International Journal of Economics, Commerce and Management
United Kingdom Vol. V, Issue 5, May 2017
http://ijecm.co.uk/ ISSN 2348 0386

AN EMPIRICAL INVESTIGATION OF THE NEXUS BETWEEN EDUCATION EXPENDITURE AND ECONOMIC GROWTH

(A CASE STUDY OF SAUDI ARABIA)

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Abstract

This research study aims to investigate the impact of education expenditure on economic growth in Saudi Arabia. This study adds education expenditure to Cobb-Douglas production function for the said purpose. Three models are specified to determine the impact of education expenditure on gross domestic product (GDP), oil GDP and non-oil GDP as Saudi Arabia is an oil rich country. Variables of the study are integrated of order one and long-run relationship among variables is confirmed by the Johansen cointegration test. It is concluded from the result of cointegration that education expenditure along with physical capital and labor force is the determinant of economic growth in Saudi Arabia. Cointegration regression of fully modified ordinary least squares is applied in the study to get long-run estimates. Results of the study confirm that education expenditure along with capital and labor force has positive significant impact on GDP and non-oil GDP whereas capital is the only significant factor to influence positively oil GDP.

Keywords: Education expenditure, GDP, oil and non-oil GDP, Cointegration, FMOLS

INTRODUCTION

The essential element of human capital development is education which is one of the keys to technological development. It is also considered that education is way to economic progress and prosperity as it can generate employment, brings social awareness, confirms sound foundation of social equity and gives vitality to culture nourishment. Education uplifts the individual's skills and productivity thus; could lead to economic progress. In the literature one

can found two basic reasons to associate education with economic growth. First, at general level, the level of individuals' education is being uplifted in the last millennium especially scientific education which root can be originated in the emergence of industrial revolution. Second, at more explicit level, one can find empirical studies in the literature that supported and documented that increase in income of individuals became possible with their education level.

Education is a key element of human capital and is considered as a merit good. It not only helps in the adoption of new and advance technology but also aids to improve innovative capacity. Solow residual has greater importance in economic literature and as pointed out by Griliches (1970) its one-third can be attributed to the educational levels of the labor force. Similarly, Wozniak (1987) also stress on the role of education, information acquisition and experience on the decision of technology adoption. In this study, Wozniak (1987) emphasizes that the differences in human capital and knowledge about new technology explains how quickly a country adapts to changing technology. Furthermore, Wozniak argued old education has to be replaced with contemporary education so that human capital and knowledge can be responsible for increase in profitable innovation thus; it would ensure the early adoption of new and advance technology. In another work on the role of human capital in the economic growth, Lucas (1990) documented that human capital can play a positive role to attract other factors of production. Lucas emphasized on the role of higher education and recommends that developing countries have to invest in higher education in order to put themselves on right track of development as this will enables developing countries to produce high skilled professionals. But, his study failed to give due importance to primary and secondary education as it is a prerequisite for higher education and one cannot ignore the importance of these education levels. One can trace another study conducted by Murphy et al. (1991) who decomposed the tertiary education into engineering and law students to examine the effect of tertiary education on economic growth. However, Murphy et al. (1991) like Lucas (1990) ignored the basic education which is a prerequisite for a higher level of education. Krueger and Lindahl (2001) examined the role of education in economic growth by first analyzing the micro economic framework and then extending it to the macro level. The study uses the techniques of ordinary least square and instrumental variable to study the impact of schooling on economic growth through cross-country regression analysis.

Yamauchi and Godo (2001) examined the complementarities between education and technologies to study the bidirectional relationship between education and economic growth for the Japanese economy. They concluded that education alone does not find its way into its productive use as the relationship between education and economic growth is very multifaceted.

This might be the reason that in a study Musila and Belassi (2004) consider that institutional framework has greater importance in the productive use of schooling.

Aghion et al. (2006) conducted a panel study to determine the relationship between technological change and educational policies. They utilized panel data for 50 sates of the US and OECD countries. They deduced from the results of their study that tertiary education is the key cause of economic divergence. Furthermore, they argued that it is not just the years of schooling but it is the quality of education that matters too to play an important role in economic uplift of countries and regions. Quality and advanced level of education produce more researchers who not only innovate but also facilitate technology adoption. In a study, Azomahou et al. (2009) made it clear that countries have to invest in higher education which is near to the contemporary technological frontier while the countries which are far behind the technological contemporary frontier should invest in primary and secondary level education to uplift their technological advancement. The study of Azomahou et al. (2009) is different from other studies as it explains the need of complementarities between education and research and development (R & D) which is vital for economic progress. Nevertheless, there are individual studies who consider time period to determine the impact of education on economic growth, for example, Kakar et al. (2011) found no significant relationship between education and economic growth in the short-run but were able to establish that educational development has an impact on economic growth in the long-run in Pakistan. They concluded that government expenditure on education does influence the economic growth in long-run in Pakistan. In another research study for Pakistan, Riasat et al. (2011)found that government expenditure on education and economic growth are in long-run relation and government expenditure on education has positive impact on economic growth in the long-run.

Son et al. (2013) examined the impact of education on income level for the European Union (EU) region. Their results assured that education played an important role in the economic growth through increase of income per capita in the EU. Kiran (2014) studied the cointegration between education expenditure and economic growth for the selected 18 Latin American countries. His study found that education expenditure and economic growth is cointegrated in considerable numbers of countries of Latin America. Likewise, in a recent study, Wang and Liu (2016) examined the impact of education on economic growth in a panel of 55 countries over period 1960-2009. They decomposed education level into three categories, primary, secondary, and tertiary level and found that tertiary education has significant and positive impact on economic growth.

The aim of this paper is to investigate the impact of public education expenditure on economic growth in the Kingdom of Saudi Arabia. So, the remaining study is structured in the

following manner. The next section describes theoretical frame work and also empirical models of the study are developed in this section. The third section explains about data and its sources and also research methods applied in this study. Results interpretation and discussion is presented in fourth section while the fifth section concludes the research study.

THEORETICAL FRAMEWORK AND EMPIRICAL MODEL

The counterpart of capital in the production theory is labour so if accumulation of physical capital is necessary for high production then in the same manner investment in human capital will provide same result henceforth; uplifting the education level of the individuals can be referred to investment in human capital and as an investment decision. In the light of the Keynesian theory a numerous researchers gave attention to the nexus between education and economic growth as according to this theory increase in the public spending will uplift the aggregate demand and in this way public spending will have multiplier effect on the economy and thus; leads to economic growth as public spending generates employment and investment opportunities. Thus, it can be concluded that government expenditure supplements the aggregate demand and its positive magnitude depends on expenditure multiplier. Education is considered as primary constituents of the human capital in the existing literature. Because, education has definite spillover externalities, benefits the educated individuals and enhances productivity, thus, human capital is an important component of economic growth in modern economies. Zhang (2013) postulated that human capital accumulation and utilization is an important element of economic growth and the role human capital in economic growth is presently a prime area in research. He further argued that human capital could explain and one should not worry about why different economies grow differently over time. Likewise, Kreishan and Hawarin (2011) argued that education not only nurtures society but its effect on economic growth has multiple dimensions in the existing literature. One of the dimensions of human capital and economic growth relationship is that human capital can be gauged in terms of health and education level. In an empirical work Barro (1991) studied the association between economic growth and various possible explanatory input factors. He analyzed that data through regression analysis for a sample of 98 countries over the period from 1960 to 1985. He found that the real per capita GDP is inversely related to initial real GDP per capita only if the initial level of human capital is considered. In the endogenous growth theory literature, technological factors are responsible for economic growth and differences between per capita income of the regions and countries. The ability to operate advance production facilities in a more productive way comes from the process of learning through education or more generally from learning to deal with rapid changes in the production structure dring industrial progress (Verbeck, 2000).

To analyze the factors of economic growth has been one of the most significant fields of research in economic literature in last three decades. The pioneer work of Romer (1986) and Lucas (1988) on endogenous growth models laid the foundation for research in this area. Furthermore, Baumol (1986) and Mankiw et al. (1992) among others contributed to growth-empirics by testing the neoclassical convergence hypothesis. It is also essential to emphasize the vital contribution relating to the development of analogous cross-country data on GDP, human capital indicators, and productivity (Barro and Lee, 2001). This current study from above discussion on education as an important element of human capital developed the empirical model of the study by introducing education into Cobb-Douglas production as shown in Equation 1 below.

GDP=f(CAP,LAB,EDU) (1)

Where; GDP, CAP, LAB, and EDU indicates gross domestic product, gross capital formation, labor force, and education expenditure respectively. Nevertheless, this study will also examine the effect of education expenditure on oil GDP (OGDP) and non-oil GDP (NGDP). Thus, for oil and non-oil GDP the models will be as presented in Eq. 2 and Eq. 3 respectively.

OGDP=f(CAP,LAB,EDU) (2)

NGDP=f(CAP,LAB,EDU) (3)

After taking natural log (log) of the Eq. 1, Eq. 2 and Eq. 3 the empirical models of the study can be written as in Eq. 4, Eq. 5 and Eq. 6 respectively.

Model 1 $\log(GDP_t)=b_{(0+)} b_1 \log(CAP_t)+b_2 \log(LAB_t)+b_3 \log EDU_t+e_t$ (4)

Model 2 $\log((OGDP)_t)=b_{(0+)} b_1 \log((CAP)_t)+b_2 \log((LAB)_t)+b_3 \log(EDU)_t+e_t$ (5)

Model 3 $\log((NGDP)_t)=b_{(0+)} b_1 \log((CAP)_t)+b_2 \log((LAB)_t)+b_3 \log(EDU)_t+e_t$ (6)

Where; t and e presents time period and error term respectively.

RESEARCH METHOD

Data has gathered from various issues of the “Achievements of the development plans” published by Ministry of economy and planning, Kingdom of Saudi Arabia. Data of all monetary variables are in constant 1999 Saudi Riyal. The GDP, OGDP and NGDP are used as a proxy for economic growth, growth of oil sector and non-oil sector of GDP respectively. Gross capital formation (CAP) and employment (EMP) is used as a proxy for physical capital and labor force respectively while government expenditure on education is represented by EDU.

This study will employ augmented Dickey-Fuller test (ADF) (Dickey and Fuller, 1979) to test stationarity properties and order of integration of the time series data. Cointegration test can be applied once it is determined that order of integration is same of all variables of concern (Johansen, 1988; Johansen and Juselius, 1990). Johansen and Juselius (1990) developed test to find long-run relation among variables that are integrated of the same order. This test considered variables at difference without losing their long-run relation and identifies that how much co-integration vectors are existed among variables. The test estimates are exactly distributed which make a foundation to apply this test for long-run relation among variables which are being made stationary through differencing. After determining the cointegration of variables, this study will employ fully modified ordinary least squares (FMOLS) to obtain long-run estimates. This cointegration regression can be attributed to Phillips and Hansen (1990). The FMOLS cointegration regression method has some advantages as it takes care of serial correlation and provides efficient estimates as it corrects endogeneity problem which maybe arise from the cointegration process.

RESULTS AND DISCUSSIONS

The results of ADF unit root test are provided in Table 1. These results show that time series data on all concerned variables is trended and the study variables possess unit root at their level. The variables becomes free of unit root after taking their first difference thus, it is deduced from these findings that study variables are integrated of order one.

Table 1. Unit Root Results

Variables	level	first difference		conclusion
logGDP	-2.59	Δ*logGDP*	-3.97[a]	*I (1)*
logOGDP	-2.62	Δ*logOGDP*	-3.36[a]	*I (1)*
logNGDP	-2.75	Δ*logNGDP*	-3.44[a]	*I (1)*
logCAP	-0.95	Δ*logCAP*	-3.45[a]	*I (1)*
logEMP	-1.48	Δ*logEMP*	-4.19[a]	*I (1)*
logEDU	2.56	Δ*logEDU*	-5.00[a]	*I (1)*

[a] shows significant at 1 percent level

Results of Johansen cointegration are presented in Table 2. This test variables at their first difference and does not lose any long-run information if any information exist among variables as study variables are stationary at their first difference. The null hypothesis of no cointegration among selected variables can be rejected in favor of alternative hypothesis that there is long-run

relation among variables of the Model 1 as there are three cointegration vectors. Thus, capital, labor force and government education expenditure are determinants of economic growth in the long-run. This finding of current study is in line with Riasat et al. (2011) and Kiran (2014) who also find that education is the determinant of economic growth in the long-run.

The results of cointegration test for Model 2 is depicted in Table 3. There is again evidence of three cointegration vectors among variables of the model thus; we can conclude that long-run relationship is found among economic growth, capital, labor force, and government expenditure on education.

Table 2. Results of Cointegration Test for Model 1

Series: *logGDP logEDU logCAP logEMP*				
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None	65.2319*	40.17493	29.70159*	24.15921
At most 1	35.5303*	24.27596	23.49583*	17.79730
At most 2	12.0345*	12.32090	11.58194*	11.22480
At most 3	0.45256	4.129906	0.452560	4.129906

* indicates rejection of null hypothesis

Table 3. Results of Cointegration Test for Model 2

Series: *logOGDP logEDU logCAP logEMP*				
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None	62.7520*	40.17493	31.46134*	24.15921
At most 1	31.2906*	24.27596	18.74895*	17.79730
At most 2	12.5417*	12.32090	12.48575*	11.22480
At most 3	0.05597	4.129906	0.055972	4.129906

* indicates rejection of null hypothesis

In the same way, the long-run relationship for Model 3 was identified by applying cointegration test. The results for Model 3 are shown in Table 4. The trace statistic and max-eigen value statistic confirmed that there are two cointegration vectors among variables of the Model 3. Thus, null hypothesis of no cointegration is rejected and alternative hypothesis of cointegration is accepted and we can conclude that there is long-run relationship among variables of Model 3.

Table 4. Results of Cointegration Test for Model 3

Series: *logNGDP logEDU logCAP logEMP*				
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None	67.0806*	40.17493	34.92253*	24.15921
At most 1	32.1581*	24.27596	21.78298*	17.79730
At most 2	10.37519	12.32090	9.560318	11.22480
At most 3	0.814869	4.129906	0.814869	4.129906

* indicates rejection of null hypothesis

Once long-run relationship is determined and it is found that variables are cointegrated then we can apply cointegration regressions to find out long-run estimates of the explanatory variables. In this study long-run estimates are obtained through FMOLS. The result estimates of FMOLS in case of Model 1 are presented in Table 5 below. It can be seen that all three explanatory variables are found to have significant and positive effect on economic growth in the long-run. The positive effect of education on economic growth is similar to what Kakar et al. (2011), Son et al. (2013), and Riasat et al. (2011) find in their studies. As we know that double long model was estimated so we can interpret coefficients of explanatory variables as elasticities of respective variables. These estimates showed that ten percent increase by government on education will increase economic growth by one percent. The coefficient of capital is 0.26 which is indicating that 10 percent increase in capital will boost economic growth by 2.6 percent and similarly, the coefficient of capital is highlighting that ten percent increase in labor force will enhance economic growth by almost two percent.

Table 5. Long-run Estimates for Model 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
logEDU	0.105519[b]	0.051312	2.056419	0.0461
logCAP	0.257551[a]	0.064567	3.988905	0.0003
logEMP	0.190734[b]	0.079920	2.386564	0.0217
Const.	6.192138[a]	1.243941	4.977841	0.0000
R-squared	0.935009	Adj. R-squared	0.930253	

[a] and [b] shows significance level at 1 and 5 percent respectively

Long-run estimates obtained through applying FMOLS for Model 2 are shown in Table 5 below. Among the explanatory variables in case of this model only capital has positive and significant effect on economic growth (oil GDP). The results did not confirm the significant effect of either

government expenditure on education or labor force on economic growth in the long-run. This means that only investment is the necessary factor to uplift oil GDP in case of Saudi Arabia.

Table 6. Long-run Estimates for Model 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
logEDU	-0.082726	0.138631	-0.596732	0.5540
logCAP	0.349174[c]	0.174442	2.001666	0.0520
logEMP	0.146417	0.215921	0.678105	0.5015
Const.	6.526371[c]	3.360783	1.941920	0.0590
R-squared	0.945220	Adj. R-squared	0.942577	

[c] shows significance level at 10 percent

Now we are going to explain the result estimates for Model 3 in which the dependent variable is non-oil GDP. These estimates are given in Table 7. The government expenditure on education is highly significant and has positive effect on economic growth (nonoil GDP) in the long-run. Its coefficient is higher than other two explanatory variables. Its coefficient is 0.27 and can be interpreted ten percent increase by government on education will bring an increase of 2.7 percent in non-oil GDP. Capital has to be found with positive and significant effect on non-oil GDP and ten percent increase in capital will increase non-oil GDP by 1.4 percent in non-oil GDP. Likewise, labor force also found to be having positive and significant impact on non-oil GDP. Its coefficient is indicating that ten percent increase in the labor force will enhance non-oil GDP by 1.5 percent in Saudi Arabia.

Table 7. Long-run Estimates for Model 3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
logEDU	0.273496	0.043841	6.238301	0.0000
logCAP	0.144819	0.055166	2.625127	0.0121
logEMP	0.148376	0.068284	2.172920	0.0356
Const.	6.060862	1.062831	5.702565	0.0000
R-squared	0.983863	Adj. R-squared	0.982682	

[a] and [b] shows significance level at 1 and 5 percent respectively

CONCLUSIONS

The results of this study emphasized that education expenditure, capital, and employment are important factors of economic growth in Kingdom of Saudi Arabia as these identified variables are cointegrated in the long-run. The long-run estimates show that education expenditure,

capital, and employment have positive and significant impact on economic growth when economic growth is proxy by GDP. As this study is interested that how different components of government expenditure affect GDP, oil GDP and non-oil GDP, thus it is also examined that education expenditure, capital, and employment are vital elements of oil and non-oil GDP. The results indicates that education expenditure and employment do not have significant effect on oil GDP but have positive and significant effect on non-oil GDP whereas capital is significant contributor of oil and non-oil GDP in the long-run. Thus, research finding of this study assured us that education is an important determinant of economic growth in the Kingdom of Saudi Arabia. An effective education system increases the competitiveness and contributes to the economic growth by training the qualified labor which could certainly increases the productivity and we are well aware that education constituent the human capital, thus improved education situation not just for men but also for women would certainly influence the Kingdom's economic growth. This study advises for future studies to disaggregate government expenditure into primary, secondary, and higher level education expenditure for better understanding of education expenditure impact on economic growth in the Kingdom of Saudi Arabia.

ACKNOWLEDGEMENT

The author highly appreciates the financial support of Ministry of Education, Kingdom of Saudi Arabia.

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