

## A Note on Education-Led Economic Growth Hypothesis Pakistan

*Yahya Rashid*

College of Engineering, Salman Bin Abdulaziz University,  
Al-Kharj 11942, Kingdom of Saudi Arabia

---

**Abstract:** This study visits the relationship between education and economic growth using Pakistani data over the period of 1972-2012. In doing so, we have applied the bounds testing approach in examining the cointegration between the variables. The VECM Granger causality approach is used to test the causal relationship between education and economic growth. Our empirical exercise indicated the presence of long run relationship between both variables. Education triggers economic growth and economic growth drives education. The causality analysis reveals the presence of feedback effect between the variables.

---

**Key words:** Cointegration • Education • Economic Growth • Causal relationship • VECM • Data

---

### INTRODUCTION

Although, there is no empirical and theoretical roots are provided by traditional economists but from the days of Adam Smith and David Ricardo had considered education an important component of economic growth. Education is the imperative part of human competency and sovereignty [1]. The theoretical modeling [2, 3] highlighted the importance of education or human capital in stimulating economic growth. Education takes into account by both capital goods and consumer goods and it is an important input in production of goods and services and it has utility for consumers. Jaoul [4] mentioned that education uses two ways to affect economic growth of a nation. Firstly, skilled and educated workers directly affect the productive activities of economic growth. Secondly, education increases the knowledge, creates new ideas which becomes the source of inventions and innovations. This further affects economic growth. Education through informal and formal ways enhances the skill acquisition which contributes to economic growth. The informal education starts from household level enabling children to acquire basic skills like how to sweep, clean their surroundings and fish or farming. The main aim of these activities is to take part in increasing the household income although there is no record for such activities. Formal education is considered an important type of investment in human that enhances their skills for raising their income by

increasing marginal product of labor [5]. So, on the basis of these unique qualities education changes the structure of traditional production function. Human capital through education is linked with the expectations of luxurious jobs and high level of income [6]. This shows that education has very deep roots in explaining economic growth.

From last few years the documents of each government focus on improving the quality of education in Pakistan. The government's main vision is to expand primary education by providing better school facilities, so that growth rate in school enrollment can increase faster than population growth, Yahya [7]. Government of Pakistan introduced a revolutionary step for education in 2009, named National Educational Policy 2009. Which discuss main issues of education: quality and quantity in schools and college education, universal primary education for all, improved facilities in primary school, early children education programs, converting primary school to elementary schools etc. Following the steps primary school enrollment and literacy rates showing upward trends but Pakistan still lag behind other countries in region. The aim of this study is to find the causal relationship between education and economic growth in case of Pakistan. As there are contradictory views among the researchers about the relationship between education and economic growth and give future course of action for improving education and economic growth.

**Literature Review:** Following the literature of last few decades, one important point of discussion remains between economists and policy makers is the link between education and economic growth. The existing empirical literature provides positive, negative, neutral and ambiguous relationship between education and economic growth. Lucas [2] and Romer [3] mentioned the importance of education in economic growth process but Barro [8] highlighted the causal link between economic growth and education. Barro [8] showed the positive relationship between growth of real output and school enrolment while investment in education reduces the gap between developed and developing world. De Meulemeester [9] investigated the causal relationship between economic growth and higher education enrollment for six developed countries over the period of 1885-1987. They reported the unidirectional causality running from higher education to economic growth in case of United Kingdom, Sweden, France and Japan. On the other hand, the bidirectional causality is found between economic growth and higher education in case of Italy and Australia. Dorian [10] analyzed the impact of education on economic growth by using the neoclassical framework. The results exposed the insignificant impact of education on economic growth.

Moving towards development path education is first step [11]. So education has two ways for its process, on one side it increases the productivity and reduces poverty, on the other side it increases economic growth. Similarly, education increases the knowledge and skills, so it plays very important role in increasing economic growth through capabilities of human. He concludes that skilled labor force becomes one of the big reasons to attract foreign direct investment. Abbas and Qaiser [12] investigated the relationship of school enrollment and economic growth in case of India and Pakistan over the period of 1970-1994. Their results indicated the positive and significant relationship between primary school enrollment and economic growth. In case of India and Pakistan, secondary and higher secondary enrollment rate have positive and significant impact on economic growth. The relationship between education and economic growth in case of Peru and Mexico is investigated by Morote [13]. He found that there is no direct relationship between economic growth and education. Nasir and Nazil [14] examined the impact of education, technical training, school quality and literacy on wage earners and salaried persons in case of Pakistan on the basis of PIHS data

(1995-1996). They noted that education has positive and significant impact on wage earners. Their results suggest that by improving schooling system Pakistan can achieve desired level of economic growth.

Jaoul [4] found the causality between economic growth and higher education in case of Germany and France during the period of 2<sup>nd</sup> world war. The results showed that education causes economic growth in case of France but there is no causal relationship in case on Germany. Babatunde and Adefabi [15] explored the relationship of GDP with different year of schooling in the presence of some other control variables in case of Nigeria over the period of 1970-2003. They noted the long run relationship between economic growth and education. This entails that trained and skilled labor force has greater capacity to enhance the total factor productivity. Loening [14] investigated the relationship of education or human capital with economic growth in case of Guatemala over the period 1951-2003. The result empirical reveal that educated labor force has positive and significant impact on economic growth. Khan [16] scrutinized the relationship between human capital and economic growth for 72 developing nations over the period of 1980-2002. Human capital or secondary school enrollment noted by Khan [16] has positive and significant effect on economic growth. Bo-nai [17] investigated the causal relationship between education investment and economic growth in case of China over the period of 1952-2003. They reported the bidirectional causal relationship between education investment and economic growth.

Kim [18] mentioned that highly educated and skilled labor force easily adopts new method of production and new technology. They argued that quantity and quality of education plays important role in achieving desired level of economic growth. The causal relationship between education and economic growth in case of Zimbabwe is investigated by Zivengwa [19]. The empirical results indicated the unidirectional causality is running from education to economic growth in Zimbabwe. Further, he suggested that for achieving desired level of economic growth government and private sector should focus on improving the standard and level of education. Hassan and Kalim [20] examined the triangular causal relationship between economic growth education expenditures and health in case of Pakistan over the period of 1972-2009. Their results exposed the bidirectional causal relationship between economic growth and education expenditure in case of Pakistan.

### Methodology and Data Collection

**Innovative Accounting Approach:** For investigating the dynamic relationship between the variables of the model Vector Auto Regression (VAR) approach is applied. The VAR is used for avoiding the weakness of endogeneity and integration order of the variables of the model. The present study used impulse response function and variance decomposition for investigating the shocks among the variables of the model. The variance decomposition permits inferences to be concluded that which proportion of movements is due to its own shocks or other variables in particular time periods. The variance decomposition approach breaks down the variance of the variables and forecast error for each variable following a shock to particular variable. This enables to find which variable have strong impact on other variables of the model. Whereas, impulse response function studies the impact of shocks of one variable and their time path for other variables. Moreover, impulse response function enables how individual act or responds over time for shocks of other variables. These two approaches are also named innovative accounting approach. This study uses the time series data over the period of 1972-2013. The empirical equation of the VAR model is modeled as following:

$$V_t = \sum_{i=1}^k \delta_i \times V_{t-i} + \eta_t$$

where  $V_t$ ,  $\eta_t$  and  $\delta_1, \dots, \delta_k$  are two by two matrices of coefficients and  $\eta$  is a vector of error terms.

**ARDL Bound Testing Approach:** There different approaches to cointegration are available in existing for applied economists such as [21, 22, 23]. We choose the ARDL bound testing approach because it has superior properties to others. It performs better in case of small sample data and provides better results in case of purely  $I(0)$ , purely  $I(1)$  or mixed order of integration. Moreover, this approach takes sufficient number of lags to capture the data generating process in a general-to-specific modeling framework [24]. The Wald or F-statistic is used to test the significance of lagged levels of the variables under conditional unrestricted equilibrium error correction model (ECM), Pesaran [25]. The unrestricted error correction model (UECM) is following:

$$\Delta Y = \alpha_0 + \sum_{i=1}^p \alpha_1 \times \Delta Y_{t-i} + \sum_{i=1}^p \alpha_2 \times \Delta X_{t-i} + \beta_1 \times Y_{t-1} + \beta_2 \times X_{t-1} + \varepsilon_{1t}$$

where  $\Delta$  is the difference operator,  $p$  represents the lag structure,  $Y_t$  and  $X_t$  are the underlying variables and  $\varepsilon_{1t}$  is error term with mean zero and finite covariance matrix.

The study uses time series data over the period of 1972-2012. We have combed the economic survey of Pakistan (various issues) to collect data on real GDP per capita proxy for economic growth ( $Y_t$ ) and composite of primary, secondary and tertiary enrollment for proxy of education ( $E_t$ ). We have transformed both series into logarithm form for empirical purpose.

### RESULTS AND DISCUSSION

Table 1 shows the descriptive statistics results of variables, the estimated results indicates that per capita income and education are normally distributed in case of Pakistan. The statistics value of Jarque-Bera reveals that time series data of both variables have zero mean and finite covariance in Pakistan. The correlation between education and economic growth is positive.

Most of time series are non-stationary and have unit root problem which makes regression results spurious. There are number of unit root tests are available for the solution of unit root in time data, so on the bases of data from 1972 to 2012 we use Augmented Dickey-Fuller (ADF), Phillips Perrson (PP) and Ng-Perron unit root test to check the stationarity of variables. Table 2, presents the unit root results of ADF, PP and Ng-Perron unit root test. The results of ADF, PP and Ng-Perron show that per capita income and education are not stationary at level having intercept and time trend. But at first difference both variables become stationary. So at first difference we rejected the null hypothesis of unit root and all variables have same order of integration.

In applying the ARDL bounds testing, the Wald statistic and Chi-square are used for investigating the cointegration between the variables of the model. The calculated Wald-test is greater than the upper critical bound which confirms there is cointegration between the variables of the model. The calculated Chi-square is greater than the upper bound which confirms that there is cointegration between the variables. This unveils the presence of long run relationship between education and economic growth over the period of 1972-2012.

The estimated regression equation-1 when per capita income (economic growth) is dependent variable shows that education has positive and significant on economic growth. The estimated coefficient of education shows that

Table 1: Descriptive Statistics and Pair-wise Correlations

Variable	Mean	Median	Maximum	Minimum	Std. Dev	Jarque-Bera	Prob.	$\ln Y_t$	$\ln E_t$
$\ln Y_t$	10.026	10.101	10.454	9.549	0.285	2.994	0.223	1.000	0.346
$\ln E_t$	5.427	5.277	6.130	4.681	0.513	2.624	0.243	0.346	1.000

Table 2: Unit Root Analysis

Variable	ADF Test		PP Test	
	T-statistic	Prob.	T-statistic	Prob.
$\ln Y_t$	-1.0829(1)	0.9191	-1.4333(3)	0.8350
$\ln E_t$	-0.9713 (2)	0.8350	-1.0055(3)	0.9315
$\Delta \ln Y_t$	-5.5494 (2)*	0.0003	-5.5577(3)*	0.0003
$\Delta \ln E_t$	-3.8790 (1)**	0.0231	-6.8750 (3)*	0.0000
Variable	Ng-Perron Test			
	MZa	MZt	MSB	MPT
$\ln Y_t$	-3.6623 (1)	-1.3192	0.3602	24.3490
$\ln E_t$	-5.6722 (2)	-1.5718	0.2771	15.8161
$\Delta \ln Y_t$	-22.9361 (5)**	-3.3829	0.1474	3.9941
$\Delta \ln E_t$	-23.3133 (2)**	-3.4100	0.1462	3.9334

Table 3: Bounds Testing Analysis

Dependent Variable	Lag order	Wald-Test	Chi-square
$\ln Y_t$	2, 2	10.600*	11.202
$\ln E_t$	2, 2	5.784***	9.569
Narayan, (2005)		Lower Bound	Upper Bound
1%		7.317	8.720
5%		5.360	6.373
10%		4.477	5.420

Note: \* and \*\*\* show significance at 1% and 10% levels respectively.

a 1 percent increase in education brings 0.193 percent increase in per capita income (economic growth) in Pakistan. This relationship is significant at 1 percent level.

$$\ln Y = 8.978 + 0.193 \ln E \quad (1)$$

(0.028) (0.000)

The estimated regression equation-2 when education is dependent variable shows that economic growth has positive and significant effect on education. This unveils that a 1 percent increase in economic growth increases education by 0.622 percent in Pakistan. This relationship is significant at 5 percent<sup>1</sup>.

$$\ln E = -0.812 + 0.622 \ln Y \quad (2)$$

(0.768) (0.028)

Once the variables are integrated at I(1) and cointegrated then the VECM Granger causality approach is suitable in examining the causal relationship between the variables. The results are reported in Table 4 and we find that in long run, education causes economic growth and economic growth causes education in Granger sense confirming the feedback effect. This shows that education and economic growth are complementary for each other. In short run, education Granger causes economic growth but same is not true from opposite side.

The VECM Granger causality test indicates the causal effect but does not inform us in how much extent dependent variables is affected by independent variable. The variance decomposition approach is used in finding the direction of causal relationship ahead the sample period. The results reported in Table 5 show that education explains economic growth by 25.547 percent while rest of economic growth is contributed by its own innovative shocks. Economic growth contributes to education minimally i.e. 0.646 percent and 99.35 of education is explained by its innovative shocks. This shows that the unidirectional causality is confirmed running from education to economic growth.

**Conclusion and Policy Implications:** This paper investigated the relationship between education and economic growth over the period of 1972-2012 in case of Pakistan. For empirical purpose, the ARDL, the VECM and innovative accounting approaches have been employed. The results confirmed the presence of cointegration between education and economic growth. Furthermore, education has positive effect on economic growth and economic growth also drives education. The causality results show the feedback effect between education and economic growth. This suggests that government should pay more attention in rising education level not only at higher level but also at grassroots level to trigger economic development for long span of time. High economic growth i.e. increase in income per capita intends the people to attain more education.

<sup>1</sup>Probability values are given in small parenthesis

Table 4: The VECM Granger Causality Analysis

Variables	Direction of Granger Causality				
	Short Run		Long Run	Joint Causality	
	$\Delta \ln Y_t$	$\Delta \ln E_t$	$ECT_{t-1}$	$\Delta \ln Y_t ECM_{t-1}$	$\Delta \ln E_t ECM_{t-1}$
$\ln Y_{t-1}$	....	9.2692* [0.0007]	-0.0143*** [0.1013]	....	7.5054* [0.0006]
$\ln E_{t-1}$	0.1391 [0.8706]	....	-0.7295*** [0.0845]	2.5081*** [0.0981]	....

Note: \* and \*\*\* represent significance at 1% and 10% levels respectively.

Table 5: Variance Decomposition Percentages of 42-year Error Variance

Percentage of forecast error variation in	Typical shocks in	
	$\ln Y_t$	$\ln E_t$
$\ln Y_t$	74.452	25.547
$\ln E_t$	0.646	99.353

## REFERENCES

- Sen, A., 1999. Development as freedom. Oxford University Press, Oxford.
- Lucas, R.E., 1988. On the Mechanics of Economic Development. Journal of Monetary Economics, 22: 3-42.
- Romer, P.M., 1990. Endogenous Technical Change. Journal of Political Economy, 98: 571-5102.
- Jaoul, M., 2004. Higher education, causality and growth: a comparison of France and Germany before the Second World War, Compare. A Journal of Comparative and International Education, 34(1): 117-133.
- Schulz, T.H., 1962. Reflections on Investment in man. Journal of Political Economics, 70(5): 1-8.
- Gylfason, T. and G. Zoeya, 2003. Education, Social Equality and Economic Growth: A view of the Landscape. Economic Studies, 49: 557-579.
- Yahya, R., 2013. Comparison between Volunteer Teachers and Permanent Public school Teachers of Pakistan: a study of their students' motivation and satisfaction level, Global Conference on Education, University of Riverside, California USA Nov 15-16.
- Barro, R.J., 1991. Economic Growth in a Cross Section of Countries. Quarterly Journal of Economics, 106: 407-443.
- De Meulemeester, J.L. and D. Rochat, 1995. A Causality Analysis of the Link between Higher Education and Development. Economics of Education Review, 14: 351-61.
- Dorian, S.K., 1997. Education and Health in an Effective – Labour Empirical Growth Model. The Economic Record, 73: 314-328.
- Raja, N., 2005. Humanization of education in Pakistan through Freire's concept of literacy. Asia Pacific Education Review, 1(6): 1-6.
- Abbas, Qaiser, 2000. The role of human capital in economic growth: A comparative study of Pakistan and India. The Pakistan Development Review, 39: 4, Part 2 (Winter), 451-473.
- Morote, E.S., 2000. Higher education, employment and economic growth: Mexico and Peru. www.americanprofessor.org/documentation/lasapaper.doc.
- Loening, J.L., 2005. Effects of Primary, Secondary and Tertiary Education: Evidence from Guatemala. Policy Research Working Paper (3610).
- Babatunde, M.A. and R.A. Adefabi, 2005. Long run relationship between education and economic growth in Nigeria: Evidence from the Johansen's cointegration approach. Regional Conference on Education in West Africa: Constraints and Opportunities Dakar, Senegal, November, 1<sup>st</sup> and 2<sup>nd</sup>, 2005.
- Khan, S. Mohsin, 2005. Human capital and economic growth in Pakistan. The Pakistan Development Review, 44(4): 455-478.
- Bo-nai, F. and Xiong-Xiang, 2006. A study on the rate of contribution of education investment to the economic growth in China; Front. Educ. Chin (2006) 4: 521, Higher education press and Springer-Verlag 2006.
- Kim, Y.J. and A. Terada-Hagiwara, 2010. A survey on the relationship between education and growth with implications for developing Asia. ADB Economics Working Paper Series 236, Asian Development Bank.
- Zivengwa, T., 2012. Investigating the Causal Relationship between Education and Economic Growth in Zimbabwe. Global Journal of Management and Business Research, 12(8): 107-117.
- Hassan, M.S. and R. Kalim, 2012. The triangular causality among education, health and economic growth: a time series analysis of Pakistan. World Applied Sciences Journal, 18(2): 196-207.

21. Engle, R.F. and C.W.J. Granger, 1987. Co-Integration and Error Correction: Representation, Estimation and Testing *Econometrica*, 55(2): 251-276.
22. Johansen, S., 1988. Statistical Analysis of Cointegrating Vectors, *Journal of Economic Dynamics and Control*, 12: 231-254.
23. Phillips, P. and B. Hansen, 1990. Statistical Inference in Instrumental Variables Regression with I(1) Processes. *Review of Economic Studies*, 57: 99-125.
24. Laurenceson, J. Joseph and J.C.H. Chai, 2003. *Financial Reform and Economic Development in China*, University of Queensland, Australia, Edward Elgar Publishing, Inc., UK.
25. Pesaran, H.M., *et al.*, 2001. Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16: 289-326.