European Journal of Social Sciences
ISSN 1450-2267 Vol. 51 No 2 February, 2016, pp.193-205
http://www.europeanjournalofsocialsciences.com/

The Nexus between Government Investment Expenditure and Private Investment in Ghana

Robert Becker Pickson
Research and Consultancy Center
University of Professional Studies, Accra-Ghana

Grace Ofori-Abebrese
Department of Economics
Kwame Nkrumah University of Science and Technology, Kumasi-Ghana

Abstract

This study employs both ARDL model and Granger causality test to examine and test the direction of causality between government investment expenditure and private investment in Ghana for the period 1970 to 2013. The study revealsthat, in both long run and short run, government investment expenditure has an insignificant negative impact on private investment. It is also established that there isa bi-causal relationship between government investment expenditure and private sector investment in Ghana. Based on the bi-causal relationship, the study advocates the need for government to invest more in physical infrastructure and human capital in order to reverse the negative and insignificant effect of government investment expenditure on private investment.

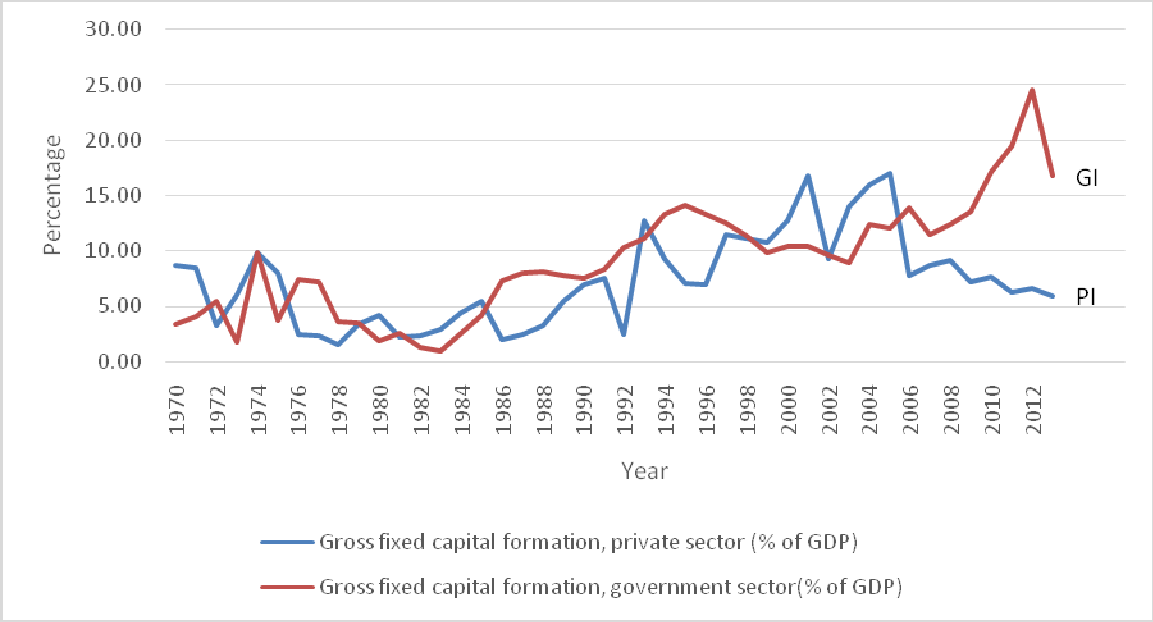
Keywords: Government investment expenditure, private investment, ARDL, Granger causality

1. Introduction

The issue of whether government investment expenditure crowds out or crowds in private investment has been a ground for strong controversy in economic theory and policy. The relationship between the two types of investment has a strong implications for determining government policy to promote economic growth. For this reason, the efforts being made by the government of Ghana in an attempt to increase its investment contributions to GDP may have repercussions on the activities of the private sector. David and Scadding (1974) postulate that an increase in government investment expenditure may crowd out private investment if government investment expenditure is tax-financed. In instances where government sector competes with the private sector for available scarce resources, proponents of free markets argue that government intervention must be minimised for the private sector to assume its role as the engine of growth.

A look at the trends in government and private investment in Ghana for the period under study reveals the following:

Figure 1: Government and private investment



Source: Authors' construct

From figure 1, private sector investment dwindled particularly during the 1980s since it declined from 8.0% in the year 1975 to 2.9% in 1983 and 4.4% in 1984 to 2.5% in 1992. Thereafter, private investment improved from 2.5% in 1992 to 12.7% in 2000, 16.7% in 2001 to 17.0% in 2005, but it eventually declined to 6.0% in 2013. This dismal performance of private investment was in contrast to the growth of government investment as a percentage of GDP.From a low of 3.4% in 1970, government investment grew sharply to 7.4% in 1976, but later declined to 0.9% in 1983. Government investment rose from 2.5% in 1984 to 10.3% in 1992. Between 1992 and 2004, the increase in government investment was averaged around 11.3%, and that continued as there was gradual improvement reaching 24.5% in 2012. Since then, it finally dropped to 16.7% in the period of 2013.

In view of the performance of government investment, the speed and strength of private sector response has not been satisfactory. It is thus important to establish whether efforts being made by the government of Ghana with regard to its investment contributions are thwarting or fostering private sector's incentive to invest.

Nevertheless, most of the existing literature on the subject matter in Ghana, for example, Asante (2000), Ibrahim (2000), Akpalu (2002), Frimpong and Marbuah (2010), and Eshun, Adu and Buabeng (2014) have focused on the determinants of domestic private sector investments and as a result of little attention in terms of empirical study has exclusively been paid to the nature of association between government investments and private investment.This paper therefore seeks to determine the relationship existing between government investment expenditure and private investment. Finally, this paper examines the direction of causality between private investment and government investment expenditure in Ghana.

2. Review of Related Literature

A number of authors has carried out several empirical studies on private investment. Some of these incorporate the relationship between private sector investment and government investment. The studies reviewed are cases carried out in different economies.

Zemguliene (2012) applied Cobb- Douglas production function to explore the nature of association between government investment expenditure and private sector productivity in Lithuania and Euro area economies. The study used quarterly data for the period of 2000 - 2010. The regression

results revealed that government investment expenditure has negatively significant impact on private sector investment for both Lithuania and the Euro area countries.

Sineviciene (2015) used cross-correlation and Granger causality test to examine the relationship between government expenditure and private investment in small open economies like Bulgaria, Estonia, Latvia, Lithuania, and Slovenia during 1996-2012. The results indicated that there is a very weak relationship between government and private investment, yet in the case of Bulgaria, government expenditure is negatively related to private investment.

Makuyana and Odhiambo (2014) explored the dynamics of public and private investment in Malawi using data from 1964 to 2011. The evolution of the two components of investment in Malawi is a product of the market intervention and market-based policies. The researchers pointed out that due to the centralized economic management system, public investment increased rapidly, particularly between 1964 and 1980 which thereby caused crowding outof private investment growth.

By the use of flexible accelerator theory, Muyambiri, Batuo, Chiwira, and Ngonidzashe (2012) examined the relationship and the direction of causality between private and public investment in Zimbabwe utilizing yearly time series data for the period 1970 to 2007. A cointegration approach and vector error correction model were employed to assess the relationship existing between public and private investments. The relationship between private and public investment was found to be insignificant and direction of causality found to be unidirectional. The study findings supported the contention that private investment precedes public investment.

In a study of private investment and public investment in Sudan, Badawi (2003) employed a Co-integrated Vector Autogressive model to examine the complementarity and substitutability of government investment to private sector investment activities in a neoclassical growth framework. The results showed that both government and private investment have boosted economic growth in Sudan in the periods of 1970-1998. The impact of private investment on real growth was more pronounced than that of government investment. Government investment was realised to have adversely affected the expansion of private sector since the impact of substitutability categories of governmentsector investment has been larger enough to offset any complementarity effects. Such crowding out effect has weakened favourable positive impact that government investment has exerted on growth by jeopardizing the activities of the private sector. The results revealed that for while both government and private sector investments to have a profound effect on real output, in the short run, government investment causes a crowding out effect on private investment, and thus negatively affects real growth.

Adugna (2013) applied OLS regressions and Engle and Granger Two Step Approach to examine the factors that influence private investment in Ethiopia for the period 1981 to 2010. In the long run, the study results indicated that government investment, real GDP per capita, and external debt have played significant role in enhancing the levels of private sector investment.

Ajide and Lawanson (2012) employed Autoregressive Distributed Lag (ARDL) to model the factors that influence private investment in Nigeria over the span of 1970 to 2010. The study proved thatreal GDP, real interest rate, credit to private sector, real exchange rate in Nigeria, during the period of study, had sought to impact positively on the activities of the private investment. Meanwhile, public investment was detrimental to the development of private sector in both long and short runs. Real GDP was the only variable that facilitates private sector investment in the short run.

Oriavwote and Oyovwi (2013) employed cointegration approach to determine the behaviour of private investment in Nigeria with data which covered the period of 1980-2011. The study showed that real exchange rate has influenced private investment as it indicated international attractiveness through expanding export to generate the needed level of private investment in Nigeria. However, inflation rate has a negative significant sign which was disadvantageous to the improvement of private investment. The result was not consistent to the study conducted by Ajide and Lawanson (2012).

Njimanted and Mukete (2013) considered the relationship between government expenditure and private investments in Cameroon, using secondary data from 1980 to 2012. The study used Vector

Autogressive technique of estimation. The results of the study discovered that government expenditure insignificantly complements private investment.

In the situation of Ghana, Frimpong and Marbuah (2010) used an ARDL framework to investigate the determinants of private investment using yearly time series data from 1970-2002. The studyfocused on crucial policy-relatedmacroeconomic variables that havehad substantial effects on private sector investmentin Ghana during the study period.The study discovered that in the short run, private investment is determined by government investment, inflation, real interest rate, trade openness, real exchange rate, and a constitutional rule regime. Yet,realoutput,inflation,externaldebt, real interestrate, openness and real exchange rate considerablyimpacted on private investmentreactioninthe long-run. The findings reached in the long term showed that there is undoubtedly an increase in real output or conditions of aggregate demand is the driving force of private investment growth in Ghana.

Asante (2000) used the Ordinary Least Squares estimation technique to determine the performance of privateinvestmentinGhanausing annual dataovertheperiods of 1970 to 1992. He found public investment to crowd in private investment therebybuttressing thehypothetical propositionbetweenthesetwovariables. The study found in addition that, growth rate of real credit to the private sector was significant with a positive sign in all tests. The measure of macroeconomic instability had a negative but significant effect on private investment.

Akpalu (2002) applied Engle-Granger two step approach with the Johansen multivariate test in modelling private investment in Ghana. He made use of yearly time series data in the period of 1970 to 1994, on privateinvestment,governmentinvestment,realGDP,inflation,lendingRate, bank credit to the private sector, and GDPper capita tomodel the determinantsofprivateinvestment.The study foundthat, in the short run, private investmentfurther reactedwith the increasein real GDP percapita, bank credit to the private sector, and governmentinvestments. It was attained that public investment negatively impact on private investment. The nature of interaction between cost of capital and private investment was a significant negative in both long and short runs. Again, the linkage between private investment and real GDP was obtained as a significant positive in both situations of short and long run. The study findings thus affirmed the acceleratortheoryof investment in Ghana.

Islamand Wetzel (1991), in a World Bank Study used Ordinary Least Squares (OLS) to experientially scrutinize the association between real private sector investment on one leg and real government investment/GDP, corporate tax revenues/GDP, credit to the private sector /GDP, real rate of interest and a dummyfor 1976. As there was a great and unexplained declined in private sector investment in that given year, the dummy for 1976 was added. The study found an inverse relationship between real private investment and government investment inGhana. The study therefore assumed that, government deficits negatively affected private investment and that government far-reaching credit need, has greatly cut the private investors access to loans.

3. Study Methodology

3.1 Model Specification

Following Blejer and Khan (1984), flexible accelerator model is formulated to capture the relationship between government investment expenditure and private investment. The flexible accelerator model assumes that in the long run steady state, private sector's capital stock is in proportion to the level of expected output.

$$K_t^* = \alpha Y_t^* \quad (1)$$

where K_t^* = The desired capital stock for the private sector in time t,

Y_t^* = Desired level of output at time t.

The actual private capital stock is assumed to adjust to the difference between the desired stock in time t and the actual stock in the lagged period t-1.

$$\Delta PC_t = \beta(PC_t^* - PC_{t-1}) \quad (2)$$

Or $PC_t = \beta PC_t + (1-\beta)PC_{t-1}$ (3)

where β is the coefficient of adjustment or adjustment speed, for $0 \leq \beta \geq 1$

If $\beta = 1$, there is instantaneous adjustment of capital stock to its desired level

If $\beta = 0$, there is no adjustment at all

ΔPC_t = Net private investment, which is the change in the actual private investment between two time periods.

Gross private investment in general terms can be written as:

$PC_t^* = \Delta K_t^* \mid \lambda K_{t-1}^*$ (4)

Where ΔK_t^* = Change in the actual capital stock at time t,

λK_{t-1}^* = Replacement investment

λ = Rate of depreciation of private capital stock

Given $\Delta K_t^* = K_t^* - K_{t-1}^*$, it implies that:

$\Delta PC_t^* = K_t^* - K_{t-1}^* + \lambda K_{t-1}^*$ (5)

Considering lag operator sign

$PC_t^* = [1-(1-\lambda)L]K_t^*$ (6)

L is the lag operator which is expressed as $LK_t^* = K_{t-1}^*$. That is changing equation (5).

Given the fact that time is needed to plan and acquire the necessary capital goods and investment information, assumption is made of a lag between the period in which the investment decision is made and the time investment actually materializes (Blejer and Khan, 1984). Therefore, a break is indicated between actual and desired investment as a partial adjustment mechanism as expressed in equation (2).

$\Delta PC_t = \beta(PC_t^* - PC_{t-1})$

for β is the speed of adjustment (adjustment coefficient).

The adjustment coefficient (β) determines the response of the private sector investment to the gap between the actual and desired capital stock. The speed of adjustment is presumed to diverge consistently based on prevailing economic policies to attain the desired level of capital stock.

In the words of Khan (2000), government investment expenditure on transports, communication, education, and energy may have crowd-in effect on private investment in developing economies like Ghana. But, government investment expenditure which results in huge fiscal deficits causes an increase in interest rates and this presumably has a negative impact on the speed of adjustment. Further, the Keynesians are of the viewpoint that an increase in interest rate raises the user's cost of capital which discourages investment, thereby leading to a decrease in the desired capital stock. This clearly gives an indication that interest rate is inversely related to the desired capital stock. Again, rising rates of inflation adversely impact the activities of the private investment by worsening the riskiness of long-term investment projects, hence reducing the average maturity of commercial loans. In effect, this study includes government investment expenditure to the adjustment coefficient. Other important variables of interest are real interest rate and real inflation. In order to fend off the problem of misspecification, this paper observes Asante (2000), Frimpong and Marbuah (2010), Fowowe (2011) and Muyambiri et al., (2012) whose studies included other important variables in the private sector investment equation centered on accelerator theory and uncertainty variables.

From the above argument, the adjustment coefficient is expressed as follows:

$$\beta_t = z_0 + \frac{1}{PC_t - PC_{t-1}}[z_1 GIE + z_2 INFL + z_3 RIR] \quad (7)$$

where GIE is the government investment expenditure, $INFL$ denotes the inflation, and RIR represents the real interest rates.

Substitute equation (7) into equation (2) to obtain the following expression:

$\Delta PC_t = z_0[PC_t - PC_{t-1}] + z_2 GIE + z_2 INFL + z_3 RIR$ (8)

Substituting equation (6) into equation (2), the net investment can be expressed as:

$\Delta PC_t = \beta[1-(1-\lambda)L]K_t^* - PC_{t-1} = PC_t - PC_{t-1}$ (9)

Substituting equation (1) into equation (9), the net investment is given as:

$$\Delta PC_t = \beta[1-(1-\lambda)L]\alpha Y_t^* - PC_{t-1} = PC_t - PC_{t-1} \quad (10)$$

From equation (10), the equation (8) thus becomes:

$$\Delta PC_t = z_0\{[1-(1-\lambda)L]\alpha Y_t^* - PC_{t-1}\} + z_2 GIE + z_2 INFL + z_3 RIR \quad (11)$$

$$\Delta PC_t = z_0[1-(1-\lambda)L]\alpha Y_t^* - z_0 PC_{t-1} + z_1 GIE + z_2 INFL + z_3 RIR \quad (12)$$

$$PC_t - PC_{t-1} = z_0[1-(1-\lambda)L]\alpha Y_t^* - z_0 PC_{t-1} + z_1 GIE + z_2 INFL + z_3 RIR \quad (13)$$

$$PC_t = z_0[1-(1-\lambda)L]\alpha Y_t^* - z_0 PC_{t-1} + PC_{t-1} + z_1 GIE + z_2 INFL + z_3 RIR \quad (14)$$

$$PC_t = z_0[1-(1-\lambda)L]\alpha Y_t^* + (1-z_0)PC_{t-1} + z_1 GIE + z_2 INFL + z_3 RIR \quad (15)$$

Here, gross private sector investment is acquired which involves expected demanded, government investment expenditure, real gross domestic product, and real interest rate as exogenous variables as stated in equation (16) below:

$$PC_t = z_0\alpha[1-(1-\lambda)L]Y_t^* + (1-z_0)PC_{t-1} + z_1 GIE + z_2 INFL + z_3 RIR \quad (16)$$

Considering rational expectations, the observed value, Y_t is used to represent the targeted value, Y_t^*. In this case, equation (16) will be written as:

$$PC_t = z_0\alpha[1 \quad (1 \quad \lambda)L]Y_t \mid (1 \quad z_0)PC_{t-1} \mid z_1 GIE \mid z_2 INFL \mid z_3 RIR \quad (17)$$

$$PC_t = z_0\alpha[Y_t - (1-\lambda)Y_{t-1}] + (1-z_0)PC_{t-1} + z_1 GIE + z_2 INFL + z_3 RIR \quad (18)$$

$$PC_t = z_0\alpha Y_t - z_0(1-\lambda)Y_{t-1} + (1-z_0)PC_{t-1} + z_1 GIE + z_2 INFL + z_3 RIR \quad (19)$$

$$PC_t = z_0\alpha Y_t + z_0(\lambda-1)Y_{t-1} + (1-z_0)PC_{t-1} + z_1 GIE + z_2 INFL + z_3 RIR \quad (20)$$

$$PC_t = a_0 + a_1 Y_t + a_2 Y_{t-1} + a_3 PC_{t-1} + a_4 GIE + a_5 INFL + a_6 RIR \quad (21)$$

where $a_0 = a_0$, $a_1 = z_0 Y_t$, $a_2 = z_0(\lambda-1)$, $a_3 = (1-z_0)$, $a_4 = z_1$, $a_5 = z_2$, $a_6 = z_3$

Again, since $PC_t = PC_{t-1}$ and $Y_t = Y_{t-1}$ in the long run, equation (21) can thus be written as:

$$PC_t = a_0 + a_1 Y_t + a_2 Y_t + a_3 PC_t + a_4 GIE + a_5 INFL + a_6 RIR \quad (22)$$

$$PC_t = a_0 + (a_1 + a_2)Y_t + a_3 PC_t + a_4 GIE + a_5 INFL + a_6 RIR \quad (23)$$

$$PC_t \quad a_3 PC_t = a_0 \mid (a_1 \mid a_2)Y_t \mid a_4 GIE \mid a_5 INFL \mid a_6 RIR \quad (24)$$

$$PC_t = \frac{a_0}{1-a_3} + \frac{a_1+a_2}{1-a_3}Y_t + \frac{a_4}{1-a_3}GIE + \frac{a_5}{1-a_3}INFL + \frac{a_6}{1-a_3}RIR \quad (25)$$

Eventually, the private investment is obtained as:

$$PC_t = \delta_0 + \delta_1 Y_t + \delta_2 GIE + \delta_3 INFL + \delta_4 RIR \quad (26)$$

where $\delta_0 = \frac{a_0}{1-a_3}$, $\delta_1 = \frac{a_2+a_3}{1-a_3}$, $\delta_2 = \frac{a_4}{1-a_3}$, $\delta_3 = \frac{a_5}{1-a_3}$, $\delta_4 = \frac{a_6}{1-a_3}$

and also $\delta_1 > 0$, $\delta_2 > or < 0$, $\delta_3 < 0$, $\delta_4 < 0$. For Y_t represents expected demand and it is proxied by GDP per capita.

The long run equilibrium relationship of equation (26) in view of a log-linear model is given as follows:

$$lnPC_t = \delta_0 + \delta_1 lnY_t + \delta_2 lnGIE + \delta_3 lnINFL + \delta_4 lnRIR + \varepsilon_t \quad (27)$$

where ln represents natural logarithm and ε_t indicates the error term. All other variables have been specified already.

3.2 Estimation Strategy

In attempt to avoid the problem of non-stationarity with time series data, Augmented Dickey-Fuller and Phillips-Perron Tests were used to validate the stationarity of the variables concerned. Further, the long run equilibrium relationship of equation (27) was examined using Autogressive Distributive Lag (ARDL) technique. The error correction model (ECM) type of ARDL assisted in estimating the short

run dynamic parameters. Specifically, the ECM helps in ascertaining the speed of adjustment to the equilibrium.

Although the presence of cointegration indicates Granger causality, it does not determine the direction of the causality. Granger causality test was therefore applied to determine the direction of causality between the variables.

3.3 Source of Data

This paper employed yearly time series data from 1970 to 2013 which were sourced from World Bank's Development Indicators 2015 CD-ROM, Aryeetey and Gockel (1991), Aryeetey and Baah-Boateng (2007), and Policy Integration Department, ILO, Geneva, Working Paper No. 80 from Bank of Ghana.

3.4 Definition of Variables and their Expected Signs

GDP per capita is gross domestic product divided by midyear population. The accelerator theory suggests that investment depends on changes in output. Thus, planned investment is often influenced by changes in aggregate demand for consumer goods as it will result in demand for capital goods. This implies that if the income of the populaces, in this GDP per capita increases, investment will increase in likewise manner and a decline in national income will result in a decrease in investment. Therefore GDP per capita is expected to have a positive influence on private investment (i.e. $\delta_1 > 0$).

Government investment expenditure was obtained by deducting gross fixed capital formation, private sector as a percentage of GDP from gross fixed capital formation as a percentage of GDP multiplied by real GDP (constant 2006, GH Cedis). Government investment can act as crowding-in catalyst via the provision of major infrastructure like transport, communication, and educations. Studying "the macroeconomic determinants of domestic private investment in Africa", Oshikoya (1994) noted thatthe relationship between private investment and government investment was positive.Hence, the exact expected impact of government investment expenditure on private investment is positive ($i.e.\ \delta_2 > 0$).

Inflation was proxied for consumer price index. High rates of inflation send out a signal that the government is unable to manage the economy properly and is a sign of instability. High and unpredictable inflation rates can be portrayed by investors as a sign that the government is losing control of the economy and thus discourage investor confidence. Thus, there exist a negative relationship between inflation rate and private investment (i.e.$\delta_3 < 0$).

The interest rate was proxied for lending rates. A high level of real interest rates raises the real cost of capital, and therefore dampens the level of private investment. Durdonoo (2004) indicates the same view when he contends that on theoretical grounds, borrowing to finance government investment expenditure results in crowding out through increased interest rates and this makes it impossible for the private sector to take advantage of the physical infrastructure which have been put in place by the government. Therefore, the expectation of the relationship between real interest rate and private investment is negative ($i.e.\delta_4 < 0.$).

Private sector investment also proxied by gross fixed capital formation, private sector as a percentage of GDP; private sector investment values were derived from real GDP (constant 2006, GH Cedis) by multiplying the percentages of private sector investment by the real GDP.

4. Empirical Results and Discussions

4.1 Test for Stationarity

Despite the fact that ARDL bound test technique can be applicable without pre-testing the variables of concern, the use of unit root test could disclose the order of integration for the various variables and

assure the researchers whether ARDL model could be applied or not. The results of unit root test are presented in the table below.

Table 1: Results of Unit Root Test

	Augmented Dickey Fuller		***Phillip Perron***	
Variable	***Level***		***Level***	
	No Trend	***Trend***	***No Trend***	***Trend***
LnPC	*-1.199*	*-3.356**	*-1.197*	*-3.386**
LnGIE	*-0.248*	*-2.048*	*-0.894*	*-3.105*
LnGDPC	*0.581*	*-0.792*	*0.946*	*-0.151*
LnINFL	*-2.675**	*-3.735***	*-3.874****	*-4.760****
LnRIR	*-1.559*	*-1.079*	*-2.481*	*-1.634*
	Augmented Dickey Fuller		***Phillip Perron***	
Variable	***First Difference***		***First Difference***	
	No Trend	***Trend***	***No Trend***	***Trend***
lnPC	*-6.976****	*-6.882****	*-9.440****	*-9.506****
lnGIE	*-4.713****	*-4.790****	*-9.700****	*-9.736****
lnGDPC	*-3.186***	*-4.948****	*-4.196****	*-6.011****
lnINFL	*-6.077****	*-6.242****	*-9.647****	*-9.976****
lnRIR	*-5.461****	*-5.746****	*-7.188****	*-7.326****

Note: ***, **, and * represent 1%, 5%, and 10% significance level respectively.

From Table 1, the Augmented Dickey Fuller method reported that private investment and inflation are stationary at 10% and 5% level of significance respectively. Whilst government investment expenditure, gross domestic product per capita and real interest rate exhibit a stochastic trend at 5 per cent significance level. Using Philip-Perron test, all the variables were confirmed stationary at the first difference.

4.2 Test for Long-run Relationship

Cointegration test is conducted to ascertain if there exists long-run relationship between private investment and the independent variables in order to perform the Granger causality test. Table 2 displays the tabular representation of the Bounds Test to Cointegration.

Table 2: Results and Analysis of Cointegration Test

Tests	***90% Lower Bound***	***90% Upper Bound***	***Cointegration Status***
*F-statistic 4.1161**	*2.7101*	*3.8204*	*Cointegrated*

* indicates the rejection of the null hypothesis at the 10% significant level
Source: Estimated and generated from Microfit 5.0

The Bounds test is conducted using the 'F' statistic. From Table2, the 'F' Statistic lies above the upper bound, thus rejecting the null hypothesis of no level effect. Here, the critical ARDL bounds test values for 90% confidence level is given by 2.7101 and 3.8204 for the lower and upper bounds respectively. The estimated F-statistic is 4.1161 which is greater than the upper bound and it is thus significant at 10%. Premised on this fact, it implies that there is long-run cointegration relationship between the estimated variables; that is private investment, government investment expenditure, gross domestic product per capita, inflation, and real interest rate at the time of the study in Ghana.

4.3 Estimated Long-run Relationships

Table 3: Estimated Long-run Coefficients using ARDL Approach
Dependent variable is lnPC. ARDL((1,0,0,0,0) selected based on Schwarz Bayesian Criterion 39 observations used for estimation from 1975 to 2013

Regressors	Coefficient	Standard Error	T-Ratio	Prob.
lnGDPC	2.7588	1.2042	2.2911	0.028
lnGIE	-0.12073	0.28271	-0.42705	0.672
lnINFL	-0.20057	0.22693	-0.88384	0.383
lnRIR	2.1531	0.62543	3.4426	0.002
Constant	-11.9325	6.9312	-1.7216	0.095

Calculated and generated from Microfit 5.0 *, **, *** denotes the rejection of the null hypothesis at the 10%, 5%, 1% significant level respectively.R^2, DW and F statistic are presented together with the short run results

In consonant with accelerator principle, GDP per capita was realised to have a positively significant relationship with the investment of the private sector in Ghana. This theory postulates that increase in national income moves in tandem with increase in investment as it is assumed that there is a fixed association between output level and the desired capital stock in the economy. The study then realised that a percentage increase in GDP per capita will lead to a 2.76% increase in private investment. This result agrees with the evidences from Akpalu (2002), Ibrahim (2000), and Mbanga (2002), Lesotho (2006) and Adugna (2013), as it rejects the results by Asante (2002).

From Table 3, government investment expenditure was found to be negatively related to private investment, yet it was not significant. It was identified that 1% increase in government investment expenditure caused private investment to decrease by 0.12%. Thus, an increase in government investment expenditure crowds – out private investment. This could be explained that both government and private sectors strive for the same resources in the economy. Economic theory suggests that if public investment is financed through borrowing it reduces loanable funds available to the private investor as it leads to an increase in interest rate, credit rationing and tax burden.Hence, it increases the cost of financing private investment. The finding confirms the studies of Islam and Wetzel (1991) and Akpalu (2002) who discovered that government investment expenditure inversely relates to private investment in Ghana, thereby suggesting a crowding-out effect of private investment caused by government investment expenditure. Similarly, Muyambiri et al., (2012) suggested there is a negative insignificant effect of government investment expenditure on private investment in Zimbabwe. However, this stands out against the results of the study conducted by Asante (2000), Frimpong and Marbuah (2010), Mbanga (2002), Njimanted and Mukete (2013), and Adugna (2013).

Consistently, the inflation coefficient was found to be negative but it was not significant. This indicates that a 1% rise in inflation will lead to 0.20% decline in private investment in Ghana. The sign of inflation as expected is based on the fact that any increase in the price level is passed on to increment in the interest rate which consequently impacts indirectly on the level of investment in the economy. This result was in conformity with theory which suggests that high rates of inflation give rise to a situation of macroeconomic uncertainty and by this means discourages private investment in an economy. The study ratifies the findings from Were (2001) for Kenya. However, the finding contradicts the evidence from Frimpong and Marbuah (2010) and Eshun et al; (2014) in the case of Ghana, as well as the results of Oriavwote and Oyovwi (2013) for Nigeria, and Adugna (2013) for Ethiopia.

In support of neoliberal standpoint, the study established that real interest rate was positively related to private investment, and it was obtained to be significant at 5% significance level. This implies that, if real interest rate increases by 1%, the activities of the private sector will be stimulated to increase by 2.15%. This may be true because an increase in real rate of interest will increase the amount of savings in the financial market, thereby increasing investible funds available for investment. The study result affirms the McKinnon and Shaw (1973) "complementarity" hypothesis in the Ghana. The coefficient of real interest rate was discovered to be positive and significant at the 5% significance level. This finding confirms the studies conducted by Asante (2000), Akpalu (2002) and Frimpong and

Marbuah (2010), and abandons the finding by Adugna (2013) which indicated that there is insignificant negative linkage between real interest rate and private investment in the long run.

4.4 Estimated Short-Run Relationships

Table 4: Estimated Short-run Error Correction Model using ARDL Approach
Dependent variable is lnPC. 39 observations used for estimation from 1975 to 2013 ARDL (1, 0, 0, 0, 0) selected based on Schwarz Bayesian Criterion

Regressors	*Coefficient*	*Standard Error*	*T-Ratio*	*Prob.*
ΔlnGDPC	*1.5223*	*0.67197*	*2.2654*	*0.030*
ΔlnGIE	*-0.0666*	*0.15150*	*-0.43975*	*0.663*
ΔlnINFL	*-0.11067*	*0.12931*	*-0.85589*	*0.398*
ΔlnRIR	*1.1881*	*0.30030*	*3.9562*	*0.000*
ECM(-1)	*-0.5518*	*0.12910*	*-4.2743*	*0.000*

R-square 0.85692 Adjusted R-square 0.83524
DW-statistic 2.2135 F-statistic F(5,33) 39.5286 (0.000)
Estimated and generated from Microfit 5.0 and *, **, *** denotes rejection of the null hypothesis at the10%, 5% and 1% significant level

The estimation procedure showed excellent result as the R-Square is 86% and the R-Bar-Squared is also 84%. The R- Square means that over 86% of all changes in the dependent variable are explained by all the independent variables. Thus, 86% of the variations in private investment is explained by government investment expenditure, gross domestic product per capita, inflation, and real interest rate. The F statistic also proved that all the independent variables are significant at 1%. The DW statistic of 2.2135 is evidence enough to reject the notion of autocorrelation in the function. The error correction term was highly significant at 1% and negative which is the appropriate sign for it. A coefficient of -0.5518 is indicative of the fact that approximately 55.2% of all disequilibria from the previous year's shock converges back to the long-run equilibrium in the existing year.

The expected demand which is proxied by the gross domestic product per capita, still preserved its significant positive. Given its coefficient of 1.5223 implies that a 1% increase in GDP per Capita fosters private investment to also raise by 1.52%. The study concurs with the accelerator principle because the desired level of capital stock is often considered as resulting from changes in demand and therefore variations in aggregate demand for consumer goods will lead to changes in demand for capital goods.

Similarly, the government investment expenditure was found to be negative and insignificant in the short – run. This means that in the event of any increment in government investment expenditure, private investment will decrease. Therefore, government investment expenditure is inclined to have a negative impact on private investment in Ghana, though it appeared insignificant during the study period. This result supports the finding reached by Badawi (2003) for Sudan. However, the study contrasts the outcome of Frimpong and Marbuah (2010) in the case of Ghana, and Ajide and Lawson (2012) for Nigeria.

Also, the inflation coefficient recorded a negative sign and it was not statistically significant in the short-run, which agreed with the findings in the long run. This implies that a percentage increase in the rate of inflation brings about 0.11% decrease in the level of private investment. This result is not consistent with the findings of Adugna (2013), and Eshun et al., (2014) whose studies reported that inflation was significant and negatively related to private investment in Ethiopia and Ghana respectively. The study result implies that the impact of inflation has been detrimental to the enhancement of private investment in Ghana but it was not significant at any of the significance levels.

Real interest rate also preserved its sign which means that it has a positively significant impact on private investment in the short run. It's coefficient of 1.1881 implies that a 1% rise in real interest rate can confer improvement in private sector investment of about 1.19%. This result does not ratify

the neoclassical theory which suggests that an increase in real interest rate will increase the cost of borrowing, hence lessening the capacity of the private investors to invest. Thus, on account of this finding, as real interest rate rises, private investment is anticipated to increase. This finding is similar to the outcome of Akpalu (2002), Frimpong and Marbuah (2010), and Adugna (2013), but it contradicts the results attained by Asante (2000) and Eshun et al., (2014).

4.5 Test for Granger Causality Test

Usually, the Granger causality test seeks to ascertain the direction of causality between the variables (Engel & Granger, 1987). In the sense of Granger causality test, F-statistic is used to determine whether current and lagged values of a given variable Y give some statistically significant evidence about another given variable say X in the existence of the lagged X.

Table 5: Granger Causality Test

Null Hypothesis	***Obs.***	***F-statistic***	***Prob.***
LnGIE does not Granger cause LnPC	*43*	*5.44941*	*0.0247***
LnPC does not Granger cause LnGIE		*7.75936*	*0.0081****

Note: *** and ** rejection of the null hypothesis at 1% and 5% significance level

From Table 5, it is obvious that the null hypothesis that changes in government investment expenditure do not granger cause private investment is rejected at 5% significance level. This implies that changes in government investment expenditure explain the variations in private investment. Same observation is made with government investment expenditure, the endogenous variable. The null hypothesis of no causality running from private investment is rejected at 1% significance level. This means that changes in government investment expenditure is influenced by changes in private investment.

From the analysis of the results, there is a dependence of the private investment to the changes in government investment expenditure and the reverse is true at 5% and 1% level of significance respectively. Therefore, there is bi-directional relationship between government investment expenditure and private investment in Ghana. This study finding contradicts the result of the study conducted by Muyambiri et al., (2012) which suggeststhat the direction of causality between public investment and private investment is unidirectional in the case of Zimbabwe.

5. Conclusion and Policy Implications

The study using yearly data from the period of 1970 to 2013, discovered that gross domestic product per capita and real interest rates in both periods (i.e. long run and short run) have positively influenced private investment in Ghana. Meanwhile, government investment expenditure and inflation were found to be negatively influenced private investment even though they were not significant. Also, it was discovered that there was bi-causal relationship between government investment expenditure and private sector investment in the case of Ghana.

Based on the bi-directional results of the study, there is the need for the government to invest more in physical infrastructure and human capital in order to reverse the negative effect of government investment expenditure on private investment since such investments are considered to crowd in private investment. This investment to a certain extent will enhance economic growth of the country.

Government should consider borrowing more from external sources to reduce the impact of its excessive domestic borrowing on interest rate and for that matter crowding out of private investment in the country. This will help the private sector to contribute immensely to GDP and help the government to finance its external debts.

References

[1] Adugna, H. (2013). Determinants of Private Investment in Ethiopia. *Journal of Economics and Sustainable Development*, *4*(20), 186-194.

[2] Ajide, K. B., & Lawanson, O. (2012). Modelling the long run determinants of domestic private investment in Nigeria. *Asian Social Science*, *8*(13), p139.

[3] Akpalu, W. (2002). Modelling Private Investment in Ghana: An Empirical Time Series Econometrics Investigation (1970-1994). The Ogua Journal of Social Sciences, Vol. 4, Faculty of Social Sciences, University of Cape Coast.

[4] Aryeetey, E., & Baah-Boateng, W. (2007). *Growth, investment and employment in Ghana*. International Labour Organization.

[5] Aryeetey, E., & Gockel, F. (1991). Mobilizing domestic resources for capital formation in Ghana: The Role of Informal Financial Sectors.

[6] Asante, Y., (2000). Determinants of Private Investment. AERC Research Paper No. 100, Nairobi: AERC.

[7] Atukeren, E., (2004). Interactions between Public and Private Investment: Evidence from Developing Countries. Swiss Institute for Business Cycle Research, Switzerland

[8] Badawi, A. (2003). Private Capital Formation and Public Investment in Sudan: testing substituting and complementarity in a growth framework. Journal of International Development, 15(6), 783-799.

[9] Batuo, M. E., Muyambiri, B., Chiwira, O., & Ngonidzashe, C. (2012). The causal relationship between private and public investment in Zimbabwe. *British Journal of Economics, Management & Trade*, *2*(3), 239-264.

[10] Blejer, M. I., & Khan, M. S. (1984). Government Policy and Private Investment in Developing Countries (Politique des pouvoirs publics et investissement privé dans les pays en développement)(Política estatal e inversión privada en los países en desarrollo). *Staff Papers-International Monetary Fund*, 379-403.

[11] David, P and Scadding, J. (1974). Private Savings: Ultrarationality, Aggregation, and "Dension's Law". Journal of Political Economy, 82,225-249.

[12] Durdonoo, C (2004). Fiscal Policy, Macroeconomic Stability and Medium-Long-Term Growth in Aryeetey, E and Kanbur, R (Eds). Macroeconomic Stability, Growth and Poverty Reduction. Institute of Statistical, Social and Economic Research.

[13] Eshun, M. E., Adu, G., & Buabeng, E. (2014). The financial determinants of Private Investment in Ghana. MPRA Paper No. 57570.Online at http://mpra.ub-uni-muenchen.de/57570/

[14] Fowowe, B. (2011). Financial sector reforms and private investment in Sub-Saharan African countries. *Journal of economic development*, *36*(3), 79-97.

[15] Frimpong, J.M., and Marbuah G., (2010).The determinants of Private Investment in Ghana: ARDL Approach, European Journal of Social Sciences, Vol.15, No.2.

[16] Granger, C. (1969). Investigating Causal Relations by Econometric Models and Cross-pectral methods. Econometrica, 37, 424-438.

[17] Granger, C. W. J. (1986). "Developments on the study of cointegrated Economic Determinants of Private Investment in Ghana". The African Finance Journal, Vol. 2, Part 2. pp. 15-39.

[18] Ibrahim,S.B.,(2000):"ModellingtheDeterminantsofPrivateInvestmentinGhana"The African Finance Journal, Vol. 2, Part 2. pp. 15-39.

[19] Islam,R.,and D.L.Wetzel,(1991):"The Macroeconomics of Public Sector Deficits: The Case of Ghana," Country Economics Department Working Papers, No. 672, World Bank.

[20] Khan, A. (2000). The finance and growth nexus. *Business Review*, *2*.

[21] Makuyana, G., and Odhiambo, N.M (2014). The Dynamics of Public and Private Investment in Malawi. Problems and Perspective in Management, Vol. 12(2).

[22] Mbanga, G.N. (2002). External Debt and Private Investment in Cameroon. *AJEP*, 109-124

[23] McKinnon, R.I. (1973). *Money and Capital in Economic Development*. Washington, DC: The Brookings Institution.
[24] Njimanted, G.F., and Mukete, E.M. (2013). Public Expenditure and Private Investment in Cameroon. A Vector Autogressive Approach. Journal of Emerging Issues in Economics, Finance and Banking. Vol.2 No. 4
[25] Oriavwote, V. E., & Oyovwi, D. O. (2013). Modeling Private Investment Behavior in Nigeria: A Cointegration Approach. *Accounting and Finance Research*, *2*(3), p14.
[26] Oshikoya, T. W. (1994). Macroeconomic determinants of domestic private investment in Africa: An empirical analysis. *Economic development and cultural change*, 573-596.
[27] Pesaran, M. H., & Pesaran, B. (1997). *Working with Microfit 4.0: interactive econometric analysis [Windows version]*. Oxford University Press.
[28] Pesaran, M. H., Shin, Y., & Smith, R. J. (2001)"Bounds Testing Approaches to the Analysis of Level Relationships" *Journal of Applied Economics*, 16(3), 289-326.
[29] Shaw, E. S. (1973). *Financial Deepening in Economic Development.* New York: Oxford University Press.
[30] Sineviciene, L. (2015). Testing the Relationship between Government Expenditure and Private Investment: the case of small open economies. Journal of Economics, Business and Management, Vol.3, No.6
[31] Were,M.,(2001):"TheImpactofExternalDebtonEconomicGrowthandPrivateInvestment inKenya: 1970-1996: An Assessment," UNU/WIDERDiscussion PaperDP2001-120, Helsinki.
[32] World Bank, (2015): "African Development Indicators," World Bank: Washington D.C.
[33] WorldBank,(2015):"WorldDevelopmentIndicators:CD-ROM,"WorldBank:Washington D.C.
[34] World Bank, world economic indicators Ghana country data 2015.
[35] Žemgulienė, J. (2012). Public Expenditure on Capital Formation and Private Sector Productivity Growth: Evidence from Lithuania and the Euro Area. *Organizations and Markets in Emerging Economies*, (Vol 3 No 1), 20-31.