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**Article**

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## Cointegration Analysis of Public Expenditure on Tertiary Education and Economic Growth in Nigeria

Japheth T. Torruam,<sup>1</sup> Moses A. Chiawa<sup>2</sup> and Cyprian C. Abur<sup>3</sup>

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*The paper investigates the Impact of public expenditure on tertiary education and economic growth in Nigeria using time series data for the period 1990-2011. The econometric methodology employed was cointegration and error correction technique. The study concludes that public expenditure on tertiary education has positive impact on economic growth in Nigeria. The study recommended that government and private sectors should partner by mobilizing resources to furnish tertiary institutions and equip them with adequate facilities in order to enhance tertiary education development for sustainable economic growth.*

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**Keywords:** Public Expenditure, Economic Growth, Cointegration, Development

**JEL Classification:** 011

### 1.0 Introduction

The role of education as human resource development in an economy has been underscored in many studies. Education, as a key component of human capital formation is recognized as being vital in increasing the productive capacity of people. Education, especially at the tertiary level, contributes directly to economic growth by making individual workers more productive and indirectly by leading to the creation of knowledge, ideas, and technological innovation (Larocque, 2008).

Public expenditure is an important instrument for a government to control the economy. Economists have been well aware of its effects in promoting economic growth. The general view is that public expenditure either recurrent or capital expenditure, notably on social and economic infrastructure can be growth-enhancing although the financing of such expenditure to provide essential infrastructural facilities-including transport, electricity,

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telecommunications, water and sanitation, waste disposal, education and health-can be growth-retarding (Olukayode, 2009).

Nigeria today is experiencing a critical manpower development handicap occasioned by the fact that the number of prospective students seeking for admission into tertiary institutions is projected at over 1.2 million (JAMB, 2001). But only about 20% of this numbers actually secure admission to such institutions. The unfortunate expectation of both parents and students are apprehensive of any new initiative in the management of tertiary institutions to mean introduction of tuition fees. In spite of the introduction of tuition fees, there still exist difficulties on the part of tertiary institutions management to meet their internal fund generation quota despite the huge government expenditure on tertiary education. Most of the evidences in the human capital growth regression analysis are cross-country regression analysis of developing countries and OECD countries.

To the best of our knowledge, there is no study yet to empirically assess the direct effect of education, especially the tertiary education on economic growth in Nigeria. The findings from this study should have a strong implication on education, especially tertiary education policy in Nigeria. The proper understanding of the relationship between public expenditure on tertiary education and economic growth will enable policy makers to formulate and implement proper policies that may help in utilizing the human resources of the country efficiently.

Thus, the purpose of this study is to empirically re-examine the relationship between public expenditure on tertiary education and economic growth in Nigeria; and determine the direction of the relationship. Though the goal of the study is similar to those of previous studies in this area of research (Omotor, 2004; Olukayode, 2009; Ighadaro and Okriakhi, 2010; Loto, 2011).

## **2.0 Literature Review**

The relationship between government expenditure and economic growth has continued to generate series of controversies among scholars in economic literature. The nature of the impact is inconclusive. While some authors believed that the impact of public expenditure on economic growth is negative or non-significant (Taban, 2010; Vu Le and Suruga, 2005), others believed

that the impact is positive and significant (Alexiou, 2009; Belgrave and Craigwell, 1995).

The theoretical relationship between government expenditure and economic growth is well-documented in the literature and therefore it will only be briefly discussed here. There are two major divergent theories in economics concerning the relationship between government expenditure and economic growth. Wagner's and Keynes approach. The Wagner's approach introduces a model that public expenditures are endogenous to economic development. While Keynesian macroeconomic theory has generally assumed that increased government expenditure tends to lead to high aggregate demand and in turn, rapid economic growth.

Adedeji *et al.* (1998) studied the impact of government spending and economic growth in Nigeria and the results obtained based on regressions used and panel techniques suggested that government spending is positively related with economic growth in the European Union countries. Chiawa *et al.* (2012) targeted on the causal relationship between government expenditure and economic growth in Nigeria by using the time series data from 1970 to 2008., they found in their study that total expenditure does not cause the growth of Gross Domestic Product (GDP), which is incompatible with the Keynesian's theory, but the growth of GDP does cause the increase in total public expenditures which is compatible with Wagner's law.

The long run relationship between education expenditure and economic growth was investigated by Babatunde and Adefabi (2005) in Nigeria between 1970 and 2003 through the application of Johansen cointegration technique and vector error correction methodology. Their findings reveal that the Johansen cointegration result establishes a long run relationship between education and economic growth. Aigbokhan *et al.* (2007) investigated the causal relationship between public expenditures and economic growth covering the time series data 1974-2002. They also found mixed evidence on their empirical results, i.e., some results support Wagner's Law while others verify Keynesian's theory.

Allege and Ogunrinola (2005) in their study on government expenditure and economic growth in Nigeria concluded that government has played an important role in economic development of the country. Appleton and Teal (1998) carried out a study titled "Human Capital Expenditure and Economic

Growth: A Disaggregated Analysis for Developing Countries" this study found out that the share of government capital expenditure in GDP is positively and significantly correlated with economic growth, but current expenditure is insignificant. This study is limited to public expenditure on tertiary institutions in Nigeria during the period 1990-2011.

### **3.0 Methodology**

To empirically re-examine the relationship between government spending on the economic growth in Nigeria and determine the direction of the relationship, we followed the standard procedure of time series analysis. First, we applied the commonly used Augmented Dickey-Fuller (ADF) unit root tests to determine the variables' order integration. Briefly stated, a variable is said to be integrated of order  $d$ , written  $I(d)$ , if it requires differencing  $d$  times to achieve stationarity. Thus, the variable is non-stationary if it is integrated of order 1 or higher. Classification of the variables into stationary and nonstationary variables is crucial since standard statistical procedures can handle only stationary series.

Moreover, there also exists a possible long-run co-movement, termed cointegration, among non-stationary variables having the same integration order. Accordingly, in the second step, we implemented a VAR-based approach of cointegration test suggested by Johansen (1988) and Johansen and Juselius (1990). Appropriately, the test provides us information on whether the variables, particularly measures of economic growth and human capital variables are tied together in the long run. The technique of cointegration, Error Correction Model (ECM) is employed.

### **3.1 Source of Data**

This study uses annual series of real gross domestic product (RGDP), capital expenditure on education (CEE), recurrent expenditure on education (REE), enrolments into tertiary institutions (TERE) and the number of tertiary graduates (GRAD) in Nigeria for the period of 1990-2011 drawn from publications of the Central Bank of Nigeria (CBN); National Bureau of Statistics (NBS); National Youth Service Corp (NYSC) annual report.

### 3.2 Model Specification

In an attempt to determine the impact of human capital development for economic growth in Nigeria, it is ideal to develop a model to justify the relationship that exists between the variables. The framework for this study has its basis on the Wagner’s law approach which states that national income causes government expenditure and Keynesian approach which states that public expenditure causes national income. In both approaches the focus is only to the unidirectional causal growth models. Therefore, the model for this study is stated as:

$$\log(RGDP_t) = \beta_0 + \beta_1 \log(CEE_t) + \beta_2 \log(REE_t) + \beta_3 \log(TERE_t) + \beta_4 \log(GRAD_t) + \mu_t$$

where  $\beta_i > 0$  ( $i = 1, \dots, 4$ ) are parameters to be estimated;  $\mu_t$  is the error term.

## 4.0 Results

### 4.1 Unit Root Tests

The results regarding the order of integration of the series have been determined by Augmented Dickey Fuller (ADF) test. The calculated t-values from ADF tests on each variable are reported in Table 1.

Table 1: Results of Unit Roots Tests using Augmented Dickey Fuller (ADF)

Variable	Level	First Difference
RGDP	1.6166	-2.101
CEE	2.7575	-2.114
REE	2.2837	-2.0224
GRAD	4.2192	-2.0121
TERE	2.4292	-2.019

*Note: Critical values in levels and first difference at 5% are -1.96 and -1.86 respectively.*

Table 1 presents the results of Augmented Dickey Fuller (ADF) test, both in levels and first differences. In the case of the levels of the series, the null-hypothesis of the non-stationarity cannot be rejected for all the series. Therefore, all the series are non-stationary which implies that these series have unit root at level, but stationary after the first difference.

### 4.3 Cointegration Test

Recall that all the variables are I(1), as evident from the unit root test. In order to capture the extent of cointegration among the variables, the multivariate Johansen based cointegration methodology were conducted and the results are shown in Table 2.

Table 2: Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05Critical Value	Prob.
None *	0.6683	60.3818	50.0146	0.0000**
At most 1 *	0.4852	42.4746	28.4812	0.0000**
At most 2 *	0.4048	23.5436	15.4322	0.0000**
At most 3	0.2710	4.5601	5.6643	0.5100
At most 4	0.8223	0.4327	3.8414	0.7556

Note: (\*) denotes rejection of the hypothesis at 5% significance level. Trace test indicates 3 cointegrating eqn(s) at the 0.05 significance level. (\*\*) denotes p values <0.05.

Table 2 indicates that the dependent variable RGDP is cointegrated with CEE, REE, TERE and GRAD. The results indicate that the dependent and independent variables are both cointegrated and have long run relationship with one another. The trace test results in Table 2 shows that there are three (3) long-run equilibrium relationships of the variables (i.e.  $r = 3$ ).

### 4.4 Regression Results

Table 3: Parsimonious Error Correction Estimation Results:  
Dependent Variable Dlog(RGDP<sub>t</sub>)

Variables	Estimated Coefficient	t- Statistic	Probability
Dlog(CEE <sub>t-1</sub> )	1.3443	4.2804	0.0001
Dlog(REE <sub>t-2</sub> )	2.3529	2.5681	0.0124
Dlog(GRAD <sub>t-1</sub> )	1.3524	3.1985	0.0214
Dlog(TERE <sub>t</sub> )	1.3584	4.2973	0.0013
$\mu_{t-1}$	-0.6515	-3.7544	0.0021
C	5.5806	3.2145	0.6322
R-Squared= 0.8074			
Adjusted R- Squared= 0.7689			
F.Statistic = 21.07			
D.W. = 1.99			

The results in Table 3 indicate that the coefficients are correctly signed and statistically significant. The coefficient of the Error Correction Model (ECM) term has a negative sign and is statistically significant. This is an indication that there exist long run relationship between real GDP growth rate and the explanatory variables and its takes more years to attain equilibrium. Therefore, 65% disequilibrium in the previous period is corrected in the current period.

The adjusted  $R^2$  is 77 % which imply that 77 percent of the variations in real GDP growth can be explained by the explanatory variables while the remaining 23 percent variations are attributed to other factors outside the model. The F-statistics of 21.07 indicates that the explanatory variables are important determinants of the GDP growth rate in Nigeria. The result revealed that the amount of government expenditure on tertiary education significantly influence output per worker growth while foreign input is also a very important determinant of productivity growth through the adaptation of foreign technology. Our result is in agreement with that of Loening (2002) who conducted a similar research for Guatemala.

In order to achieve maximum economic growth, government expenditure on education needs to be given more priority. Investing in education offers high return in terms of economic growth. This means that increasing expenditure on education services does not only have a large impact on poverty per naira spent, but also produces greater growth in human productivity. This is because as more people get good education, they will increase their productivity. This implies that shifting resources from low-productivity sectors, such as general administration to education, will generate economic growth in the country.

## **5.0 Conclusion**

The study concluded that human capital development contributes positively to economic growth in Nigeria. However, Nigeria is confronted by most of the problems that could limit the capacity of expansion in human capital development to stimulate growth such as under-employment, low absorptive capacity, and shortage of professionals, regional imbalances and brain-drain. This means that if Nigeria is to achieve sustainable economic growth rate, it is of utmost importance for the country to reposition herself as a potent force through the quality of her products from the tertiary school systems as well as making her manpower relevant in the highly competitive and globalized



economy through a structured and strategic planning of her educational institutions.

Based on the results obtained in this study, it is recommended that government and private sectors should join hands by mobilizing resources to furnish tertiary institutions and equip them with adequate facilities, libraries, laboratory equipment, computers and modern instructional materials in order to improve the quality of education and enhance human capital development, labor productivity and ensure sustainable growth and development. Factors responsible for drop-out rate from tertiary institutions needs to be addressed through effective synergy between post-primary and technical institutions. Government should continue to provide enabling environment by ensuring macroeconomic stability that will encourage increased investment in human capital by individuals and the private sector. Regular closure of tertiary institutions due to strikes, cult activities, and excesses of student unions, etc. should be addressed by the relevant authorities.

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