Education and Economic Growth: Empirical Evidence from Nigeria

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Education and Economic Growth: Empirical Evidence from Nigeria

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Abstract

The nexus between education and growth as an engine for increased economic growth has continued to attract the attention of economists and policy makers. Experts observe that education has an impact on society, both at the micro and macro levels. However, education has not been given its rightful place in the case of Nigeria, as reflected in the nation's budgetary allocations. The country is also characterized by dualism in every form, such as an oil and non-oil sector. This dualism is also reflected in the contributions to growth, as education impacts the components of growth differently. It is against this backdrop that this study examined the impact of different levels of education on different components of growth in Nigeria. Data for the study were sourced from Central Bank of Nigeria Annual Bulletins and the Nigerian Bureau of Statistics, as well as from the World Bank for the period 1970–2013. The Fully Modified Ordinary Least Square (OLS) and Dynamic OLS approaches were employed for the analysis. Education was captured by enrolment rates at different levels of schooling and completion rate, which revealed that different levels of education have positive impacts of varying magnitude on each of the components of growth, as well as on overall growth in Nigeria, but the magnitude of the impact from completion rates is much higher on overall growth. By implication, since completion rate explains growth at a higher magnitude than enrolment rates in Nigeria, the government should endeavour to provide modalities to curtail school dropouts in the education system as a measure to boost completion rates that will facilitate growth.

Keywords: Education, Non-oil Growth, Oil Growth, Fully Modified OLS

JEL Classification: I2, J24, O4

1. Introduction

Policy makers and development planners have recognized the pivotal place of education as a means of increasing output as it has the capacity to improve health and productivity, and provides an escape out of poverty. Hence, considering the place of education in nation building, countries of the world have been investing in this all-important sector as the development of any nation may be traceable back to its level of stock of human capital, which normally entails education and health (Umo, 2007; Dauda, 2010; Kakar et al., 2011). While these two factors are key to national development, several studies have found that the former has a positive impact on the latter (see Gyimah-Brempong, 2011). The focus in this study is on education.

The nexus between education and growth as an engine for increased economic growth has continued to attract the attention of economists and policy makers. Experts argue that education has an impact on society, both at the micro and macro levels (Barro and Lee, 2010; Bashir et al., 2012; Barro, 2013), but the quest of most developing countries to maximally utilize education to break out of the vicious cycle of poverty and increase output has been a challenge (Barro, 1997; Anyanwu et al., 1997). Additionally, investment in education secures returns in the form of skilled manpower that could be geared to the needs of development, both for accelerating economic development and for improving the quality of the society (Yogish, 2006). For example, in countries that are closer to the technological frontier, high-level education includes research and innovation because technological advances increase labour productivity and economic growth, whereas low-level education is sufficient for the imitation of technology that enhances productivity in countries further away from the frontier (Aghion et al., 2006).

In Nigeria, investment in recurrent and capital expenditure on education has been low, unstable and inadequate considering the ever increasing demand for formal education, therefore the available learning infrastructure cannot cope. For instance, the Federal Government of Nigeria and the Academic Staff Union of Universities (ASUU) agreed that the nation's educational sector is faced with infrastructural deficiencies, to the extent that much of the available learning infrastructure is used beyond the original carrying capacity, i.e. lecture theatres, classrooms, laboratories and workshops are shared by many programmes across different faculties. To salvage the situation, the government and ASUU came to an agreement that all regular federal universities would require the sum of N1,518,331,545,304 for the period 2009–2011 and each

state university would require N3,680,018 per student for the period 2009–2011. Of this amount, the government would spend N400 billion in each of the years 2009 and 2010 on federal universities, and N500 billion in 2011, but surprisingly, the government did not fulfil this promise, leaving the system unchanged. They further agreed that a minimum of 26% of the annual budget of the state and federal governments should be allocated to education and at least 50% of the budgeted 26% shall be allocated to universities if the educational sector is to be salvaged (MOE, 2009). Available evidence (Figure 3) shows that federal government spending on education does not follow this increased trend, but rather a dwindling trend over the years, and it is still far from achieving this goal. A cursory look at available state government data (Table 2) indicates the same dwindling pattern for most of the states except for Lagos, which has met this objective.

Similarly, the federal government set up a needs assessment committee of Nigerian public universities, and the report of the committee confirmed earlier discussions. The committee report revealed that fewer than 10% of universities had video conferencing facilities, and fewer than 20% of universities used interactive boards (even the ones that deployed interactive boards were using them in fewer than 10% of their lecture rooms/theatres). More than 50% did not use a public address system in their lecture rooms/theatres, internet services were non-existent, library resources were outdated, no university library was fully automated, and fewer than 35% were partially automated. The committee further submitted that 23,030 (61.0%) lecturers were employed in federal universities, while 14,474 (39.0%) taught in state universities. The teaching staff-student ratio was very high in many universities: For the National Open University of Nigeria it was 1:363, for the University of Abuja 1:122, for Lagos State University 1:114, and in some universities it was 1:500. There were about 109,509 on-campus hostel beds across all public universities in Nigeria, implying that only 10.3% of the total student population could be accommodated (MOE, 2012).[1] It then implies that if such an assessment were to be carried out on the primary and secondary levels of education, similar results would be found. The inability of the government to meet these infrastructural deficiencies and increase education expenditure has had a negative impact on the quality of the outcomes from these institutions, sometimes culminating in a prolonged duration of study as a result of incessant strikes and protests by staff and students.

Further evidence of the crisis in the Nigerian education sector can be found in the report of the Joint Admissions and Matriculations Board (JAMB), where it was stated that 61% of the 1,375,652 candidates who wrote the examinations in the 2010/2011 academic session scored 180 (required minimum score) out of 400, which means 839,147 candidates were eligible for admission into conventional higher institutions. It was further reported that all tertiary institutions combined cannot accommodate more than about 500,000 new students, due mainly to unavailability of physical learning infrastructures. This was the same for the 2011/2012 academic session, where about 1.5 million candidates sat for the JAMB examinations but the available capacity was not sufficient to accommodate even one-third of the candidates (JAMB, 2012). If this is

the case for the tertiary level, it could be inferred that the demand is much greater at lower levels of education because in Nigeria, Universal Basic Education (UBE) offers free and compulsory basic education for the first nine years of a child's schooling.

With all its oil wealth, Nigeria is ironically classified as a low income country, a mono-product-dependent economy with a rapidly growing population, and a low adult literacy rate, among other things. For instance, the Human Development Index for Nigeria stood at 0.42, 0.44 and 0.46 for the years 2005, 2009 and 2011, respectively. Similarly, the adult literacy rate in Nigeria was 29%, 39.9% and 39.2% in 2006, 2008 and 2009, respectively. This varies from that of other countries in the same region, such as Ghana, whose adult literacy rate was 35.8%, 34.2% and 33.4% over the same periods, and Benin, where it stood at 60.3% and 59.3% for 2006 and 2008, respectively, but was then reduced to 30% in 2009. An abundance of well-educated people goes hand in hand with high levels of labour productivity, and a larger number of more skilled workers have a greater ability to absorb advanced technology coming from developed countries (Barro and Lee, 2010).

While there has been an abundance of literature on the effects of education on growth, from an analytical perspective the issue has been identifying the best instrument for measuring education (Dowrick, 2002; Barro and Lee, 2010; Barro, 2013). A closer look at the literature classified these measurements into flow variables (flow of resources devoted to education capital formation) and stock variables (stock of education in human capital). However, the available evidence favours stock variables, but it all depends on data availability. Several ways of measuring education are given in the literature. While some studies measure it as the enrolment rate (Easterly and Rebelo, 1993; Barro, 1997; Dowrick, 2002; Hanushek and Woessmann, 2007), others measure it as the education expenditure/GDP ratio (Musila and Belassi, 2004; Pradhan, 2009; Chandra, 2010; Nurudeen and Usman, 2010; Riasat et al., 2011; Loto, 2011; Odior, 2011; Adewara and Oloni, 2012). Some other studies measure it as completion/attainment rate as well as years of schooling (Barro and Sala-i-Martin, 2004; Barro and Lee, 2010; Gyimah-Brempong, 2011; Barro, 2001, 2013). However, enrolment rate and education expenditure are classified as flow variables, that is, they show the flow of resources to human capital formation, while years of schooling or school attainment are stock variables, that is, they measure the stock of educational human capital (Gyimah-Brempong, 2011; Barro, 2013). Most endogenous growth empirics used enrolment rate as a measure of human capital (see Barro, 1997, 2001; Dowrick, 2002; Diop et al., 2010). Of all these measures of education, school attainment or years of schooling is most preferred as espoused in the literature, because it is a measure of stock of human capital, but this method is often faced with measurement problems and data availability constraints (Easterly and Rebelo, 1993; Barro, 2013).

For Nigeria specifically, almost all studies used education expenditure as measure of education (Nurudeen and Usman, 2010; Riasat et al., 2011; Loto, 2011; Odior, 2011; Adewara and Oloni, 2012) though few of them included the primary school enrolment rate to capture human capital in their growth model. However, the available expenditure data capture only the federal government expenditure on education and

not the consolidated education expenditure. Nigeria operates a three-tier government system (local, state and federal) where all the tiers have spending commitments to education, as does the private sector. Besides, Diop et al. (2010) showed that public expenditure in most Economic Community of West African States (ECOWAS) countries would reach its growth objectives if public office holders were made more accountable to the public, which would see a reduction in bribe-seeking and rent-seeking behaviour in public investment. This study further reiterated that most ECOWAS countries are faced with a diversion of public funds, embezzlement and poor public service delivery. In Nigeria, the recent fight against corruption was regarded as questionable as it was politically-oriented and not growth-oriented. It is in this regard that the present study intends to use different levels of enrolment rates that capture the three tiers of government flow of resources to the different levels of education or schooling better than the available federal government expenditure as used by previous studies. The study also uses the only available stock variable (secondary school completion) data to capture education, and examines its impact on the different aspects of growth.

Motivation of the study

Prior to the mid-1970s, agriculture was the main driver of the Nigerian economy, together with some aspects of manufacturing. However, oil became the main source of export earnings from the late 1970s. Rather than the huge oil wealth having an impact on the growth of the other sectors, the advent of oil contributed to an outright neglect of these sectors. This reduced Nigeria to an oil-dependent economy, which it still is. The oil and non-oil sectors are different components of growth, and education is key to reducing poverty and social and income inequalities, thereby putting the economy on a path to sustainable growth and development. However, there are different levels of education and they have an impact on growth in different ways. Available studies in Nigeria captured the flow of resources to education from federal government expenditure, which did not take into account the state and local government commitments, hence giving misleading results. From the literature, it is clear there is a better way to capture the flow of resources to the different levels of education against expenditure and their impacts on growth. It is on this premise that the present study examines the impact of these different levels of education on the different components of growth in Nigeria.

Several studies (Babatunde and Adefabi, 2005; Dauda, 2010; Adesoye, 2010; Nurudeen and Usman, 2010; Loto, 2011; Odior, 2011; Adewara and Oloni, 2012; Odeleye, 2012) have delved into the likely effects of education on economic growth in Nigeria, with many focusing in their growth model on capturing education from an expenditure perspective, with specific emphasis on primary school enrolment rates as a proxy for human capital.

Surprisingly, the available expenditure data do not capture consolidated education expenditure in Nigeria as the country has a three-tier system of government. While school enrolment and education expenditure are good measures for assessing education, they are not sufficient, as the flow of resources is devoted to education

capital formation; enrolment rate would be a better measure, especially in Nigeria, and the present study intends to bridge this gap.

Gyimah-Brempong (2011) found that different levels of education have an impact on growth in different ways, and that studies in this area need to disaggregate education into the different levels, otherwise the results will be misleading and biased. From the available literature, there are few or no studies on Nigeria that examine educational impact on growth by capturing the different levels of education in one study and the present study intends to bridge this gap as well.

Similarly, if people with education in Nigeria earn more than those without, the same should be true in other countries. Another motivating factor for this study is borne of the desire to investigate the contributions of education to the development of both the oil and non-oil sectors in Nigeria. Since Nigeria is a mono-product-based economy, education has the capacity to improve other sectors of its economy and adapt new technologies so as to promote long-run economic growth. The study is at variance with previous studies as it focuses on the impact of different levels of education or schooling on different components of growth in Nigeria.

Furthermore, this study adopts two cointegration techniques of analysis, which deviates methodologically from previous studies as most of the country-specific studies employ the error correction cointegration approach ordinary least squares (OLS), despite other cointegration approaches being available in the econometric literature. Specifically, the study employs the Fully Modified OLS and the Dynamic OLS approaches, which are recent cointegration techniques in the econometric literature when a unit root problem is associated with variables in the model. One advantage of these estimators over the OLS methods is that they correct the standard OLS for serial correlation and endogeneity of regressors that are normally present in a long-run relationship.

The findings of the study will inform decision-making for education stakeholders, including the federal and state ministries of education, the Nigerian education regulatory authorities and education research institutes such as the National Universities Commission (NUC), National Board for Technical Education (NBTE) and National Institute for Educational Planning and Administration (NIEPA), as well as organized private-sector education policy makers.

Objectives of the study

The main aim of this study is to examine the impact of education on economic growth in Nigeria. Specifically, it intends to:

i.   examine the impact of different levels of schooling on overall growth in Nigeria;

ii. examine the impact of different levels of schooling on oil growth in Nigeria; and

iii. analyze the impact of different levels of schooling on non-oil growth in Nigeria.

Research questions

The following research questions will help to achieve the stated objectives:

i.   What is the effect of different levels of schooling (enrolment rates or completion rates) on overall growth in Nigeria?

ii.   What is the effect of different levels of schooling (enrolment rates or completion rates) on oil growth in Nigeria?

iii.   What is the effect of different levels of schooling on non-oil growth in Nigeria?

2. Background issues

Brief review of schooling in Nigeria

Nigeria operates a 9-3-4 system of education. There are nine years free and compulsory primary and junior secondary school, created to ensure that there is a 100% transition from the primary to the junior secondary school level so as to widen access to basic education, among other things. Primary education makes up the first six years, while junior secondary schooling is for a period of three years. Both are referred to as basic education. The next three years are for the senior secondary school level, followed by another four years of tertiary education, depending on the nature of the discipline at the higher learning level. Notably, education is a shared responsibility between the public (federal, state and local government) and the private sector in Nigeria, in terms of ownership and funding. Apart from budgetary allocations to publicly owned institutions in the country, private companies contribute to infrastructural facilities in the form of endowments through the Education Tax Fund (ETF) (MOE, 2004).

There has been a monumental increase in schools at various levels. For instance, enrolment rates for Nigeria in comparison with other country groups reveal that the average primary school enrolment rate rose after 1970 and has remained high although it has fallen to lower than the average for the Least Developed Countries (LDC) group in recent years. Nigeria compares favourably with sub-Saharan Africa (SSA) and LDCs in terms of secondary and tertiary enrolment rates (in fact, tertiary education rates are much higher in Nigeria than in both SSA and LDCs). Despite this, a wide gap still remains between developed (Organisation for Economic Cooperation and Development, or OECD) countries and Nigeria. A comparison of enrolment rates between Nigeria and the other country groups is shown in Table 1.

Table 1: Enrolment rates in Nigeria and other country groups

Year	School enrolment				Secondary school enrolment				Tertiary education enrolment			
	Nigeria	SSA	LDC	OECD	Nigeria	SSA	LDC	OECD	Nigeria	SSA	LDC	OECD
1970–1980	61.48	61.12	58.30	101.15	7.68	14.95	14.17	75.78	1.19	1.66	1.83	27.45
1981–1990	98.28	75.68	67.47	104.00	24.86	22.75	17.80	84.34	3.25	2.74	2.71	34.30
1991–2000	90.19	75.60	72.15	103.04	23.94	24.40	23.16	91.73	6.08	3.80	3.11	46.12
2001–2005	98.72	88.65	87.75	101.79	31.43	29.77	30.61	96.73	9.97	5.38	4.46	56.80
2006–2010	89.63	97.69	100.58	102.43	36.72	36.28	36.14	96.95	-	6.93	6.61	63.46

Source: World Bank, World Development Indicators, 2013

Education and growth in Nigeria: Some stylized facts

Table 2 presents the percentage share of federal government education expenditures in GDP, oil GDP and non-oil GDP. Generally, there was a large swing from the late 1960s to mid-1970s, compared to the mid-1970s and early 1980s to mid-1980s. This large swing was a result of the fact that agriculture was the main driver of the Nigerian economy until the mid-1970s, but oil became the main driver of the Nigerian economy from the mid-1970s as oil accounted for the country's main exports during this period, as reflected in the expenditure of the country. However, there was a drop due to the early 1980s recession. For example, federal government expenditure on education as a share of non-oil GDP lies between 0.2 in 1971, 1.6 in 1990 and 3.3 in 2010, while its share of oil GDP lies between 1.2 in 1971, 2.8 in 1990 and 17.5 in 2010 (an overall change of 1,360 percentage points). Similarly, federal government expenditure as a share of GDP in the period under review was at its peak at about 4.3% in 1995, and fluctuated between 2.0 in 2000 and 2.8 in 2010. However, federal government expenditure on education as a share of total federal government expenditure has seen a dwindling and inconsistent trend within the same period. For instance, it was 0.8 in 1971, then increased to 4.6 in 1990 and 9.7 in 2000, but shrunk to 5.2 in 2010.

Table 2: Education expenditure as percentage of total government expenditure, GDP and non-oil GDP

Year	Edxnogdp	Edxogdp	Edxgdp	Edugxp
1971	0.200699	1.239343	0.172727	0.816783
1975	3.540148	13.12934	2.788316	12.74933
1980	3.570469	13.10576	2.806013	5.913793
1985	0.298933	0.532129	0.191407	2.950651
1990	1.686552	2.807917	1.053672	4.677591
1995	6.485894	12.98761	4.325686	4.893232
2000	3.082755	6.399301	2.080506	9.768907
2005	2.678188	8.304316	2.025086	6.245319
2010	3.370483	17.54149	2.827246	5.233115

Source: CBN Annual Bulletin, various issues, 2010, and authors' calculations.
Notes: EDXNOGDP = federal government expenditure on education as share of non-oil GDP; EDXOGDP = federal government education expenditure as share of oil GDP; EDXGDP = federal government expenditure on education as share of GDP; and EDUGXP = federal government expenditure on education as share of total government expenditure.

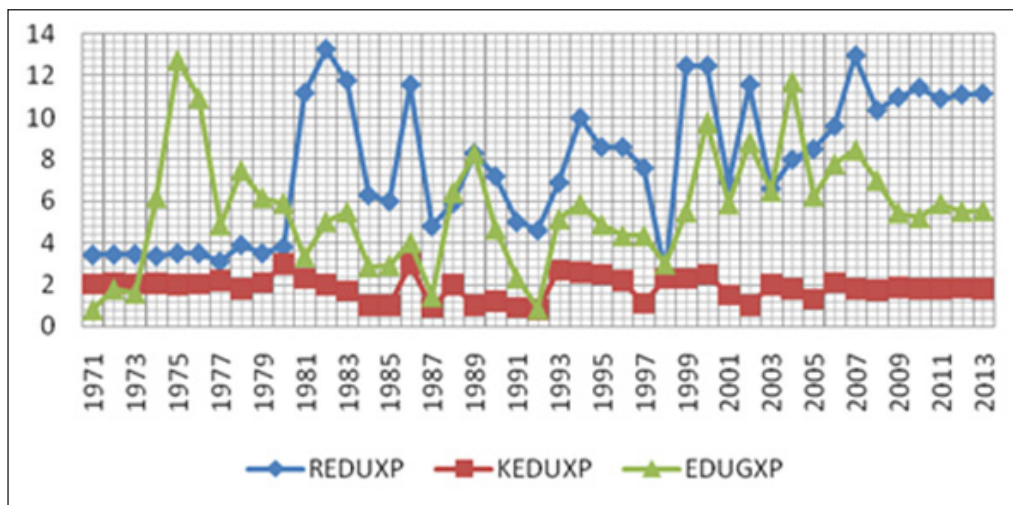## Share of federal government education expenditure in total government expenditure and GDP

The share of government expenditure on education in the budgetary allocation and spending programme is key and informs the public and stakeholders of the priority the government has given to the education sector in its spending, as well as the percentage of both oil and non-oil GDP that education expenditure accounts for. This

section presents and discusses these allocations. Table 2 presents the share of federal government expenditure on education in total expenditure and GDP.

In relation to its components, federal government education expenditure as a ratio of total expenditure was relatively high during the 1970s, reaching a maximum of 13.2% in 1974 (see Figure 1). Since then, the share of recurrent education expenditure in total recurrent expenditure has remained higher than the other variables. Capital expenditure on education has remained very low over the period, suggesting that more of the expenditure on education was channelled towards recurring activities. Also, capital formation in education is seen to be critically low (the highest share of capital expenditure on education as a share of total capital expenditure reaches a maximum of 3% in the period). This explains the wanton lack of physical facilities in education institutions in the country, both at the lower and tertiary levels.

Figure 1:   Federal government education expenditure as share of total expenditure


Note: REDUXP = federal government recurrent expenditure on education as share of total recurrent expenditure; KEDUXP = federal government capital expenditure on education as share of total government capital expenditure; and EDUGXP = federal expenditure on education as share of total government expenditure.

The proportion of federal government education expenditure in total and disaggregated GDP is reported in Figure 1. The three shares seem to follow a similar pattern, although that of oil GDP has a less smooth trend. Rapid changes in the three variables were noted in the mid and late 1970s as well as early 2000s. The share of federal government education expenditure in non-oil GDP has been relatively stagnant since 2005.

In Figure 3, the share of federal government education expenditure in real GDP and total expenditure is given. Two issues are apparent from the chart: both ratios are unsteady in terms of trend movement over the period, and there are no obvious correlations over time. The share of education spending in total government

expenditure is fraught with deep fluctuations arising from arbitrary budgetary allocations that do not follow a consistent pattern. Another crucial outcome from the chart is that the two ratios have actually followed a divergent trend since 1999; while the share in GDP tends to be falling, that of total spending displays an upward trend.

Figure 2:   Federal government education expenditure as share of GDP
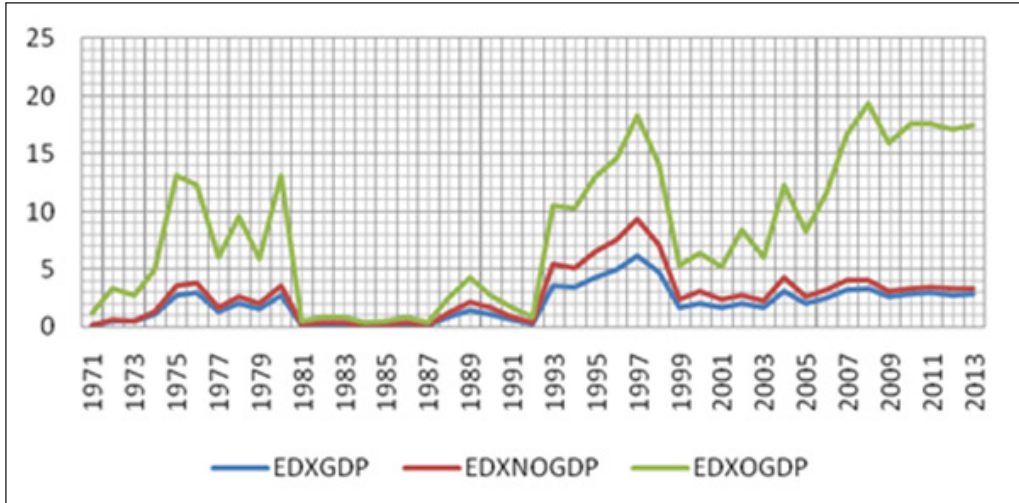
Note: EDXGDP= education expenditure as share of GDP; EDXNOGDP = education expenditure share in non-oil GDP; and EDXOGDP = education expenditure share in oil GDP.

Figure 3:   Federal government education expenditure as share of total expenditure and GDP
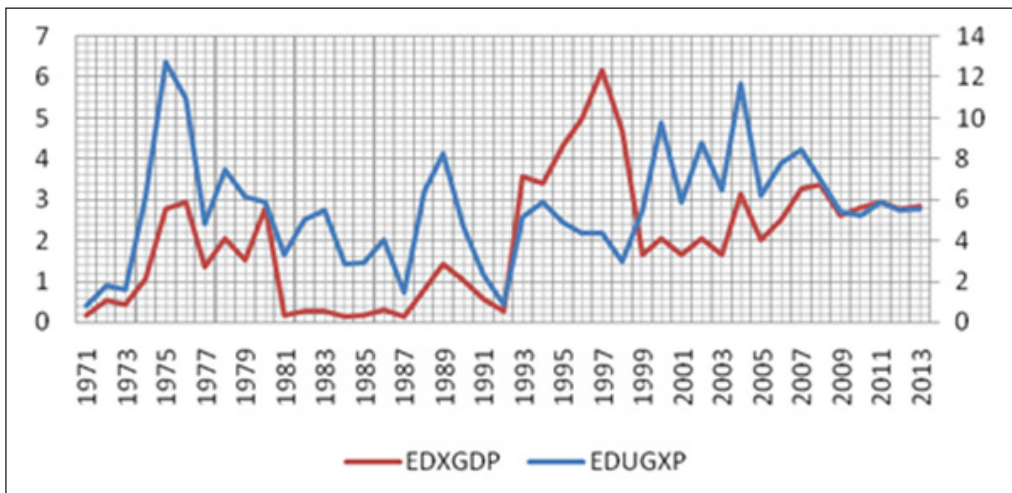
Note: EDXGDP = education expenditure as share of GDP; and EDUGXP = education expenditure as share of total spending.

Table 3 presents education expenditure as a share of total expenditure for selected states in Nigeria. Nigeria has a three-tier government system that allows all the tiers to be responsible for their own expenditure in the education sector. Table 3 shows the share of selected states'[2] expenditures as a proportion of their total spending.

Table 3:   Education expenditure as share of total expenditure, selected states in Nigeria

State	2001	2002	2003	2004	2005
Borno	10.8	Na	Na	Na	26
Cross Rivers	Na	19.4	14.6	11.3	12
Enugu	31.3	27.7	41.1	29.7	Na
FCT	Na	Na	Na	Na	9.2
Jigawa	Na	Na	10.4	22.1	20.3
Kaduna	16.2	15.5	12.1	12.2	15.6
Kano	15.2	11.9	12.6	14.3	18.0
Lagos	38.6	49.1	45.2	39.2	32.9

Source: Education Expenditure Review, Ministry of Education, 2007.

From the table, it is very clear that education has seen rather high public expenditure from states as part of their total expenditure, although it has not maintained a consistent increase as would have been expected due to the ever increasing demand for education at all levels. For instance, Enugu, Kaduna and Lagos states' expenditures on education stood at 31.3, 16.2 and 38.6, respectively, in 2001, while the 2004 education share of total expenditure for the same states was 29.7, 12.2 and 39.2, respectively.

GDP and non-oil GDP growth rates in Nigeria

The graph in Figure 4 shows the rate of growth of total real GDP and real non-oil GDP since 1970. The pattern of movement of both components seems to be similar over the period. There was a sharp and drastic drop in the late 1970s in response to the sudden fall in oil revenues accruing to the federation account. The system improved briefly in 1980, but quickly plunged back into the sub-zero region the next year. Since then, rapid variations in the growth rate of real GDP were noticed, with zero growth rates recorded intermittently until early 2000. There was a sharp rise in the real GDP growth rate after 2000, reaching a peak of close to 20 per cent in 2002.

Unsurprisingly, this was the period of increased inflows of oil revenue into the country. There was a slight drop in the growth rate in 2003, but the rate has remained close to the 10% zone since then. One interesting aspect that is presented in Figure 4 is the closely related movement pattern in real GDP and non-oil GDP. As demonstrated

in the chart, a major driving factor of real GDP movement is oil revenue inflows. The close link between the two variables shows that non-oil GDP has not been sufficiently decoupled from oil GDP.

Figure 4:   GDP and non-GDP growth rates
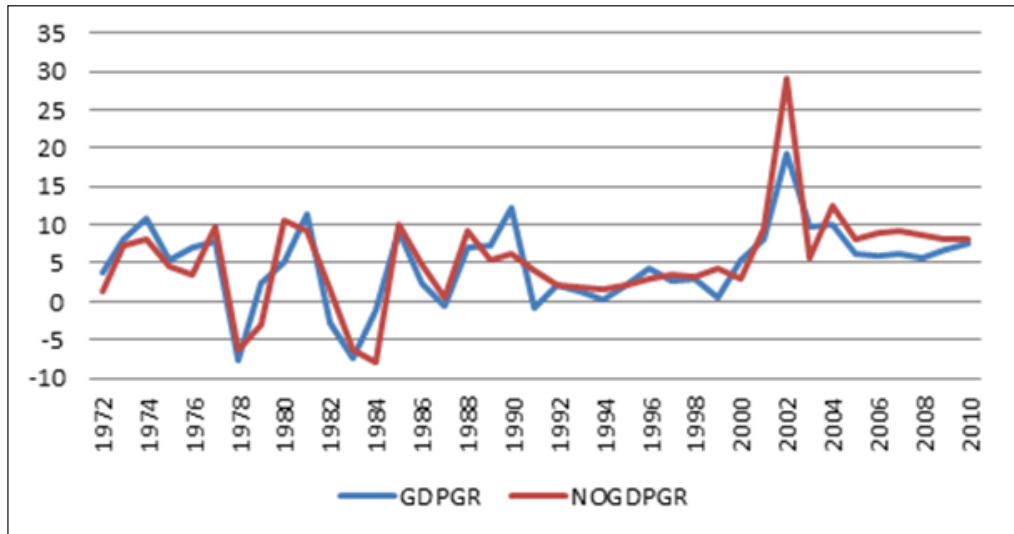
Note: GDPGR = real GDP growth rate; and NOGDPGR = non-oil GDP growth rate.

Human development in Nigeria and selected countries

Human development is an important aspect for any country that desires to be on a path of sustainable growth and development. This is because human capital represents the vast inexhaustible stock of resources in a country. The quality of a nation's human capital determines the level of its productive base, as well as its international competitiveness. In this section, we examine the level of human capital in Nigeria and compare it to some sub-Saharan African countries. One of the best ways to determine the quality of a nation's education is through the level of its human capital development.

Adult literacy rates in selected West African countries

Table 4 shows adult literacy rates for some West African Countries in three selected years. This is an indication of the literacy rate among adults in the country derived from the number of adults that have had formal education.

   The table presents available statistics on adult literacy from two countries neighbouring Nigeria for comparison purposes, which will inform the state of adult literacy in Nigeria compared to those countries.

Table 4: Adult literacy rates in selected West African countries

Year	Nigeria	Ghana	Benin
2006	29	35.8	60.3
2008	39.9	34.2	59.2
2009	39.2	33.4	30

Source: United Nations Human Development Report, 2010 (hdr.undp.org/en/content/human-development-report-2010)

Table 4 reveals that Nigeria's adult literacy rate trailed that of Benin in 2006 and 2008. It also shows the level of investment in human capital development in Nigeria with regard to education investment intended for that purpose. It is unexpected for Nigeria to have this level of adult literacy considering the large number of the adult population who make up the majority of the labour force. According to Barro (2010), an abundance of well-educated people accompanies a high level of labour productivity, which implies larger numbers of more skilled workers who have the ability to absorb advanced technology from developed countries.

In the same vein, a national survey on literacy rates in Nigeria recently revealed that about 57.9% of the adult population was literate in English while only about 30.2% were aware of the existence of literacy programme centres in the country. This may not be unrelated to the fact that these literacy centres are far away from the people who actually need them (NBS, 2010).

Teacher-pupil ratio in Nigeria and other country groups

Another key indicator of the quality of education in a country is the ratio of teachers to pupils/students. Table 5 presents the ratio of primary school teachers to pupils for Nigeria and three country groups. Unlike the OECD group, the ratio has increased over the period for Nigeria, suggesting a decline in teaching effectiveness and student relationship with teachers. Indeed, the number of primary school teachers increased by 457 per cent, while the number of pupils increased by 513 per cent. The trend in the ratio is similar for Nigeria and other SSA and LDC countries (where they are slightly higher).

Table 5:   Teacher-pupil ratio (primary school)

Year	Nigeria	SSA	LDC	OECD
1970–1980	34.0	36.83	41.56	20.45
1981–1990	39.32	36.58	41.54	19.51
1991–2000	38.39	38.65	42.40	18.19
2001–2005	38.0	42.63	44.65	17.15
2006–2010	41.35	43.21	43.36	16.25
2011	40.25	41.51	41.20	16.04
2012	40.08	40.73	39.53	16.06

Source: World Bank, World Development Indicators, 2013

The primary school completion rate for Nigeria is rather high compared to the other SSA countries. However, as shown in Figure 5, between 2004 and 2010, the rate declined from 86.9 to 80.3, even though those SSA countries maintained a steady increase over the period. Apparently, education quality in terms of participation tends to decrease towards the end of primary school education in Nigeria. This situation is further supported by the figures in Table 1. Statistics from the Ministry of Education (2004) revealed that of the estimated primary school age population (18.6 million children), 15.4% were not enrolled in schools. The gross enrolment rate is estimated at about 70%, and the national average for functional literacy is 51%.

Figure 5:   Primary school enrolment rates in Nigeria, and SSA and OECD countries
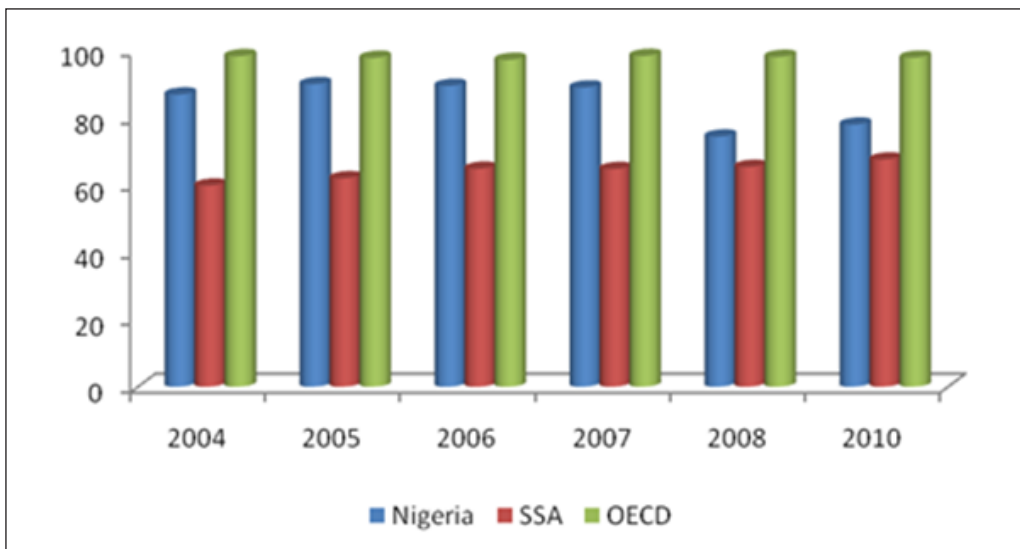
Source: World Bank, World Development Indicators, 2013

At the secondary and tertiary levels, the story is no different. Apart from inadequacies in learning infrastructure and teaching staff, the quality of education cannot be expected to be high considering teacher/student ratios. For instance, the teaching staff-student ratio for some selected universities are: National Open University of Nigeria 1:363, University of Abuja 1:122, Lagos State University 1:114, and in other universities 1:500. There are about 109,509 on-campus hostel beds across all public universities in Nigeria, implying that only 10.3% of the total student population can be accommodated (MOE, 2012). Meanwhile, paucity of data is a major constraint with regard to completion rates for the secondary and tertiary education levels in Nigeria.

Nigeria and educational development

Formal education arrived in Nigeria by way of European Christian Missionaries during the 18th Century. The missionaries established schools, designed curricula and took the responsibility of controlling and managing the schools. However, Adeyegbe

(1992) reported that the Nigerian government became involved in education in 1882 by promulgating codes, regulations and guidelines as well as policies on the overall organization and management of schools by making grants available. Education developments in Nigeria have evolved over the years, with the government showing commitment to such an extent that it was later handed some of these missionary schools. In addition, there has been an increase in the enrolment numbers at different levels, although not very significant (see Figure A1 in the Appendix).

Educational policies in Nigeria

The objective of education in Nigeria is contained in the original National Policy on Education (NPE) document launched in 1977. According to Omotor (2004), the orientation of the policy is geared towards self-realization, individual and national efficiency, and national unity aimed at achieving social, cultural, economic, scientific and technological development. Meanwhile, the five main national objectives of education as stated in the Second Development Plan shortly before the launch of the NPE are building a:

- free and democratic society;

- just and egalitarian society;

- united, strong and self-reliant nation;

- great and dynamic economy; and

- land with a bright future and full of opportunity for all citizens.

The NPE has experienced several reviews to cater for the changes and innovations in the sector. For instance, the structure of education in Nigeria was changed from the 6-5-2-4 system inherited from its British colonial master to a 6-3-3-4 system, i.e. six years of primary education, three years of junior secondary school, three years of senior secondary school and four years of tertiary education (Anyanwu et al., 1997). Meanwhile, several education policies and programmes have evolved over the years, geared towards increasing access to basic education. For instance, in the recent past the system has been modified to a 9-3-4 policy, making the first nine years of basic education free and compulsory for all children of school age.

Universal Primary Education (UPE) and Universal Basic Education (UBE) policies

A major milestone for education in Nigeria was the introduction of UPE, which kicked off in 1955 in the Western region under the astute leadership of the late Chief Obafemi Awolowo, the then Premier of the region, and later spread to other regions. The policy

was meant to ensure that primary education was universal, free and compulsory. For the first time, with the introduction of UPE, Nigeria saw an unprecedented increase in the number of schools (particularly primary) as well as in enrolment rates. For instance, before the launch of UPE, the number of primary schools in Nigeria stood at 14,525 in 1974, with a pupil enrolment of about 486,705,8. However, shortly after the introduction of the scheme, the number of primary schools rose to about 34,575, with an increase in enrolment rates of over 136% (NBS, 2010).

Nigeria joined other countries and agencies in adopting the World Declaration on Education for All (EFA) (Ogboru, 2008). Interestingly, UPE was re-launched in 1999 under a new nomenclature as Universal Basic Education (UBE) in the fourth republic by Chief Olusegun Obasanjo. It stated that the first nine years of schooling should be free and compulsory, and certificates should be awarded at the completion of the primary and junior secondary levels. This was meant to ensure that those who could not further their education could continue with vocational training to acquire skills and training for self-reliance, as captured in the NPE. This initiative was to ensure that every child of school-going age has access to basic education. There have been successes recorded in the number of pupil enrolments since inception, although it is still a far cry from the attainment of Millennium Development Goal 2 (i.e. achieving universal primary education by the year 2015).

Management of education in Nigeria

It is worth noting that Nigeria operates a federal system of government, with the federal government as the central government, 36 states and the Federal Capital Territory (FCT) Abuja, and 774 local governments. In Nigeria, education funding is a shared responsibility among the federal, state and local tiers of government, with participation from the private sector, from primary to tertiary levels. As a federal state, the Nigerian government has continued to invest in the education sector in order to attract the overall benefits of education for its citizenry and to improve national output. Education in Nigeria is an enterprise that has witnessed intervention and participation by all tiers of government (FRN, 1981). At independence in 1914, Nigeria had only two universities (University of Ibadan and University of Nigeria, Nsukka) with a total student enrolment of about 1,400 (Adawo, 2011). Now there are about 128 universities in Nigeria, with federal, state and private universities numbering 38, 40 and 50, respectively. In addition, the number of polytechnics, monotechnics, and colleges of education and agriculture across the country are also on the increase. The federal government has focused more on tertiary education, with higher expenditure directed towards that sector than to the secondary and primary sectors. The state and local governments have focused more on the secondary and primary education sectors. However, the state governments are still involved in catering for tertiary education in each state, while the federal government also caters for some secondary education.

3. Empirical review

The empirical literature on the effects of education on economic growth has been an issue of intellectual discourse for a long time, with several and sometimes conflicting views. Economists believe that investment in education or human capital increases output and labour productivity. The argument stems from the position that a positive causal relationship exists between the proportion of government income spent on education and long-run growth, while others hold the view that increasing education spending does not necessarily translate to economic growth. However, in light of the above, this study presents an overview of empirical literature on these mixed viewpoints based on similar criteria used in the studies carried out in Nigeria and other countries.

In Nigeria, as in several other countries, empirical investigations have continued to attract the attention of scholars. For instance, Babatunde and Adefabi (2005) examined the long-run relationship between education and economic growth in Nigeria using evidence from Johansen's co-integration approach for the period 1970–2003. The study specifically examined two channels through which human capital can affect long-run economic growth in Nigeria. The first channel is when human capital is a direct input in the production function, while the second channel is when human capital can affect the technology parameter. The study observed that although it may be difficult to separate the two channels from each other, the result revealed that a well-developed labour force has a positive and significant impact on economic growth through factor accumulation, and on the evolution of total productivity. Therefore, good economic performance in terms of per capita growth may be attributed to a well-developed human capital base. The study recommended that concerted efforts be made by policy makers to increase the level of human capital in Nigeria. The implication of this result is that the level of human capital stock is directly related to increased output per worker.

Adesoye (2010) examined the link between government spending and economic growth in Nigeria for the period 1977–2006 using time series data to analyze the RAM model comprising three variants constructed for the study. These are: regressing real GDP on private investment, human capital investment, government investment and consumption spending at absolute levels; regressing it as a share of real output; and regressing the growth rate real output to the explanatory variables as a share of GDP in order to capture the precise link between public investment spending and economic

growth in Nigeria based on different levels. The results revealed that private and public investments had insignificant effects on economic growth during the period under review. The study's main policy recommendation was that government spending in Nigeria should be channelled especially to education and infrastructure facilities in order to influence economic growth significantly and positively. Results from this study are not vastly dissimilar to the submission of Nurudeen and Usman (2010), who found a negative effect of government expenditure on education and growth in Nigeria, and recommended an increase in education spending in both recurrent and capital expenditure.

Loto (2011) investigated the growth effects of government expenditure in Nigeria over the period 1980–2008 with a particular focus on sectoral expenditure. In the study, five key sectors were selected: security, health, education, transportation, and communication and agriculture. Results from the study revealed that in the short run expenditure on agriculture was found to be negatively related to economic growth. The impact of education, although also negative, was not significant. The impact of expenditure on health was found to be positively related to economic growth. Although expenditure on national security, transportation and communication were positively related to economic growth, the impacts were not statistically significant. The study added that it is possible that education expenditure could be positive in the long run if brain drain is kept in check.

Odior (2011) examined the impact of government increase in spending on education and economic growth in Nigeria using the Computable General Equilibrium (CGE) model calibrated with 2004 Social Accounting Matrix (SAM) data of the Nigerian economy. Among other things, the study revealed that reallocating resources to the education sector is significant in explaining economic growth in Nigeria. Based on the findings of the study, the author concluded that education should be highly prioritized among other public expenditures as it is capable of leading to substantial economic growth in the long run. Unarguably, moving resources from unproductive ventures to education, as is the case sometimes (due to rent seeking, misallocation of funds, or diversion of public funds), would enhance the quality of education and reduce poverty levels as investment in education is one of the pro-growth policies for promoting economic growth.

In a study on the composition of public expenditure and economic growth in Nigeria for the period 1960–2008, Adewara and Oloni (2012) observed that expenditure on education failed to enhance economic growth. This, the study argued, may not be unrelated to the high rate of rent-seeking coupled with the growing rate of unemployment.

Odeleye (2012) examined education and economic growth in Nigeria using primary and secondary data for the period 1985–2007, by adopting the OLS technique. Findings from the study revealed that only recurrent expenditure had significant effects on economic growth, and the academic qualifications of teachers also had a significant impact on students' academic performance. The result of this study is not very different from several other studies on the impact of public expenditure on education, except

that it tends to deviate a little by revealing the pivotal place of recurrent expenditure on learning outcomes as well as growth.

The findings from the above studies revealed that education expenditure could not enhance growth in Nigeria, probably due to the level of investment in the sector. Their recommendation is in essence to channel more resources to education. Using available statistics, public investment into education has not really been able to keep pace with the growth of the sector in Nigeria (Adesoye, 2010; Loto, 2011; Adewara and Oloni, 2012).

Other studies from outside Nigeria, for instance that of Fiszbein and Psacharopoulos (1992) who analyzed the effects of education investment in Venezuela, found that primary education investments have the highest effects on growth, whereas higher education investment exhibits the lowest returns among the three levels of education. This may be due to the fact that the high cost of university education offsets the benefits accrued from a university degree. Easterly and Rebelo (1993) also examined the effects of investment in education on growth using a large pool of both developed and developing countries. The study affirmed that investment in education was highly significant, implying that it is able to have a significant influence on growth. The study argued that this may not be unrelated to the pool of externalities arising from investment in education, thus raising the levels of productivity of both human and physical capital.

In a cross-country study, Buffie (1994) researched the effects of reducing human capital expenditure. In his model, he distinguished between skilled and unskilled labour in the manufacturing sector. The study assumed that skilled labour growth is governed entirely by the human capital investment of government and the stock of skilled labour is fixed in the short run, thereby rising or falling over time depending on whether public investment in human capital is positive or negative. The findings from the study revealed that investment in human capital formation leads to capital accumulation on a broad front. Given that factors are usually complementary, a lower supply of skilled labour (or social infrastructure) reduces the productivity of both capital and unskilled labour. This finding corroborates the view of Myers (1964) that the most obvious way of developing human capital is through formal education.

Devarajan et al. (1996) examined the composition of public expenditure and economic growth using panel data from 43 developing countries over a period of 20 years. The study observed that an increase in the share of current expenditure had positive and significant growth effects, while the relationship between the capital component of public expenditure and per capita growth was negative. It concluded that developing country governments misallocated public expenditure in favour of capital expenditure components.

A study by Jung and Thorbecke (2001) examined the impact of public expenditure on human capital, growth and poverty in Tanzania and Zambia. The study employed the multisector computable general equilibrium model. Results from the study revealed that education expenditure can raise growth in these countries. However, to maximize these benefits from education expenditure, a sufficiently high level of

physical investment is needed and a well-targeted pattern of education expenditure can be effective in poverty alleviation.

Dowrick (2002) reviewed empirical studies that examined the relationship between economic growth and education and R&D (research and development). These studies showed that education and R&D are substantial resources for promoting economic growth. Participation in education and public expenditure on education increased during the 19th and 20th centuries. Enrolment in the public education system had increased by 40 per cent from 1870 to 2001, whereas public expenditure on education increased from 0.86 per cent to 4.85 per cent of GDP during the same period. GDP also increased ninefold in the same period.

Blankenau and Simpson (2004) examined the relationship between education expenditure and long-run growth in 23 developed countries. The study found that a positive relationship existed and concluded that the relationship is thus sensitive to the imposition of a government budget constraint. However, the relationship was not significant.

Baldacci et al. (2004) conducted a panel study of 120 developing countries for the period 1975 to 2000. The study revealed that education expenditure had a positive direct impact on human capital accumulation and an indirect impact on economic growth. The study also found that both immediate and lagged effects of spending on education may arise, meaning that education spending might lead to growth over time.

Barro and Sala-I-Martin (2004) found that public spending has a positive impact on growth, as does level of educational attainment, which is also significantly related to growth. Previously, in a study of 100 countries between 1965 and 1995, Barro (2001, 2013) found that growth is positively related to the starting level of average years of school attainment of adult males at the secondary and higher levels. The results from the study further revealed that the quality of education and its impact on economic growth is different among rich and poor countries. This result may not be unrelated to the wide gap in the quality of education that exists between the LDCs and OECD countries.

Musila and Belassi (2004) examined the impact of education expenditure on economic growth in Uganda using evidence from time series data for the period 1965–1999. The study adopted the use of co-integration and error estimation procedures using capital and labour as some of the key variables that seem to affect the long-run growth performance of the economy. The results indicated that average education expenditure per worker is positively correlated with economic growth. The LR test indicates that education expenditure in the model is weakly exogenous, suggesting therefore that it drives economic growth. They added that, based on their findings, the policy advice given to the Ugandan authority by the international donor community to increase education expenditure in order to improve the economy's growth performance is considered economically sound.

Bose et al. (2007) examined the growth effects of government expenditure with an emphasis on sectoral expenditure for 30 developing countries for the period 1970–1990, introducing the role of government budget constraint and likely biases

that may arise from omitted variables. The researchers deduced that the proportion of government capital expenditure on GDP is positive and significantly correlated. The study added that at the sectoral level, government investment and total expenditure are significantly associated with growth. Hanushek and Woessmann (2007) examined the place of education in promoting economic well-being and the role of educational quality. The study revealed that the cognitive skills of a population have a strong relationship with individual earnings, distribution of income, and economic growth.

Basu and Bhattarai (2009) carried out a panel study of 47 countries on the impact of government expenditure on education, growth and school returns between 1960 and 2007. In their study, it was established that growth is positively correlated with education expenditure in the countries that spend more of their resources on education (i.e., richer countries) while a negative relationship was found in countries with low education spending.

Pradhan (2009) investigated the causality between public education spending on education and economic growth in India in 1951–2001 by adopting the error correction model. The findings suggest that there is a unidirectional causality between education and economic growth in the Indian economy. The direction of causality is from economic growth to education spending and not vice versa. But the work of Chandra (2010), in which a causal relationship between education investment and economic growth for India for the period 1951–2009 was examined using the linear and non-linear Granger causality methods, found that there was a bi-directional causality between education and public spending and GDP. The results also indicated that the direction of causality from education expenditure to economic growth is not immediate, rather it can be said that investment in education is expected to affect the economic growth of a country after some time. The study inferred that India's major breakthrough in the software industry in the recent past may be due to the massive investments in the technical education sub-sector. Riasat et al. (2011), adopting the bonds testing approach, measured the impact of educational expenditure on economic growth using evidence from Pakistan for the period 1972–2010. The study found that education expenditure had a positive and significant impact on economic growth in the long run.

Gyimah-Brempong (2011) examined the effects of education on several development outcomes in African countries for the period 1960–2010 using different sets of estimation techniques. The study revealed, among other things, that educational attainment had a significant impact on all development outcomes, ceteris paribus, and that different levels of education affect development outcomes differently.

Other country studies carried out include those by Bashir et al. (2012), who empirically analyzed the relationship between higher education growth and economic growth in West Virginia using a set of simultaneous equations comprised of three endogenous variables: Per capita change income, education change and population change. Results from the study showed that income growth and education growth were positively related, while education growth reduced population growth in West Virginia.

From the empirical review, it is obvious that education has the capacity to improve output depending on expenditure, the quality of education and the stock of human capital available. Many studies in Nigeria that examined the effect of education expenditure on economic growth used federal government expenditure on education, which focused more on the tertiary education sub-sector and used either primary or secondary enrolment rate as human capital variable in their growth model. However, the present study is at variance with the previous studies as it focused on not just expenditure but also the impact of the various levels of education on growth in Nigeria. Public expenditure on education data should have been consolidated data on the three tiers of government expenditure in the sector, but previous studies used only federal government expenditure on education, perhaps due to unavailability of education expenditure data from sub-national governments. This may not necessarily be a true measure of education as expenditure on education in a growth equation would yield no reasonable result because it is merely an allocation of funds.

4. Research methodology

This section presents the theoretical underpinning behind the empirical model as well as the method of analysis, the data coverage and sources of data for the study.

Theoretical framework and model specification

Here, we present the theoretical consideration for the empirical model as well as the specification of the model for the study.

Theoretical framework

This study follows a framework espoused by Barro and Lee (2010) that assumes a Cobb-Douglas production function. This framework follows the endogenous growth theory. Assume a Cobb-Douglas function is:

$$Y = AK^{\alpha}H^{1-\alpha} \qquad (1)$$

Where, Y=output, K=stock of physical capital, H=human capital stock, and A=total factor productivity.

Assuming $H = hL$ where h represents the amount of human capital per worker and L=number of workers, the production function can be rewritten as:

$$Y = AK^{\alpha}(hL)^{1-\alpha} \qquad (2)$$

Expressing the variables in per worker term and then taking log, we have:

$$\log\left(\frac{Y}{L}\right) = \ln A + \alpha \log\left(\frac{K}{L}\right) + (1-\alpha)\log\left(\frac{H}{L}\right) \qquad (3a)$$

or

$$\log y = \ln A + \alpha \log k + (1-\alpha)\theta \log h \qquad (4b)$$

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Where, y=output per worker and k=capital stock per worker, Barro and Lee (2010) assumed human capital per worker to be directly proportional to education (schooling), so we have:

$$h = e^{\phi(s)} \tag{4}$$

In the above equation, $\phi(s)$ denotes the efficiency of a unit of labour, with S years of education. If we assume further that $\phi(s)$ is linear, then:

$$h = e^{\theta s}. \tag{5}$$

Substituting Equation 5 for Equation 3b:

$$\log y = \log A + \alpha \log k + (1-\alpha)\theta s. \tag{6}$$

To measure the relationship between output and human capital, Barro and Lee (2010) estimated as follows:

$$\log(Y_t) = \beta_0 + \beta_1 \log(K_t) + \beta_2(S_t) + \varepsilon_t \tag{7}$$

Model specification

Based on the above framework and following Hanushek and Woessmann (2009) and Barro (2013), who extended the above to account for different levels of education (primary, secondary and tertiary), the study specifies an empirical model on the relationship between education and economic growth as follows:

$$\log(Y_t) = \psi_0 + \psi_1 pryenrl_t + \psi_2 \sec enrl_t + \\ \cdot \psi_3 terenrl_t + X\beta + \mu_{1t} \tag{8}$$

$$\log(Y_t) = \alpha_0 + \alpha_2 \sec comp_t + X\beta + \mu_{2t} \tag{9}$$

Where y is used to capture either oil growth, non-oil growth or overall economic growth depending on the model, pryenrl, secenrl and terenrl are primary school enrolment rate, secondary school enrolment rate and tertiary school enrolment rate, respectively, seccomp represents secondary school completion, X is a vector of

other explanatory variables included in each of the models (the included variables are defined below), and μ is a stochastic error term. Equation 8 is used to examine the effect of education on growth through flow of resources devoted to human capital formation, while Equation 9 examines the effect of education on growth through the stock[3] of education capital channel.

Data sources and method of analysis

To empirically analyze the long-run relationships and short-run dynamic interactions between education captured by school enrolment and completion rates and growth, the theoretical framework used in Equations 1 to 6 is adopted. Several estimators are proposed in the presence of cointegration. These include the error correction approach (OLS), fully modified OLS (FMOLS), and the dynamic OLS (DOLS). The study adopted the FMOLS and the DOLS approaches. These estimators correct the standard OLS for serial correlation and endogeneity of regressors that are normally present in a long-run relationship (Pedroni, 1996, 2004). They also allow consistent and efficient estimation of cointegrating vectors. The FMOLS and DOLS as alternative cointegration approaches also bypass the problem faced by econometricians by usually having to start with an over-parameterized model and then trying to arrive at a parsimonious model (Pedroni, 1996). The FMOLS and DOLS equations are, respectively:

$$y_t = \alpha + \beta x_t + \mu_t \tag{10}$$

$$y_t = \alpha + \beta x_t + \sum_{k=-k}^{k} \gamma_t \Delta x_{t-k} + \mu_t \tag{11}$$

Where y is the dependant variable which takes either non-oil GDP growth, oil GDP growth and/or per capita RGDP growth.

X is a vector of explanatory variables depending on the model. K takes the form of a lead (1) or lag (1) and μ is the stochastic error term.

The data cover the period 1970–2013 and were extracted from the CBN Statistical Bulletin and the Nigerian Bureau of Statistics. The data used in the estimation are non-oil GDP growth (captured by log of non-oil GDP per capita, or NOGDPPC), oil GDP growth (captured by log of oil GDP per capita, or OILGDPPC), economic growth (proxied by log of real GDP per capita, or RGDPPC), primary school enrolment rate (PRYENRL), secondary school enrolment rate (SECENRL), secondary school completion rate (SECCOMP), and tertiary school enrolment rate (TERENRL). Other variables included in the models are log of capital formation (KFM)[4] and a time trend (t).

5. Empirical results

The empirical results for the study based on the specified model are presented in this section. The unit root test results are first presented, followed by the cointegration test results to establish the long-run relationship among the variables of the model and finally, the FMOLS and DOLS results are presented and discussed thereafter.

Unit root test

The study began its analysis by conducting a stationarity test to establish the unit root status or otherwise of the variables and the appropriateness of the specification of the FMOLS and DOLS modelling approaches. Thus, both the Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) unit root tests are employed in this study. The results are reported in Table 6.

Table 6:   Unit root test result

Variables	Augmented Dickey Fuller				Phillips-Perron				Rmk
	Without trend		With trend		Without trend		With trend		
	Level	1st diff.	Level	1st diff	Level	1st diff	Level	1st diff.	
Log (non oil GDP per capita)	3.44	-4.34*	0.92	-5.31*	3.57	-4.34*	0.87	-5.31*	I(1)
Tertiary enrolment rate	-0.82	-4.11*	-1.96	-4.12*	-0.45	-6.75*	-2.13	-6.77*	I(1)
Secondary enrolment rate	-0.42	-2.65	-2.03	-3.76*	-0.42	-4.39*	-2.52	-3.78*	I(1)
Primary enrolment rate	-2.46	-3.78*	-2.18	-3.58*	-2.30	-3.58*	-1.78	-3.75*	I(1)
Secondary completion rate	-1.29	-4.30*	-1.69	-4.29*	-1.26	-6.16*	-1.79	-6.12*	I(1)
Log (oil GDP per capita)	-1.33	-5.26*	-2.15	-5.34*	-1.24	-7.22*	-2.47	-7.28*	I(1)
Log (real GDP per capita)	-0.66	-4.89*	-2.32	-4.83*	4.46	-6.43*	-2.36	-6.34*	I(1)
Log (capital formation)	-0.36	-5.04*	-0.89	-5.11*	-0.76	-6.32*	-0.27	-4.98*	I(1)

Source: E-view 7 estimation by authors
Note: * indicates 1% level of significance

The results as reported in Table 6 show that all the variables are non-stationary at their levels. The variables became stationary after the first difference. This is supported by both the ADF and PP unit root test results. This is an indication of I(1) variables. Hence, testing for the long-run relationship between the variables was necessary.

Cointegration test

One of the main steps in using any of the cointegration approaches is to establish the long-run relationship among the variables using a cointegration test. Therefore, this study adopted the Engle-Granger residual-based single-equation cointegration test. The results are presented in Table 7.

Table 7:   Engle-Granger residual-based single equation cointegration test result[5]

Residuals	ADF stat	Critical values			Residuals	ADF stat	Critical values		
		1%	5%	10%			1%	5%	10%
Residual 1	-5.36	-3.54	-2.86	-2.52	Residual 4	-5.68	-3.54	-2.86	-2.52
Residual 2	-5.46				Residual 5	-6.47			
Residual 3	-5.61				Residual 6	-5.38			

Source: Authors' estimation from E-Views.

It is evident from Table 7 that the residuals from the long-run models all passed the unit root test as they were all significant at the 1% level, which establishes the existence of cointegration in all the models and alludes to the fact that a long-run relationship exists in all the models.

Empirical result

Based on establishing a long-run relationship among the variables, we proceed to estimate empirical models using the FMOLS and DOLS[6] cointegration approaches. The results are presented in Table 8.

Table 8 shows that about 78% of the total variation in economic growth can be explained by the variables included in the result. The Durbin-Watson statistic values of 1.82 and 2.04 also indicate that the result has no serious econometric problem as the value implies that there is no serial correlation associated with this result.

A cursory look at the result indicates that schooling has positive and significant effects on economic growth in Nigeria. It was revealed that all levels of schooling had a positive impact on overall real GDP per capita, although the magnitude of the effect differs across levels of schooling. For instance, the coefficient of schooling at the primary school level proxied by primary school enrolment rate was found to be 0.02 and is significant at 10%, which invariably indicates that changes in primary school enrolment facilitates per capita GDP of about 0.02.

Table 8:   Schooling and economic growth in Nigeria

Dependant variable: Log of per capita real GDP (RGDPPC)				
	School enrolment and growth equation		School completion rate and growth equation	
Regressors	Coefficients	T-ratio	Coefficients	T-ratio
c	0.17**	2.214	0.05*	1.721
Primary enrolment rate	0.018*	1.677	-	-
Secondary enrolment rate	0.064***	6.048	-	-
Secondary completion rate	-	-	1.12***	3.664
Tertiary enrolment rate	0.031**	2.478	-	-
Log (capital Formation)	0.43**	2.443	0.57***	2.962
t	0.024***	2.986	0.025*	1.79
R^2	0.782		0.792	-
Durbin-Watson	1.82		2.04	-

Note: ***;**;* indicate 1%; 5% and 10% level of significance, respectively.

However, the coefficient of schooling at the secondary level captured by secondary enrolment rate was found to be 0.06, therefore significant at the 1% level, which implies that changes in the secondary enrolment rate triggered overall GDP per capita of about 0.06. The coefficient of schooling at the tertiary level was found to be 0.03 and is significant at 5%, thus the magnitude of the effect is less than that of secondary level schooling in Nigeria. This is not surprising as the percentage of the Nigerian population with secondary level schooling is greater than that for tertiary education, and they are involved in more productive activities than those with tertiary level schooling who are faced with an alarming rate of unemployment that renders them unable to be involved in productive activities. Conversely, secondary-level schooling captured by secondary completion rate was found to have a greater magnitude of positive and significant effects on overall growth in Nigeria than that captured by enrolment rate. The coefficient was found to be 1.12 and it is significant at 1%. This is an indication that not all who enrolled completed their secondary schooling and the effect of education from the perspective of completion rate is much higher. The findings here are consistent with the studies by Barro (2013), Gyimah-Brempong (2011), Benhabib and Spiegel (1994), Barro and Sala-I-Martin (1995), Sala-i-Martin (1997), and many others who find schooling to be positively correlated with per capita real GDP. All other variables included in the model were found to have the expected signs and were significant. As the other variables have the expected signs, it is an indication that schooling in the output per capita models is not just one of the control variables but a key and relevant variable in the output equation in Nigeria. A time trend was also included to capture productivity and it was found to have a positive and significant impact on overall growth in Nigeria. One main implication that can be drawn from this result is that disaggregating schooling or education into different levels is key in explaining the effect of education on growth.

Table 9:   Schooling and non-oil GDP growth in Nigeria

Dependant variable: Log of non-oil GDP per capita (NOGDPPC)				
	School enrolment and growth equation		School completion rate and growth equation	
Regressors	Coefficients	T-ratio	Coefficients	T-ratio
C	0.26**	2.33	0.32*	1.68
Primary enrolment rate	0.134*	1.712	-	-
Secondary enrolment rate	0.101***	3.71	-	-
Secondary completion rate	-	-	1.217***	2.92
Tertiary enrolment rate	0.027**	2.21	-	-
Log (capital Formation)	0.11	1.09	0.07*	1.78
T	0.03**	2.54	0.09*	1.82
R^2	0.891	-	0.684	-
Durbin -Watson	1.81	-	1.89	-

Note: ***;**;* indicate 1%; 5% and 10% level of significance, respectively.

One main area where the present study is at variance with the previous studies, especially in Nigeria, is that it examined the effect of schooling or education on sectoral output and for this reason, the study separated growth into non-oil and oil growth and examined how different levels of schooling have an impact on them.

Table 9 shows the value of R^2 as 0.89, from which about 89% of the variation in non-oil GDP growth is explained. The Durbin-Watson values of 1.81 and 1.89 indicate that there is no autocorrelation associated with this result, which is an indication of the fact that the result has no econometric problem.

A closer look at the results in Table 9 show that schooling has a positive impact on non-oil GDP per capita, and that this is significant. However, lower levels of schooling were found to have a greater magnitude of effect on non-oil GDP growth in Nigeria. For example, the coefficients of primary, secondary and tertiary enrolment rates are 0.13, 0.10 and 0.03, respectively, and they were all significant, but the magnitude of the effect is much higher at the primary school level. This is not surprising as agriculture still dominates employment statistics for the Nigerian population and the agricultural sector is dominated by people who have lower levels of education, basically primary and secondary levels. All other variables had the expected signs. Completion rate, which is the alternative measure of schooling/education in this study, was found to have a positive impact on non-oil GDP per capita, and which is significant. The coefficient is bigger than that of schooling captured by enrolment rates. The coefficient is 1.22, which also provides support for the fact that school completion has a much greater impact than only school enrolment.

Table 10:   Schooling and oil GDP growth in Nigeria

Dependant Variable: log of oil GDP per capita (OILGDPPC)

Regressors	School enrolment and growth equation		School completion rate and growth equation	
	Coefficients	T-ratio	Coefficients	T-ratio
C	0.43**	2.64	0.19**	2.52
Primary enrolment rate	0.036	0.774	-	-
Secondary enrolment rate	0.07***	5.74	-	-
Secondary completion rate	-	-	1.281***	2.83
Tertiary enrolment rate	0.16**	2.30	-	-
Log (capital Formation)	0.06	1.22	0.12*	1.73
T	0.046***	3.32	0.092**	1.98
R^2	0.731	-	0.792	
Durbin-Watson	1.97	-	2.03	

Note: ***;**;* indicate 1%; 5% and 10% level of significance, respectively.

Table 10 shows the impact of schooling on per capita oil GDP in Nigeria. It is evident from the table that about 79% of the total variation in oil GDP per capita is explained as shown by the R^2 value of 0.792, and the Durbin-Watson statistic values of 1.97 and 2.03 are indications that there is no serial correlation in this regression result.

It can be deduced from the result that schooling at different levels has a positive and significant effect on oil GDP per capita in Nigeria, except for the coefficient of primary level of schooling that is found to be insignificant though positive in its impact on oil GDP per capita. It is also clear from the table that the magnitude of the effect is much greater at higher levels of schooling than at lower levels. For instance, the coefficients of education are found to be 0.04, 0.07 and 0.16, respectively, for the primary, secondary and tertiary levels of schooling. This might not be unrelated to the fact that the oil sector involves more technical skills and knowledge, which demand a higher level of schooling or education for proper contributions to be made to the sector. Other variables in the model were found to have the expected signs and were significant. Completion rate was also found to have a positive and significant impact on oil GDP growth, and as in the previous result, the magnitude is much greater than that of enrolment rates. For instance, the effect was around 1.28 for the period under review. This also provides support for previous results that school completion rate is more relevant in explaining growth than just enrolment rates, because those who enrol might not complete their schooling at all levels.

6. Conclusion

This study examined the impact of education on economic growth in Nigeria. Specific attention was paid to the different components of growth such as non-oil growth, oil growth and overall economic growth captured by non-oil GDP per capita, oil GDP per capita and real GDP per capita, respectively, in Nigeria. The role of the non-oil sector in facilitating growth and development cannot be overemphasized as the sector determines, to a large extent, the necessary diversification of the economy and salvages the Nigerian economy from being wholly oil-dependent. However, the oil sector has not triggered the expected growth and development in the country, despite huge revenues. Experts argue that one of the main problems facing resource-dependent economies such as Nigeria is management of the resource wealth. Conversely, education serves as an engine of growth and development and, therefore, investment in education is a tool for developing inexhaustible resources (human capital). Therefore, this study is not only timely but inevitable.

The study captured education or schooling through two channels: enrolment rate and completion rate. The study finds that all levels of schooling are cardinal in effecting overall growth positively, and that schooling in a growth model does not serve as a control variable but a relevant variable in explaining the behaviour of growth in Nigeria. The study revealed that the effect of primary, secondary and tertiary enrolment rates on overall growth are 0.02, 0.06 and 0.03, respectively, and of completion rate 0.12, which indicates that secondary schooling has more of an impact on overall growth than on other levels, and the magnitude of the effect is much higher when education or schooling is captured by completion rate. This can be explained by the fact that school completion is more relevant to overall growth than enrolment. This is the case for all the other estimated models, that is the non-oil GDP and oil GDP growth models, as completion rate has an impact on them to a great extent. In all models, productivity as captured by a time trend was found to facilitate overall growth as well as non-oil and oil growth in Nigeria. One significant finding of this study is that lower levels of schooling have much more of an impact on non-oil GDP growth than oil GDP growth, while higher levels of schooling have a greater impact on oil GDP growth than on non-oil GDP growth. Consequently, since completion rate explains growth at a higher magnitude than enrolment rates in Nigeria, the government should endeavour to provide ways to curtail school dropout rates in the schooling system, which could possibly be explained by the inability of

citizens to afford or cope with the cost of education. It is therefore recommended that the present universal basic education policy be given top priority with proper monitoring, supervision and financial support, as the basic education policy has the capacity to reduce school dropout rates and ensure that all have access to basic education at no or low cost. This will facilitate higher completion rates in Nigerian schooling, which is crucial for growth. Therefore, the conclusion is that education or schooling is important for growth in Nigeria.

Notes

1.   Ministry of Education (MOE, 2012). Nigerian University Needs Assessment Report. Abuja. Federal Ministry of Education.

2.   These states were selected because of availability of state expenditure data on education at the time of this study.

3.   We were unable to obtain primary and tertiary school completion rates to capture stock at these two levels.

4.   Capital formation is used with a time trend because there are no data on capital stock.

5.   Residual 1: Residual from long-run model of enrolment and economic growth; Residual 2: Residual from long-run equation of enrolment and non-oil GDP growth; Residual 3: Residual from long-run equation of enrolment and oil GDP growth equation; Residual 4: Residual from long-run model of completion rate and economic growth; Residual 5: Residual from long-run equation of completion rate and non-oil GDP growth; Residual 6: Residual from long-run equation of completion rate and oil GDP growth equation.

6.   As the FMOLS and the DOLS as well as the error correction results are similar, only the FMOLS result is presented.

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Appendix 1:   Tertiary enrolment rate

Figure A1:   Tertiary enrolment rate
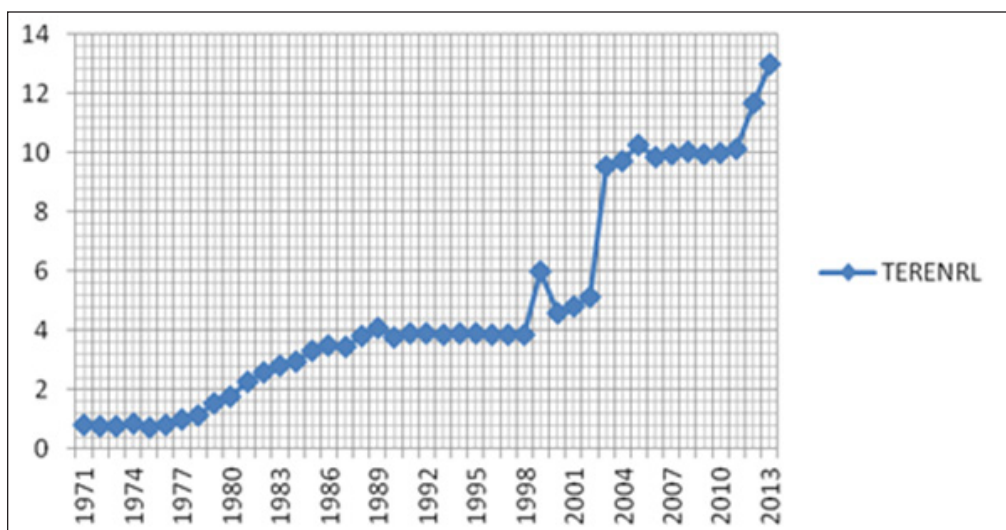
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