

Public Capital Accumulation and Economic Development in Nigeria; 1970-2010

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Abstract

This study empirically examine the relationship between Public Capital Accumulation and Economic Development in Nigeria from 1970-2010. Public capital accumulation was disaggregated into Federal Government capital expenditure on Administration, Economic sector, Social and Community services and Transfers. The stationarity and non stationarity of the data series were examined using group unit root test. The variables PCGDP, ECONS, ADM, SOC, and TRANSF attained stationarity after first differences. The Johansen cointegration test of trace and maximum Eigen value statistics was used to establish long run equilibrium relationship among the variables in the model. We also estimated the overparameterized and parsimonious ECM to account for short run dynamic adjustment required for stable long run equilibrium relationship among the variables in the model. The impact of ECON, ADM and SOC on economic development was positive and statistically insignificant while TRANSF was negative and statistically significant. The positive but insignificant impact of ADM, SOC, ECON is worrisome because these are the sectors that account for a huge amount of government capital expenditure. Transparency and accountability in the conduct of Government activities should be encouraged. Thus the entrenchment of the culture of transparency and accountability will help to conserve public resources for the many things the Government has to do for the society. Government should cut its spending particularly on projects and programs that generates least benefits or impose highest cost. The study showed that disaggregation of public capital accumulation truly revealed the impact of each component on economic development than aggregation.

1. Introduction

Capital accumulation is a component of economic growth and development in any society. The other components include growth in population and hence eventual growth in the labour force and technological progress. Capital accumulation results when some proportion of present

income is saved and invested in order to augment future output and incomes (Todaro and Smith, 2003).

Capital accumulation encompasses all the mechanisms and institution involved, within a given structure of ownership of means of production, in the extraction of surplus from the economy, and in the mobilization and channeling of the surplus in such a manner as to create and expand the productive capacity of the economy (Ekuere, 1984).

In Nigeria, Government Capital expenditure has continued to rise due to the huge receipts from production and sales of crude oil, and the increased demand for Public (utilities) goods like roads, communication, power, education and health. Besides there is the increasing need to provide both internal and external security for all the people and the Nation. Available statistics showed that Government Capital expenditures have continued to rise in the last three decades. For instance Government Capital expenditure increased from ₦187.8 million in 1970 to ₦10,163.4 million in 1980 and further to ₦960,900.0 million in 2008. Unfortunately rising Government expenditures has not translated to meaningful Growth and Development as Nigeria ranks amongst the poorest Countries in the World. The dilapidated state of infrastructure (especially roads and Power Supply) has led to the collapse of many industries, including high level of Unemployment. Moreover macroeconomic indicators like balance of Payments, inflation rate, exchange rate, and National Savings revealed that Nigeria has not fared well in the last three decades (CBN, 2009). Hence this paper seeks to investigate the impact of various public capital expenditures on economic development using the growth rate of real per capita gross domestic product as index for economic development.

The rest of the paper is organised as follows: section two is a review of relevant literature. Section three is theoretical framework underlying the study. Methodology and data sources are discussed in section four. Section five contains empirical model specification. The empirical results and discussion of findings are in section six, while section seven discussed policy implications and recommendation. Section eight concludes the paper.

2. The Literature

Niloy and Osborn (2003) used a disaggregated approach to investigate the impact of public expenditure on economic growth for 30 developing countries in 1970s and 1980s. The authors confirmed that government capital expenditure in GDP has a significant positive association with economic growth, but the share of government current expenditure in GDP was shown to be insignificant in explaining economic growth. At the sectoral level, government investment and expenditure on education are the only variables that had significant effect on economic growth, especially when budget constraint and omitted variables are included.

Gregorio (2007) used the heterogeneous panel to investigate the impact of government expenditure on economic growth. The authors discovered that countries with large government expenditure tend to experience higher growth, but the effect varies from country to country. In Saudi Arabia, Abdulah (2000) analysed the relationship between government expenditure and

economic growth. The author reported that the size of government is very important in the performance of economy. He advised that government should increase its spending on infrastructure, social and economic activities. In addition, government should encourage and support the private sector to accelerate economic growth.

Liu and Owoye (2007) examined the causal relationship between GDP and public expenditure for the US data during the period 1947-2002. The causality results revealed that total government expenditure causes growth of GDP. On the other hand, growth of GDP does not cause expansion of government expenditure. Moreover, the estimation result indicated that public expenditure raises the US economic growth. The authors concluded that, judging from the causality test Keynesian hypothesis which emphasised on the role of Government demand management policies as a major determinant influencing supply exerts more influence than the Wagner's law of rising Government expenditure as National economies grows in US.

Lizides and Vamvoukas (2005) employed the trivariate causality test to examine the relationship between government expenditure and economic growth, using data set on Greece, United Kingdom and Ireland. The authors found that government size granger causes economic growth in all the counties they studied. The finding was true for Ireland and the United Kingdom both in the long run and short run. The results also indicated that economic growth granger causes public expenditure for Greece and United Kingdom, when inflation is included.

Mitchell (2005) argued that the American government expenditure has grown too much in the last couple of years and has contributed to the negative growth. The author suggested that government should cut its spending, particularly on projects and programmes that generates least benefits or impose highest cost. In Sweden, Peter (2003) examined the effect of government expenditure on economic growth during 1960-2001 periods. The author emphasized that government spends too much and it might slow down economic growth.

Devarajan, Swaroop and Zou (1996) studied the relationship between the composition of government expenditure and economic growth for a group of developing countries. The regression results illustrated that capital expenditure has a significant negative association with growth of real GDP per capita. However, the results showed that recurrent expenditure is positively related to real GDP per capita.

Folster and Henrekson (2001) studied the relationship between government expenditure and economic growth for a sample of wealthy countries for 1970-1995 Period, using various economic approaches. The authors submitted that more meaningful (robust) results are generated, as econometric problems are addressed. In India, Rajan and Sharma (2008) examined the effect of government development expenditure on economic growth during the period 1950-2007. The authors discovered a significant positive impact of government expenditure on economic growth. They also reported the existence of co-integration among the variables. Al-Yousif (2000) indicated that government spending has a positive relationship with economic growth in Saudi Arabia.

Komain and Brahasrene (2007) examined the association between government expenditure and economic growth in Thailand, by employing the Granger causality test. The results revealed that government expenditures and economic growth are not co-integrated. Moreover, the results indicated a unidirectional relationship, as causality runs from government expenditures to growth. Lastly, the results illustrated a significant positive effect of government spending on economic growth.

Olugbenga and Owoye (2007) investigated the relationships between government expenditure and economic growth for a group of 30 OECD countries during the period 1970-2005. The regression results showed the existence of a long run relationship between government expenditure and economic growth. In addition, the authors observed a unidirectional causality from government expenditure to growth for 16 out of the OECD countries, thus supporting the Keynesian hypothesis. However, causality runs from economic growth to government expenditure in 10 out of the countries, confirming the Wagner's law. Finally, the authors found the existence of feedback relationship between government expenditure and economic growth for a group of four countries.

Cooray (2009) used an economic model that takes government expenditure and quality by governance into consideration, in a cross-sectional study that includes 71 countries. The results revealed that both the size and quality of the government are associated with economic growth. Abu-Bader and Abu-Qarn (2003) Employed multivariate co-integration and variance decomposition approach to examine the causal relationship between government expenditure and GDP, military burden, and economic growth illustrated that military burden has a negative impact on economic growth in all the countries. Furthermore, civilian government expenditures have positive effect on economic growth for both Israel and Egypt.

Nurudeen and Usman (2010) in an attempt to investigate the effect of government expenditure on economic growth employed a disaggregated analysis. The results reveal that government total capital expenditure (TCAP), total recurrent expenditure (TREC), and government expenditure on education (EDU) have negative effect on economic growth. On the contrary, rising government expenditure on transport and communication (TRACO), and health (HEA) results to an increase in economic growth.

The author's recommended increase in both capital and recurrent expenditures on education, investment in transport and communication, health sector, funding of anticorruption agencies to tackle high level of corruption found in public offices.

Ogundipe and Aworinde (2011) investigate the impact of public investment on economic growth in Nigeria. Regression analysis and unit root test were used to examine the stationary of the variables considered in the study. The Study used the annual data covering the period between 1970-2008, it was discovered that government spending in agriculture, education, defence and internal security services as well structural adjustment programme were statistically significant while government spending in health, transport and telecommunication sectors are statistically insignificant. This implies that government spending in agriculture,

education, defence, and internal security services as well as structural adjustment programme are significant factors influencing the level of economic growth in Nigeria.

Most of the studies seem to support the theoretical postulation that public investment has a positive effect on output, some studies found no evidence for this postulation as indicated by Otto and Voss (1996) that there is no relationship between public capital and labour or output; private capital however affects public capital using Australian time series data. Ansari (1997) using Ghana, Kenya and South Africa also established that there is no evidence of government expenditure causing national income, i.e. no support for the Keynesian hypothesis. Furthermore, some have found a negative relationship, Ghali (1998) on Tunisia, Bogunjoko (1998) on Nigeria, Ashipala and Haimbodi (2003) on Namibia, South Africa and Botswana, while others found a weak one, Al-Faris (2002) on six gulf cooperation council countries, Kweka and Morrisey (1999) on Tanzania.

Also Ford and Poyet (1991), Toen-Goet and Jongeling (1994) employed the aggregate production function to evaluate the impact of public investment on growth based on U.S data. They found that public investment has a significant and positive impact on private output and also that public investment on infrastructure has a significant and positive influence on growth. Using the same approach, Ram (1996) established that public investment appears more productive than private investment in 53 developing countries using panel data.

Easterly and Rebelo (1993) also reported that government infrastructure is complementary with private investment although other types of government investment are not. Greene and Villanueva (1991) and Serven and Salimano (1991) report similar findings based on multi country panel data. Ariyo (1998) using time series study of investment in Nigeria established that only private domestic investment has consistently contributed to raising GDP growth rates during the period, although public investment has a positive sign but it is statistically insignificant.

Levine and Renelt (1992) also reported that physical investment ratio was the most consistent and robust explanatory variable accounting for differences in growth performance of a large sample of countries over an extended period of time. According to Schmidt-Hebbel et al. (1996), this result corroborates other empirical analyses of the determinants of growth for regions of the world.

Based on economic theory that growth in output and growth in public investment are positively correlated, a number of empirical studies have been conducted to determine the effect of public investment on growth. For instance, East Africa was able to sustain a growth rate of about 7-8 per cent because it maintained rates of gross capital formation of about 30 per cent of the GDP (Ariyo, 1998). Odedokun (1993) in a study based on a cross section of 42 African countries also identifies investment as the major factor accounting for the differential growth performance of the countries in the sample for the period 1970 to 1987.

Kweka and Morrissey (1999), found that public investment on physical infrastructure or human capital can be growth enhancing, but because of disincentive effects the financing of such investment might be growth retarding. This means that if public investment is financed through taxation, it may discourage private investment thereby affecting economic growth negatively. Therefore the overall effects will depend on the trade-off between the productivity of public investment and the distortionary effects of taxes.

Joseph and Eric (2009) examined the issue of whether increasing government expenditure is the cause of economic growth or economic growth is the cause of growth in government expenditure especially in developing countries where the public sector absorbs a relatively large share of society's economic resources. Also the convergence criteria required for joining the West African Monetary Zone (WAMZ). Cointegration and Granger Causality tests were carried out. There was no causality in both directions; neither Wagner's hypothesis nor its reverse was valid for any of the selected countries. The authors indicated that non economic factors play an important role in government spending in three of the WAMZ countries- Ghana, Gambia and Nigeria. For WAMZ countries to meet the convergence criteria there will be the need for fiscal discipline in the area of cutting down on productive consumption spending while at the same time widening the revenue sources through innovative measures.

Ariyo and Raheem's (1991) estimated the effect of fiscal deficit on macroeconomic aggregate in Nigeria employing the following independent variables: public investment, rate of growth of GDP, domestic credit to the private sector and interest rate. Their results showed that all the variables were statistically significant and evidence of "crowding in" was arrived at.

Moshi and Kilindo (1999) estimated the impact of government policy on macroeconomic variables in Tanzania using ordinary least square (OLS). The work was able to establish a direct empirical link between government policy and private capital formation. The result indicated that public investment crowded out private investment, but the effect depended on the way in which public investment was introduced into the model (Mammat, 2001; Naqri, 2002; Pereira, 2001; Rashid, 2005).

Hermes and Lensink (2001) investigated the impact of fiscal policy on private investment in less developed countries. This work main contribution is that it was the first attempt to analyze the existence of a non-linear relationship between fiscal policy variables and investment. The researchers employed a panel estimate for a set of LDCs, using observations of variable that have been averaged over three periods: 1970-1979, 1980-1989 and 1990-1998. The result of the investigation showed that a reduction of budget deficits was not a panacea and could even be harmful and that the combination of specific expenditure and revenue reforms might be of crucial importance.

Elbadawi (2003) in an attempt to address the issue of complementarity and substitutability of state capital for private sector investment in a neoclassical growth framework employed a co-integrated vector autoregressive model to account for potential endogeneity and non stationarity problems. Results revealed that both private and public capital spending had

simulated economic growth in Sudan over the period 1970-98. He further observed that the impact of private investment on real growth had been more pronounced than that of public sector investment.

Iyoko (2006) tested the relationship between public and private investment in Nigeria. Her result reinforced the findings by Ndikumana that public investment does not crowd out private investment in Africa. Aka (2002) investigated the impact of public and private investment on Cote d'ivoire's economic performance (GDP growth) over the period 1969 – 2001, using autoregressive – distributed lag (ARDL) error correction model (ECM). The results showed that in the short run an increase in private investment by 100 percent enhance economic growth by 28 percent, where a 100 percent increase in public investment leads to only seven percent increase in GDP.

In the long run nevertheless, the impact of public investment on GDP growth has been higher than private investment. A 100 percent increase in private investment leads to 25 percent increase in GDP, while public investment impacts growth by 30 percent. On the other hand, a 100 percent increase in employment leads to 38 percent increase in long run GDP growth. The findings indicated that while the short run efficiency of public capital could be further improved in Cote d'Ivoire, in the same time the efficiency of private investment could be improved in the long run.

Ahmed (2007), Ahmed and Qayyum (2008) examined the effect of government spending and macro economic uncertainties on private fixed investment in services sector of the Pakistan for the period 1972 – 2005. The time series properties of data were investigated, and then the long run model was estimated using co-integration technique. The result showed that government spending and interest rate affected private investment in services sector in Pakistan. The preferred short-run dynamic investment function indicated that increase in government current spending and interest rate discouraged private investment and similarly macro-economic instability and uncertainty affected the private investment negatively.

Elbadawi (2005) used a blend of co integration, vector autoregressive and error correction techniques to estimate long and short-run coefficients. The empirical result suggested that public sector investment had a negative crowd out impact on private investment over the period of study. Devaluation policy contributed to discouraging private sector capital expansion. He further observed that monetary policy in the form of restrictive domestic credit appeared to have an insignificant negative impact on private investment and suggested that a restrictive monetary policy might lead to shrinking private capital formation by tightening the flow of financial resources to private firms.

Akpokodje (2000) explored the association between export earning fluctuations and capital formation in Nigeria using a reduced form equation built around the flexible accelerator model and adopted a cointegration technique. Result revealed that the current level of export earnings fluctuation adversely impinged on investment (that is the change in capital stock in the short-run).

Evidently, from the studies reviewed so far there seems to be lack of consensus on the impact of public capital accumulation on economic growth and economic development. Positive and negative impact of public capital accumulation on economic development was obtained. The present study disaggregated public capital accumulation into economic, social, administration, and transfer sectors and empirically examines their impact on economic development in Nigeria.

3. Theoretical Framework

Keynesian analysis became the new orthodoxy in economic theory and policy after the Second World War. This marked the abandonment and, in fact, the direct inversion of the Classical Supply-Side approach in which, according to Say's Law, supply creates its own demand in a free market system. This reversal shifted the debate on State intervention from the supply side of the economy by advocating a public policy of government demand management and expansion based on a theory of inadequate effective demand.

The summary of the thesis is that an increase in demand will call forth a corresponding increase in supply (Holland, 1977; Frank, 1983). Keynesianism thus assigned to government, various responsibilities that are truly unorthodox by the standards of Classical and Neoclassical economic thought and their Public Choice School derivation. According to Keynes, in addition to the provision of public goods, government is the chief regulator of the economy.

At the heart of the Keynesian analysis is the observation that left on its own, capitalism is an unstable economic system which cannot provide full employment or even socially adequate capital utilization without State intervention through appropriate monetary and fiscal policies (Schott, 1982). The Keynesian argument is that government expenditure raises output and employment.

Given the possibility of full employment equilibrium in the classical analysis such that aggregate expenditure (consumption plus investment (C+I) equals output, but at a level where there would be unused capacity, State spending is required to bring about full employment. What public expenditure does is 'to fill the gap between private saving and investment, that is, adjusting the propensity to consume, on the one hand to the inducement, to invest, on the other' (Keynes, 1936).

Keynes' concern was with two fundamental policy issues, namely employment and equity, in which the capitalist system scores very poorly. According to him "the outstanding faults of the economic society in which we live are its failure to provide for full employment and its arbitrary and inequitable distribution of wealth and incomes" (Keynes, 1936).

But Keynes considered the existing tax structure as adequate for redressing the inequitable distribution of wealth. In fact, he favored significant inequalities in income and wealth; hence we are left with one challenge: how to ensure full employment. This calls for some 'central

controls' which necessarily entail an increase in the traditional functions of government beyond the classical analysis.

The 'revolutionary' essence of the Keynesian interpretation of economic reality was the acknowledgement of the inability of market forces alone to guarantee the stability of the capitalist system, hence the need for conscious intervention by the State. This is a radical departure from the automatic adjustment mechanism of the free-enterprise system.

For (Keynes, 1936),

It is not a correct deduction from the principles of economics that enlightened self-interest always operates in the public interest. Nor is it true that self-interest generally is enlightened; more often individuals acting separately to promote their own ends are too weak to attain even these. Experience does not show that individuals, when they make up a social unit, are always less clear – sighted than when they act separately (emphasis in the original).

The study support Keynes advocacy of regulated economy especially in the developing countries like Nigeria where the private sector is not well developed, the capital market is not perfect thus constraining domestic private capital accumulation. At independence in 1960, the nationalist assumed political power only to find them economically weak and dangerously exposed. The state (public sector) inevitably had to become the most important source of capital accumulation. The public sector therefore expanded in scope and size, offering subsidy and incentives to foreign capital.

This sounds more like an endorsement of collective action through the state. In concrete terms, however, though ambiguously demarcated, the boundary that Keynes set for the public sector really covers a limited agenda of the leftover of the private sector or at best its complementary requirements. "The important thing for government", according to Keynes, "is not to do things which individuals are doing already, and to do them a little better and a little worse; but to do those things which at present are not done at all" (Keynes, 1936).

4. Methodology and Data

In estimating the model for the study, we used three steps methodology. These steps include;

- i. Univariate Statistical Analysis of time series (Test for unit root using Group Unit Root Test by Levin, Lin and Chu and individual unit root process by Im, Pesaran and Shin Test) to ascertain the stationarity or non stationarity status of the data series.
- ii. Multivariate Cointegration Analysis and the estimation of the long run equilibrium models of public capital accumulation using Johansen (Trace and Max-Eigen Statistics) cointegration test.
- iii. To obtain the parsimonious short run dynamic models of public capital accumulation through the error correction mechanism which has been shown to better capture the short run dynamics of the relationships.

Data for the study were obtained from various CBN Bulletins, Annual Reports and Statement of Accounts, National Bureau of Statistics [NBS] which cover the period 1970-2010.

5. Empirical Model Specification

The model specifying the impact of various public sector capital expenditure on economic development using Keynes, theory which advocate for public policy of Government demand management and expansion based on a theory of inadequate effective demand. This implies that an increase in demand will result to a corresponding increase in supply. The model is specified as follows:

$$\Delta\text{PCGDP} = f(\Delta\text{ADM}, \Delta\text{ECON}, \Delta\text{TRANS}, \Delta\text{SOC}, \text{INFLA})$$

The econometric model estimation is of the form:

$$\Delta\text{LPCGDP} = \lambda_0 + \lambda_1\Delta\text{LADM} + \lambda_2\Delta\text{LECON} + \lambda_3\Delta\text{TRANS} + \lambda_4\Delta\text{LSOC} + \lambda_5\text{INFLA} + \Psi \dots\dots\dots(9)$$

$$\lambda_1 > 0, \lambda_2 > 0, \lambda_3 > 0, \lambda_4 > 0, \lambda_5 < 0$$

Where

ΔLPCGDP = Change in log of growth rate of real per capita gross domestic product, a measure of economic development

ΔLADM = change in log of government capital expenditure on administration.

ΔLECON = change in log of government capital expenditure on economic sector

ΔTRANS = change in government capital expenditure on transfers

ΔLSOC = change in log of government capital expenditure on social services

INFLA = inflation rate

Ψ = Error term

6.0 Results of Public Capital Accumulation and Economic Development Model

6.1 Results of Unit Root Test for Public Capital Accumulation and Economic Development Model

Group Unit Root Test: Summary

Series: LPCGDP, LADM, LECON, LSOC, TRANSF, INFLA

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.13509	0.4463	6	222
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.60564	0.7276	6	222
ADF - Fisher Chi-square	12.8943	0.3768	6	222
PP - Fisher Chi-square	34.8208	0.0005	6	232

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality

Group unit root test: Summary: First difference of variables

Series: LPCGDP, LADM, LECON, LSOC, TRANSF, INFLA

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.1255	0.0000	6	218
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-12.4144	0.0000	6	218
ADF - Fisher Chi-square	137.787	0.0000	6	218
PP - Fisher Chi-square	192.118	0.0000	6	226

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Note: L Implies Natural Logarithm

Source: Authors computation

The null hypothesis of non stationarity of all the variables is however rejected at the five percent level of significance after first differences, indicating that all variables are stationary in their first differences.

Given the unit root properties of the variables, we proceeded to establish whether or not there is a long run equilibrium relationship among the variables in the public capital accumulation and economic development model using the Johansen Trace and Maximal Eigen value test. This is presented in section 6.2.

The conclusion drawn from the test is that both the Trace and Maximal Eigen Value Tests indicate one cointegrating equation each at the five percent level of significance.

The null hypothesis of no cointegration relationship among the variables in the model is rejected. This implies that there exist a unique long run relationship among RPCGDP, ADM, ECON, SOC, TRANS, and INFLA. Since there is one cointegrating vector, an economic interpretation of the long-run Real Per Capita GDP can be obtained by normalizing the estimates of the unconstrained cointegrating vector on the real per capita GDP. The identified cointegrating equation was used as an error correction term (ECM) in the error correction model. This series forms the error correction variable.

So far the result shows that the variables in the public capital accumulation and economic development model tend to move together in the long run as predicted by economic theory. In the short run, deviations from this relationship could occur due to shocks of any of the variables.

6.2 Results of Johansen cointegration test for public capital accumulation and economic development model

Series: LPCGDP LADM LECON LSOC TRANSF INFLA

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.768814	120.0747	95.75366	0.0004
At most 1	0.498456	67.35153	69.81889	0.0774
At most 2	0.386834	42.50919	47.85613	0.1450
At most 3	0.321455	24.90091	29.79707	0.1650
At most 4	0.246985	10.93993	15.49471	0.2152
At most 5	0.020014	0.727811	3.841466	0.3936

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized	Eigenvalue	Max-Eigen	0.05	
No. of CE(s)		Statistic	Critical Value	Prob.**
None *	0.768814	52.72315	40.07757	0.0012
At most 1	0.498456	24.84234	33.87687	0.3957
At most 2	0.386834	17.60828	27.58434	0.5280
At most 3	0.321455	13.96098	21.13162	0.3682
At most 4	0.246985	10.21212	14.26460	0.1984
At most 5	0.020014	0.727811	3.841466	0.3936

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Authors computation

The over parameterized error correction model (ECM) shows how the system adjusts to the long run equilibrium implied by the cointegrating equation. This is presented in section 6.3.

In the over parameterized model the error correction term (ECM_{t-1}) is well specified and is of the expected negative sign and significant in the RPCGDP function. The absolute value of the coefficient of the error correction term indicates that about 84 percent of the disequilibrium in the long run is offset by short-run adjustment within a year. This implies a high speed of adjustment. In this case the full adjustment is achieved and takes twelve months to complete the cycles. In addition to the disequilibrium, the results in the over parameterized model shows that RPCGDP is influenced by both the current year and one lag period of inflation, LECON, LSOC, TRANSF, LADM. The coefficient of the current and one lag periods of inflation have the wrong sign. In the current period, it is statistically significant at five percent level. But in the one lag period, it is insignificant. This means that a unit change in inflation rate results to 0.0000327 per cent and 0.000348 per cent increase in Economic Development for the current and one lag periods respectively.

The coefficient of determination (adjusted R^2), in the over parameterized model used in measuring the goodness of fit of the estimated model is 0.615 indicates that about 61 per cent of variations of the dependent variable are explained by the joint effects of the explanatory variables. The high value of adjusted R^2 shows that the overall goodness of fit of the model is satisfactory. The F statistics of 3.233959 shows that the overall regression is significant at the five percent level of significance and is a good fit.

6.3. Results Of Over Parameterized Error Correction for Public Capital Accumulation and Economic Development Model

Dependent Variable: Δ LPCGDP

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000509	0.039148	-0.013002	0.9897
Δ ADM	3.67E-07	3.52E-07	1.043045	0.3062
Δ ADM(-1)	-5.28E-07	5.32E-07	-0.992286	0.3299
Δ SOC	6.48E-06	3.01E-06	2.151274	0.0520
Δ SOC(-1)	2.16E-06	3.95E-06	0.546129	0.5895
Δ ECON	9.24E-02	4.15E-02	.2.916150	0.0407
Δ ECON(-1)	4.58E-07	8.00E-07	0.572359	0.5718
Δ TRANS	-5.19E-07	8.00E-07	-0.647848	0.5226
Δ TRANS(-1)	-9.53E-07	1.52E-06	-0.625805	0.5367
Δ INFLA	3.27E-05	1.42E-05	2.450077	0.0257
Δ INFLA(-1)	2.48E-04	1.68E-04	1.476190	0.1508
ECM(-1)	-0.842066	0.219660	-4.744002	0.0001
R-squared	0.6518765	Mean dependent var		-0.001820
Adjusted R-squared	0.615353	S.D. dependent var		0.251879
S.E. of regression	0.201763	Akaike info criterion		-0.137990
Sum squared resid	1.099121	Schwarz criterion		0.297394
Log likelihood	12.55281	Hannan-Quinn criter.		0.015503
F-statistic	3.233959	Durbin-Watson stat		1.833482
Prob(F-statistic)	0.008643			

Source: Authors computation

The equation's standard error of 0.2017 signifies that in about two-thirds of the time, the predicted value of RPCGDP would be within 20 percent of the actual value. The Akaike and Schwarz information criterion shows correct specification of the model.

The estimated public capital accumulation and economic development model passes the normality and diagnostic test. Therefore we reject the null hypothesis that the error terms are not normally distributed. This suggests that the ordinary least square estimator is unbiased, has minimum variance, consistent and follow a normal distribution.

The parsimonious results which was obtained by removing all jointly insignificant variables in the over parameterized model until parsimony is obtained is presented in section 6.4

In the parsimonious model, the error correction term ECM(-1) is well specified and correctly signed. The coefficient of the ECM(-1) is -0.83736 and is statistically significant at the five percent level. It also means that about 84 percent departure from long run equilibrium is corrected in the short run. The speed of adjustment is high. It is also interpreted to mean that about 84 percent of the disequilibrium in the previous year adjusts back to equilibrium in the current year. The negative sign in the ECM(-1) confirm the existence of cointegrating relationship and the statistically significant coefficient of the error correction term means disequilibrium in the long run.

6.4. Results of Parsimonious Error Correction for Public Capital Accumulation and Economic Development Model

Dependent Variable: Δ LPCGDP

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.006068	0.036640	0.165601	0.8696
Δ ADM	2.70E-07	2.46E-07	1.099242	0.2804
Δ ADM(-1)	-2.86E-07	3.83E-07	-0.746457	0.4612
Δ SOC	8.73E-07	3.46E-06	0.252232	0.8026
Δ ECON	1.01E-06	5.62E-07	1.803842	0.0813
Δ TRANS	-2.58E-07	1.29E-07	-2.167676	0.0571
Δ INFLA	3.16E-06	2.68E-06	1.117910	0.4250
ECM(-1)	-0.83736	0.199619	-5.218617	0.0000
R-squared	0.658013	Mean dependent var		-0.001820
Adjusted R-squared	0.600615	S.D. dependent var		0.251879
S.E. of regression	0.193535	Akaike info criterion		-0.278055
Sum squared resid	1.123679	Schwarz criterion		0.026713
Log likelihood	12.14401	Hannan-Quinn criter.		-0.170610
F-statistic	5.162863	Durbin-Watson stat		1.850604
Prob(F-statistic)	0.000948			

Source: Authors computation

The adjusted R^2 of 0.6006 implies that about 60 per cent of the variations in the dependent variable (RPCGDP) are explained jointly by all the repressors (ECONS, SOC, ADM, TRANSF and INFLA) in the model. The explanatory power of the model is satisfactory and is a good fit. The F statistics of 5.162863 showing the joint significance of all the regressors in the model is statistically significant and is a good fit. The model passes the goodness of fit test.

The Durbin Watson statistics of 1.850604 signifies the absence of serial correlation. The equation's standard error of 0.193535 means that about two-thirds of the time, the expected value of the dependent variable (RPCGDP) will be within 19.3 per cent of the actual value. The AIC, SC, HQ, criteria indicates that the model is correctly specified.

Administration sector (ADM) in the current period impact positively and insignificantly on economic development with low elasticity. In the one lag period, the impact of ADM on economic development is negative and insignificant. The result indicate that a one percent change in ADM in the current period results to 0.00000027 per cent increase in Economic Development, while a unit change in ADM in the one lag period brings about a 0.000000286 per cent decrease in Economic Development. The impact of SOC in the current period on per capita GDP is positive and insignificant. A unit change in SOC in the current period results to a 0.000000873 per cent increase in Economic Development. Positive and insignificant relationship exists between ECON in the current period and RPCGDP. The result indicates that a one percent change in ECON brings about a 0.00000101 per cent increase in Economic Development. Negative and significant relationship exists between TRANSF and economic development. A unit change in TRANSF results to a 0.000000258 percent decrease in Economic Development. The coefficient of INFLA in the current period is positive. Its impact on per capita GDP is positive and insignificant. The result indicates that a one percent change in inflation rates brings about a 0.00000316 percent increase in Economic Development.

6.5 Analysis of the Results of Public Capital Accumulation and Economic Development Model

Inflation is wrongly signed. A unit rise in inflation result to an insignificant increase in PCGDP. ADM, ECON, SOC impacts positively but insignificantly on RPCGDP thereby conforming to apriori expectations.

Administration (ADM), ECON, SOC satisfies apriori expectations. It is properly signed and has insignificant positive impact on RPCGDP. TRANSF has negative sign and statistically significant. A one percent change in ADM in the current period results to about 0.0000003 per cent rise in RPCGDP. Also a one percent change in SOC and ECON result to a less than proportionate rise in RPCGDP. The elasticities for ADM, ECON, SOC are very low. This view of positive but weak relationship between Government capital accumulation and economic development is supported in the literature (see Al-Faris, 2002, on the study of six gulf co-operation council countries Kweka and Morisey, 1999, on Tanzania).

The positive but insignificant impacts of economic Services (ECON), SOC and ADM as components of Public capital accumulation on economic development outweigh the negative impact of TRANSF on RPCGDP. Therefore we conclude that public capital accumulation conforms to apriori expectations. This shows that there exist a positive relationship between public capital accumulation and economic development.

The null hypothesis is therefore rejected. Consequently, we accept the alternative hypothesis which states that there is a positive relationship between economic development and public sector capital expenditure in Nigeria.

The statistically significant coefficient of the error correction term shows that error terms are normally distributed. This means that the OLS estimation is unbiased, has minimum variance and is consistent. We therefore reject the null hypothesis that the error terms are not normally distributed at the five percent level of significance.

7. Policy Implications and Recommendation

The insignificant positive impact of ECON, SOC and ADM sectors and the significant negative impact of transfers as components of public capital accumulation on economic development calls for deliberate policy trust to ensure that resources channeled into these sectors contribute significantly to economic development.

Transparency and accountability in the conduct of government activities will make less easy for corrupt minded people to carry out their acts. Thus, the entrenchment of the culture of transparency and accountability will help to conserve public resources for the many things the government has to do for the society. Government should cut its spending particularly on projects and programs that generates least benefits or impose highest cost to society.

8. Conclusion

A point that needs to be highlighted in our public capital accumulation model was the insignificant positive impact of capital expenditure on ADM, ECON, SOC (with low elasticities) on economic development and the significant negative impact of TRANSF on economic development. These are the sectors that the bulk of the country's capital expenditure is spent yet impact insignificantly on economic development. This is a clear indication of wasteful spending, mismanagement of nation's resources and corruption in the public sector. This showed that the public sector is inefficient and unproductive.

When public capital accumulation was disaggregated, the impact of ECON, SOC, ADM, TRANSF on economic development clearly manifested. Positive and insignificant impacts of ECON, ADM and SOC, and negative and significant impact of TRANSF on economic development.

Thus, in view of the above considerations the study showed that disaggregation of public capital accumulation truly revealed the impact of each component on economic development than when the components are aggregated and/or studied in isolation of the other.

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APPENDIX 1

Functional Classification of Capital Expenditure of the Federal Government (N Million), and Inflation Rate 1970-2010

Year	Admini- stratio n	% of Tota l	Econo mic Service s	% of Tota l	Social Comm. Service s	% of Tota l	Trans- fers	% of Tota l	Total	% of GDP	GDP Per Capit a	Inflatio n Rate
1970	70.2	37.4	15.5	8.3	1.4	0.7	100.7	53.6	187.8	3.6	125.7	13.8
1971	63.2	36.4	58.2	33.5	13.2	7.6	39.0	22.5	173.6	2.6	151.7	15.6
1972	108.8	24.1	132.9	29.4	42.0	9.3	167.6	37.1	451.3	6.3	154.6	3.2
1973	133.8	23.7	249.5	44.1	40.4	7.1	142.0	25.1	565.7	5.1	176.1	5.4
1974	268.4	21.9	465.9	38.1	358.1	29.3	131.1	10.7	1,223.5	6.7	365.5	13.4
1975	747.8	23.3	1,314.7	41.0	927.4	28.9	217.8	6.8	3,207.7	14.9	405.2	33.9
1976	795.4	19.7	2,231.4	55.2	899.7	22.3	114.8	2.8	4,041.3	14.8	480.3	21.2
1977	1,013.4	20.2	3,124.6	62.4	824.9	16.5	41.7	0.8	5,004.6	15.3	543.5	15.4
1978	1,112.5	21.4	3,017.6	58.0	866.0	16.7	203.9	3.9	5,200.0	14.4	570.9	16.6
1979	769.5	18.2	2,812.1	66.6	613.3	14.5	24.6	0.6	4,219.5	9.8	674.8	11.8
1980	1,501.1	14.8	5,981.1	58.8	2,456.7	24.2	224.5	2.2	10,163.4	20.0	767.1	9.9
1981	720.1	11.0	3,629.4	55.3	1,299.0	19.8	918.5	14.0	6,567.0	6.4	712.9	20.9
1982	385.4	6.0	2,542.5	39.6	968.3	15.1	2,521.0	39.3	6,417.2	6.8	717.4	7.7
1983	1,098.2	22.5	2,290.7	46.9	1,026.5	21.0	470.3	9.6	4,885.7	4.1	751.2	23.2
1984	262.7	6.4	656.3	16.0	237.6	5.8	2,943.5	71.8	4,100.1	3.3	816.7	39.6
1985	459.6	8.4	892.7	16.3	1,154.0	21.1	2,958.4	54.1	5,464.7	3.8	899.5	5.5
1986	264.8	3.1	1,099.9	12.9	655.4	7.7	6,506.7	76.3	8,526.8	5.9	887.6	5.4
1987	1,816.2	28.5	2,159.7	33.9	619.1	9.7	1,777.5	27.9	6,372.5	3.1	1,307.1	10.2
1988	1,898.6	22.8	2,159.7	25.5	1,726.0	20.7	2,586.8	31.0	8,340.1	3.0	1,671.7	38.3
1989	2,617.5	17.4	3,926.3	26.1	1,844.8	12.3	6,645.5	44.2	15,034.1	3.7	2,553.6	40.9
1990	2,919.9	12.1	3,485.7	14.5	2,096.0	8.7	15,547.0	64.6	24,048.6	4.8	3,085.9	7.5
1991	3,345.0	11.8	3,145.0	11.1	1,491.7	5.3	20,359.2	71.8	28,340.9	4.9	3,527.0	13.0
1992	5,118.5	12.9	2,336.7	5.9	2,132.6	5.4	30,175.5	75.9	39,763.3	4.4	5,852.9	44.5
1993	8,081.7	14.8	18,344.7	33.7	3,575.3	6.6	24,500.1	45.0	54,501.8	4.8	7,267.5	57.2

1994	8,785.1	12.4	27,102.8	38.2	4,994.4	7.0	30,036.0	42.4	70,918.3	4.9	9,299.9	57.0
1995	13,337.8	11.0	43,149.2	35.6	9,215.6	7.6	55,435.7	45.8	121.138.3	4.0	19,429.3	72.8
1996	14,863.6	9.4	63,581.1	40.1	8,656.2	5.5	71,577.4	45.1	158,678.3	3.8	26,414.4	29.3
1997	49,549.0	18.4	169,613.1	62.9	6,902.0	2.6	43,589.6	16.2	269,651.7	6.3	26,632.2	8.5
1998	35,270.4	11.4	200,861.9	65.0	23,365.6	7.6	49,517.7	16.0	309,015.0	7.5	25,034.0	10.0
1999	42,737.2	8.6	323,580.8	65.0	17,253.5	3.5	114,456.1	23.0	498,027.6	10.4	28,571.6	6.6
2000	53,279.5	22.3	111,508.6	46.6	27,965.2	11.7	46,697.6	19.5	239,450.9	3.5	39,768.5	6.9
2001	49,254.9	11.2	259,757.8	59.2	53,336.0	12.2	76,347.8	17.4	438,696.5	6.2	39,773.5	16.5
2002	73,577.4	22.9	215,333.4	67.0	32,467.3	10.0	0.0	0.0	321,378.1	4.0	56,584.7	12.1
2003	87,958.9	36.4	97,982.1	40.5	55,736.3	23.1	11.3	0.0	241,688.6	2.4	67,561.1	23.8
2004	137,775.8	39.2	167,721.8	47.7	30,032.5	8.5	15,729.8	4.5	351,259.9	3.0	81,013.7	10.0
2005	171,614.1	33.0	265,034.7	51.0	71,361.2	13.7	11,500.0	2.2	519,510.0	3.5	110,840.8	11.6
2006	185,224.3	33.5	262,207.3	47.5	78,681.3	14.2	26,272.9	4.8	552,385.8	3.0	138,036.9	8.5
2007	220,900.0	29.1	367,900.0	48.5	131,100.0	17.3	394,230	5.2	759,323.0	3.6	150,147.7	6.6
2008	287,100.0	29.9	504,400.0	52.5	152,100.0	15.8	17,300.0	1.8	960,900.0	4.0	169,405.8	15.1
2009	330,200	28.3	615,500	52.8	170,200	14.6	49,330	4.3	1,165,230	4.4	182,215.6	11.5
2010	375,610	27.4	705,110	51.4	219,200	16.0	70,630	5.2	1,370,550	4.7	205,415.7	13.5

Source: Central Bank of Nigeria (CBN) Statistical Bulletin (2010) Edition

APPENDIX 1.1

**Table of Variables for Public Capital Accumulation and Economic Development Model:
Dependent Variable = Δ LPCGDP**

Year	Δ PCGDP	Δ ADM,	Δ ECON,	Δ TRANS,	Δ SOC	INFLA (%)
1970	0.2	10.2	-11.8	67.2	-0.6	13.8
1971	0.3	-7.0	42.7	-61.7	11.8	15.6
1972	0.1	45.6	74.7	128.6	28.8	3.2
1973	0.4	25.0	116.6	-25.6	-1.6	5.4
1974	16.8	134.6	216.4	-10.9	317.7	13.4
1975	16.7	479.4	848.8	86.7	569.3	33.9
1976	1.7	47.6	916.7	-103	-27.7	21.2
1977	2.2	10218	893.2	-73.1	-74.8	15.4
1978	-4.7	99.1	-107.0	162.2	41.1	16.6
1979	-0.1	-10343	-205.5	-179.3	-252.7	11.8
1980	0.9	10731.6	3169	199.9	1843.4	9.9
1981	3.6	-10781	-2351.7	694	-1157.7	20.9
1982	-3.0	-334.7	-1086.9	1602.5	-330.7	7.7
1983	-0.1	10712.8	-251.8	-2050.7	58.2	23.2
1984	-5.1	-10835.5	-1634.4	2473.2	-788.9	39.6
1985	-0.3	196.9	236.4	14.9	196.4	5.5
1986	7.6	-194.8	207.2	3548.3	-498.6	5.4
1987	1.7	11551.4	1059.8	-4729.2	-36.3	10.2
1988	10.5	82.4	0	809.3	1106.9	38.3
1989	11.8	10718.9	1766.6	4058.7	118.8	40.9
1990	0.9	302.4	-440.6	8901.5	251.2	7.5
1991	-3.4	10425.1	-340.7	4812.2	-604.3	13.0
1992	-1.2	21773.5	-808.3	9816.3	640.9	44.5
1993	-0.9	32963.2	16008	-5675.4	1442.7	57.2
1994	-1.7	703.4	8758.1	5535.1	1419.1	57.0
1995	1.4	44552.7	16046.4	25399.7	4221.2	72.8
1996	1.0	11525.8	20431.9	16141.7	-559.4	29.3
1997	0.4	354685.4	106032	-27987.8	-1754.2	8.5
1998	-1.4	-144278.6	31248.8	5928.1	16463.6	10.0
1999	-0.3	67466.8	122718.9	64938.4	-6112.1	6.6
2000	2.7	110542.3	-212072.2	-67758.5	10711.7	6.9
2001	-0.8	-34024.6	148249.2	29650.2	25370.8	16.5
2002	0.0	234322.5	-44424.4	-76347.8	-20868.7	12.1
2003	5.0	144381.5	-117351.3	11.3	23269	23.8

2004	-3.0	499816.9	69739.7	15718.5	-25703.8	10.0
2005	-0.1	333838.3	97312.9	-4229.8	41328.7	11.6
2006	-0.5	143610.2	2172.6	25122.9	7320.1	8.5
2007	0.2	345675.7	105692.7	367957.1	52418.7	6.6
2008	0.8	676200	136500	-376930	21000	15.1
2009	5.6	735,970	156,820	256	35280	11.5
2010	8.4	628,553	175,925	165,235	547,295	13.7

Source: Author's Computation