

# Public Education Expenditure and Economic Growth in Nigeria: A Disaggregated Approach

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## Abstract

This study examines the effects of the components of public education expenditure on both education attainment and economic growth in Nigeria from 1970 to 2010. The Instrumental Variable Two Stage Least Squares estimation technique is employed to test the hypothesis that both recurrent and capital expenditure on education have different effects on education attainment and economic growth. The result reveals that public education expenditure has both direct and indirect effects on economic growth. The indirect channel has been more relevant for economic growth in Nigeria. Thus, total public education expenditure can promote economic growth without necessarily first improving education attainment. The study also reveals that recurrent and capital expenditure on education have different effects on economic growth. While recurrent expenditure had a negative impact on education, capital expenditure was found to have a positive impact. On the contrary, recurrent education expenditure had a positive and significant impact on economic growth while capital expenditure had a negative impact. However, to maximize the benefits from public education expenditure, strategies that ensure greater efficiency of public education expenditure are suggested.

**Keywords:** public expenditure, education, economic growth

## 1. Introduction

The foremost macroeconomic objective of governments in virtually all countries is the achievement of rapid and sustained economic growth with price stability. Increasing overall prosperity improves the lives of those able to partake in the system. An examination of Nigeria's real GDP per capita between 1970 and 2010 shows that the country has been more or less stagnant - a situation reminiscent of the pre-industrial revolution era. Given a real GDP per capita of \$679.7 in 1970, average real GDP for the period under review was \$669.2. This trend poses a serious cause for concern when viewed against countries that were virtually at the same level of income in the past, which have made tremendous progress over time.

The role of Government in promoting economic growth and development has been well established. Public investment in education affects economic growth directly - through the Keynesian multiplier effect - or indirectly - through the acquisition of knowledge which promotes productivity. During the past four decades (1970 - 2010) public education expenditure in Nigeria increased persistently in both absolute and relative terms. Total government expenditure on education as a ratio of total government expenditure ranged between 0.5 and 10.8 per cent.; resulting in an average of 5.7 per cent. Until 1980, the proportion of capital expenditure on education was above that of recurrent expenditure. However, since 1981, the reverse has been the case. In spite of the huge investment in education over this period, both the proximate target - education - and the ultimate objective - economic growth - leave much to be desired. For instance, secondary school enrolment ratio in Nigeria has barely exceeded 40 per cent since 1970: this is before accounting for the quality of education. Similarly, economic growth (measured in real GDP per capita) was not only inconsistent, but averaged only 0.602 per cent. This observation tends to negate the numerous theories and empirical studies which have found a robust relationship between public investment in education and

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economic growth. The gap between observed trends in public education expenditure, education attainment and economic growth on one hand and empirical results on the other could be attributed to faulty conceptualisation of the relationship between the variables. In view of the dynamic relationship between public education expenditure and economic growth this study examine both the direct and indirect effects of public education spending on economic growth in Nigeria.

## **2. Literature Review**

The divergence between private and social rate of returns to education is one of the rationale for intervention by the state in ensuring equity in opportunity across the population. Other motives include; market failure, social cohesion and nation-building. With respect to the effect of sectoral expenditure on economic growth, Poot (1999) notes that ‘the most conclusive result in the literature relate to the positive impact of education expenditure on growth’. This assertion has further been supported by recent studies such as Niloy et al (2003), and Saad and Kalakeck (2009). The proximate goal is to ensure the provision of education facilities as well as the quantity and quality of education of all school age children. The ultimate goal of public education expenditure is to ensure rapid and sustained economic growth. A review of empirical studies on these two objectives is presented below.

- **Public Education Expenditure and Outcome**

Although the gap in enrolment at both primary and secondary level between high and low income countries is reducing, there is still much difference especially at the secondary school level. As at 2007 gross secondary school enrolment in high income countries is 99.9 per cent, while that of low income countries stands at 36.3 per cent (UNESCO Institute for Statistics). An examination of public education expenditure between these two groups of countries also reveals the same trend. For instance, in Luxembourg, average public expenditure on education per pupil in primary school between 2003 and 2006 was US\$9953. In the same period, Congo recorded US\$39 (Human Development Report, 2009). Notwithstanding the fact that access to education does not necessarily imply enrolment, a number of studies have examined the extent to which public education expenditure has been instrumental to the level of education attainment.

The role of education in economic growth has been well documented. Thus, considering the nature of education (merit good), especially at the lower levels, public investment becomes a necessary means for ensuring adequate quantity and quality. However, the evidence on the effect of public education expenditure on education attainment is mixed. Many studies found a strong relationship between public education expenditure and measures of education attainment. Such studies include Gupta, Verhoeven and Tiongson, (1999); McMahon, (1999); Lopes, (2002); Anyanwu and Erhijakpor, (2007); Baldacci et al, (2008); Amin and Ntilivamunda, (2009); Diawara (2009); and Fadiya, (2010). On the contrary, Landau, (1986); Noss, (1991); Anand and Ravallion, (1993) and Al-Samarrai (2002) found a weak relationship. Rather, they attributed the development of the education sector to other factors such as per capita income, family background or parental education (Appleton, Hoddinot, and Mackinnon, 1996).

Gupta, Verhoeven and Tiongson (1999) applied both ordinary least squares (OLS) and two stage least squares (2SLS) estimation techniques to a sample of 50 developing and transition countries. Their result shows that education spending has a positive and significant effect on secondary school enrolment. Also, a five percentage point increase in public education expenditure increases gross secondary enrolment by one percentage point. McMahon (1999) finds a negative and significant relationship between per pupil expenditures and the primary gross enrolment rate, and a positive and significant impact of total education expenditure as a proportion of GNP. The results of the McMahon study suggest that increasing primary education expenditure while holding per pupil expenditures constant, has a positive and significant impact on the primary gross enrolment rate. The positive effect of public education expenditure on education attainment is also supported by other cross-country studies based on Africa. Lopes (2002) used data on 48 Sub-Sahara African countries for the period 1980 – 1999. Except for the ratio of education expenditure to total government expenditure all other measures of public education were found to have positive effect on

education. Anyanwu and Erhijakpor (2007), using panel data of African countries from 1990 to 2002, examined the effect of public expenditure on educational enrolment with illustration from Nigeria and other SANE (South Africa, Algeria, Nigeria, and Egypt) countries at the primary and secondary school levels. The results show that government expenditure on education has a positive and significant direct impact on primary and secondary education enrolment rates. Using panel data from 118 developing countries in 1971–2000, Baldacci et al. (2008) estimate a non-linear model to capture the spending-outcome relationship. They account for the interaction between education and health, and control for governance and the higher growth attributable to better human capital and country income levels. The fixed-effects model is utilized to make the most out of limited cross-country time series data, and minimize distortions from heterogeneity. Baldacci et al. find strong evidence that public expenditure on education directly results in increased better educational outcomes. However, the positive effects of education spending are reduced in countries suffering from poor governance. Also, based on 27 African countries for the period 1960 – 2005 on a five-year basis, Diawara (2009) found that public expenditure on education is positively and significantly associated with the primary and secondary education outcome. Amin and Ntilivamunda (2009) studied the relationship between education expenditure and outcome in Senegal, with the outcome being the primary school gross enrolment and completion rate. Both measures of education employed (ratio of education expenditure over GDP and education expenditure over total public budget) were found to have positive effect on education outcome. Fadiya (2010) applied Johansen cointegration technique to investigate the determinant of educational outcome in Nigeria between 1975 and 2008. The result shows a positive but insignificant relationship between government education expenditure and education outcome.

Leclercq (2005) and Hanushek (2006) present a survey of the empirical studies that examine the relationship between educational spending and outcomes in developed and developing countries. The main conclusion from this literature supports Gupta, Verhoeven and Tiongson's (1999) findings since the results have shown the ambiguous impact of school resources factors on education outcome. This ambiguity, however, seems to be valid for rich nations only because, as attested by Wößmann (2001), resources may render positive effects at very low endowment levels prevailing in many developing countries.

Anand and Ravallion's (1993) empirical results indicated that there was no significant relationship between education outcomes and public spending on education. Using UNESCO data and focusing on primary school education, Al-Samarrai (2002) examined the relationships between school resources (public spending on primary education, spending per pupil, pupil-teacher ratio) and educational performance (primary gross and net enrolment rates, primary survival and completion rates). The cross-country analysis shows that the link between educational access and performance and public education spending is weak. Besides, Al-Samarrai suggests that the levels of household spending, the effectiveness of the public expenditure management system and the composition of public education spending are important factors explaining the weak link.

Several factors have been adduced for the weak relationship between public education expenditure and education attainment. While Al-Samarrai (2002) attributed it to poor data, omitted variables and inefficient resource utilization, Wößmann (2001) and Diawara (2009) identified the state of development of the country or region concerned as a limiting factor. It is believed that resources may render positive effects at very low endowment levels prevailing in many developing countries.

- **Public Education Expenditure and Economic Growth**

Following the overwhelming findings of the positive effect of public expenditure on economic growth several studies have specifically examined the effect of public education expenditure.

Musila and Balassi (2004) applied cointegration technique to investigate the relationship between government education expenditure per worker and economic growth in Uganda during the period 1965-1999. Their results show that education expenditure per worker has a positive and significant impact on economic growth both in the long run and short run. In this study, average level of education per worker was used as a proxy for education expenditure. This was based on the assumption that the average level of education per worker is directly proportional to the average expenditure on education per worker. This assumption may not

hold in situations where expenditure on education is not used efficiently. Based on data from Nigeria between 1977 and 2007, and using the same analytical technique as Musila and Balassi, Dauda (2009) also found a positive and significant long run relationship between investment in education and economic growth. This study did not only assume direct proportionality between the level of education and average expenditure on education per worker, it also glossed over the issue of endogeneity between education and economic growth. The use of total public education expenditure in its aggregate form precludes that both recurrent and capital expenditure have the same effect on education and economic growth.

From the above it could be observed that studies on the effectiveness of public education expenditure either relate it to its outcome (such as enrolment rate, literacy rate, completion rate, and average years of schooling), or to economic growth. There is no doubt that as a component of aggregate government expenditure, education expenditure (in line with the Keynesian theory) could have a direct effect on economic growth. It is also true that public investment in education promotes education attainment, which in turn affects economic growth – indirect effect. Furthermore, Bils and Klenow (2000) noted that most studies tend to establish correlation between education and economic growth, but not the direction of causation. Neglecting these issues could lead to misspecification of empirical growth models.

Among the few studies that have considered all three variables (public education expenditure, education attainment and economic growth) in a concise manner, are Jung and Thorbecke, (2001) and Baldacci, Clements, Gupta and Cui, (2004).

Jung and Thorbecke employed a computable general equilibrium (CGE) approach to study ‘the impact of public education expenditure on human capital, growth and poverty in Tanzania and Zambia’. The simulation result by Jung and Thorbecke suggests that education expenditure can raise economic growth.

Baldacci, Clements, Gupta, and Cui (2004), used a recursive system of equations to examine both the direct and indirect channels linking public education spending, human capital, and economic growth. A sample of 120 developing countries from 1975 to 2000 was employed. The result show that public spending on education have a positive and significant impact on the accumulation of education, and consequently on higher economic growth. The use of a recursive system of equations was based on the assumption of zero contemporaneous correlation of the disturbances. This assumption was however, not tested. Furthermore, Gujarati and Porter (2009: 714) argued that “although recursive models have proved to be useful, most simultaneous equation models do not exhibit a cause-and-effect relationship. Therefore, OLS in general, is inappropriate to estimate a single equation in the context of a simultaneous-equation model”.

Results obtained from empirical studies are veritable tools for policy makers. Therefore, robustness of such results cannot be overemphasized. Achieving an unbiased and consistent coefficient estimates require a thorough understanding of the relationships among the variables being studied. For instance, Jung and Thorbecke (2001), adopted a neoclassical multi sector computable general equilibrium (CGE) approach with optimizing agents and flexible prices. Educated labour (which promotes GDP), is determined as a function of education expenditure, which in turn is a function of total government expenditure. It should however, be noted that increased government expenditure may not necessarily result in increase in education expenditure. This is often determined by the priority the government attached to the sector. Education expenditure in this model is seen to influence labour supply. The model regards the outcome of education expenditure as exogenous. Also, the authors assumed both recurrent and capital expenditure in education to have the same effect. Baldacci *et al* (2004) adopted a panel data regression approach. A recursive systems model was specified. This model also suffers from the endogeneity bias. Furthermore, the education expenditure variable was used in its aggregate form.

The above review shows that studies that examine the relation between public education expenditure and economic growth either regard public spending as an exogenous variable or use its outcome (literacy rate, enrolment rate, completion rate or average years of education) as a proxy. Considering the fact that the relationship between public spending and education attainment may not be linear and perfect such a proxy may be weak and lead to biased results. Inefficient use of resources fuelled by corrupt practices among other factors has been identified as a major factor. More so, the assumption of exogeneity of education in growth

models is not often tested. Furthermore, all the studies reviewed employed aggregate measure of public expenditure on education, thus assuming equal efficiency in the use of both capital and recurrent expenditure. The violation of this assumption may have serious consequences for estimated regression results.

It is important to note that the interdependence among public education expenditure, education attainment and economic growth is often ignored by empirical studies. Consequently, most studies adopt a partial approach in their analysis. While some evaluate the effect of public education expenditure on economic growth, others analyze the effect of education on economic growth: thus, ignoring the link between education expenditure and education attainment. Furthermore, studies that have analyzed all three variables in a concise manner have failed to distinguish between recurrent and capital expenditure on education. Both serve different purposes and their effectiveness may vary. It is pertinent to state that on general note findings on the relationship between public education expenditure and economic growth present mixed and suspicious results.

### 3. The Model

Following both theoretical and empirical literature on the role of public education expenditure in models of economic growth (Ram 1986, Lucas 1988, Barro 1990, Barro and Sala-i-Martins 1992), an endogenous growth model that incorporates government spending is specified. It recognizes the interrelationship between economic growth and education in a structural equation model. The specification allows for the identification of the channels through which public education expenditure and other policy interventions affect economic growth over time.

We consider a structural equation model with the scalar dependent variable  $y$  which depends on one endogenous regressor, denoted by  $h$  and two sets of exogenous regressors,  $g$  and  $c$ .

$$y = f(h, g, c) \quad (1)$$

where,

$y$  : real Gross Domestic Product (GDP) per capita growth rate (grypc)

$h$  : education

$g$  : a vector of public education expenditure measures

$c$  : a vector of control variables (variables that are often included in growth models)

The above equation is stated in econometric form as follow;

$$y_t = \omega + \alpha h_t + \beta_i g_{it} + \delta_j c_{jt} + u_t \quad (2)$$

$\alpha, \beta$  and  $\delta$  are unknown parameters of interest, while  $u$  is the structural disturbances or error term.

The set of exogenous regressors  $g$ , include the following measures of public expenditure on education – ratio of public education expenditure to total government expenditure (ptee); ratio of public recurrent education expenditure to total government expenditure (pree); ratio of public capital education expenditure to total government expenditure (pcee); ratio of public education expenditure to GDP (teey), ratio of public recurrent education expenditure to GDP (reey) and ratio of public capital education expenditure to GDP (ceey).

The second set of exogenous variables  $c$ , is made up of variables often included in growth equations. Those included in this study are initial level of GDP, physical capital, trade openness, financial depth, and inflation rate. Consequently, equation 2 is restated as follows;

$$y_t = ah_t + \sum_{i=1}^6 \beta_i g_{it} + \sum_{j=1}^5 \delta_j c_{jt} + \mu_t \quad (3)$$

The regression error  $u$  is assumed to be uncorrelated with  $g$  and  $c$  but is correlated with  $h$ . This correlation is as a result of the simultaneity bias arising from the simultaneous relationship between economic growth and education as illustrated by the Lucas model. This correlation leads to Ordinary Least Squares (OLS) estimator being biased and inconsistent for  $\beta$ .

To obtain a consistent estimator, we assume the existence of at least one instrumental variable  $z$  that satisfies the assumption

$$E(u_t / z) = 0 \quad (4)$$

This is the condition for instrument validity. Also, the instrument  $z$  needs to be correlated with  $h$  so that they provide some information on the variables being instrumented.

Apart from the simultaneous relationship between education and economic growth, two other instances - omitted-variable bias, and errors in variables - could lead to the violation of the zero-conditional-mean assumption in economic research. Although each of these problems arises for different reasons, the solution to each is the same econometric tool: the instrumental-variables (IV) estimator.

A variable is endogenous if it is correlated with the disturbance term. The presence of an endogenous variable among the regressors in a model necessitates the use of instrumental variables or instruments. This has been demonstrated to solve the problems of biased and inconsistent parameter estimates associated with the use of OLS technique [see Verbeek (2004, chapter 5); Cameron and Trivedi (2005, chapter 4); Baum (2006, chapter 8); and Wooldridge (2009, chapters 15 and 16)].

### **A Priori Expectation**

The model above has been specified based on the endogenous growth theory by Lucas (1988) and Barro and Sala-i-martin (2004), as well as the result of empirical investigation between public education expenditure and education attainment. Consequently, the following relationships are expected between the endogenous variables and their regressors.

$$\frac{\partial y}{\partial h} > 0$$

$$\frac{\partial y}{\partial g_i} > 0, \quad i = 1, \dots, 6$$

$$\frac{\partial y}{\partial c_j} > < 0, \quad j = 1, \dots, 5$$

$$\frac{\partial h}{\partial g_i} > 0, \quad i = 1, \dots, 6$$

#### **• Instruments Relevance**

The identification of an instrument hinges on both its validity and relevance. It is often impossible to test the first property. Although the second property can be tested, the relevance of an instrument is more of a theoretical issue than a statistical one. The theoretical / intuitive relationship between each of the instruments and the endogenous variable ( $h$ ) are presented below.

**a) Age Dependency Ratio:** This is the ratio of dependents - people younger than 15 or older than 64 - to the working-age population - those ages 15-64. Data are shown as the proportion of dependents per 100 working-age population (World Development Indicators 2010). In view of the peculiar nature of education (that is merit good) for a given level of income, an increase in dependency ratio will have an adverse effect on the quantity and quality of schooling. Thus, there is an inverse relationship between age dependency ratio and education attainment.

**b) Life Expectancy at Birth:** Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life (World Development Indicators 2010). Taking into consideration the private returns to education, a higher life expectancy will motivate greater investment in education.

**c) Urbanization:** Urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects. Urbanization refers to a process in which an increasing proportion of an entire population lives in cities and the suburbs of cities. It includes increase in the number and extent of cities. It symbolizes the movement of people from rural to urban areas. The density of population in urban areas increases because of the migration of people from less industrialized regions to more industrialized areas. A continuous increase in the population of a town will over-stretch the capacity of existing facilities such as schools and other infrastructure.

#### Data Sources

Variables included in the study, their definitions and sources are presented in the table below.

**Table 3.1 Variables, Definition and Sources.**

S/no	Variable	Description and Measure	Sources of Data
1	Grypc	Real GDP per capita growth rate (expenditure approach) [%]	UN Statistical Division
2	Rypc	Real GDP per capita [US\$]	UN Statistical Division
3	Sedu	Secondary sch enrolment rate [%]	WDI
4	Ptee	Ratio of public expenditure on education to total government expenditure [%]	CBN Statistical Bulletin (2010) CBN Annual Report and Statement of Accounts (VI)
5	Pcee	Ratio of public capital expenditure on education to total government expenditure [%]	Same as Above
6	Pree	Ratio of public recurrent expenditure on education to total government expenditure [%]	Same as Above
7	Teey	Ratio of public expenditure on education to GDP [%]	Same as Above
8	Ceey	Ratio of public capital expenditure on education to GDP [%]	Same as Above
9	Reey	Ratio of public recurrent expenditure on education to GDP [%]	Same as Above
10	Capy	Gross fixed capital formation (Ratio of GDP) [%]	UN Statistical Division
11	Tpen	Trade openness (ratio of total trade to GDP) [%]	World Bank, World Development Indicators (WDI)
12	Fdep	Financial Depth (ratio of broad money supply to GDP) [%]	CBN Statistical bulletin (2010)
13	Infr	Inflation rate [%]	CBN Statistical Bulletin (2010)
14	Depr	Age dependency ratio [%]	WDI
15	Leb	Life expectancy at birth [years]	WDI
16	Pupt	Proportion of total population in urban areas [%]	WDI

Source: Compiled by Author

#### 4. Results

Equation 3 was estimated using the Instrumental Variable (IV) Two Stage Least Squares (2SLS) technique with Stata econometric software. The *ivregress* with the *2sls* estimator and the options *vce (robust)*

- to control for heteroskedastic errors – as well as ‘*first*’ - to provide output that additionally report results from the first-stage regression - was used. The result is in two parts (see appendix 1a and 1b). The first part presents results for the reduced form equation. That is the regression of *sedu* on all exogenous variables - both those in the structural equation and the instruments for *sedu*.

A crucial issue in this study is that the components of public education expenditure (*pree*), that is public recurrent expenditure on education (*pree*) and public capital expenditure on education (*pcee*) serve different purposes; and to that extent could have different effects on both education and economic growth. We justify this claim by examining the results presented in appendix 4. In Models 1 and 3, the coefficients of *pree* in both the OLS and IV 2SLS estimations are positive and similar in magnitude (0.047 and 0.043 respectively). On the contrary, while *pree* is positive in both estimations, *pcee* had a negative coefficient (see Models 2 and 4). From the results presented above, the use of aggregate public education expenditure (*pree*) will obviously lead to misleading conclusion on the effect of public education expenditure (*pree*) on economic growth. These findings are robust to the addition of more regressors and different concepts of public education expenditure.

The first-stage regression has a reasonable explanatory power. It shows that public recurrent expenditure on education (*pree*), life expectancy at birth (*leb*) and urbanization (*pupt*) have negative effects on education in Nigeria. On the contrary, capital expenditure on education (*pcee*) and age dependency ratio have positive effects. While public education expenditure were found insignificant, all the instruments employed for education - *depr*, *leb* and *pupt* - were found to be statistically significant at 1 percent, 5 percent and 10 percent respectively. This confirms the relevance of the instruments.

In the IV 2sls regression, education (*sedu*), per capita income (*rypc*), public recurrent education expenditure (*pree*) and capital formation (*capy*) have positive and significant effect on economic growth. While *sedu*, *pree* and *capy* conform to a priori expectation, *rypc* does not. Based on the convergence hypothesis, there should be an inverse relationship between real income per capita (*rypc*) and its growth rate (*grypc*). On the contrary, public capital expenditure on education (*pcee*) has an adverse and insignificant effect on economic growth. It does not conform to a priori expectation.

The result shows that a 1 percent increase in education will increase economic growth by almost 4 percent. Similarly, a 10 percent increase in the proportion of total public expenditure allocated to recurrent expenditure on education will increase economic growth by 1.7 percent. The above result shows the potency of education in promoting economic growth.

### **Summary of Findings**

- Public education expenditure could influence economic growth through two channels – direct and indirect effect. The direct effect follows Barro and Sala-i-martin’s (2004) theory, while the indirect effect works through Lucas’ (1988) theory. However, public education expenditure in Nigeria during the period under review, seem to have affected economic growth through both channels. While *pcee* proves more instrumental through the indirect channel, *pree* is found to have a greater direct effect on economic growth.
- Both *pree* and *pcee* have different effects on education attainment in Nigeria. While *pcee* has a positive effect, *pree* had a negative effect. Although both coefficients are not statistically different from zero, their magnitudes are quite different.
- Although public education expenditure has a positive effect on education attainment in Nigeria, such effect is statistically insignificant.
- *Pree* has a positive and statistically significant effect on economic growth in Nigeria.
- *Pcee* has a negative and statistically significant effect on economic growth in Nigeria.
- There is a positive relationship between education and economic growth in Nigeria.

- Holding all other factors constant, a 10 percent increase in pree will increase economic growth by 1.7 percent.

## **5. Policy Implications of Findings**

### **i. Public Education Expenditure and Education in Nigeria**

The result shows a negative and insignificant relationship between education expenditure and the level of education. As observed earlier, access to education, which results from investment in education, does not necessarily guarantee enrolment. Other factors such as actual and opportunity cost of education may have a stronger effect on enrolment at the secondary school level. A unique feature of secondary education in Nigeria is that it has maintained virtually a constant gap from the level of primary education. Though Nigeria is still far from achieving primary education for all, the universal primary education policy put in place has contributed to the present (relatively higher) level of enrolment rate. An introduction of a similar policy at the secondary school level will boost the current level of less than 40 per cent enrolment rate.

The above view is however predicated on the efficiency of resource use in the education sector. Much has been said about the corrupt practices in the country. The education sector definitely is not an exception. Efforts at increasing the efficiency of expenditure in the education sector will no doubt contribute to education attainment significantly. These efforts should be combined with earlier suggestions such as empowering families economically so as to reduce the reliance on their daughters' labour for household chores, thereby releasing them to go to school (Okojie, 2002). Also, Anyanwu and Erhijakpor highlighted issues such as sustained democracy and international commitment to aid promises as complementary factors to public education expenditure in the quest toward achieving high and quality human capital in Africa. Fadiya (2010), has suggested greater government investment in health and nutrition to complement education.

### **ii. Public Education Expenditure and Economic Growth**

The result shows that public education expenditure has contributed to economic growth more through the direct channel than the indirect channel. Furthermore, public recurrent education expenditure has a positive and significant effect on economic growth. As noted earlier, while the expenditure on education may not be spent on the sector, such resources will most probably be spent in the economy. However, recurrent expenditure in form of teachers' salary will have a greater effect on economic growth through the multiplier effect than capital expenditure which is usually a lump sum. Thus, public education expenditure that targets the citizens directly such as meal subsidy to students and incentives to teachers, will not only increase the quality of education, but have a great impact on economic growth.

### **iii. Education and Economic Growth.**

The positive impact of education on economic growth conforms to endogenous growth theory. This study emphasized quantity of education rather than the quality. Considering the importance of education in the economic growth of Nigeria, other factors aside public education expenditure that promote education should be given prompt attention by the government. Also, efforts should be made to address issues that could serve as obstacles to increased education. These include the level of dependency ratio and urbanization. The impact of high dependency ratio could be mitigated through tax policies that recognize such. More so, the challenges of urbanization could be stemmed by enacting policies and programmes that encourages the sighting of industries in the rural areas.

## **6. Concluding Remarks**

Economists are often interested in obtaining reliable estimates of the causal effect of one variable on another. Valid estimates could be used to predict the effect of changes in policies, holding other factors constant. Unfortunately, standard regression analysis can fail to yield reliable estimates of causal effects for

the following reasons; (i) omitted variable bias, (ii) reverse causality or simultaneous equation bias, and (iii) measurement error. The inability to identify and account for these issues could be attributed to poor or lack of research design, which emanates from non-adoption of a relevant economic theory. This eventually results in the misspecification of theoretical models upon which estimations are based.

The consideration of these issues in the analysis of the relationship between public education expenditure and economic growth in Nigeria has brought about new revelations. The present understanding will no doubt be useful in policy designs and implantation in the education sector in particular and at the national level in general

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Appendix 1a

IV 2SLS Estimation of the Empirical Relationship between Public Education Expenditure and Economic Growth in Nigeria

. ivregress 2sls grypc drypc pree pcee dcapy (dlnsedu = dddepr ddleb ddpupt), first robust

First-stage regressions

Number of obs = 38  
 F( 7, 30) = 11.90  
 Prob > F = 0.0000  
 R-squared = 0.5422  
 Adj R-squared = 0.4354  
 Root MSE = 0.0827

dlnsedu	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
drypc	-.0004915	.0002255	-2.18	0.037	-.000952	-.000031
pree	-.0090953	.0070223	-1.30	0.205	-.0234367	.0052462
pcee	.0125618	.0090637	1.39	0.176	-.0059488	.0310723
dcapy	-.0008717	.0031511	-0.28	0.784	-.0073071	.0055638
dddepr	.4504659	.1119121	4.03	0.000	.2219108	.679021
ddleb	-1.151508	.4609496	-2.50	0.018	-2.092893	-.2101234
ddpupt	-1.786576	.9721817	-1.84	0.076	-3.772036	.1988839
_cons	.083465	.0382574	2.18	0.037	.005333	.161597

Instrumental variables (2SLS) regression

Number of obs = 38  
 Wald chi2(5) = 773.37  
 Prob > chi2 = 0.0000  
 R-squared = 0.9825  
 Root MSE = 1.0141

grypc	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
dlnsedu	3.988886	2.390497	1.67	0.095	-.6964019	8.674175
drypc	.1483643	.0060318	24.60	0.000	.1365422	.1601864
pree	.1724458	.0880936	1.96	0.050	-.0002144	.345106
pcee	-.1904418	.1314616	-1.45	0.147	-.4481018	.0672182
dcapy	.1111149	.0461221	2.41	0.016	.0207173	.2015125
_cons	-.2421552	.4505714	-0.54	0.591	-1.125259	.6409485

Instrumented: dlnsedu  
 Instruments: drypc pree pcee dcapy dddepr ddleb ddpupt

Appendix 1b

OLS and 2SLS Estimates of the relationship between the Ratio Public Education Expenditure to Total Government Expenditure and Economic Growth in Nigeria.

. estimates table model1 model2 model3 model4, star stat (N r2 r2\_a rmse)

Variable	model1	model2	model3	model4
dlnsedu	3.8292569*	5.3419315**	3.1351876	3.9888864
drypc	.14944766***	.14896039***	.14913026***	.1483643***
pree	.04698161		.0425068	
dcapy	.08292481*	.11877809**	.08349176	.11111492*
pree		.18009619		.17244579
pcee		-.22521168		-.19044182
_cons	-.19696883	-.28986953	-.116356	-.24215517
N	39	39	38	38
r2	.97922153	.9827183	.97924791	.98245132
r2_a	.976777	.98009986	.97673251	.97970933
rmse	1.166674	1.0799869	1.1027827	1.0141012

Legend: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001