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Impact of Government Expenditure on Economic Growth in Nigeria: A Disaggregated Analysis

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Abstract

The purpose of this paper was to assess the impact of government capital expenditures on economic growth in Nigeria during 1970 and 2012. A multiple regression model based on a modified endogenous growth framework was utilized to capture the interrelationships among capital expenditures on agriculture, education, health economic infrastructure and economic growth. Drawing on error correction and cointegration specifications, an OLS technique was used to analyze annual time series. Both short and long run effects of government capital expenditures on economic growth were estimated. Government capital expenditures had differential effects on economic growth. Capital expenditures on Agriculture did not exert any significant influence on growth both in the long and short runs. Similarly, the corresponding short-run and long-run impacts on growth of capital expenditures on Education were 0.45 and 0.48, respectively. These results were positive and statistically significant at the 5% level. The short-run impact of health capital expenditures on economic growth was 0.21, while the long-run impact was 0.16. These impacts were negative and insignificant. Expenditures on economic infrastructure had significant positive impacts on growth of 0.28 in the short-run and 0.32 in the long-run. Moreover, these expenditures do not crowd-out private investment. These results indicate that government expenditure on human capital development through the social services sector tended to promote economic growth unlike that on Agriculture. Given that Agriculture still remains a mass major provider of livelihood opportunities, it is still an important channel of economic growth. There is need, therefore, to strengthen the quality and sustainability of, especially, capital expenditures on Nigeria's Agricultural sector.

Keywords: Nigeria, Capital expenditure, Economic growth, Co-integration, Error correction model, productive spending.

Contents

1. Introduction

Early development theories stressed the need for the state to create adequate physical infrastructure as well as institutions and social conditions for development. Some called for implementing large-scale public investment programmes, economic planning and the formulation of policies to accelerate economic growth and development. These must have given governments in Nigeria and other developing countries, where market failures and other socially unwarranted vices are rife, the impetus to exercise greater controls and discretion over their economies. They do this through periodic planning for the allocation of resources and productive spending in critical areas of need. Thus, public spending has become an important factor for self – sustaining productivity improvements and long-term growth. For instance, government expenditure can contribute to agricultural growth and the latter can indirectly, through creating rural non – farm jobs and increased wages, generate economic growth. That way public expenditure policy has become critical, and equally so, the sectoral distribution of these expenditures (see (Onimode, 1995; World Bank, 2009)).

The discovery of crude petroleum in commercial quantities in Nigeria in the middle of the 1960s greatly enhanced the performance of the economy in the 1970s. The newly found oil wealth ensured that the economy performed impressively in terms of real GDP growth rates. These averaged 5 percent annually during the period 1970 to 1979. However, by the early 1980s, the economy had started to experience real problems. The crash in world crude petroleum prices in 1980/81, the severe economic crises in developed industrial countries, coupled with political instability and internal ad hoc economic policies following high regime turnovers at home, created hard times for the economy between 1980 and 1985. From 1980, therefore, the economy had begun to experience negative GDP growth rates which averaged about 0.24 per cent between 1980 and 1985, down from the 5.0 percent in the 1970s. Real GDP growth was positive between 1986 and 1993, at an average of 4.62 per annum. However, and in spite of the structural adjustment program (SAP), it fell to an average of 2.30 per annum during 1986 and 1993. Real GDP growth rate appears to have been improving since 1999, averaging 4.79 per cent annually.

In the 1970s, unprecedented Nigeria's oil revenue obviously permitted massive federal government expenditure. A dramatic jump in capital expenditure was noticeable between 1974 and 1980, reflecting the significant increase in government revenue following favourable developments in the international petroleum market. The period thus witnessed a boost in the provision of economic and social infrastructure such as highways, air and sea ports, hospitals, schools and housing. However, capital expenditures of the Federal Government as a percentage of GDP decreased steadily from 20.48 per cent in 1980 to 6.27 per cent in 1995. These reflected adherence to the prescriptions of SAP and also the impact of the oil glut of the 1980s on revenue of government and by extension on its expenditure. Between 1999 and 2010, it had fallen to a low of 0.30 per cent, from 5.23 per cent in 2000. In general, the period, 1990 – 1998, was characterised by high growth in capital expenditure in nominal terms, though in real terms, growth was only marginally. The upward trend in nominal capital outlay during the period reflected high rates of inflation and the consequent low value of the naira (see also Oni (2014)).

As yet, there is no complete theory of optimal expenditure policy that provides well-defined rules for expenditure allocation. However, various quantitative techniques (reduced form regressions, general equilibrium models, investment appraisal methods, incidence analysis) have been used with several types of data sets (cross section, time series, primary data, panel data) to compare marginal return to spending across sectors (see, for example, (Fan and Rao, 2003; Loto, 2011; Oni, 2014)). However, as currently implemented, such studies suffer various drawbacks. In a number of cases, specifications seem ad hoc and not drawn from any of existing economic theories. In addition, expenditure components covered by most of these studies are often a small fraction of all expenditure options available to governments. In many cases time periods covered are not sufficiently long to enable making meaningful inferences about short-term and long-term effects of government spending. Opinions are, therefore, not agreed as to the impacts of public spending on economic growth, although there have been significant advances in quantifying linkages between expenditure components, on the one hand, and economic growth on the other (see Musaba *et al.* (2013)).

What is at stake here is how a government should allocate public spending across various sectors of an economy in order to maximize prospects of achieving its growth and development objectives. Given the lack of consensus among researchers concerning the effects of public expenditure on economic growth, a preponderance of cross-country studies and a relatively insignificant number of country-specific studies in this direction, our paper represents an attempt to re-examine the issues in the light of the Nigerian experience. Specifically, it is concerned with determining the relative contributions to economic growth in Nigeria of government capital expenditures on agriculture, education, health and infrastructures. The importance of disaggregating government expenditure for proper appreciation of the role of the state in the Nigerian economy is being underscored in this study. According to Canning (1999) apart from affording a better understanding of the role of the state in the growth process, opportunity could then be taken to carefully restructure and scrutinize the composition of public expenditure so as to simultaneously enhance growth and promote the needed environment for private sector development along the lines suggested in the state – in- society model.

The rest of the paper is organized into five sections. Section 2 contains the literature review where the theoretical and empirical issues are highlighted. In section three, we take on government capital expenditure patterns in selected sectors of the Nigerian economy. Sections 4 and 5 are concerned, respectively, with the study's empirical strategy and the presentation and discussion of empirical results. In the sixth and last section is the conclusion.

2. Literature Review
2.1. Theoretical Issues

With respect to the relationship between government expenditure and economic growth, Wagner's law of increasing state activities is instructive. Propounded by a German economist, Adolph Wagner (1835-1917), this law states that there are inherent tendencies for activities of different layers of governments to increase both intensively

and extensively. According to this position, there exists a functional relationship between growth of an economy and growth of government activities in which the government sector grows faster than the economy. The emphasis is on long-term forces rather than short-term changes in public expenditure (Wagner, 1911). Empirical evidence has also confirmed that all kinds of governments, irrespective of their levels, have same tendency of increasing their expenditures-with pace of increase being different for different branches of government (Usman *et al.*, 2011).

Wagner's law is applicable to modern progressive governments that are interested in expanding public sector of the economy and undertaking other activities for general benefits. However, it does not provide any precise quantitative relationship as to extent to which public expenditure would increase and time this would take. This may be because his study was based on historical experience. That over time public expenditure has been increasing is hardly sufficient grounds for predicting extent to which public expenditure would change in future.

There is the developmental state model which sees the state as the main catalyst in developing "late developer" economies. It assigns the role of shifting the frontier of industrialization rests solely on the state, the state leadership being expected to guarantee the guided control of the economy. According to this theory, overcoming barriers to economic growth requires an authoritarian state that is interested in economic development, since it is only the state that can create the necessary level playing ground for local industries to be competitive (see Odusola (2006)).

There is also the state-in-society model. This looks beyond the developmental state by coveting the active role of society in bringing about meaningful development. It rests on the principle that state-society relations are the principal determinants of successful national development. This strategy clearly acknowledges the existence of limits on the efficacy of state capacity to promote economic development and the need for society to fill this gap. There is a form of public-private partnership philosophy and some element of social contract with mutually agreed roles and responsibilities for each party. State and society interactions drive equitable growth and development, though the role of each party necessarily varies from time to time (see (Schaltegger and Torgler, 2006)). This is exemplified in the case of human resources development which is undertaken jointly by the state and the private sector).

Massive public investment in human resources development is expected, in the long-run, to speed up growth, as human capital would have been made more productive (Oluwatobi and Ogunrinola, 2011) Besides, in their "sources of economic growth" studies, Romer (1994) and Lucas (1988) attribute growth in production to externalities created by investment in human capital, apart from technology and policy variables.

2.2. Economic Growth Theories

Classical theories of economic growth assume existence of a perfectly competitive economy in which the "invisible hand" maximizes national output. The "trickle-down" doctrine then explains how the beneficence of growth affects all in society equitably. To the classical economists, capital accumulation is basic for economic growth. Emphasis is, therefore, on mobilization of savings to generate adequate capital for investment with which to accelerate economic growth (Todaro, 1994).

On the other hand, neoclassical growth theories allow for factor substitution, diminishing returns to capital, and exogenous technical change in an environment of price-taking firms. Using a production function framework, they generally predict that long-run per capita income growth rate is independent of savings rate, but dependent only on rate of technical advance. Changes in savings rate only have transitory effects on growth as the economy adjusts from one steady-state level of per capita income to another. Implication of this for cross-country growth differences is that differences in per capita growth rates will only persist if rates of technical advance differed across countries. Without this, diminishing returns to capital will ensure that poor countries grow faster than the richer ones. This development is expected to eventually lead to convergence in per capita income levels across countries. In this theory output comes from one or more of three factors: increases in labor quantity and quality (through population growth and education); increases in capital (through saving and investment); and improvements in technology.

Unlike the traditional and neo-classical economic growth theories, the endogenous economic growth theories deal with models that can generate long-term growth without relying on exogenous changes in technology or population. A general feature of these models is the presence of constant or increasing returns in the factors that can be accumulated (see (Lucas, 1988; Romer, 1994)). There is a set of models in which private and social returns to investment diverge such that while private returns to scale may be diminishing, social returns – which reflect spillovers of knowledge or other externalities – can be constant or increasing (see Romer (1994)). There is another set of models without externalities, in which privately determined choices of saving and growth are Pareto optimal (see Rebelo (1991)). These models rely on constant returns to (private) capital, broadly defined to encompass human and non-human capital (Romer, 1994). There are yet others which derive from the original contribution of Barro (1990) who theorized the linkage between public spending and economic growth by adopting an endogenous growth model. We have adopted the Barro (1990) variant for this study, rewriting it in an extended production function framework which endogenizes government expenditure.

2.3. Empirical Evidence

Two dominant approaches have been adopted in the literature to investigate the link between government and economic performance: the public finance approach and the macroeconomic approach. Investigations within the public finance approach are directed at establishing the validity or otherwise of the Wagnerian hypothesis: that there exists a positive relationship between the size of a country's public sector and its stage of economic development. Thus the more/less developed a country is, the smaller/larger its public sector. Studies in this group have generally questioned the validity of this hypothesis. Landau (1986) in studies of less developed countries, report a negative relationship between government expenditure and growth both for less developed and developed economies. However, Cheng and Lai (1997) in a study of public expenditure dynamics in South Korea, do not find any support for the hypothesis.

However, several studies have been supportive of a positive relationship between government size and economic growth. Ram (2006) study finds evidence in support a positive impact of government size on economic growth.

However, Dritsakis and Adomopoulos (2004) find support for the hypothesis only when tested with disaggregated public (capital or recurrent) expenditure data. With respect to Nigeria, Longe (1984) examines the profile of federal government expenditure for the fiscal years 1959/60 through 1979/80 and finds a rising size of government which he attributes to the country's stage of development, and hence in support of the hypothesis (see also Oni *et al.* (2014)).

The thrust of macroeconomic impact studies, on the other hand, has been on the linkage between public expenditure, capital accumulation, and economic growth; along the lines suggested in the Keynesian hypothesis. The latter treats public expenditure as an exogenous policy instrument designed to influence economic growth and correct short-term fluctuations in economic activities. To this end, the effects of government total expenditure or government consumption expenditure on growth have been tested in their aggregated and disaggregated forms, and have yielded mixed results. While public investment has been found to exert a beneficial impact on private investment, labor productivity, and profitability (Munnell, 1992) a strong direct relationship could not been established between public investment and growth in the empirical literature (see Ogiogio (1996)). Barro (1990) employing theoretical models inspired by the new growth theory, find that initial increments to public capital accelerated growth. At some point, however, additional increments to public capital tend to reduce growth. And from a simultaneous equations model, Loto (2011) reports a significantly positive relationship between public investment and economic growth based on disaggregated public capital expenditure. He notes that the impact of public capital on growth varies according to the category of public expenditure. In particular, infrastructure exerted a positive and significant impact.

In such disaggregated analyses, Akpan (2005) finds that at the aggregate level capital spending tends to have a more positive growth effect than current spending. Among current items, spending on directly productive sectors has the most positive growth impact. Among capital spending items, spending on social sectors and infrastructure tended to have a positive effect, with the stronger effect for the former, This finding agrees with Ekpo (1996) who also investigates the relationship between aggregate government expenditure and growth performance for the period 1960 to 1992 in Nigeria, using a modified Denison-style growth accounting methodology. His finds some support for the claim of a positive relationship between economic growth and public expenditure (see also Okoro (2013)).

Sattar (1993) using a simple growth modeling framework and time series data, however, finds evidence of differential impacts of public spending on the growth performance of developed and developing economies – "favorable for the latter and inconsequential for the former. His study also finds support for the hypothesis that an effective role for the state was directly linked with the state of backwardness of the economy: the more backward, the more critical the role of the state. According to him, since the LDCs suffer many of the "backwardness" syndromes, they seem to require more of the crutches of government support than their developed counterparts.

Kelly (1997) explores the effect of public expenditure on economic growth in a cross-section study of 73 nations covering the period 1970-1989. Based on an econometric model of the relationship between economic growths, public investment generally and particularly public social expenditures, he finds that social expenditures enhance growth by fostering welfare and productivity improvements. His result contradicts a strand of the literature which continues to be dominated by the view that social expenditure is unproductive consumption expenditure which inhibits growth and emphasizes, rather, the importance of the complementarities of public and private actions, especially in developing countries. He argues, that such factors as severe income disparity; asset concentration, the disparate nature of production in the agricultural and industrial sectors, and fragmented financial markets, which characterize many developing countries may warrant substantial public investment programmes, which, he stresses, may be decisive for successful private sector activity and, hence economic growth.

Studies by Aschauer (2000) and tests new classical growth models' predictions of the complementarity between public and private capital, and find public expenditure to have a positive and statistically significant impact on economic growth. Sectorally, they find that investments in transport and communications and in education have the largest impacts on growth, while the effects of investments in agriculture, health, housing, and industry were statistically insignificant.

Fan and Rao (2003) estimate Cobb-Douglas production functions for Africa, Asia, and Latin America, with national GDP as the dependent variable, using labour, non-government capital, and government expenditure on education, health, transportation and telecommunications, social security, and defense as independent variables. The government capital stock variables were constructed from past government spending (both current and capital) in each functional area. They find most coefficients significant at the 10 percent level with expected signs positive (except for defense), the only coefficients with the "wrong" signs being those for education in Africa and Latin America, which both have negative signs. For Africa, the strongest positive effect was for health spending followed by agriculture, while defense spending had a strong negative effect (see Aiyedogbon and Ohwofasa (2012)).

A second approach continues to see capital accumulation, ("capital" broadly defined to include human capital) as the driving force behind economic growth. It is therefore not the expenditure per se, but outcomes of such expenditure that are the concerns of this approach. This position is exemplified by studies using cross country regressions which results have pointed to the special role human capital plays in the growth process (see Romer (1994)). But different authors have interpreted differently the positive partial correlation between growth rates and various proxies for the stock of human capital (see (Schultz, 1999; Paternostro *et al.*, 2005; Oluwatobi and Ogunrinola, 2011)). Consequently, there has not been much success in establishing macro-level links between indicators of human capital accumulation (e.g. health and education outcomes) and economic growth. However, at the aggregate level, the links between such measures and growth are tenuous and have not been found to be strong in empirical analyses (see Oni (2014)).

3. Government Capital Expenditure Patterns in Selected Sectors

Table 1 shows total capital expenditure and capital expenditures on agriculture, education, health and infrastructure for selected years, each as a percentage of GDP. Total capital expenditure was 3.56 per cent of GDP in 1970. This increased through 14 .94 in 1975 to 20.48 in 1980 but fell to 8.05 per cent of GDP in 1985, and rose marginally to 8.99 per cent in 1990. Intense efforts at reducing the size of the federal government actually played up

in the declining proportions of its total expenditure to GDP. Total capital expenditure fell from 6.27 per cent in 1995 to 3.56 per cent in 2005. It fell to only 0.03 per cent of GDP in 2010 and 2011.

Capital expenditures on each of agriculture, education, health and infrastructure as percentages of GDP were equally dismal. For all four, none was up to one per cent of GDP except expenditure on Education in 2000. Expenditure on agriculture appears to have been worst hit over the years. As a percentage of GDP, this remained at less than 0.01 per cent, except in 1975 and 1990 when it stood at 0.10 per cent each year; and at 0.14 and 0.11 per cent in 2000 and 2005, respectively (see table 1). However, as a percentage of total capital expenditure shown in table 2, capital expenditure on agriculture was 1.02 per cent in 1970. It fell to 0.70 and 0.17 per cent in 1975 and 1980, respectively. Capital expenditure on agriculture increased gradually from 1.07 per cent of total capital expenditure in 1995 through 3.14 per cent in 2005 to 3.19 per cent in 2010. It was 4.48 per cent in 2011. These show that Nigeria has not, over the years, met the required 10% minimum allocation to its agricultural sector. Patterns of expenditure on social and community services were comparably different. As shown in table 1, capital expenditure on education (out of GDP) was 0.46 per cent in 1970. Capital expenditure on education peaked at 1.26 per cent of GDP in 2000, from 0.90 per cent in 1990. It declined from 0.57 per cent in 2005 to 0.11 per cent in 2011.

Table-3.1. Sectoral Capital Expenditure as Percentage of GDP (Selected Years)

Year	GDP Growth (%)	Total	Agriculture	Education	Health	Infrastructure
1970	-	3.56	0.04	0.46	0.23	0.27
1975	5.00	14.94	0.10	0.59	0.17	0.15
1980	-	20.48	0.03	0.31	0.11	0.09
1985	-	8.05	0.03	0.38	0.19	0.22
1990	4.62	8.99	0.10	0.90	0.19	0.24
1995	5.98	6.27	0.08	0.50	0.17	0.09
2000	-	5.23	0.14	1.26	0.33	0.11
2005	4.72	3.56	0.11	0.57	0.38	0.12
2010	7.07	0.30	0.01	0.06	0.03	0.02
2011	10.08	0.30	0.01	0.11	0.08	0.06

Source: computed by authors from CBN's data

Intense efforts at reducing the size of the federal government showed up again in declines in the proportion of its total expenditure to GDP. This declined from 20.48 percent in 1980 to an annual average of 7.02 per cent between 1990 and 2000. It has been on the decline since 2005 (3.56 per cent).

 Capital expenditure on health as a percentage of GDP had no discernible trend. It fluctuated between 0.23 per cent in 1970 and 0.11 per cent in 1980. However, expenditures were 0.33 and 0.38 per cent of GDP in 2000 and 2005, respectively. It was as low as 0.03 of GDP in 2010. As percentages of total capital expenditure, it did not fare any better between 1970 and 1995. Intense efforts on the part of the federal Government to down-size are likely explanations for the observed patterns. These observed patterns also account for the poor state of health facilities in the country today. Things, however, improved from 2000 when capital spending on health was 6.36 per cent, increasing through 10.72 per cent in 2005 to 25.24 per cent in 2011.

Expenditure on Infrastructure as a percentage of GDP was rather unfocussed. It declined from 0.37 per cent in 1970 to 0.09 per cent in 1980. Expenditures were not more than 0.10 per cent between 1995 and 2011. As percentage of total capital expenditure, expenditure trend followed a similar pattern, falling to 0.45 per cent in 1980 from 7.00 per cent in 1970; and from 2.77 per cent in 1985 to 2.98 per cent in 2000. This shows that ever since the immediate post-war, rehabilitation of old and reconstruction of our facilities, infrastructure sector has not received much of a serious attention. This is borne out by the persistent decline in capital expenditure on infrastructure over the years. However, infrastructure development appeared to have started to receive attention from 2005 when it received 3.45 per cent of total capital expenditure. It was allocated 6.36 and 21.32 per cent, respectively, in 2010 and 2011 (see Tables 3.1and 3.2).

Table-3.2. Sectoral Capital Expenditure as Percentage of Total Capital Expenditure
(Selected Years)

Year	Agriculture	Education	Health	Infrastructure
1970	1.02	13.01	6.65	7.60
1975	0.70	3.94	1.12	1.00
1980	0.17	1.53	0.52	0.45
1985	0.37	4.73	2.42	2.77
1990	1.07	9.99	2.08	2.64
1995	1.25	8.05	2.74	1.40
2000	2.65	24.20	6.36	2.08
2005	3.14	15.94	10.72	3.45
2010	3.19	19.32	11.21	6.36
2011	4.48	36.56	25.24	21.32

Source: computed by authors from CBN's data

In general, patterns of economic and social expenditure were rather unfocussed. As could be seen from tables 3.1 and 3.2, spending (out of GDP) of 1.88 on education, 1.4 agriculture, and health were consistently lower than the levels expected by the UN. These obviously non-performing expenditure patterns could neither arrest the absence of basic (essential) commodities nor rescue the decadence in the state of social facilities in the country.

4. Empirical Strategy

4.1. The Model

This is a policy-oriented empirical study of the impact of government expenditure on economic growth in Nigeria. In this context, economic growth is expected to be achieved both directly through public investments in physical capital and indirectly through investments for mass improvements in the quantity and quality of human resources. It is reasoned that government expenditure for human development feeds through the enhanced labour-productivity and, together with physical capital accumulation, determine growth of output. To investigate the impact on economic growth of the patterns of government expenditure in Nigeria, we adopted the following general model:

$$GDP = f (K, L, G^*) \qquad (4.1)$$

where,

GDP = gross domestic output of the economy

K = physical capital

L = total labour force; and

G* = government capital expenditures

Because of the need to trace the responsiveness of economic growth to specific components of government expenditure, we have specified our model to incorporate government capital expenditures on agriculture, education, health, and infrastructure.

A generalized Cobb-Douglas (C-D) production function has been utilized for the growth equation but augmented to include total capital expenditure of government disaggregated as suggested. Thus G* enters the model as:

$$G^* = g(agrkex, edukex, hltkex, infrkex) \qquad (4.2)$$

where,

kexagr = capital expenditure on agriculture

kexedu = capital expenditure on education

kexhlt = capital expenditure on health

kexinfr = capital expenditure on economic infrastructure

Consequently, to allow for this latter condition, the production relationship in equation (4.1) is rewritten as:

$$GDP = f (K, L, kexagr, kexedu, kexhlt, kexinfr) \qquad (4.1')$$

Each is expected to impact positively on economic growth.

4.2. Data Definitions and Measurements

GDP – gross domestic product. This is treated here as an indicator of economic performance. It is ultimately used here in its growth rates. Measurement is in percentages

K – this depicts the level of physical capital in the economy; gross fixed capital formation, (gfkf) being used ad the proxy.

L - this depicts total labour (labf)available in society.

kexagr, kexedu, kexhlt and kexinfr are, respectively, annual capital expenditures on agriculture, education, health and infrastructure.

4.3. Tests of Time Series Properties of the Variables

The order of integration of the series was examined using both the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) approaches. There were only a few discrepancies in the results from both approaches which were resolved in favour of the ADF approach (Dickey and Fuller, 1981). Therefore, only ADF results are reported here. That the variables are integrated of order one, I(1) series, is overwhelming. There was only one exception: the labour force, which was found to be integrated at order two (i.e. I(2)). An overwhelming number of series therefore needed to be differenced once to be made stationary and effectively eclipsed the impact of the only one that needed to be differenced twice to become stationary

We also tested for cointegration using the Engel-Granger two-step procedure to see whether the variables can be used together to give meaningful results in the long-run. From the estimated static long-run regression equation, the associated residuals were tested for stationarity. Stationarity of residuals implies that variables in the equation that generates the residuals are cointegrated (Engle and Granger, 1987).

Given the non-stationary nature of our data, and that the vector of variables in our equations are cointegrated, we have estimated our model within the framework of an error correction model (ECM). This was intended to provide short-run dynamics of the dependent variable in the stochastic equation. It also provided the basis for assessing both short-run behaviour and the speed of adjustment to the steady state. The ECM, which incorporates short-run information from the cointegrated properties of time series, allows for the integration of short-run dynamics with long-run equilibrium, in addition to preserving the causal linkage between two (or more) variables stemming from an equilibrating relationship. It says, essentially, what percentage of any disequilibrium in the long-term relationship will be corrected in the current period. It also tells whether, and to what extent, a given system has any in-built mechanisms to return to equilibrium after a shock. Residuals from the cointegrating regressors lagged one period only (due to small size of our sample) were used as the error correction mechanism in the short-run dynamic equations.

Government investments are known to have long lead times in affecting production and their effects can be long term once they kick in. thus, one of the thornier problems to resolve when including government investment variables in a production or productivity function has to do with the choice of an appropriate lag length. Like Fan *et al.* (2004) we have used a free-form lag structure in our analysis since the shape and length of these investments are largely unknown. Thus, we have included current and past government expenditures items in the respective equations, used appropriate statistical tests to determine appropriate length of lag in the case of tests of unit roots; but, constrained by the number of observations, we have used a maximum lag length of one in estimating the models.

4.4. Sources of Data

Annual time series data from 1970 to 2011 have been used in this study. They were sourced from both domestic and international sources. Data were of two sets: macroeconomic data and welfare indicators. Macroeconomic data were essentially economic performance indicators and public expenditure. These were extracted mainly from domestic sources: the Central Bank of Nigeria's Statistical Bulletin (various issues) and the National Bureau of Statistics' (formerly, Federal Office of Statistics) Annual Abstract of Statistics, the Digest of Statistics (various issues), and the Nigerian Statistical Facts (several issues).

5. Presentation and Discussion of Empirical Results
5.1. Results of Tests of Time Series Properties of Variables
5.1.1. Unit Roots Test Results

The test shows that almost all the variables were integrated of order one. There were only one exception, labour force, found to be integrated of order three (i.e., I(2)), shown in Table 5.1

Table-5.1. ADF Stationarity Test Results

Variable	Lag Length	Level			Remark
		0	**1**	**2**	
Lngdp	1	-1.65	-3.87**	-	I(1)
Lngfkf	1	-2.69	-2.83***	-	I(I)
lnlabf	3	-1.84	-1.40	-3.09**	I(2)
Lnkexagr	1	-2.88	-5.44***	-	I(1)
lnkexedu	1	-2.56	-6.36***	-	I(1)
Lnkexhlt	1	-0.39	-4.29***	-	I(1)
Lnkexinfr	1	-2.60	-6.22***	-	I(1)

Critical Values:
1% - -3.65
5% - -2.96
10% - -2.62
Note: *** => significant at 1% level; ** => significant at 5% level

5.1.2. Cointegration Test Results

The non-stationary nature of the series having been so established, it became necessary to check the prospect of long-run relationships between the variables in the equation. As was expected, its regression residual was confirmed as having zero mean and no deterministic trend. Test, conducted without intercept and time trend, revealed that equilibrium error were integrated at level, i. e., I (0). Consequently, the variables in the static equation were adjudged to be cointegrated and have been treated as such.

However, the Engle-Granger test procedure had to be utilized in spite of the fact that it may not be that robust. Besides, being guilty of small-sample bias, it may fail to detect a long run relationship even when one exists.

5.2. Presentation of Estimated Model

In an error correction model, a variable reacts to both short-run movements in other variables individually and to changes in the long-run cointegrating relationship, the latter being captured by the error correction term (ECT_{t-1}). The estimated form of this model, with capital public expenditures, is given in table 5. In estimating this model, total capital expenditures were disaggregated into their agriculture, education, health, and economic infrastructure components. Results for short and long run estimates are as provided in Tables 5.2 and 5.3 respectively.

Table-5.2. Long – Run Estimates

Variable	Coefficient
Constant	-3.60 (-1.02)
ln gfkf	0.69*** (4.67)
Lnlabf	0.28 (1.51)
Lnkexagr	-0.10 (-0,79)
Lnkexedu	0.45*** (3.26)
Lnkexhlt	-0.16 (-0.72)
Lnkexinf	0.32*** (2.64)
R-squared	0.97
Adjusted R-squared	0.97
S.E. of regression	0.53
Durbin-Watson stat.	1.30

Notes: i. ***=> significance at 1 per cent; **=> significance at 5 per cent
  ii. t-statistics in parentheses

In the long run, capital expenditures on education and economic infrastructure have significant positive impacts of 0.45 and 0.32, respectively, on economic growth. These expenditures appear to have crowded-in gross fixed capital formation, which also makes a significant positive impact of 0.69 on economic growth. However, capital expenditures on agriculture and health make no impacts on economic growth in the long run.

Table-5.3. Short - Run Estimates

Variable	Coefficient
Constant	0.08 (0.07)
Δlngfkf	0.85*** (6.02)
Δlnlabf	-3.61 (-1.06)
Δlnkexagr	-0.12 (-1.03)
Δlnkexedu	0.48*** (3.90)
Δlnkexhlt	-0.21 (-1.06)
Δlnkexinf	0.28** (2.50)
ecm(-1)	-0.39** (-2.41)
R-squared	0.98
Adjusted R-squared	0.97
S.E. of regression	0.47
Durbin-Watson stat.	1.78

Notes: i. ***=> significance at 1 per cent; **=> significance at 5 per cent
ii. t-statistics in parentheses

In the short run, capital expenditure on education has a significant impact of 0.48 on economic growth. Similarly, capital expenditure on economic infrastructure also makes a significant impact of 0.28 on growth, corroborating Loto (2011); Musaba *et al.* (2013) and Canning (1999). Capital expenditures on agriculture, economic infrastructure and health make no short-run impacts on economic growth, contrasting Fan and Rao (2003). In particular, the result on health capital expenditure appears to support the view that social expenditure is unproductive consumption expenditure (see Kelly (1997)). Speed of adjustment to shocks in the short run is a mere 39.40 per cent. These results also corroborate the findings of Loto (2011) and Oni *et al.* (2014).

5.3. Discussion of Estimated Results

Tables 5.2 and 5.3 provide information on relative contributions of different forms of capital expenditure to changes in rates of economic growth. With respect to economic growth, the contributions of capital expenditures on Education and economic infrastructure stand very frustrating. Good education and health care help make labour more productive and increase returns on investment. That expenditures on agriculture and health do not make any significant impacts on economic growth in Nigeria is sad though expected. In an economy with a prominent oil sector, the battle for economic diversification may be difficult to win. Apart from inherent instability in the relationships being examined, as indicated by a speed of adjustment of only 39 per cent, an unhealthy labour force coupled with an undeveloped agricultural sector paints a gloomy picture for the economy. Concerted efforts are necessary to reverse their negative, though insignificant, impacts to enhance economic growth.

6. Conclusion

This study was about how a government can allocate its spending across various sectors to maximize prospects for achieving its growth and development objectives. In an effort to tackle this problem, an economic growth model was formulated and estimated within an error correction framework. Within this framework, we have captured reactions of economic growth to short-run movements in disaggregated public spending as well as some control variables individually; and to changes in their cointegrating relationships (exemplified by error correction term). We consider disaggregated analysis invaluable from the policy point of view.

The study has provided evidence suggesting that the structure of public spending is an important factor for economic growth. However, we have found that government spending was not consciously structured with growth promotion in mind. We find investment in education and infrastructure not only highly significant, but the magnitude of their impacts on economic growth is considerable. This may be due to the effect of strong externalities of these investments in raising the productivity of both human and physical capital as canvassed in the new growth literature.

A notable strength of our work is the finding that the key sectors to which public expenditure should be targeted are education and economic infrastructure. In this respect, our opinion is that though increasing public investment in these sectors could generate more growth than focusing only on one sector, Nigeria cannot afford an agricultural sector that is not contributing to economic growth. Deliberate efforts are, therefore, commanded so as to make the agricultural sector relevant in the Nigerian economy.

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