European Journal of Business and Social Sciences, Vol. 4, No. 04, **July 2015.** **P.P. 87 - 104**
URL: *http://www.ejbss.com/recent.aspx-/*
ISSN: 2235 -767X

THE EFFECT OF SECTORIAL PUBLIC INVESTMENT EXPENDITURE ON PRIVATE INVESTMENT IN NIGERIA: AN ERROR CORRECTION ANALYSIS

Awolaja Gbenga, Oluwalaiye O. Babatunde, Lawal Esther

Babcock University,
Department Of Economics Banking and Finance

ABSTRACT

The literature on the relationship between public and private investment seems unclear on whether there exists a complementarity or crowding out effect. This paper however examined the crowding in or crowding out effects of the composition of public investment on private investment in Nigeria. A neoclassical investment model within an error correction framework was employed to understand the dynamics of the relationships between aggregate and sectoral central government investment expenditure and private sector investment spending. The empirical results from the analysis reveal that central government investment in defence, health and transportation and communications crowd in private investment in the long run. The crowding in effect of public investment in transportation and communications lend support to infrastructural hypothesis in the long-run. The effects of aggregate central government investment and public investment in education are positive and negative respectively but not significant. The short run estimates show that private investment is crowded in by public investment in defence and education. The effects of both aggregate capital expenditure and public investment in transportation and communications are positive but insignificant. While public investment in health has insignificant negative. For the other variables, aggregate demand proxy by output stimulates private investment in the long run when modelled with PIED, PIHE and PITCM. Similarly, bank credit to the private sector promotes private investment in the long run when modelled with PCE, PID, PIED and PIHE. User cost of capital is negatively related to private investment when modelled with PID and PITCM in the long run.

Keywords: composition of public investment, private investment, crowding in and crowding out.
JEL classification: *H54; E22; C32*

1. BACKGROUND

Priority has not only been given to the private sector, but giants strides are also being taken to enhance its development in the developing economies. This is because of the unanimity that has emerged on the predominance of increasing total investment; promoting private sector development and also increasing its share of total investment for long-run growth. Equally imperative is the public investments which must be undertaken by governments at all levels. Public investment is more of infrastructural outlay – for road and rail networks, ports, bridges, energy-generating plants, telecommunications structures and sanitations networks, government buildings (UNCTAD 2009).

Issues surrounding the relationship between public and private investment has drawn a lot of attention in the literature and this is basically because of its policy relevance. This interest on the relationship between government provision of public investment and private sector spending on investment was rekindled by Aschauer (1989a, 1989b, 1993). Nonetheless, the relationship remains unsettled in the econosmic literature plausibly because of the differing and contrasting arguments that exit.

The argument by the neoclassical economists is that, public investment crowds out private investment. This occurs when increase in government capital expenditure is financed by borrowing, resulting in the rise of the interest rates. On the assumption of full employment of resources, high interest rates lead to a decline in private investment. Analogously, Rossiter (2002) argues that public investment may crowd out private investment, if the additional investment is financed by a deficit which leads to an increase in the interest rate, credit rationing and tax burden. The Keynesians in contrast posit that, an increase in the government expenditure stimulates the domestic economic activity thus crowding in private sector spending on investment.

Another point of strong controversy in the economic theory and policy is whether public and private investments are substitutes or complements. The free markets advocates argue that, public sector activity competes with private sector for scarce resources and drives their prices up. Particularly, if government capital expenditures are financed by borrowing, this leads to rise in market interest rates and thereby raising the cost of capital for the private sector. As a result public sector investments crowd out private investment. Contrary to this argument is that public investment may be of benefit to the development of the private sector. Government capital expenditure, particularly in infrastructures crowd in private sector spending by reducing costs, and raising productivity, this in turn increases private returns (see Aschauer, Munnell, 1992 and Buiter, 1977). This is known as the infrastructural hypothesis. Similarly, government capital expenditures in education and health can help to improve the level of the quality of human capital in the private sector economy. Government capital expenditures can also be used as a counter-cyclical economic policy measure to smooth the business cycle and revive activities in the private sector economy.

The empirical literature on the relationship between government capital expenditures and private investment seem diverging both for developed and developing economies, see table 1.

Table 1: Empirical findings

AUTHOR(S)	Countries	Findings
Oshikoya (1994)	African	Public investment in infrastructure is complementary to private sector investment for most of the countries.
De Oliveira Cruz and Teixeira (1999)	Brazil	Public investment crowds out private investment in the short run, but private investment is crowded in in the long run.
Clements and Levy (1994)	Caribbean	Crowding out effect
Blejer and Khan (1984)	Developing	Public investment in infrastructure complements private investment while other types of public investment are not.
Balassa (1988)	Developing	Crowding out effect
Greene and Villanueva (1991)	Developing	Complementary effect
Heng (1997)	Developing	Crowding in effect of public capital through raising the marginal productivity of labour and saving
Ghura and Godwin (2000)	Developing	Public investment crowds in private investment in SSAFR, but crowds out in Asia and LAC.
Shafik (1992)	Egypt	Mixed results, evidence of crowding out in credit markets and crowding in as a result of public investment in infrastructure.
Sobhee (1999)	Mauritius	Public expenditures on health and infrastructure stimulate private investment while expenditure on education does not.
Nazmi and Ramirez (1997)	Mexico	Crowding out
Musalem (1989)	Mexico	Crowding in
Looney and Frederiken (1997)	Pakistan	Crowding in
Sakr (1993)	Pakistan	Public investment in infrastructure and non- infrastructure crowds in and crowds out private investment respectively.
Ahmed and Miller (2000)	OECD and Developing	Government expenditure crowds out for both samples, plus pooled sample. Government expenditure in transport and communication crowds in private investment for the developing countries.
Argimom, Gonzalez-Paramo, Alegre (1997)	OECD	Crowding in effect of public investment through the positive impact of infrastructure on private investment productivity.
Pereira and Flores de Frutos (1999)	USA	Crowding in
Pereira (2001)	USA	Crowding in
Abdullatif, Alani (2006)	Japan	Crowding in effect of public investment
Erden, L. and G. Holcombe(2005)	Developed and€ developing	Public investment complements private investment in developing economies. Crowding out effects in developed countries.
Karagol, Erdal (2004)	Turkey	Public investment and government consumption expenditure crowd out private investment.
Udah, Enang (2010)	Nigeria	Government size variable does not stimulate private investment.
Ariyo and Raheem (1991)	Nigeria	Crowding out
Ekpo (1994)	Nigeria	Crowding in effect of aggregate public investment. Crowding in effects of public investment in agriculture and transport and communication.
Chete and Akpokodje (1997)	Nigeria	Crowding in effect of public investment
Ghali (1998)	Tanzania	Public investment has negative effect on private investment in both the short and long-run.
Toshiya Hatano (2010)	Japan	Crowding in effect
Baotai Wang (2004)	Canada	Government expenditure in infrastructure has crowding out effect. Government expenditure in health and education has crowding in effects.

Various methodologies, nevertheless, exist in the literature for investigating the crowding-in and crowding-out effects of public investment on private sector investment (see Cruz and Teixeira 1999). Pardahan, Ratha and Sarma (1990) make use of the computable general equilibrium models. These models make it possible to investigate the impact of public investments on other macroeconomic variables and income distribution. More so, the effect of public investment on private investment based on the various sources of financing, such as increased taxes, money issue , increase in public debt to mention a few. This method leaves out the possibility of long run-relationship. Another method is the estimation of an IS-LM type model. This method gives rise to skewed results due to the econometric techniques used (see Ramirez 1991, Sant'Ana *et al* 1994). Another approach is the supply-side method which allows for the estimation of the effect of public investment on total factor productivity (Ram 1986, Aschauer 1989). Lastly is the demand-side approach methodology which estimates of an investment function in order to investigate the relationship between public investment and private investment. This approach is popular and has been employed by most of the studies on the crowd-in and crowd-out effects of government capital expenditures basically because of its relative advantages and higher relevance.

Literature on the crowding in or crowding out implication of government capital expenditure for developing economies is also inconclusive. Studies by Khan and Reinhart (1990) and Khan and Kumar (1997) have shown that private sector investment has more effect on economic growth in the developing economies compared to public investment. Nigeria, as a developing economy, in recent years has been making assiduous efforts to develop her private sector in order to achieve her growth objective. Thus this empirical investigation for Nigeria is motivated by the far reaching policy implications of this important and controversial nature of the relationship between public and private investment on the growth of the economy. A better understanding of this relationship will help in shaping the direction of public policy on government capital expenditures. Also the composition of public investment is expected to have differential effects on the private sector spending on investment.

To the best of our knowledge empirical literature on the relationship between government capital expenditure and private sector investment for Nigeria is scanty. Ariyo and Raheem (1991) estimated an investment function which has public investment as one of the explanatory variables and their findings reveal crowding out effect of public investment. Ekpo (1994) reveals that public sector investment on the aggregate crowds in private investment. Also public investment in communications and transport, and agriculture has positive impact on private investment. Evidence from Chete and Akpokodje (1997) supports crowding in effect of public investment. Recently, Udah (2010) reveals that government size variable does not complement private investment despite the huge government expenditure on capital projects related infrastructure in the past two decades. While the attention of most of the studies is on the aggregate government capital expenditure, Ekpo (1994) equally investigated the relationship between public investment components and private investment from 1960-1990 by estimating a differenced investment function which gave rise to loss of long-run information. The distinguishing qualities of this paper from existing studies include : examination of aggregate and differential effects of sectoral central government capital expenditure on private sector investment, employment of recent advancement which helps to evade the problems of spurious relationships and also to rigorously separate among long-run and short-run crowding in and crowding out effects of government capital expenditure.

Hence this paper examines both the consolidated government capital expenditure and differential effects of sectoral central government capital expenditure on private sector investment spending in Nigeria for the 1980 – 2011.

The remainder of the article is structured as follows. Section 2 gives synopsis of the composition of public investment and private investment in Nigeria. Section 3 discusses the data and methodology. The econometric methodology is discussed in section 4. Empirical results are presented and discussed in section 5. Section 6 gives the conclusion and policy recommendations.

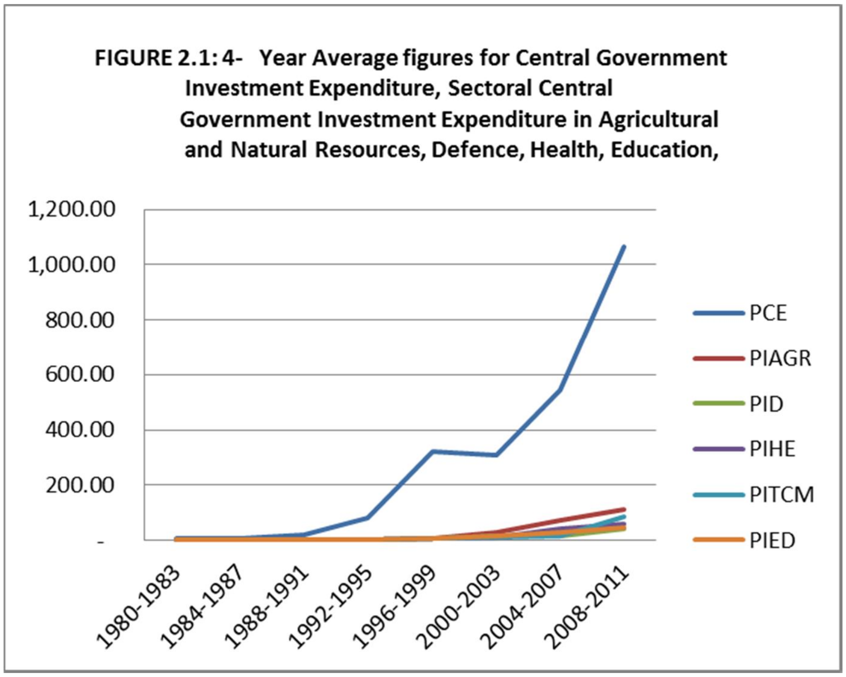
2. SYNOPSIS OF CENTRAL PUBLIC INVESTMENT EXPENDITURE IN NIGERIA

The importance of private sector as major driver of growth and development brought to dawn the era of free market economy that started in the 1986 and since then public policies have given more priorities to the development of the private sector economy.

This section gives a synopsis of central public investment expenditure (PCE) and sectoral investment expenditure in: agriculture and natural resources (PIAGR); defense (PID); health (PIHE); education (PIED) and transport and communications (PITCM) averaged four years from 1980-2011. These public investment expenditure variables are as abbreviated hereafter. The structure of the Nigerian government comprises of central, state and local government. The availability of data, however, informed the focus of the paper on central government. Nigeria as a country had gone through different phases of national development plan and economic reforms which exerted influence on government expenditure.

The third National Development Plan (1975 -1980) which had as its target a twelvefold increase in the annual rate of government capital investment, could account for the average figures of ₦7,008.3 million; ₦857.75million; ₦126.7million; ₦135.5 million;

₦1,588.33million and ₦557.03 million for PCE, PIAGR, PID, PIHE, PITCM and PIED respectively between 1980 and 1983. The decline in the average values of PCE, PIAGR, PID, PIHE, PITCM and PIED to ₦6,116.03million, ₦623.88million, ₦74.13, ₦ 64.5million, ₦348.53million and ₦226.68 million respectively by 1984 to 1987 could be attributed to the economic crisis of early 1980s which was caused by the fall in oil output and prices and coupled with the stabilization measures of 1983 - 1985. The average annual values of central public capital expenditure and the sectoral public investment variables rose to ₦18,940.9million (PCE), ₦971.73million (PIAGR), ₦250.73million (PID), ₦175.95million (PIHE), ₦654.55million (PITCM) and ₦281.13 (PIED) between 1988 and 1991. This period however covered the Structural Adjustment Programme (SAP) which spanned 1986 to 1991. Contrary to what holds conventionally, there was a sharp increase in government investment expenditure during the Structural Adjustment Programme. The average annual figures of PCE, PIAGR, PID, PIHE, PITCM and PIED recorded all-time rise and stood at ₦1,062.712billion, ₦112.125billion, ₦40.025billion, ₦60.725billion, ₦87.2billion and ₦43.8billion by 2008-2011 respectively. This all-time rise in the average annual figures of central government investment expenditure and its decomposition are not unconnected with the oil booms of the 1990s; the windfall gains from higher oil prices in the year 2000 and the pressure on the government to deliver the dividends of democracy. More so, the National Economic Empowerment and Development Strategy (NEEDS) initiated in 2003 had among other objectives, the acceleration of infrastructural development and increased investment in key priority areas such as education, health, agriculture and water. This upward trend in the central government investment expenditure has far reaching implications on the decision of the private sector on investment.



3. METHODOLOGY AND DATA

In order to achieve the purpose of this paper an augmented investment function that is situated on simple theoretical framework of the neoclassical theory of investment is adopted. According to Jorgenson (1971), there exists a stable relationship between an economy's capital, the level of real output and the real user cost of capital in the long-run. To Pelgrin et al. (2002), the existence of long-run relationship between gross investment, output and the cost of capital is on the assumption that, rates of depreciation and real growth are constant at the steady state. Samuelson ( ), however, emphasizes a reciprocal relationship between investment and production thereby proposing the ''Accelerator Hypothesis''. It is also argued that, the value of the desired capital stock for a typical firm is positively related to the demand level. Aggregate demand as a determinant of private investment is measured by Gross Domestic Product, GDP. This however, captures the output of an economy and also explains the dynamics associated with the accelerator effect (see Long and Summers, 1991 and Blomstorm et al., 1996). Another determinant of private investment in the economic literature is the rate of return and which is approached through real rate of interest. It represents the cost of capital. Real interest rate is negatively related to the desired capital stock as suggested by Jorgenson (1971). The real lending rate of banks to the private sector however, measures the user cost of capital. Asides this baseline investment model, there exist other determinants of private investment in the literature.

Bank credit to the private sector is also a vital source of investible resources. Access to credit is a major problem in developing economies due to lack of long term financing. Bank credit captures the level of financial development and it is positively related to private investment.

The degree of trade liberalization of an economy could also determine private investment; the relationship is however, unclear. An economy that is integrated to the world is expected to attract investment in tradable sectors in order to increase productivity and competiveness (Balasubramanyam et al 1996). While on the other hand, an abrupt rise in exposure to external competition in certain sectors can make these sectors less attractive as a destination for new capital flows (Serven 2002).

Another determinant of private investment is real exchange rates and its effects are in two ways. First, increases in the prices of imported capital and intermediate goods due to a devalued currency can discourage private investment at least in the short-run. Secondly, a devalued currency stimulates private investment in the short-run if the country relies on the export of tradable goods.

The literature on investment in developing economies has nevertheless, identified output growth, public investment, real interest rates, real exchange rates, FDI, fiscal deficits and uncertainty as the key determinants of private investment amongst other spectrum of factors (see Rama, 1993; Serven and Solimano, 1993; and Larrain and Vergara, 1993).

From the foregoing an augmented neoclassical investment function is specified in order to understand the relationship between central government aggregate investment expenditure, central government sectoral investment expenditure and private investment in Nigeria:

$$PVI = f(RGDP, PLR, BCP, PCE) \qquad 1.$$
$$PVI = f(RGDP, PLR, BCP, PIAGR) \qquad 2.$$
$$PVI = f(RGDP, PLR, BCP, PID) \qquad 3.$$
$$PVI = f(RGDP, PLR, BCP, PIED) \qquad 4.$$
$$PVI = f(RGDP, PLR, BCP, PIHE) \qquad 5.$$
$$PVI = f(RGDP, PLR, BCP, PITCM) \qquad 6.$$

where PVI is private investment; $RGDP$ is the real Gross Domestic Product; PLR - prime lending rate proxy for user cost of capital. The private investment is measured by gross fixed capital formation less consumption of fixed capital. The central government investment expenditure variables are: PCE – central capital expenditure; $PIAGR$ – public investment in agriculture and natural resources; PID – public investment in defense; $PIED$ – public investment in education; $PIHE$ – public investment in health; and $PITCM$ is public investment in transport and communications. The central government investment expenditure variables are expected to either have positive or negative effect on private investment. Data for the variables in the function specified above are from Central Bank of Nigeria Statistical Bulletins. The variables are deflated using implicit deflator.

4. Econometric Methodology

The techniques of cointegration and error correction were adopted to investigate the dynamics of the effects of total public investment and sectoral public investment on private investment. These techniques, among other things, help to overcome: the problem of spurious regression arising from the use of standard OLS regression since most macroeconomic variables are found to be trended; and the loss of long-run information stemming from differencing of time-series variables. A dynamic error correction model is found suitable for this paper because, the relationship between public investment and private investment may be one of substitution in the short-run or one of complementary in the long-run depending on how productive public investment is (see Boopen and Khadaroo).

Our choice of VAR approach is because; it does not impose an a priori restriction on the dynamic relations among the different variables.

A *p*th – order vector auto-regression (expressed as VAR (p)) representation for equation (1) is

$$X_t = c + a_1 X_{t-1} + a_2 X_{t-2} + ... + a_p X_{t-p} + u_t \quad 7.$$

Where, $X_t = (PVI, RGDP, PLR, BCP, PCE)$, and u_t is the disturbance term and it is $iid(0,a)$. There are six variants of equation (7) and each has a public investment expenditure component. A reparametarisation of equation (7) gives a vector error-correction model (VECM):

$$\Delta X_t = c + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + ... + \Gamma_{p-1} \Delta X_{t-p-1} + \prod X_{t-p} + u_t \quad 8.$$

where $\Gamma_i = (I - a_1 - a_2 - .... - a_p)$ $(i = 1, 2, ..., p-1)$ 9.

and

$$\Pi = -(I - a_1 - a_2 - .... - a_p) \quad 10.$$

The error correction term ΠX_{t-p} is the only difference between equation (7) and a standard VAR in differences. The VAR system in equation (7) contains information on both the short-run and the long-run adjustment to changes in X_t through the estimates of Γ_i and $\prod$ respectively. The transformation of a VAR model for *I (1)* variables into equation (7) can be called a cointegrating transformation. $\prod$, is a 5 x 5 matrix and it contains information about the long-run relationships among the variables in the system. The non-stationary component *a* can also be factorized to test the null hypothesis of reduced rank or equivalently, the number of cointegrating relationships. That is

$$H_0 : \prod = \alpha\beta'$$

If rank$(\prod) = r < n$, then there are matrices β' and α of dimension $n \times r$ such that $H_0 : \prod = \alpha\beta'$, and there are $'r'$ cointegrating relations among the element of $\beta' X_t$. Matrix β' is interpreted as a matrix of cointegration vectors and has the property that elements in $\beta' X_t$ are stationary even though X_t is non-stationary. On the other hand, the elements of α indicate the speed of adjustment of a particular variables with respect to a disturbance in the equilibrium relation. It is however important to note that $\beta' X_{t-1}$ is equivalent to the error term. More so, X_t is a vector of nonstationary variables, change in X_{t-1} are *I(0)* and ΠX_{t-1} is *I(0)* so that u_t can be *I(0)* hence given a well behaved system. Thus the model can be estimated with the ordinary least square method [Granger and Lee (1989)]. All variables in the VAR system are transformed into natural logs except real lending rate.

The econometric analysis is in three steps. First and foremost, the data generating process of the individual series is explored/examined using Augmented Dickey Fuller (ADF, Dickey and Fuller 1981), Dickey Fuller - Generalized Least Squares (DF-GLS, Elliott et al. 1996), Ng-P (Ng and Perron 1995) and KPSS (Kwiatkowski–Phillips–Schmidt–Shin, 1992) tests. This barrage of tests is to ensure efficient unit roots tests for our series. The DF-GLS, Ng-P and KPSS tests are likely to give more robust results this is because of their best size adjusted power properties. The KPSS test is used to test the null hypothesis of stationarity rather than the null hypothesis of nonstationarity or *I(1)* in levels tested by the other tests.

The second test involves testing for the existence of cointegrating relation among the variables. The null hypothesis of '*r*' cointegrating vectors, that is, $H0(r) : rank(\prod) \leq r$, is tested using Johansen (1998) multivariate cointegrating test. Our choice of Johansen cointegration procedure over Engle and Granger technique is because of its greater power to identify cointegration and also evaluate multiple cointegration vectors (Adam, 1991 and Ericsson, 1998). The number of cointegrating vectors are, however determined by the maximum Eigenvalue and Trace statistics. A long-run cointegrating private investment equation is estimated for each of the central government investment component after establishing the existence of a cointegrating relation among the variables of our models. The appropriate lag length of the VAR system was determined using Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Hannan-Quinn Information Criterion (HQ) and Sequential Modified LR test Statistic. This necessary to make the residual of the VAR system uncorrelated.

The final step involves the estimation of dynamic error correction for private investment function using OLS method. By so doing the short-run effect and speed of adjustment are thereby estimated. A general model is first estimated and from which an empirically parsimonious model is obtained using the general-to-specific modelling strategy. The parsimonious error correction private investment function model is however, subjected to a number of diagnostic tests.

5.0 Empirical Results

I. Unit root tests

The stationary tests were applied on the levels as well as first differences of all the relevant series before and after logarithmic transformations. Table 1A gives the summary of the unit roots results before logarithmic transformation while Table 1B reports the stationary tests results of the log of the series except real prime lending rate. The ADF, DF-GLS, NG-Perron unit root results reveal that PVI, RGDP, BCP, PCE, PIAGR and PIHE are not stationary at levels. The unit root tests results, however, are not consistent for PIED, PID and PLR. The variables are stationary at first differences and consistent across ADF, DF-GLS, NG-Perron and KPSS except for PVI, RGDP and BCP which have inconsistent results. The results in Table 1B seem to be more consistent. Given the best size adjusted power properties of the DF-GLS, NG-Perron and KPSS tests, their results reveal that the variables are *I(1)* series hence they are non-stationary variables. Having established that the variables are nonstationary, there is then need to investigate the existence of long-run relationships among the variables in the specified models.

TABLE 1A: UNIT ROOT TESTS

VAR	LEVEL				FIRST DIFFERENCE			
	ADF	**DF-GLS**	**NG-P**	**KPSS**	**ADF**	**DF-GLS**	**NG-P**	**KPSS**
PVI	-1.154[a]	-0.822[b]	3.974[b]	0.536[a*]	8.074[a]	-3.30[b**]	14.14[b]	0.550[a*]
RGDP	0.470[b]	-1.422[b]	-0.105[b]	0.693[a*]	-12.14[b*]	-3.976[b*]	-1.866[b]	0.298[a*]
PLR	-3.61[b**]	-3.72[b**]	-2.46[b**]	0.35[a*]	-6.29[a*]	-6.40[b*]	-2.70[a*]	0.28[a*]
BCP	-0.140[a]	-2.520[b]	3.482[b]	0.505[a*]	6.114[a]	-2.261[b]	2.179[b]	0.483[a*]
PCE	-1.000[b]	-2.280[b]	-1.874[b]	0.631[a*]	-7.197[b*]	-7.151[b*]	-2.726[a*]	0.156[a*]
PIAGR	-2.315[b]	-2.283[b]	-1.918[b]	0.555[a*]	-4.338[a*]	-3.44[b**]	-2.078[a**]	0.107[b*]
PID	3.475[a]	-3.237[b**]	-4.174[b*]	0.605[a*]	-4.740[b*]	-3.40[b**]	-2.100[a**]	0.212[a*]
PIED	4.345[a]	-2.228[b]	-2.889[b***]	0.592[a*]	-7.205[a*]	-2.47[a**]	-2.475[a**]	0.128[a*]
PIHE	9.655[b]	-2.658[b]	-0.193[b]	0.510[a*]	-4.797[a*]	-4.864[b*]	-2.69[b]***	0.086[a*]
PITCM	-3.33[b***]	-4.701[b*]	-21.77[b*]	0.485[a*]	-4.502[a*]	-4.727[b*]	-7.839[a*]	0.206[a*]

Note: [a] Indicates a model with constant but without deterministic trend; [b] is the model with constant and deterministic trend. *, **, *** imply that the series is stationary at 1%, 5% and 10% respectively. ADF, DF-GLS, Ng-P and KPSS represent, Augmented Dickey Fuller, Dickey Fuller, Ng-Perron and Kwiatkowski–Phillips–Schmidt–Shin Unit root tests respectively. The null hypothesis for ADF, DF-GLS and Ng-P is that an observable time series is not stationary (i.e. has unit root) while that of KPSS tests for the null hypothesis that the series is stationary.

TABLE 1B: UNIT ROOT TESTS

VAR	LEVEL				FIRST DIFFERENCE			
	ADF	**DF-GLS**	**NG-P**	**KPSS**	**ADF**	**DF-GLS**	**NG-P**	**KPSS**
LNPVI	-3.06[b]	-1.73[a***]	-2.16[b]	0.50[a*]	-7.98[a*]	-4.25[b*]	-1.74[a***]	0.195[b*]
LNRGDP	-1.73[b]	-4.66[b*]	-0.28[b]	0.09[b*]	-39.1[b*]	-4.16[b*]	-1.85[b]	0.24[a*]
LNBCP	-2.62[b]	-2.20[b]	-1.68[b]	0.59[a*]	-8.03[a*]	-4.01[b*]	-2.08[b]	0.14[b*]
LNPCE	-5.37[a*]	-4.41[b*]	-2.07[a**]	0.37[a*]	-8.08[a*]	-5.78[b*]	-1.73[a***]	0.38[a*]
LNPIAGR	-3.90[a*]	-3.59[b**]	-2.22[a**]	0.24[a*]	-7.53[b*]	-5.37[b*]	-2.39[a**]	0.50[a*]
LNPID	-6.66[b*]	-6.61[b*]	-2.68[b***]	0.65[a*]	-6.85[a*]	-9.21[b*]	-2.44[a**]	0.12[a*]
LNPIED	-3.17[a**]	-3.36[b**]	-2.42[a**]	0.23[a*]	-8.16[a*]	-7.05[b*]	-2.61[a*]	0.50[b*]
LNPIHE	-3.01[b]	-3.11[b***]	-2.37[b]	0.56[a*]	-7.13[a*]	-5.54[b*]	-2.46[a**]	0.13[a*]
LNPITCM	-2.60[a]	-2.56[a**]	-2.56[a**]	0.22[a*]	-6.50[b*]	-5.32[b*]	-5.32[b*]	0.50[b*]

Note: [a] Indicates a model with constant but without deterministic trend; [b] is the model with constant and deterministic trend. *, **, *** imply that the series is stationary at 1%, 5% and 10% respectively. ADF, DF-GLS, Ng-P and KPSS represent, Augmented Dickey Fuller, Dickey Fuller, Ng-Perron and Kwiatkowski–Phillips–Schmidt–Shin Unit root tests respectively. The null hypothesis for ADF, DF-GLS and Ng-P is that an observable time series is not stationary (i.e. has unit root) while that of KPSS tests for the null hypothesis that the series is stationary.

11. Cointegration Tests

The results of the Johansen cointegration test are reported in Table 2. The appropriate lag length for the VAR system is 1 for the 6 variants of the private investment models. The Trace and Max-eigen values indicate one cointegrating equation at 5 per cent level of significance for all the variants of the private investment model except for variant 2 which has the public investment expenditure in agriculture and natural resources. The existence of cointegration relation implies that the variables share same stochastic trends thus maintaining an equilibrium relationship. The rejection of the existence of cointegration equation for variant 2 indicates that long run relationship does exist between private investment, real GDP, bank credit to private sector, real prime lending rate and public investment expenditure in agriculture and natural resources.

European Journal of Business and Social Sciences, Vol. 4, No. 04, **July 2015.** **P.P. 87 - 104**
URL: *http://www.ejbss.com/recent.aspx-/*
ISSN: 2235 -767X

Table 2: Cointegration Test Results Using Johansen's Maximum Likelihood Technique

Model	Optimal VAR-Lag Length	Trace			Max- Eigen			Conclusion
		Rank	Statistic	Critical Value	Rank	Statis tic	Critical Value	
LNPVI=F(LNRGDP,LBCP,LR,LNPCE)	1	1	74.49	69.82	1	35.09	33.88	Cointegrated
LNPVI=F(LNRGDP,LBCP,LR,LNPIAGR)	1	Nil	68.53	69.82	Nil	33.53	33.88	Not Cointegrated
LNPVI=F(LNRGDP,LBCP,LR,LNPID)	1	1	89.76	69.82	1	46.59	33.88	Cointegrated
LNPVI=F(LNRGDP,LBCP,LR,LNPIED)	1	1	75.51	69.82	1	37.41	33.88	Cointegrated
LNPVI=F(LNRGDP,LBCP,LR,LNPIHE)	1	1	83.59	69.82	1	45.03	33.88	Cointegrated
LNPVI=F(LNRGDP,LBCP,LR,LNPITCM)	1	1	84.55	69.82	1	42.18	33.88	Cointegrated

Note: Optimal lag length was chosen based on Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Hannan-Quinn Information Criterion (HQ) and Sequential Modified LR test Statistic. Trace and Max-eigenvalue tests indicate existence of cointegrating equation(s) at the 0.05 level

The normalized cointegrating equations for the variants of the private investment model are reported in Table 3. The positive long run estimate of aggregate public investment expenditure implies a crowding-in effect though not statistically significant at 1, 5 and 10 per cents. A one percent change in aggregate public investment expenditure crowds in private investment by 0.31 per cent. The long-run coefficients of the central government sectoral public investment expenditure in defense, health and transportation & communications reveal significant crowding in effects. A one per cent change in public investment expenditure in defense, health and transportation & communications crowd in private investment by 0.45, 0.18 and 0.32 per cents respectively in the long-run The crowding in effects of public investment in defense and transportation & communications are statistically significant at 1 per cent level while that of health is at 5 per cent. The finding on the complementarity of public investment expenditure in transporation and communications to private investment supports the Infrastructural Hypothesis documented by Aschauer (1989), Pereira (2000), Ahmed and Miller (2002) to mention a few. Public investment expenditure in education crowds out private investment by 0.15 per cent, although not statistically significant. Real GDP, which is a proxy for output, is found to significantly stimulate private investment in the long-run when modelled with public investment in education, health and transportation & communications. In variants (4), (5) and (6), a 1 per cent change in output, that is real GDP, leads to 0.68, 0.49 and 0.99 per cent change in private investment respectively. This is typical of the accelerator characteristics. Output is negatively related to private investment, though not statistically significant, when modelled with public investment in defense. The coefficient of output in variant (1) is positive but not significant. Bank credit to private sector is found to significantly promote private investment in all the variants of the pivate investment model except for variant (6). This finding is in line with Wong (1982), Blejer and Khan (1984) and Loza (2005). The user's cost of capital proxy by real prime lending rate has the expected negative sign except in variant (5), which is positive. The negative coefficients of user's cost of capital are significant at 5 and 1 per cent levels in variants (3) and (6) respectively.

Table 3: Normalized Cointegrating Equations Dependent Variable: LNPVI

Independent Variables	Variant (1)	Variant (3)	Variant (4)	Variant (5)	Variant (6)
Constant	-5.07	2.77	-3.11	-0.87	-5.96
LNRGDP(-1)	0.32 (0.21) [-1.54]	-0.28 (0.17) [1.68]	0.68 (0.24) [-2.87]	0.49 (0.18) [-2.64]	0.99 (0.19) [-5.04]
LNBCP(-1)	0.70 (0.16) [-4.35]	0.72 (0.11) [-6.70]	0.48 (0.20) [-2.46]	0.31 (0.14) [-2.20]	0.07 (0.15) [-0.51]
LR(-1)	- 0.004 (0.004) [1.27]	- 0.006 (0.002) [2.53]	-0.004 (0.004) [1.03]	0.01 (0.003) [3.54]	-0.01 (0.002) [4.74]
LNPCE(-1)	0.31 (0.19) [-1.61]	--------------	--------------	--------------	--------------
LNPIAGR(-1)	--------------	--------------	--------------	--------------	--------------
LNPID(-1)	--------------	0.45 (0.08) [-5.77]	--------------	--------------	--------------
LNPIED(-1)	--------------	--------------	-0.15 (0.12) [1.24]	--------------	--------------
LNPIHE(-1)	--------------	--------------	--------------	0.18 (0.08) [-2.08]	--------------
LNPITCM(-1)	--------------	--------------	--------------	--------------	0.32 (0.06) [-4.88]

Note: ( ) and [ ] indicate standard error and t-statistic respectively.

III. Error Correction Model

Error Correction Models were expressed and estimated after establishing the existence of long-run cointegration relationships using Johansen Maximum Likelihood approach. The estimated general and parsimonious Error Correction Models are reported in table 4. The general models were estimated using one lag of each variable in first differences. The error correction term in the models contains the residual from the corresponding long-run private sector investment models estimated earlier. The reduction from the general model to specific model was carried out by eliminating longest lag of each variable with low t-values. The Schwartz criterion is the used to check the validity of the simplification. The coefficients of the error correction term, which is the speed of adjustment towards equilibrium, have significant negative signs (in both the general and parsimonious models) as expected in all the five variants of the private sector investment models. This however, reinforces the acceptance of the hypothesis of cointegrating relationship. The speed of adjustment toward equilibrium for the parsimonious models for variants (1), (3), (4), (5) and (6) are -0.80, -0.70, -0.62, -0.75 and -0.85 respectively. The speed of adjustments is very high for all the variants as reported in table 4. The short-run dynamics shows that change in real private sector investment is significantly determined by: changes in real private sector investment lagged by a year and central public investment expenditure in defense (for variant 3), also 74 per cent of the disequilibrium from long-run is corrected in the first year; changes in real private sector investment and public investment in education lagged by a year (for variant 4), likewise 62 per cent of the deviation from equilibrium is corrected in the first period; changes in real private sector investment lagged by a year and bank credit to the private sector (for variant 5), similarly 75 per cent of the deviation from long-run is corrected for in period one; change in real private sector investment lagged by one period (for variant 6), and likewise 87 per cent of the disequilibrium from the long run is corrected in the first period. Findings from the short-run dynamics however, reveal crowding in effects of central government investment expenditure in defence and education. Similarly, coefficients of aggregate public capital expenditure, public investment expenditure in transportation and communications are positive while that of public investment expenditure in health is negative but not statistically significant.

Table 4: General and Parsimonious Error Correction Models

Dependent Variable: ΔLNPVI (Variant 1)			Dependent Variable: ΔLNPVI (Variant 3)		
	General	Parsimonious		General	Parsimonious
Variable	Coefficient	Coefficient	Variable	Coefficient	Coefficient
Constant	-0.07 (-0.84)	-2.63 (-1.57)	Constant	-0.05 (-0.61)	-0.02 (-0.438)
Δ LNPVI(-1)	0.25 (1.30)	0.22 (1.36)	Δ LNPVI(-1)	0.25 (1.28)	0.32** (2.146)
Δ LNRGDP	0.65 (0.49)	-------------	Δ LNRGDP	0.49 (0.34)	----------
Δ LNRGDP(-1)	0.38 (1.08)	0.54*** (1.80)	Δ LNRGDP(-1)	0.24 (0.79)	-----------
Δ LNBCP	0.61 (1.62)	0.67* (3.17)	Δ LNBCP	0.33 (1.36)	0.33 (1.47)
Δ LNBCP(-1)	-0.51 (-1.40)	-0.59** (-2.32)	Δ LNBCP(-1)	-0.33 (-1.34)	-0.22 (-1.15)
Δ LR	-0.002 (-0.49)	------------	Δ LR	-0.002 (-049)	---------
ΔLR(-1)	-0.0001 (-0.04)	------------	ΔLR(-1)	0.003 (1.13)	0.004 (1.31)
Δ LNPCE	-0.04 (-0.20)	------------	Δ LNPID	0.10 (1.45)	0.12*** (1.85)
Δ LNPCE(-1)	0.12 (0.59)	0.26 (1.54)	Δ LNPID(-1)	0.11 (1.36)	0.10 (1.40)
ECM(-1)	-0.72* (-3.24)	-0.80* (-5.16)	ECM(-1)	-0.72* (-3.10)	-0.74* (-4.55)
R^2	0.59	0.608	R^2	0.63	0.612
Sum sq. Resids	1.40	1.33	Sum sq. resids	1.27	1.31
F-statistic	2.69	5.94	F-statistic	3.18	4.95
S.E equation	0.27	0.24	S.E equation	0.26	0.244
D-Watson	1.98	1.91	D-Watson	2.05	2.13

Note '*' , '**' and '***' indicate significance at the 1 percent, 5 percent and 10 per cent respectively

Table 4 Contd.,: General and Parsimonious Error Correction Models

Dependent Variable: ΔLNPVI (Variant 4)			Dependent Variable: ΔLNPVI (Variant 5)		
	General	parsimonious		General	parsimonious
Variable	Coefficient	Coefficient	Variable	Coefficient	Coefficient
Constant	-0.04 (-0.40)	-0.05 (-0.67)	Constant	-0.02 (-0.25)	-0.04 (-0.80)
Δ LNPVI(-1)	0.31 (1.31)	0.24*** (1.99)	Δ LNPVI(-1)	0.37*** (1.85)	0.31*** (1.77)
Δ LNRGDP	0.84 (0.56)	0.74 (0.612)	Δ LNRGDP	-0.36 (-0.26)	-------------
Δ LNRGDP(-1)	0.07 (0.19)	------------	Δ LNRGDP(-1)	0.16 (0.36)	0.08 (0.32)
Δ LNBCP	0.18 (0.59)	0.21 (0.74)	Δ LNBCP	0.49*** (1.85)	0.51** (2.09)
Δ LNBCP(-1)	-0.26 (-0.85)	-----------	Δ LNBCP(-1)	-0.13 (-0.45)	-----------
Δ LR	-0.001 (-0.41)	-0.001 (-0.25)	Δ LR	-0.001 (-0.27)	- 0.001 (-0.35)
ΔLR(-1)	0.002 (0.63)	------------	ΔLR(-1)	0.002 (0.68)	-----------
Δ LNPIED	0.17 (1.47)	0.62*** (1.74)	Δ LNPIHE	-0.09 (-0.91)	-0.08 (-0.89)
Δ LNPIED(-1)	0.06 (0.47)	----------	Δ LNPIHE(-1)	-0.10 (-1.00)	-0.12 (-1.42)
ECM(-1)	-0.62** (-2.61)	-0.62* (-3.10)	ECM(-1)	-0.79* (-3.67)	-0.75* (-4.46)
R^2	0.53	0.491	R^2	0.57	0.54
Sum sq. resids	1.59	1.73	Sum sq. resids	1.47	1.55
F-statistic	2.16	3.69	F-statistic	2.47	3.71
S.E equation	0.29	0.274	S.E equation	0.28	0.27
D-Watson	1.90	1.79	D-Watson	1.78	1.74

Note '*' , '**' and '***' indicate significance at the 1 percent, 5 percent and 10 percent respectively

Table 4 Contd.,: General and Parsimonious

Error Correction Models

Dependent Variable: ΔLNPVI (Variant 6)		
	General	parsimonious
Variable	Coefficient	Coefficient
Constant	-0.03 (-0.35)	-0.02 (-0.31)
Δ LNPVI(-1)	0.36*** (1.75)	0.31*** (1.79)
Δ LNRGDP	0.48 (0.36)	-------------
Δ LNRGDP(-1)	0.04 (0.14)	-0.16 (-0.65)
Δ LNBCP	0.25 (0.82)	0.27 (1.04)
Δ LNBCP(-1)	-0.29 (-1.02)	----------
Δ LR	-0.004 (-1.13)	-0.003 (-0.95)
ΔLR(-1)	0.001 (0.20)	-----------
Δ LNPITCM	0.08 (0.87)	0.10 (0.24)
Δ LNPITCM(-1)	0.006 (0.05)	-----------
ECM(-1)	-0.85* (-3.12)	-0.87* (-4.58)
R^2	0.57	0.53
Sum sq. Resids	1.45	1.58
F-statistic	2.53	4.36
S.E equation	0.28	0.26
D-Watson	1.73	1.71

Note '*' , '**' and '***' indicate significance at the

1 percent, 5 percent and 10 percent respectively

1V. Diagnostic Tests

The evaluation of the statistical properties of the error correction models was done using a battery of diagnostic tests and which results are reported in tables 5A and 5B. The residuals of the error correction models were tested for normality using Jarque - Bera (1980) test, autocorrelation using Breusch (1978) – Godfrey (1978) LM test, and the autoregressive conditional heteroskedasticity (ARCH) test was based on Engle (1982). There is no evidence of serial correlation, autoregressive conditional heteroskedasticity (ARCH) and non-normality in both for the general and parsimonious error correction models. Similarly, the Ramsey RESET test does not show any evidence of misspecification. Summarily from the reports of the diagnostic tests the Error Correction Models seemed to be well specified.

Table 5A: Diagnostic test Statistics for the General Error Correction models

	Variant 1	Variant 3	Variant 4	Variant 5	Variant 6
Normality	χ^2 = 0.29 [0.865]	χ^2 = 1.223 [0.542]	χ^2 = 0.071 [0.965]	χ^2 = 1.762 [0.414]	χ^2 = 0.104 [0.949]
Serial Correlation LM	χ^2 = 0.952 [0.621]	χ^2 = 0.573 [0.751]	χ^2 = 2.004 [0.367]	χ^2 = 2.250 [0.325]	χ^2 = 1.747 [0.418]
Heteroscedasticity ARCH	χ^2 = 0.152 [0.696]	χ^2 = 0.029 [0.865]	χ^2 = 0.147 [0.701]	χ^2 = 0.001 [0.977]	χ^2 = 0.010 [0.919]
Ramsey RESET	F(1,18) = 0.338 [0.568]	F(1,18) = 0.101 [0.754]	F(1,18) = 0.077 [0.784]	F(1,18) = 0.360 [0.556]	F(1,18) = 0.044 [0.837]

Table 5B: Diagnostic test Statistics for the Parsimonious Error Correction models

	Variant 1	Variant 3	Variant 4	Variant 5	Variant 6
Normality	χ^2 = 0.705 [0.703]	χ^2 = 1.085 [0.581]	χ^2 = 0.637 [0.727]	χ^2 = 2.43 [0.296]	χ^2 = 0.44 [0.80]
Serial Correlation LM	χ^2 = 0.932 [0.628]	χ^2 = 1.482 [0.477]	χ^2 = 2.65 [0.266]	χ^2 = 2.781 [0.249]	χ^2 = 2.26 [0.32]
Heteroscedasticity ARCH	χ^2 = 0.734 [0.392]	χ^2 = 0.043 [0.836]	χ^2 = 0.961 [0.327]	χ^2 = 0.045 [0.832]	χ^2 = 0.024 [0.877]
Ramsey RESET	F(1,22) = 0.196 [0.662]	F(1,21) = 0.195 [0.663]	F(1,21) = 0.061 [0.807]	F(1,21) = 0.401 [0.534]	F(1,22) = 0.401 [0.533]

6. CONCLUSION AND POLICY RECOMMENDATIONS

This paper adopts an error correction framework to understand the dynamic relationship between central government, aggregate and sectoral public investment expenditure and private investment in Nigeria from 1980 - 2011. A neoclassical investment model within an error correction framework was however, found suitable for this study. Six variants of the private investment model were examined and each variant consists of a public investment expenditure variable and user's cost of capital (proxy by real prime lending rate), bank credit to the private sector, and output (measured by real GDP). The examination of the dynamic properties of the series in the six variants revealed that the variables are non-stationary.

From the cointegration analysis it is established that there exist long run relationship between private sector investment and aggregate central public investment expenditure, central public investment expenditure in education, defense, health and transportation and communications with the exception of variant (2) which contained the central public investment expenditure in agriculture and natural resources. Similarly, there also exists long run relationship between the private sector investment and output, user's cost capital and bank credit to the private sector in all the variants except variant (2).

The estimates of the long run equations for the variants of the private sector investment model reveal crowding in effects of central government investment expenditure in defence, health and transportation and communications. Similarly, central government aggregate investment expenditure has crowding in effect but not significant at the conventional levels. Central government investment expenditure in education is found to crowd out private sector investment, but not statistically significant. Output is found to stimulate private sector investment when modelled with central government investment expenditure in defence, health and transportation and communications. Analogously, bank credit to private sector promotes private investment in all the variants with the exception of variant (6). The negative relationship between user's costs of capital is only significant when modelled with central government investment expenditure in defence and transportation and communications.

Estimates of the short run dynamic equations reveal crowding in effects of changes in central government investment expenditure in defence and education. The short run estimates, though not statistically significant, of central government aggregate investment expenditure and government investment expenditure in transportation and communications are positive while public investment expenditure in health is negative. The change in private sector investment is determined by its last period value in the short run in all the variants except variant (1). Change in bank credit to private sector has positive effect on change in private sector investment in variants (1) and (5). Similarly, output is found to have significant positive effect on private sector investment in variant (1).

Government should give more priority to sectoral government investment expenditure rather than aggregate government investment expenditure. Equally of great importance is the need for government policy on investment spending to favour sectors that stimulate private sector capital formation.

REFERENCES

1. Abdullatif Alani, Emad. (2006).“Crowding-out and Crowding-in Effects of government Bonds Market on Private Investment (Japanese Case Study)". *Institute of Developing Economies Discussion Paper No. 74*
2. Ariyo, A and MI Raheem .(1991). “Effect of Fiscal Deficit on some Macroeconomic Aggregate in Nigeria.” Final Report Presented at AERC in Nairobi
3. Aschauer, D. (1989a). “Is Public Expenditure Productive?” *Journal of Monetary Economics*, 23(1), 177-200
4. Aschauer, D. (1989b). “Does public capital Crowd-out Private Capital?” *Journal of Monetary Economics*, 23(2), 171-188
5. Aschauer, D. (1993). “Genuine Economic Returns to Infrastructure Investment.” *Policy Studies Journal*, 21(1), 380-390
6. Balasubramanyam , VN and Salisu, M and Sapsford, D .(1996). “Foreign Direct Investments and Growth in EP and IS Countries.” *Economic Journal*, 106(434) pages 92-105.
7. Blejer, Mario and Moshin Khan .(1984). “Government Policy and Private Investment in Developing Countries.” *IMF Staff Papers* 31: 379-403.
8. Blomstorn M and Lipsey R.E, and Zejan M .(1996). “Is fixed Investment the Key to Economic Growth?” *NBER Working Papers*, 4436, National Bureau of Economic Research, Inc.
9. Buiter, W. (1977). “Crowding-out and the Effectiveness of Fiscal Policy”, *Journal of Public Economics*, 7(1), 309-328
10. Chete, L.N. and Akpokodje, D .(1997). “Macroeconomic Determinants of Domestic Private Investment in Nigeria: An Empirical Exploration.” *CBN Economic and Financial Review*, Vol. 35 pp.345-403.
11. Cruz, O. B. and Teixeira J.R. (1999). “Modelling Private Investment in Egypt.” *Journal of Development Economics* 39 (2): 263-77
12. De long. J Bradford and Summers, Lawrence H .(1991). “Equipment Investment and Economic Growth.” *The Quarterly Journal of Economics* 106(2), 445-502.
13. Eisner, R and R. Strotz. (1963). Determinants of Business Investment: Impacts of Monetary Policy Prentice- Hall
14. Ekpo, A.H . (1995). ‘‘Government Policy and Foreign Private Investment in Nigeria, 1960-1996.’’ Final Report Submitted to African Economics Research Consortium, Nairobi, Kenya.
15. Erden, L. and G. Holcombe. (2005). “The effects of public investment on private investment in Developing Economies,” *Public Finance Review* Vol. 33No. 5.
16. Greene, Joshua and Delano Villanueva .(1991). “Private investment in developing countries: An Empirical Analysis.” *IMF staff Paper* 38(1): 33-58
17. Habib Ahmed and Stephen Miller. (1999). “Crowding-Out and Crowding-In Effects of the Components of Government Expenditure. University of Connecticut, Department of Economics” *Working Paper Series* 1999-02.
18. Jorgenson, D.W. (1963). “Capital Theory and Investment Behaviour”. *American Economic Review* 53, No. 2 (May) 247-259.
19. Jorgenson D.W . (1971). “Econometric studies of investment behaviour: A Survey.” *Journal of Economic Literature* 1111-1147.
20. Khan, Moshin and M. Reinhar .(1990). “Private Investment and Economic Growth in the Developing Countries.” *World Development* 18(1): 19-27.
21. Khan, Moshin and M.S Kumar. (1997). “Public and Private Investment and the Growth Process in

Developing Countries." *Oxford Bulletin of Economics and Statistics* 59:69-88

22. Karagol, Erdal .(2004). "A Disaggregated Analysis of Government Expenditures and Private Investment in Turkey." *Journal of Economic Cooperation*, Vol.25 Nos.2 Pp.131- 144.
23. Laopodis, N,T. (2001). "Effects of Government Spending on Private Investment." *Applied Economics*, 33, Pp. 1563-1577
24. Larrain F, and R, Vergara .(1993). Investment and Macroeconomic Adjustments: *The Case of East Asia in Striving for Growth after Adjustment: The Role of Capital Formation, ed. by L. Serven, and A. Solimano, (Washington: World Bank) pp.229-74*
25. De Long, J Bradford and Summers, Lawrence H .(1991). "Equipment Investment and Economic Growth." *The Quarterly Journal of Economics,* 106(2), 445-502.
26. Mamatzakis, E.C.(2001). "Public spending and private investment: Evidence from Greece." *International Economic Journal*, 15(4), pp 33-46
27. Munnel ,A.H. (1992). "Policy watch: Infrastructure investment and economic growth." *The Journal of Economic Perspectives*, 6(4), Pp 189-198
28. Musalem, A. (1989). "Private Investment in Mexico: An Empirical Analysis." *Working Papers*, No. 183, Washington, D.C. World Bank.
29. Namzi, N. and M. Ramirez .(1997). "Public and Private Investment and Economic Growth in Mexico." *Contemporary Economic Policy*, vol. 15, No. 1, Huntington beach, California,Western Economic Association
30. Oshikoya ,Temitope W. (1994). "Macroeconomic Determinants of Domestic Private Investment in Africa: An Empirical Analysis." *Economic Development and Cultural Change* 42 :573 – 96
31. Pandahan L, Ratha D Sarma A, (1990). "Complementarity between Public and Private Investment in India." *Journal of Development Economics* 33 (1), 101-116
32. Pelgrin F, S Schich, and A de Serres .(2002). "Increases in Business Investment Rates in OECD Countries in the 1990: How much can be Explained by Fundamentals?" *Economic Development Working Paper* no.327, OECD, Paris.
33. Pereira, A.M. (2001). "On the Effect of Public Investment on Private Investment: What Crowds in What." *Public Finance Review*, 29(1), pp 3-25
34. Ram, R. (1986). "Government Size and Economic Growth: A New Framework and some Evidence from Cross-section and Time-series Data." *American Economic Review,* vol.76, No.1.
35. Rama, M. (1993). Empirical Investments Equations in Developing Countries, in Striving for Structural Adjustment: Role of Capital Formation by Serven L, and A, solimano, Eds.,The world bank, Washington D.C, 107-146
36. Ramirez, M.D.(2000). "The Effect of Public Investment on Private Investment Spending in Latin America, 1980-95." *Atlantic Economic Journal*, 28, 210-25.
37. Rossiter R. (2002). "Structural Cointergration Analysis of Private and Public Investment." *International Journal of Business Economics*, 1(1), 59-67
38. Sant'Ana, T., C.H. Rocha and J.R. Teixeira .(1994). "The Impact of Public Investment on Private Capital Formation in Brazil; 1965-1985," *Proceedings of the Brazilian Meeting on Operational Research*, No. 26, Curitiba.
39. Shafik, N. (1992). Private investment public policy: The Egyptian case, in A. Chibber, M Dailami and N. Shafik, Reviving Private Investment in Developing Countries: Empirical Studies and Policy lessons, Amsterdam, Netherlands, North-Holland Publishing Company.
40. Serven , L .(2002). "Real Exchange Rate Uncertainty and Private Investment in Developing Countries". *World Bank Policy Research Working Paper*, no 2823.

41. Serven L, and A Solimano .1992. "Private Investment and Macroeconomic Adjustments: A Survey." *World Bank Research Observer* 7(1), 95-114.
42. Serven L, and A Solimano .(1993). Economic Adjustments and Investment Performance in Developing Countries: the Experience of the 1980's, in striving for Structural Adjustment : the Role of Capital Formation by Serven L and A, Solimano, Eds, The World Bank: Washington D.C.,147-180.
43. Udah, Enang .(2010). "Macroeconomic Reforms, Government Size and Investment Behavior in Nigeria: An Empirical Investigation." *Journal of Sustainable Development in Africa* Vol.12 No.1.
44. Wai. T.U., and C. Wong .(1982). "Determinants of Private Investment in Developing Countries." *Journal of Development Studies* pp. 19-36.
45. Wang, C .(2005). "Effects of Government Expenditure on Private Investment: Canadian Empirical Evidence." Empirical Economics, 30(2), 123-136.