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PUBLIC SPENDING ON EDUCATION AND ECONOMIC GROWTH IN ALGERIA: CAUSALITY TEST

Abstract:

In this article, we seek to study the relationship between education and economic growth.For this purpose, we studied multipleentrances(dimension) information relating education and Economic Growth on theoretical and empirical background in the first, as the second part of study to analysis and examine the effect of Public spendingon education on economic growth in Algeria over the period 1974-2012. with the use of endogenous growth model. In this model, gross domestic product
(GDP) is based on the Cobb Douglas form which is the function was adoptedwith five variables: Real Gross National Product (GDP), Capital (K), Labor (L), Expenditure on Education (SEDU). Two unit root tests (Philips-Perron Test) have been employed to test the integration order of the variables.study uses Ordinary Least Squares (OLS) and Johansen Co-integration test and Causality Test is as analytical techniques for this purpose. The empirical results support the main hypothesis of this study that Public spending on education affects positively economic growth in Algeria. Even though that the most important effect on economic growth is for education, the other three explanatory variables affect also, positively, the economic growth; yet their effect is relatively less important than the effect of education.

Keywords:

Economic Growth; Public spending on education; Co-integration Analysis; Causality Tests.

JEL Classification: A10, A20, C59

1. INTRODUCTION

Education plays an important role in human capital development which is a key to scientific and technological advancement. Education is also regarded as a sustainable route to economic prosperity, it combats unemployment, confirms sound foundation of social equity, awareness and cultural vitality. It raises the productivity and efficiency of individuals and produces skilled manpower capable for leading the economy towards the path of economic development.

There are two very basic reasons for expecting to find some link between education and economic growth. First of all at the most general level it is intuitively plausible that living standards have risen so much over the last millennium and in particular since because of education. Secondly, at a more specific level, a wide range of econometric studies indicates that the incomes individuals can command depend on their level of education. If spending on education delivers returns of some sort, in much the same way as spending on fixed capital, then it is sensible to talk of investing in human capital, as the counterpart to investing in fixed capital. The process of education can be analysed as an investment decision.

The relationship between education and economic growth has been extensively investigated, with the theoretical and empirical models, although the question of how education affects economic growth is not yet fully resolved. One of the issues that cause controversy is that of the apparent contradictions between the effects of education on the growth of personal income (microeconomic effect) and on economic growth (macroeconomic effect). Regarding the microeconomic effect, the consensus is that on average, more education tends to increase an individual's earnings. However the growth effects of public spending have also received much attention in the analytical literature on endogenous growth. As shown in an influential early contribution by Barro (1990) and much of the subsequent literature spawned by it, public services and capital in infrastructure may promote growth through their effect on the productivity of factors and the rate of return on capital, and the growth-maximizing rates of taxation and public investment are in general positive.

In spite of what Algeria uncircumcised huge financial education sector in order to achieve the Millennium Development Goals on the one hand and the presence of a number of studies and evidence of economic pilot looked at the relationship between investment spending, educational and economic growth of developing countries and developed countries alike, but this relationship tinged so many of the ambiguities and vary from state to state, as well as to oppose the scholars of the subject of the relationship between performers (Positive relationship), and opponents of the (negative relationship), hence This study is to measure and determine the direction and strength of the relationship and shape between education (educational expenditure) and the rate of economic growth in Algeria and to determine the impact on each other using a standard model based on indicators known and hence the problem study in an attempt to answer the main question:

In particular, this paper will address the following questions:

- Does public spending on education at all levels cause economic growth in Algeria?

- To what extent can to improve the level of education resulting from the increased spending in educational opportunities for economic growth?

To get to the analysis of the problematic question of the current study adopts the following assumptions:

- There is a causal relationship between the proportional investment spending on education and the real GDP in the long term.

- Contribute to the education spending in the accumulation of huge store of human capital, especially in the period from 1991 to 2013.

On these concepts Algeria is seeking to improve the education sector because it represents a pivotal aspect can depend upon the government in the implementation of many development policies; This study also seeks to highlight the range of the following objectives:

• Exposure to the theoretical framework for investment spending in education and highlight the importance of human capital in the creation of economic growth through the interpreter theoretical framework for economic growth through previous studies to multiple dimensions of the relationship between education and economic growth.

• Tracking the situation in Algeria through research to find out the relationship between income and expenditure of education and its impact on real income by clarifying the correlation between two variables (educational expenditure) and (economic growth), on the basis of investment spending in education; through research and review the results of An Empirical Study . And thus validate the provisions ranging from robbery or positive about the impact of this relationship negatively or positively on the long-term.

Accordingly, the rest of this paper is divided into several sections. Section two offers some education background in Algeria. Theoretical and empirical background of the study discussed in section three. Section four presents the main elements of the methodology. The empirical results are reported in section five followed by the main conclusions of in section six.

2. EDUCATION BACKGROUND IN ALGERIA

Said the main objective of the adoption of the state to free education as stated by the Decree 67/76 of 04.16.1967 is not to be the opposite and financial costs of schooling obstacle toward equal opportunities for his students.

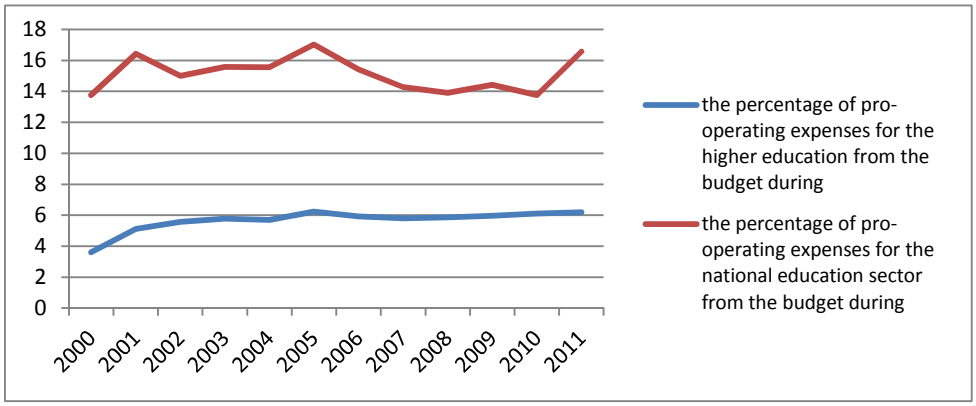
Then this is the position outright adopted by the government, the direction of the education sector make her go to allocate amounts, considering the budget in order to finance this sector, due to the rise of financial resources resulting from rising incomes Petroleum, which has helped the state to play the important role and basic education through the provision of financial resources needed to finance the education sector, especially in front of a deficit of financial resources to the private education sector for the provision of substantial amount of funding for this elves.

Government funding of education in Algeria comes from different sources. The major one for all levels of government is the public revenue from oil and taxation, Education funds are

reported to be distributed among the primary, secondary and tertiary education levels in the proportion of 30%, 30% and 40%, respectively.

Government expenditure on education in Algeria includes direct government expenditure; for teachers' salaries and instructional materials, as well as indirect expenditure in the form of subsidie. **Figure(1)** shows the percentage of pro-operating expenses for the national education sector and higher education from the budget during (2000-2011).

Figure 1 the percentage of pro-operating expenses for the national education sector and higher education from the budget during in Algeria (2000-2011).



Source :ONS, Annual Report,2011.

It also includes payment from Education Tax Fund mainly for capital expenditure, the main sources of funds that the taxes and duties on petroleum, profits, imports and exports, which form the revenue of Government.

Said that the decline in the percentage of government expenditure mobilized for the education sector, which did not exceed 24 % for the education(primary ; secondary ;tathy school) sector and 10 % for the higher education sector. Does not reflect the size of the amounts that have benefited these sectors, Where the education sector benefited from 240 (billion /DA) additional sum for the 2008 compared to 1999 , while the higher education sector benefited from 147 (billion /DA) additional sum for the 2008 compared to 1999 .

Also the **Figure(1)** above shows the form of evolution, what is meant by credit management-oriented (Recurrent government allocations) sector of higher education and scientific research, which has moved from the 34.86 (billion /DA) for the 2000 to 212.83 (billion /DA) , an increase of more than 170 (billion DA). Are different the percentage increase in funds destined for sector from year to year, so the percentage increase its lowest level in the 2000 by 4%, while in 2011 this ratio reached its maximum level at a rate exceeded 22%, and explain this increase in order to provide for Conduct scientific research centers new; improve the qualifications of administrators and workers belonging to the sector; development of undergraduate academic. But in spite of all this remain the percentage increase in the value of financial allocations for the education sector targeted low when compared to years of the nineties Ayna the percentage increase in the maximum allocations management in the year 1992 by more than 45 %.

The government allocations to the educational sector from 2008 to 2013 in Algeria is presented in Table(1).

Table 1: Government Expenditure on Education in Algeria (2008/2013) (=N=Million)

Expenditure	Recurrent	Capital	Tot Exp On Educ	Total Exp.	%Of Tot Exp On Educ
2008	375 257 514	162 165 000	537 422 514	4 409 229 596	12
2009	475 834 524	241 933 000	717 767 524	5 824 865 585	12
2010	496 664 203	283 462 000	780 126 203	6 169 951 823	13
2011	709 226 507	540 754 000	1 249 980 507	5 909 794 134	21
2012	593 515 833	133 624 000	727 139 833	7 458 104 745	10
2013	676 299 111	273 134 000	949 433 111	6 879 821 144	14

Source: - Ministry of Finance,2013

-ONS (the centrally collected Value in Algeria)

Table(1) above shows the analysis of expenditure on education between 2008 and 2013. This analysis separated the recurrent from capital and eventually summed them. It also highlighted the percentage of total expenditure on education on the total expenditure. The secend shown that, it ranges between 12 percent in 2009 and 21 percent in 2011. None of the year march up with the national standard of 28 percent as recommended by national program (2009-2015) of Millennium Development Goals, the table also indicated that the recurrent expenditure dominates the expenditure pattern throughout the period of analysis. This is an indication that no development can be witnessed during this period in education sector.

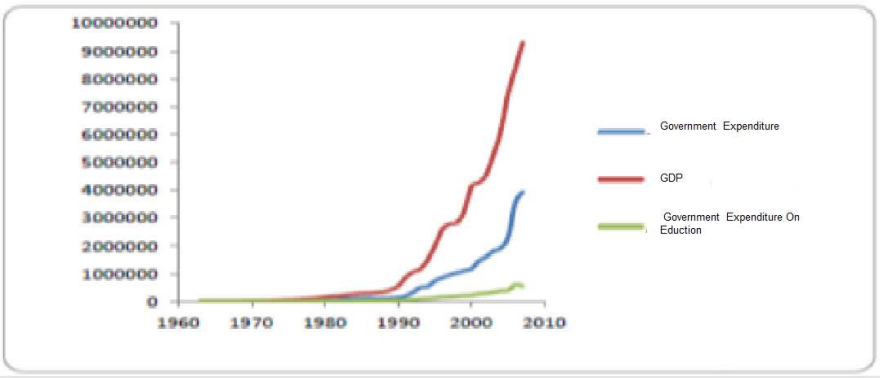
The total expenditure on education as shown above was high from 1 249 980 507 (M/Da) in 2011 compared with the preceding years of 727 139 833 (M/Da) and 727 139 833 (M/Da) for 2012 and 2013 respectively when it fell considerably.

This trend continues until 2011 when the expenditure increases as high as 1 249 980 507 (M/Da), It is interesting to note that literacy rate increases with increasing total federal expenditure on education throughout the period.

In the period 2010/2014 with the attention the President of the Republic on the completion of the development process has been an underscore second five- program 2010/2014 financial value total convergence 286 (B/Da), It is worth signal that 40% of program resources addressed to improve the human development, And Ually this foundation has supported the education sector by 852 (M/Da) framework of the program of public investments for the period 2010-2015 than With 21.214 (M/Da) prompt to accomplish many of the infrastructure for the completion of 3,000 elementary school and 1,000 medium in addition to the 850 secondary and 2,000 buildings, between residencies internal and half boarding ; On a related context indicates the report prepared by the Ministry of National Education and the season the academic 2009/2010 that this period witnessed a reception 8,147,237 pupil Including (3,796,640 ; 3,211,428 and 1,139,169) in primary and secondary, teltey education ,in where this number represents an increase of 381.000 pupils compared to the previous season, which reflects the estimated increase of 4.06%.

The rate of total public spending on education to GDP has ranging during the period in 1995 was estimated at 5.7%, while as much as during the period 1996-2007 up to 6.3%, which is illustrated in Figure(2). The rate of total spending on public education for the public expenditure is a decline in the average after the other that it was in the period 1975-1995 in the range of 22.8% to settle in the range of 18.8%, its highest rate in 2004 to 19.9% and the lowest rate in 2007 of 14.6%

Figure 2 The rate of total spending on public education for the public expenditure and GDP 1962-2007



Source: ONS (the centrally collected Value in Algeria).

3. THEORETICAL AND EMPIRICAL BACKGROUND

Economists, since the time of Adam Smith and David Ricardo have been interested in the issue of economic growth and its cause. It was not until the 1950s and 1960s (Abiodun &Wahab,2011,225).

Solow's (1957) neo classical model provides the necessary foundations for growth estimation; however, it has ignored the role of human capital in the determination of economic growth.

The study of the determinants of economic growth has been one of the most important fields of research in economics since the mid-1980s. This field of research was spurred by the endogenous growth literature pioneered by the analysis of Paul Romer (1986) and Lucas (1988). Moreover, an important contribution came from the growth-empirics approach that began with the testing of the neoclassical convergence hypothesis (Baumol, 1986; Barro,1991; Barro & Salt-I-Martin, 1992; Mankiw, Romer, & Weil, 1992). It is also necessary to underline the important contribution relating to the development of comparable cross-country data on GDP, productivity and human capital indicators (Summers & Heston, 1988; Barro & Lee, 1993, 1996, 2001).

Existing literature accepts education as one of the primary components of human capital since education, other than improving productivity of labor, has certain spillover benefits (externalities) meaning that in addition to benefiting the individuals who receive it, In modern

economies, human capital is a key determinant of economic growth. The role of human capital accumulation and utilization in economic growth is currently a main topic in economic theory and empirical research. It has become evident that it is not enough to be only concerned with capital accumulation in the neoclassical growth theory in order to explain why economies grow differently over space (Zhang,2013,2), education also benefits society (Kreishan and Hawarin,2011,47); however, **there are multiple dimensions** (entrances) of the relationship between education and economic growth in existing literature, As part of the first dimension; human capital, can be measured in terms of education level and health. As such, Barro (1991) examined the relationship between economic growth and various possible explanatory input factors. The study was conducted by using regression analysis on the sample of 98 countries for the period 1960–85.The study 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 accounted for.

The study found a positive relationship between economic growth and initial human capital, and an inverse relationship between economic growth and market distortions. The study found that poor countries can converge towards the richer countries if they have a high level of human capital per person with respect and the country is better equipped to acquire and adapt the efficient technologies that have been developed in the leading countries. Sach & Warner (1995) also noted that a rapid increase in human capital development would result in rapid transitional force, in terms of better education and health, is likely to be able to produce more from a given resource base, than less-skilled workers.

Li & Liang (2010) studied human capital in the form of health and education for a group of economies of East Asia such as China with use of panel data relating to years 1961-2007. On the basis of results of this research, capital and health have significantly positive effect on economic growth; however, the effect of an investment in education on economic growth is a weakening effect. In addition, results show that in East Asia, the effects of health on economic growth are stronger than the effects of education. On the basis of this research, it is more believable for policy makers of East Asia to make more investments in health than education. Article of Li is one of the first experimental studies for analyzing effects of human capital in two forms of health and education on the economic growth in East Asia.

Benhabib & Spigel (1994) analyzed the role of human capital in light of exogenous and endogenous growth theory by using a data set from Summers & Heston (1991). To overcome this, Mankiw et al. (1992) have incorporated human capital in growth models.

According to (Levine & Zervos ,1993), countries that have more students enrolled in secondary schools grow faster than countries with lower secondary school enrolment rates. However, (Gallup & al,1998) draw their variables from Barro & Lee (1993) using the average total years of education of the adult population as their main measure of education, they are unable to find a statistically significant relationship between initial levels of education and subsequent economic growth in their sample of countries.

Bosworth and Collins (2003) claim that most of the variability of the empirical results obtained for the effects of education on growth are due to variations in the sample of countries observed or definitions used, the time periods covered, measurement problems, and the inclusion of additional explanatory variables. Also, they point at unrealistic expectations:

given that the change of the average years of schooling changes very slowly, its effects on output may be difficult to detect in the cross-country data. They conclude that educational quality is positively and significantly related to the growth in output per worker only if a control for the quality of the government institutions is not included.

Khattak and Khan (2012) studied the contribution of education to economic growth of Pakistan during 1971-2008. On the basis of results of this research that secondary education contributes significantly to the Real GDP Per Capita in Pakistan. The elementary education also positively affects economic growth but the result is statistically insignificant. The cointegration test results confirmed the existence of long run relationship in education and Real GDP Per Capita. It is therefore, suggested to keep education on top priority in public policies, make serious efforts for Universalization of Primary Education and discourage the drop-out rate at all levels of education to achieve sustained economic growth.

Either through entrance of the Second most studies on the effects of education on development have used cross-country data and focused on the growth effects of education (Barro, 1999; Romer, 1990; Atardi & Sala-i-Martin, 2003; Fukase, 2010; Nelson & Phelps, 1996; Gyimah-Brempong et al., 2006; Ciccone & Papaioannou, 2009; Mamoon & Murshed, 2009). Others use time series data or cross-state data within a country (Baldwin & Borrelli, 2008) to investigate the effects of education on income growth. These studies generally find education to have a positive and significant effect on income growth rate.

However, education is the most important instrument to enhance human capabilities and to achieve the desired objectives of socio and economic development. Education enables individuals to make informed choices, broaden their horizons and opportunities and to have a voice in public decision-making. At the macro level, education means strong and sustainable economic growth due to productive and skilled labour force. At the micro level however, education is strongly correlated to higher income generating opportunities and a more informed and aware existence.

Either through the third entry, (Armellini ,2012,285) sets to find an explanation for that paradox, proposing that the ‘right’ set of institutions can increase the impact of education on economic growth, and arguing that democracy encapsulates that set of institutions appro-priately. Therefore, while education is generally conducive to increases in individual income, its effect on economic growth is mediated by the level of democracy of the political system, so that different democratic performances yield different effects of education on economic growth. This can help explain the apparent micro-macro paradox.

In summary, despite the diversity of methods and measures of human capital variables, the role of human capital or education in the convergence process is still not consistently positive. It is unclear that the countries that invested more in education universally experienced a higher growth rate, In this sense, the government is directly responsible for the majority of the investments in basic education in most countries.

This paper contributes the fourth entrance to the existing literature on productive public spending and growth in several ways. It develops a Lucas-type endogenous growth model of a developing economy with it is possible to relate the accumulation of human capital to

government spending and external effects associated with public capital in infrastructure, and examines the dynamics of spending shifts as well as the optimal determination of the tax rate and the shares of tax revenue allocated to public infrastructure investment and education services (Agenor,2011,109). As, for instance, in [Futagami & al. (1993); Glomm & Ravikumar (1994); Fisher & Turnovsky (1998); Baier & Glomm (2001); Turnovsky (1997, 2000); Gômez (2004); Yakita (2004) & Chen (2007)], public infrastructure is treated as a stock.

With Others ecsprichn in the several articles have constructed theoretical models relating government spending on education to economic growth, Explanation in which government investment in education has a direct effect upon the accumulation of human capital, and consequently on long run growth (Teles & Andrade,2013,352).In this sense. Easterly & Rebelo (1993) studied the relationship between education and economic growth also found such a relation, but for only certain specifications, while Levine & Renelt (1992) concluded that government spending on public education is not robustly correlated with rates of growth. In that sense, Judson (1998) and Vandenbussche & al. (2004) argue that the composition of human capital between basic and higher education is important to explain the relation between human capital and economic growth, and Miller & Russek (1997) and Kneller & al. (1999) show that the government budget constrains are relevant to understand the relevance of human capital as engine of growth.

Sylwester (2000) observes the relationship between public education expenditure and economic growth, and finds that contemporaneous education expenditure has a negative effect on economic growth: when both variables are taken for the period 1970–1985 the effect of public education expenditure is negative However, education expenditure appears to have a positive long-run effect: education expenditure in the period 1960–1964 has a positive effect on economic growth in the period 1970–1985.

Toward this end, using UNESCO data between 1999 and 2001, we observed that in countries with high per-capita gross national product (GNP), a lower proportion of overall government outlays for education is spent on basic education, as compared to countries with lower per capita GNP. For example, the USA, UK and Japan, respectively, spent 31.4, 24.4, and 35 percent of their overall outlays for education on primary education, while Chad, Bangladesh, Lesoto & Niger, respectively, spent 57.5, 38.1, 48.6 and 49.3 percent (Su, 2004).

Baldwin & Borrelli (2008) studied the relationship between education and economic growth in the USA by assuming control of linear predicting effects of economic growth. He studied the direct and indirect relationship between expenses spent for education and per capita income as economic growth. Research results showed that expenses of higher education has positive correlation with per capita income while expenses spent for primary education to high school education and ratio of student-teacher showed a negative correlation with per capita income growth during 1988-2005.

The fundamental goal of this study was to visualize the relation between Public (government) spending on basic education and the human capital accumulation process, observing the impacts of this spending on Public and individual investments in education, and on economic

growth (Teles & Andrade, 2008, 353). It was demonstrated that the magnitude of the marginal effect of Public spending in basic education on growth crucially depends on:

A. the composition of Public spending with regard to basic and education; and
B. the public budget constrains

4. THE METHODOLOGY

Estimation of how certain components Public spending on education (primary school, secondary School) affects economic growth will be performed with a macroeconomic model which based on the following augmented form of Cobb Douglas Production Function(1):

$$Y = (A, K, L) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

If human capital is introduced in equation (1), it becomes;

$$Y = (A, K, L, H) \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where Y shows (GDP Per Capita Real), (L) shows labour. while (H) shows human capital which is considered as engine of economic growth. The human capital in the present study has been measured by Public spending on education (primary school, secondary School), the empirical form Function(2) of the model for estimation becomes:

$$\mathbf{lnY = \alpha_0 + \alpha_1 lnK + \alpha_2 lnL + \alpha_3 lnPEEUD + U_i} \ldots\ldots\ldots (\mathbf{3})$$

Where

PSEUD = Public spending on education (primary school, secondary School) in this study while Physical capital (K) is measured by Gross Fixed Capital infrastructural (KF) (Naeem & Jangraiz,2012,146), (PSEUD) rate for GDP Per Capita (Real).The present study has used labour force participation rate for labour in the model. error term respectively, whereas $\boldsymbol{\alpha 0, \alpha 1, \alpha 2, \alpha 3}$ denote respective parameters.

The final equation of economic growth for estimation is given as below/

$$\mathbf{Y = \alpha_0 + \alpha_1 lnK + \alpha_2 lnL + \alpha_3 lnPEEUD + U_i} \ldots\ldots\ldots (\mathbf{4})$$

Government expenditures on education, are regressed in an attempt to estimate their impact on economic growth in Algeria with Granger Causality Test. We have used the method of Ordinary Least Squares (OLS) and Johansen Cointegration test as econometric techniques for data analysis.

Since the majority of economic variables are non -stationary, we will first check the presence of unit roots for each variable before estimating the model. A formal method to test for stationarity of a series is the Unit Root test. To this effect the standard Augmented Dickey Fuller (1979;1981) (ADF) test and the Phillips-Peron (PP) tests were utilized and all variables were. found to be stationary, the empirical form Function(5). Next, the following model is formulated to test for a causal relation (James & Watson,2003,556):

$$\Delta \mathbf{Y_t} = \boldsymbol{\alpha} + \mathbf{b_1 Y_{t-1}} + \sum_{\mathbf{i=1}}^{\mathbf{l}} \mathbf{b_i}\, \Delta \mathbf{Y_{t-i}} + \boldsymbol{\varepsilon_t} \quad \boldsymbol{\varepsilon_t} \sim \mathbf{iid}(\mathbf{0}.\boldsymbol{\sigma}^{\mathbf{2}}) \ldots\ldots (\mathbf{5})$$

If unit roots exist in any variable, then the corresponding series is considered to be non-stationary (Saad & Kalakech,2009,41). To do so, the augmented Dichey-Fuller (ADF) (and Phillips and Perron (PP) tests are used both on the levels and first differences of the variables. Both the ADF and PP unit root.

Where, (Yt) is the level of the variable under consideration, (t) denotes time trend and (ε_t) is normally distributed random error term with zero mean and constant variance. In the second stage, cointegration test is performed to identify the existence of a long-run relationship. (zt) is a p×1 vector of stochastic variables, ε is a constant term and (zt) is a vector of non-stochastic variables, such as seasonal orinter-vention dummies, then the Johansen (1988 ;1990) procedures begins by setting out a model in error-ecrrection form as follows, where Δ is the difference operator (6,7,8) Functions:

$$Z_t = \pi_1 z_{t-1} + \pi_2 z_{t-2} + \cdots \ldots \ldots \ldots \ldots \pi_k z_{t-k} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

$$\Delta Z_t = \Gamma_1 \Delta z_{t-1} + \Gamma \Delta_2 z_{t-2} + \cdots \ldots \ldots \Gamma_k \Delta z_{t-k-1} + \prod z_{t-k} + \mu + \varepsilon_t \ldots\ldots\ldots\ldots (7)$$

$$Z_t = \pi_1 z_{t-1} + \pi_2 z_{t-2} + \cdots \ldots \ldots \ldots \ldots \pi_k z_{t-k} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

where (k) is the lag length. In our model (zt)is comprised of economic growth, (GDP), the Public spending on education (PSEUD).If the data are integrated of order one, hereafter I (1), then the matrix $\prod$ has to be of reduced rank,:

$$P = \alpha B$$

In Data description**.** We use in this study annual time series covering the period from 1974 to 2012. The variables under consideration are Gross domestic product, , education expenditure, Gross Fixed Capital infrastructural (KF), Labour force (L). Gross domestic product (GDP) is a dependent variable, whereas, the other variables are determinant factors of GDP. The data by sector (KF, L, SPEUD) are constructed by consulting a large number of annual bulletins of the Central Bank (Banque du Algeria) and from the ministry of finance. However, the annual values of the GDP are drawn from the United Nations. All variables are measured in real

terms, deflated using the consumer price index, CPI (2000 = 100). They are all expressed in logarithm

5. EMPIRICAL RESULTS

As discussed, Firstly, this study is an effort to unveil the contribution of Public spending on education to economic growth of Algeria. The results have been derived by using the method of Ordinary Least Squares (OLS). To strengthen our results, Johansen Cointegration has been used. The OLS results show that Public spending on education affects economic growth positively and the result is statistically significant at 5% level of significance. Labour force participation rate, an important variable of out model also showed positive significant impact on GDP per Capita during the study period. The physical capital as expected showed positive sign and it was statistically significant. The value of R-Sq remained 97.45% which shows validity of fit. The results are displayed in Table (2).

Table 2: Regression Results for Economic Growth Model.

Variable	Coefficient	Std. Error	t-Statistic	Prob
SPEUD	0.013760	0.003324	4.139308	0.0002
K	0.009241	0.008513	1.085517	0.0001
L	0.556383	0.136050	4.089559	0.0002
R-Sq 97.45 % R-Sq (Adj) 97.23 % F-Stat 445.862 Prob (F-Stat) 0.0000 DW Stat 1.401				

Secondary we investigate the order integration of (GDP) and (PSEUD) series employing PP unit root tests for the determination of the maximum order of integration of series (*d* max) in the system. The results of PP unit root tests are show that all variables of study are nonstationary at level. They become stationary when first difference at the 5% significance level is taken. This is shown in Table 3 and Table 4. Table 3 shows that results with trend assumption of intercept but No Trend while Table 5 shows the assumption with trend and intercept, and none.

Table 3: The Results of PP Unit Root Tests (With intercept but No Trend)

Variable	Level (Intercept)			First Difference (Intercept)				
	Calculated value	Critical value	P-Value	Calculated value	Critical value			P-Value
		1%	5%			1%	5%	
log(GDP)	13.208	-3.615	-2.941	1.000	-6.203-	-4.226	-3.536	0.0000
log(SPEUD)	4.555	-3.615	-2.941	1.000	-5.83	-3.621	-2.943	0.0000
log(KF)	1.187	-3.615	-2.940	0.995	-7.766	-3.621	-2.943	0.0000

log(L)	2.207	-3.615	-2.941	0.999	-6.534	-3.621	-2.943	0.0000
Lag Selection has been made by Using Minimum AIC Criteria.. All the variables have been taken in log form.								

Table 4: The Results of PP Unit Root Tests (Trend & intercept) and none

Variable	Level(Trend and Intercept)			First Difference(Trend and Intercept)				
	Calculated value	**Critical value**	**P-Value**	**Calculated value**		**Critical value**		**P-Value**
		1%	5%			1%	5%	
log(GDP)	6.429	-4.219	-3.533	1.000	-2.822-	-2.629	-1.950	0.0060
log(SPEUD)	0.528	-4.219	-3.555	0.999	-7.269	-4.226	-3.200	00000
log(KF)	-1.317	-4.219	-3.533	0.869	-11.192	-4.226	-3.536	0.0000
log(L)	-1.099	-4.219	-3.533	0.9160	-6.999	-4.226	-3.539	0.0000
Lag Selection has been made by Using Minimum AIC Criteria.. All the variables have been taken in log form								

Variable	Level (None)			First Difference (None)				
	Calculated value	**Critical value**	**P-Value**	**Calculated value**		**Critical value**		**P-Value**
		1%	5%			1%	5%	
log(GDP)	16.797	-2.627	-1.949	1.000	-6.203-	-4.226	3.536	0.0000
log(SPEUD)	7.268	-2.627	-1.949	1.000	-5.177	-2.628	-1.950	0.0000
log(KF)	1.950	-2.627	-1.949	0.986	-7.497	-2.628	-1.950	0.0000
log(L)	8.555	-2.627	-1.949	1.0000	-4.2550	-2.628	-1.950	0.0001
Lag Selection has been made by Using Minimum AIC Criteria.. All the variables have been taken in log form.								

The order of integration would be determined to be I(1) for both of (GDP) and (PSEUD) variables Consequently, the maximum order of integration of series (d max) in the system would also be determined as1.

After determining maximum order of integration of series (*d* max) in the system as 1, we next examine the optimal lag-length (*k*) of VAR model and the optimal lag-length is established also as 1 in Table 5 .

Table 5: VAR Lag order selection critertia

lag	log	lR	FPE	AIC	SC	HQ
0	-2319.89	NA	2.75.4e+54	136.69	136.87	136.76

1	-2196.78	210.016	5.08e+51	130.39	131.29	130.70
2	-2161.67	51.638	1.72e+51	129.72	130.89	129.82
3	-2083.82	96.160	5.07e+49	125.63	127.97	126.43
4	-2046.81	37.016	1.85e+49	124.40	126.45	125.44
5	-2006.94	30.486	7.03e+48	122.99*	126.767*	124.28*
*Indicates lag order selected by the criterion						

The cointegration test results for Public spending on education rejected the null hypothesis of no cointegration by showing the existence of at most one cointegrating equation. This means that Public spending on education affect Real GDP per capita in long run in Algeria. The results are displayed in Table 6.

Table6: Johansen Co integration Test for Economic Growth Model

trace test				
Hypothesis Null	Critical Value **5 %**	(λ_{trace})	*Eigenvalue* λi	*prob*
r≤0	47.856	*102.5642*	*0.851*	*0.0000*
r≤1	29.797	*37.4155*	*0.620*	*0.0055*
r≤2	15.494	*4.72859*	*0.125*	*0.8335*
r≤3	3.841	*0.24502*	*0.007*	*0.6192*
Maximum Eigenvalues Test				
Hypothesis Null	Critical Value **5 %**	(λ_{max})	*Eigenvalue* λi	*prob*
r≤0	27.584	*65.148*	*0.896*	*0.0000*
r≤1	21.131	*32.685*	*0.628*	*0.0008*
r≤2	14.254	*4.448*	*0.126*	*0.8053*
r≤3	3.841	*0.245*	*0.007*	*0.6192*

We have also used different tests to strengthen our results. These techniques include LM test, (White Heteroscedasticity and Normality Test of Residual). The autocorrelation is checked mostly by Durban-Watson statistic but this method has few drawbacks (Naeem & Jangraiz,2012,149). It becomes inappropriate when the results are inconclusive. Therefore, to avoid such problems LM test developed by Breusch (1978) and Godfrey (1978) has been used for detection of autocorrelation. The results of LM test are displayed in Table (7).

Table 7: LM Test Results

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Lags	GDP	
	LM-Stat	Prob
1	21.341	0.165
2	21.485	0. 160
3	18.590	0.290
4	11.701	0.764
5	22.934	0.115
Null Hypothesis: No Serial correlation Included Observations 36		

Lags	Public spending on education	
	LM-Stat	Prob
1	35.590	0.0033
2	29.855	0.0188
3	32.401	0.0089
4	30.250	0.0167.
5	18.764	0.2811
Null Hypothesis: No Serial correlation Included Observations 36		

The results show that irrespective of lag length the value of LM Statistic lies in acceptance region suggesting the acceptance of null hypothesis of no autocorrelation. This means that the estimates are reliable. The existence of heteroscedasticity is mostly checked with White Heteroscedasticity Test (WHT). The results of WHT accepted the null hypothesis suggesting no existence of heteroscedasticity in the model. The result is shown in Table(8).

Table 8:White Heteroscedasticity Test

Equation	Chi-sq	df	Prob
Public spending on education Test	2976.683	280	0.0539

The normality tests are used to find whether a data set is well modeled by a normal distribution or not. In other words the normality tests tell us about the type of distribution of the residuals. In case of linear regression model if the residuals are normally distributed then it may create many econometric problems and the derived results may not be valid.

The normality test in this study is shown in Table(9). All the statistics, Kurtosis, Chi-Sq and Jarque- Bera shows that the residuals are normally distributed in both equations of economic growth i.e Public spending on education.

Table (9): VAR Residual Normality Tests for Equation with Public spending on education

Component	**Kurtosis**	**Chi-sq**	**df**	**Prob**
1	2.911703	0.011694	1	0.9139

2	4.855751	5.165717	1	0.0230
3	3.021314	0.0006981	1	0.9792
4	6.838698	22.10340	1	0.0000
Joint	27.29150		4	
Component	**Jarque-Bera**		**df**	**Prob**
1	0.052348		2	0.9742
2	8.744507		2	0.0126
3	0.018101		2	0.9910
2	28.83550		2	0.0000
Joint	37.6504		8	

If there a long run relationship between different variables exists then an error correction process is also taking place. Error correction model indicates the speed of adjustment towards the long run equilibrium after a short run shock. In order to check error correction following equation is estimated:

D(GDP) = C(1)*(GDP(-1) – 0.023980611073* SPEUD (-1) -0.0308526991828*KF (-1)-0.067064136048 *L(-1)+ 1647463.02439°+C(2)*D(GDP(-1))+C(3)*D(SPUD(-1))+C(4)*D(KF(-1))+C(5(*D(L(-1))+C(6)

TABLE (10: Error Correction model estimation

Variable	Coefficient	Std.Error	t-Statistic	Probability
ECT(-1)	-0.586142	0.077566	-7.556712	0.0000
R-squared 0.742458		Mean dependent var 437090.3		
Adjusted R-squared 0.700920		S.D. dependent var 690717.3		
S.E. of regression 377741.2		Durbin-Watson stat 1.794297		
Sum squared resid 4.42E+12		Log likelihood 28.66920		

The estimated results shows that estimated lagged error correction term is negative and significant, suggesting that error correction is happening in the model. The coefficient of feedback coefficient (Error Correction term) is -0.586142, suggesting that approximately 58.61 % of disequilibrium in previous year is corrected in the current year. Alternatively, it takes approximately 5 years for any deviation from the long run relationship between education expenditure and GDP to be corrected after a change in education expenditure.

Table (11) presents the results of the short run Granger causality test based on a standard F-test statistics that tests jointly the significance of the coefficients of the explanatory variables in their first differences.

TABLE 11: Results of Granger Causality Test

Null Hypothesis	F Statistic	Probability	Direction of Causality
GDP does not Granger Cause education expenditure	5.37314	0.00020	**GDP → expenditure**
education expenditure does not Granger Cause GDP	18.1079	3^{E}+07	education **expenditure→ GDP**

results indicates that there exists a bilateral causality and long run relationship between per capita GDP and public education expenditure. These results reveal that the public education expenditure a major education input variable cause per capita GDP

6. Conclusion

In this paper, the relationship between public education expenditure and economic growth in Algeria has been analyzed. According to the existing literature, there is a large amount of evidence for human capital having a significant impact on economic growth. In the present study, the same type of relation is seen in Algeria in terms of correlations between public education expenditure, and growth. However, correlations in themselves provide, at best, an intuition about the relation between five variables. Having found these encouraging correlations, this study utilized 'Granger causality' to analyze the predictive powers of public education expenditure on future growth in the presence of its own lagged values. Over and above allowing for a test of causality, this technique is helpful in time series regression analysis since it also helps to eliminate any possible serial correlation by adding lagged values of the dependent variable on the right hand side. The results showed that public education expenditure, which in the correlation analysis indicated a strong positive relation between public education expenditure and growth, is causal only public education expenditure.The conclusion education is the main causal force in economic growth in Algeria must be qualified since education's impact is likely to show only after long time lags and there may be important omitted variables.

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