.

Mohd Yahya and Razak Abdul Azila (2012) have investigated the impact of educational expenditure on economic growth in Malaysia for the period 1970-2010. By using VAR method, it has revealed that the GDP has a positive long run relationship with the fixed capital formation (CAP), labour force participation (LAB) and government expenditure on education (EDU). All these showed a significant relationship.

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Islam (2014) examined causal relationship between education and National Income (GDP) growth for Bangladesh over the period 1973-2010 by using a multivariate approach in his study. The variables are GDP at constant price, Total Educational Expenditure, Total Revenue Expenditure and Total Development Expenditure. The empirical methodology adopted for this purpose includes the Granger Causality test within an error -correction framework. The finding suggested strong evidence for unit-directional causality from economic growth to education expenditure.

Pradhan (2009) proved that education has high economic value and must be considered as a national capital. He suggested that this capital must be invested and his country, India, must capitalize this human capital development besides the physical capital that contributes to country's economic growth.

Solaki (2008) investigated the causal relationship between education and economic growth for Greece covering the period from 1961 to 2006, using a bi-variate approach based on human capital theory. Empirical results suggested that in the long-run real GDP Per Capita is affected by changes in primary, secondary and tertiary education and educational public expenditures.

Idrees and Siddiqi (2013) examined long run relationship between public expenditure on education and economic growth. They made comparison of developed and developing countries. The study concluded that public financing of education is an important determinant of economic growth. The result of panel FMOLS implies that, in general, 1 dollar increase in education expenditures brings about 20.85 dollars increase in Gross Domestic Product. Public education expenditure is an investment in labour raising productivity of labour, which results in economic growth by increasing the output levels. The Panel FMOLS result also indicated that the impact of public education expenditures on economic growth is greater in the case of developing countries as compared to the developed countries.

Yakubu and Akanegbu (2015) analysed the impact of education expenditure on economic growth in Nigeria over the period of 1981-2010. Co integration and Granger Causality tests are used in analysed the causal nexus between education expenditure and economic growth. It was found that there is co integration between real growth rate of gross domestic product, total government expenditure on education, recurrent expenditure on education and primary school enrolment. The results also revealed that there is no causality real growth rate of gross domestic product (RGDPG) and total government expenditure on education (TGVTEE), but there is a bi-directional causality between recurrent expenditure on education (REDEXP) and total government expenditure on education (TGVTEE).

Kesharajah (2010) examined causality between public expenditure and economic growth in Sri Lanka using time series annual data over the period of 1979-2009. The empirical evidence suggested that in the long run, public expenditure on education, heath, agriculture and transport and communication have positive and statistically significant effects on economic growth, while defense expenditure shows negative but statistically significant effects on economic growth. Granger causality confirms that there is unidirectional causality form education expenditure to economic growth, defense expenditure to economic growth and agriculture expenditure to economic growth, which supports the Keynesian hypothesis in Sri Lanka.

III. OBJECTIVES OF THE STUDY

Specifically the study aimed at achieving the following objectives:

1. To examine a long run co integration relationship between Government Expenditure in Education and Economic Growth. In India.
2. To examine a long run causality between Government Expenditure in Education and Economic Growth in India.

IV. RESEARCH DESIGN

In this study, annual data are used over the period of 1951 to 2012. All the data were collected from HAND BOOK OF INDIA (RBI) 2012-13. Variables used in this study and the definitions are GEE (log of government expenditure in education and GDP (log of Gross Domestic Product) the data are analyzed to determine the causality between government expenditure in education and Economic Growth. Before analyzing the causal relationship between government expenditure in education and Economic Growth, data have been transformed in to natural logarithms, and then possible existence of unit roots in the data is examined. The stationarity of each series is investigated by employing Augmented Dickey-Fuller unit root test. The number of lagged differences included is determined by the Schwarz Information Criterion and Akanke Information criteria. Further proceed with the VAR lag order selection criteria to choose the best lag length for the VAR time series model to examine the Granger Causality test for all the series is performed. Johansen co-integration test is also applied to test for co-integration. The basic empirical investigation has two purposes. The first one is to examine the long-run relationship between government expenditure in education and Economic Growth while the second is to examine the short-run dynamic causal relationship between government expenditure in education and Economic Growth. The basic testing procedure requires three steps. The first step is to test whether the variables contain a unit root to confirm the stationarity of each variable. This is done by using the Augmented Dickey–Fuller tests (ADF). In the second step we test for the existence of a long-run co integrating relationship between the variables. This is done by the use of the Johansen co-integration test. Finally, the last step, if all variables are integrated of same order and co-integrated then short run and

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long run causality test can be computed using the vector error correction model (VECM) method suggested by Engle and Granger (1987).

V. EMPIRICAL RESULTS

5.1 Result of Stationarity Test:

One of the most important attributes of a time series variable is its order of integration. Hence, we first perform unit root test in levels and first difference in order to determine the order of integration of the series. To test the order of integration, we employ the conventional Augmented Dickey-Fuller (ADF) test.

Table: 1 Result of Unit Root Test Using Augmented Dickey Fuller Test

Variable	At Level		At First Difference		Conclusion
	ADF	Prob.	ADF	Prob.	
GDP	18.59668	1.0000	-5.94735	0.0000	I (1)
GEE	0.248060	0.9735	-6.27423	0.0000	I (1)

It is evident from the above table that the calculated ADF statistics for level variables are less than the critical values in all cases, suggesting that the variables are not level stationary. Table 1 also shows that the ADF statistics for all the variables imply first-difference stationary.

5.2 Result of Lag Order Selection Criteria for GEE and GDP

For getting optimal lag Length for co integration analysis, we have used five criteria namely, LR test statistic, Final prediction error, Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion. All the criteria have suggested a leg length of 1 as an optimal leg length.

Table 2 VAR Lag Order Selection Criteria for GEE and GDP

Lag	Log	LR	FPE	AIC	SC	HQ
0	-95.54605	NA	0.127081	3.612817	3.686483	3.641227
1	184.1783	528.3682*	4.67e-06*	-6.599195*	-6.378197*	-6.513965*
2	187.8937	6.742749	4.72e-06	-6.588654	-6.220324	-6.446604
3	191.0788	5.544531	4.88e-06	-6.558475	-6.042812	-6.359604
4	193.1372	3.430611	5.26e-06	-6.486563	-5.823568	-6.230872
5	196.5810	5.484634	5.39e-06	-6.465964	-5.655637	-6.153453

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic
FPE: Final prediction error
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion
AIC: Akaike information criterion

5.3 Result of Co-Integration Test Based on Johnson Juselius Method:

Once we have the results of unit roots, the next step is to determine whether there exists co-integration, using the same order of integrated variables. To test for co-integration, the Johansen and Juselius (1990) procedure was used, which leads to two test statistics, trace test and maximum eigenvalue test, for co integration.

Table: 3 Result Of the Co-integration Test based on Johnson Juselius method

Johansen Test for Co-integration (Trace Test)				
Hypothesized No. of CE(s)	**Trace Statistic**	**0.05 Critical Value**	**Prob.**	**Conclusion**
None	19.13017	15.49471	0.0135	One Co integrating Relationship
At most 1	0.097704	3.841466	0.7546	
Johansen Test for Co-integration (Maximum Eigen value Test)				
Hypothesized No. of CE(s)	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob.**	**Conclusion**
None	19.03246	14.26460	0.0082	One Co integrating Relationship
At most 1	0.097704	3.841466	0.7546	
Source: Estimated by researcher				

Table3 express the results of the co-integration test. There are two test statistics for co-integration, the Trace test and Maximum Eigen value test. The Trace-Statistic value is shown to be greater than the critical values 5% levels. Therefore, we reject the null hypothesis of no co-integrated equation among the variables. Thus, we conclude that there is at most one co-integrated equation among the variables. The results of Maximum Eigen value test statistics also express same here. Finally, we can say that there is a long run relationship between Government Expenditure in Education and Economic Growth.

5.4 Result of Granger Causality Test Based on VECM:

The long run causality test based on VECM result presented in Table 4 revealed the long run causal relationship among Government Expenditure in Education and Economic Growth. The result showed that the error correction term for co-integrating equation with gross domestic product (GDP) as a dependent variable is significant and negative at one percent, implying that there strong long run relationship running from Government Expenditure in Education to Economic Growth. However, the error correction term for co-integrating equation with Government Expenditure in Education as a dependent variable is negative but not significant. It means that there is no long run causal relationship running from economic growth (GDP) to Government Expenditure in Education. Therefore, we conclude that there is uni-directional causality running from Government Expenditure in Education to Economic Growth in long run.

Table 4 Long run Causality Test Based on VECM: GEE and GDP

Null Hypothesis	ECMt-1	T-Statistic	P-Value	Result
Causality from GDP to GEE	-0.078372	-4.043923	0.0002	Uni directional Causality
Causality from GEE to GDP	-0.032956	-1.498671	0.1396	
Source: Estimated by researcher				

VI. CONCLUSION

In this paper, we have examined the relationship between Government Expenditure in Education and gross domestic product (GDP) in India using time series data over the period of 1951 to 2013. This study uses the ADF unit root test, Johansen co-integration and Vector Error Correction techniques to investigate the long run causality between Government Expenditure in Education and gross domestic product (GDP) in India. From the above study, it can be concluded that the Augmented Dickey Fuller unit root tests show that Government Expenditure in Education and gross domestic product (GDP) series become stationary when first difference are considered. The empirical result reveals a long run co-integrating relationship between Government Expenditure in Education and gross domestic product (GDP) in India. We found evidence of unidirectional causality running from Government Expenditure in Education to gross domestic product (GDP) in long run. Thus, education is an important ingredient to economic growth.

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