
Does government debt affect private investment?

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Abstract: This paper examines the nexus between government debt and private investment in developing market, Ghana. Specifically, we examine the link between external debt, gross domestic product (GDP), net tax, inflation, domestic credit, exchange rate, interest rate, and constitutional government on private investment. We use time series data ranging from the period of 1975 to 2014. Augmented Dickey Fuller test, vector error correction model, and Granger causality are used to test co-integration, long run relationships and the short run relationships, respectively. We find that external debt, domestic credit and constitutional government are positively linked to private investment. GDP, net taxes, inflation, exchange rate, and interest rate are negatively related to private investment in the long run. Our contribution is that external debt crowds in private investment in the long run in the developing country perspective.

Keywords: private investment; developing country; augmented Dickey Fuller test; vector error correction model; VECM; Granger causality; government debt; Ghana.

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1 Introduction

Does government debt affect private investment? Extant studies on government debt-private investment nexus, however, is unclear (Asari et al., 2011). Although there

have been numerous empirical researches on the impact of government activities on private investment lately, there seem to be minimal empirical consensus regarding the extent of the impact, and also the various perceptions held on the issue are uncertain (Traum and Yang, 2015). Others suggest positive significant relationship between government debt and private investment (see Afonso and Aubyn, 2010; Mbanga, 2002); while others suggest that there is no relationship between government debt and private investment (e.g., Forgha et al., 2014). Empirical studies on government debt-private investment nexus in emerging market especially in Africa countries are few (see Oyieke, 2012; Biza et al., 2015); most specifically in countries where their leaders want to sustain their economy beyond aid with the support of private sector. Therefore, researchers are calling for more research on the extent of the impact of which government debts or activities and other macroeconomic factors affect private investment in emerging market.

This paper intends to fill this gap. Specifically, in the perspective of emerging markets, we examine whether government debts affect private investment in Ghana, by including macroeconomic factors such as gross domestic product (GDP), net taxes, inflation, domestic credit, official exchange rate deposit interest rate, and constitutional government; in the short and long run. We use time series data 1975 to 2014 from World Bank, International Monetary Fund (IMF), Statistical Service and Bank of Ghana. We find that external debt, domestic credit, and constitutional government have a positive coefficient (implying a crowding-in) whilst GDP, net tax, inflation, exchange rate, and deposit interest rate have negative coefficients (implying crowding-out) effect on private investment in the long run. The short run analysis shows unidirectional Granger causalities between GDP and private investment, GDP and inflation, inflation and private investment, exchange rate and inflation, and also between exchange rate and net tax on products.

Our study contributes to literature and practices. For instance, we examine whether government debts prompt more private investment in Ghana, an emerging market. To the best of our knowledge, this study is the first of its kind in the context of Ghana. Thus, the prior studies' findings may not be appropriate in Ghana, because the country is lower middle income with estimated debt to GDP ratio of about 70%. Hence, the study's findings can benefit policy makers, government, academicians, investment analyst and entrepreneurs. The study can be of greater relevance to policy makers and government in creating motivating forces to advance private investment in Ghana. Investors and investment analyst can use our findings to discover a comprehensive knowledge of governments' activities that can aid them provide appropriate policy directions.

The rest of the paper is structured as follows. Sections 2 and 3 present literature review and method, respectively. Section 4 present results, and Section 5 concludes the study.

2 Literature review

The controversies on crowding-in and crowding-out impacts have been at the cutting edge of numerous scholarly works, and have been investigated in various studies in recent times. Extant studies by Smith (1776), Keynes (1929), Bailey (1971), Buitter (1977) and Arestis (1979) are phenomenal regarding the hypothetical debates of the impact of government spending on private investment. Though, studies on crowding-in and crowding-out mostly concentrate on measuring the nexus between government

spending and private investment, others also analyse the impacts of government budget deficits on private investment. Others (e.g., Frimpong and Marbuah, 2010; Mittnik and Neumann, 2011; Oyieke, 2012; Acosta and Loza, 2005, Laopodis, 2001; Kibet, 2013) government investment-private nexus.

Frimpong and Marbuah (2010) use the eclectic functional model variables adopted from the neo-classical and accelerator theories to find out the determinants of private sector investment, and conclude that, there is a crowding-in effect of public investment on private investment in the short run but a crowding-out effect in the long run. Oyieke (2012) also report that if government expenditure is agriculture related, then it crowds in private investment in the short run but if they are recurrent in nature, then it has crowding-out effect on private investment. Another study by Laopodis (2001) finds that if the nature of government expenditure is developmental in nature, then it crowds in private investment, but the crowding-out effect of government expenditure is as a result of recurrent expenditure by the government. Furthermore, Kibet (2013) explores the effect of budget deficit and corruption on private investment in developing countries, and conclude that most developing countries experience low levels of private investment due to the links between budget deficit and high rates of corruption. Mittnik and Neumann (2001) analyse the nexus between government investment and private investment using vector auto-regression (VAR) model, and find that there is no crowding-out effect of government investment on private investment, however, government investment crowd in private investment.

Afonso and Aubyn (2010) likewise use a VAR model for 14 countries specifically selected from EU countries. They find that both government and private investment positively affect output; whilst investment by the government crowds out private investment in some selected countries. The findings of the research further prove that, government investment could either have a crowding-in or crowding-out effect on private investment. Moreover, Voss (2002) investigate the short and long run connections between government investment and private investment in the USA and Canada, and report that government investment does not crowd in private investment since the two are complementary.

Forgha et al. (2014) study on the relation between external debt, domestic investment, and economic growth using a system estimation approach find that external debt does not have a significant impact on gross domestic investment and economic growth. They reveal that, government debts are incurred mostly on recurrent expenditure and the little devoted to developmental expenditure are applied to unproductive sectors in the economy. Extant literature on government debt-private investment nexus in developing markets context is limited, hence this study.

3 Methods

We purposively select quantitative variables from World Bank, IMF, Bank of Ghana and the Ghana Statistical Service to estimate private sector investment model over a 40-year period (1975 to 2014). Put differently, as a result of availability of data, our samples are restricted to some specific timeframe leading to 40-year observations. We employ foreign

direct investment as dependent variable for private sector investment. External debt is used as proxies of government debts. GDP at market value, net taxes on products, inflation rate, domestic credit to private sector, official exchange rate, real interest rate, and constitutional government are control variables. Our econometric model is:

$$\begin{aligned} \text{Private investment}_t = & \beta_0 + \beta_1 \text{External debt}_t + \beta_2 \text{Gross domestic product}_t \\ & + \beta_3 \text{Net tax}_t + \beta_4 \text{Inflation}_t + \beta_5 \text{Domestic credit}_t \\ & + \beta_6 \text{Exchange rate}_t + \beta_7 \text{Interest rate}_t \\ & + \beta_8 \text{Constitutional government}_t + \mu \end{aligned} \quad (1)^1$$

where investment is the private sector investment using foreign direct investment at time t , external debt is the prevailing external debt at time t , gross domestic product is the GDP at market value, net tax is the net taxes on products in current US dollars, inflation equals the consumer price index, domestic credit represents the domestic credit to private sector at percentage GDP, exchange rate is the official exchange rate between the Ghana cedis and US dollars, interest rate represents the real interest rate at time t , and constitutional government² is a dummy variable where 1 denotes government in constitutional rule and 0 is there is no constitutional rule. t , β_0 , β_1 to β_8 and μ represent the time series, constant terms, coefficients, and stochastic or error terms, respectively.

Before estimating the ordinary least square for our models, we carry out some tests. First, we perform lag selection using Akaike information criterion (AIC), likelihood ratio (LR) criterion, Schwarz information criterion (SIC), Hannan-Quinn (HQ) information criterion, final prediction error (FPE), and Schwarz' Bayesian information criterion (SBIC) tests to determine the maximum lag for all tests that will require lag selection. Second, we use the augmented Dickey Fuller (ADF) test, vector error correction model (VECM), and Granger causality to test co-integration, long run relationships and the short run relationships, respectively.

4 Results and discussion

4.1 Lag selection, unit root and co-integration tests

We use the running system equation models (e.g., Johansen co-integration test, VECM and VAR model) in the lag selection criteria. Table 1 shows that the selected lag for running the system equation models would be lag 1 as suggested by most of the test.

We also use the unit root test by comparing the results of the t-test using the ADF estimation. ADF's results in Table 2 show that the null hypothesis is rejected for all the variables at significance levels except inflation that is not stationary. Also, the intercept and trend of inflation and private investment are accepted for null hypothesis at 0.1% and 5% significance levels, respectively. However, the test of unit root of the first differences of the variables makes them stationary. We employ the Phillips-Perron (PP) criteria to confirm the results of the ADF test results. Table 3 results confirm that the variables have unit roots for both intercept only, and also for intercept and trend at level and first difference.

Table 1 Lag selection-order

<i>Lag</i>	<i>LL</i>	<i>LR</i>	<i>Df</i>	<i>p-value</i>	<i>FPE</i>	<i>AIC</i>	<i>HQIC</i>	<i>SBIC</i>
0	-233.618				0.0007	12.6641	12.7714	12.9658
1	-15.088	437.06	49	0.000	1.0e-07*	3.7415*	4.6001*	6.1547*
2	28.6396	87.454*	49	0.001	1.8e-07	4.0189	5.6289	8.5439

Notes: 40-year observations (1975–2014).

* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

LL = lead-lag, LR = likelihood ratio criterion, FPE = final prediction error, AIC = Akaike information criterion, HQIC = Hannan-Quinn information criterion (HQ), and SBIC = Schwarz' Bayesian information criterion.

Table 2 Unit root tests – ADF

<i>Variables</i>	<i>ADF</i>		<i>ADF</i>	
	<i>Test statistic at level</i>		<i>Test statistic at 1st diff.</i>	
	<i>Intercept only</i>	<i>Intercept + Trend</i>	<i>Intercept only</i>	<i>Intercept + Trend</i>
Private investment	-0.355	-3.463*	-6.200***	-6.220***
External debt	-1.072	-2.151	-6.089***	-6.054***
Gross domestic product	0.271	-1.196	-4.794***	-4.740***
Net taxes	-1.234	-2.239	-5.198***	-5.185***
Inflation	-4.106***	-6.229***	-9.506***	-9.397***
Domestic credit	-0.23	-3.010	-5.340***	-5.517***
Exchange rate	-2.091	-0.200	-3.617***	-4.082***
Interest rate	-1.806	-1.749	-5.953***	-5.942***

Notes: 40-year observations (1975–2014).

* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Table 3 Unit root tests – PP criteria

<i>Variables</i>	<i>PP</i>		<i>PP</i>	
	<i>Test statistic at level</i>		<i>Test statistic at 1st diff.</i>	
	<i>Intercept only</i>	<i>Intercept + Trend</i>	<i>Intercept only</i>	<i>Intercept + Trend</i>
Private investment	-0.279	-3.463*	-6.356***	-6.394***
External debt	-1.075	-2.151	-6.101***	-6.068***
Gross domestic product	0.11	-1.196	-4.796***	-4.718***
Net taxes	-1.15	-2.239	-5.135***	-5.123***
Inflation	-4.191***	-6.229***	-11.717***	-11.564***
Domestic credit	-0.383	-3.010	-5.341***	-5.518***
Exchange rate	-1.84	-0.200	-3.532***	-3.933***
Interest rate	-1.822	-1.749	-5.953***	-5.962***

Notes: 40-year observations (1975–2014).

* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

We again use the Johansen co-integration test to find out whether the model has co-integration or not. We denote the null hypothesis (H_0) that the result has no co-integration between the variables after the test. Table 4 results indicate that the variables are co-integrated for both trace test (at 5% critical value) and max. statistic test (5% critical value). However, we selected one co-integrating equation for our study based on the trace statistic results; meaning there is a long run relationship between the variables. Thus, there is the need to setup a VECM to investigate the long run relationship between the variables.

Table 4 Results of Johansen co-integration test

<i>Trace</i>				<i>Max.</i>			
H_0	H_1	<i>Statistics</i>	<i>At 5% critical value</i>	H_0	H_1	<i>Statistics</i>	<i>At 5% critical value</i>
$r = 0$	$r = 1$	225.4272	192.89	$r = 0$	$r = 1$	72.8205	57.12
$r \leq 1$	$r \geq 2$	152.6067**	156	$r \leq 1$	$r = 2$	52.5315	514,245.28
$r \leq 2$	$r \geq 3$	100.0752	124.24	$r \leq 2$	$r = 3$	36.3239**	45.28
$r \leq 3$	$r \geq 4$	63.7515	94.15	$r \leq 3$	$r = 4$	18.0751	39.37
$r \leq 4$	$r \geq 5$	45.6762	68.52	$r \leq 4$	$r = 5$	17.5206	33.46
$r \leq 5$	$r \geq 6$	28.1556	47.21	$r \leq 5$	$r = 6$	14.7397	27.07
$r \leq 6$	$r \geq 7$	13.4159	29.68	$r \leq 6$	$r = 7$	8.0133	20.97
$r \leq 7$	$r \geq 8$	5.4026	15.41	$r \leq 7$	$r = 8$	5.0036	14.07
$r \leq 8$	$r \geq 9$	0.3991	3.76	$r \leq 8$	$r = 9$	0.3991	3.76

Notes: 40-year observations (1975–2014).

* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Variables: private investment, external debt, GDP, net tax, inflation, domestic credit, exchange rate, interest rate and constitutional government.

4.2 Model results

Table 5 and Table 6 show the co-integration equation (VECM) and Granger causality test results for all variables used in the study, respectively. Granger causality is not performed for constitutional government because it is a national decision that is difficult to test its Granger causality.

From Table 5, we report significant chi-squared (p -value $< 0.1\%$), indicating that our model has a strong predictive power on the dependent variables. Moreover, all the variables are significant with the exception of GDP at market value and domestic interest that have no significant long run impact on private investment in Ghana. External debt and constitutional government, specifically, display a significant positive relationship with private investment, net taxes, inflation, and exchange rate, however, shows a significant negative relationship with private investment. This suggests that private investment increases in the long run as a result of increase in external debt, domestic credit provided by financial sector and constitutional government, but not net taxes on products, inflation, exchange rate and GDP.

From Table 6, we record unidirectional Granger causality between GDP and private investment; GDP and inflation; inflation and private investment; exchange rate and inflation; and exchange rate and net tax on products. The Granger causality between GDP

and private investment indicate that past figures of GDP have a predictive ability on the current values of private investment; and this may be explained that investors use GDP to analyse economic performance of an economy before making meaningful investment. GDP and inflation Granger causality means the level of stability in an economy could be linked with GDP which will also indicate how the general prices of goods and services could be in the future. Moreover, the test reveals that inflation Granger causes private investment in Ghana indicating that past figures of inflation have predictive power on current private investment in Ghana. This suggests that, a deteriorating inflation rate leads to deteriorating private sector investment in developing country. Furthermore, the Granger causality between exchange rate and inflation suggests that government policies on exchange rate have impact on future rates of inflation in Ghana. Lastly, the implication of the Granger causality test on exchange rate and net tax suggest that, past rates of exchange rate have a very strong forecasting power on the current rate of net tax on products. Put differently, exchange rate may determine the tax rate to be imposed on products in the future.

Table 5 VECM results

<i>Variables</i>	<i>B</i>	<i>Standard error</i>	<i>P values</i>
External debt	2.751	1.265	0.030
Gross domestic product	-0.706	0.744	0.343
Net taxes	-2.365	0.294	0.000
Inflation	-3.500	0.614	0.000
Domestic credit	4.256	0.801	0.000
Exchange rate	-2.244	0.320	0.000
Interest rate	-0.543	0.932	0.560
Constitutional government	0.235	0.939	0.000
_Constant	-23.530		

Notes: 40-year observations (1975–2014).
 $\text{Chi}^2 = 201.263$ and $p > \text{Chi}^2 = 0.0000$.

Table 6 Results of Granger causality test^a

	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
1 Private investment		3.51	7.67***	1.79	4.75**	1.63	2.01	0.28
2 External debt	0.14		0.87	1.33	0.02	0.03	3.26	1.8
3 Gross domestic product	0.64	0.43		0.041	0.18	0	2.31	0.4
4 Net taxes	0.78	0.29	3.29		0.37	1.5	6.11**	0.06
5 Inflation	0.46	0.58	9.94***	1.73		3.39	9.13***	2.24
6 Domestic credit	0.13	1.43	1.61	0.34	0.58		2.23	0.48
7 Exchange rate	0.93	1.22	1.66	0.01	3.54	0.12		1.35
8 Interest rate	0.19	0.02	1.22	0.95	0.24	0.93	0.20	

Notes: 40-year observations (1975–2014).

* $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

^aNo Granger causality test is performed on constitutional government because system of governance is a national decision making it difficult to test its Granger causality.

4.3 Further robustness test

We use Breusch-Godfrey LM, Lagrange-multiplier, and the Durbin's alternative tests for autocorrelation. We set null hypothesis that the model has no serial correlation or the model has autocorrelation. When the p -value is less than 5% significance level, then the null hypothesis is accepted. We report p -values more than 5% for Breusch-Godfrey LM ($\text{Chi}^2 = 0.168$, $p = 0.682$), Lagrange-multiplier (Chi^2 Lag 1 = 72.74, $p = 0.732$; Chi^2 Lag 2 = 73.63, $p = 0.707$) and the Durbin's alternative tests ($\text{Chi}^2 = 0.125$, $p = 0.724$) show our model has no autocorrelation. We further use Jarque-Bera test to investigate whether the normalities of residuals are evenly distributed or not. Our results indicates that the null hypothesis cannot be rejected for the model ($\text{Chi}^2 = 146.72$, $p = 0.000$), suggesting that variables in the model are unevenly distributed. Finally, the Breusch-Pagan/Cook-Weisberg test records chi-squared with p -value less 5% ($\text{Chi}^2 = 4.87$, $p = 0.027$) indicating that the variables in the model are homoscedastic. Tables showing the results of Breusch-Godfrey LM, Lagrange-multiplier, the Durbin's alternative, Jarque-Bera, and Breusch-Pagan/Cook-Weisberg tests are not reported to conserve space but is available upon request.

5 Conclusions

We examine the relationship between government debt and private investment in developing market, Ghana. Specifically, we investigate the nexus between GDP, net tax, inflation, domestic credit, exchange rate, interest rate, and constitutional government on private investment using time series data from 1975 to 2014. ADF test, VECM, and Granger causality are used to test co-integration, long run relationships and the short run relationships, respectively. Our results support the Keynesian perspective, indicating that there is a positive link between government debt and private investment in the long run.

Our findings reveal that external debt, domestic credit by private sector and constitutional government has a positive long run effect on private investment. This suggests that external debt of the government may be used as a means to boost private investment in Ghana. This results confirm the Zaman and Arslan (2014) study. Most extant studies conclude that government expenditures that is geared towards development are the only debt that boost private investment; however, this is not the case of Ghana. The Government of Ghana depends on external debts for developments but end up recording huge financial loss to the state. An important implication here is that, government should be very circumspective in adding to the country's debt and needs to consider developmental expenditure to boost private investment. Government needs to also concentrate on policies that can boost export, and also provides credit facilities (examples, tax rebates and subsidies) to encourage private sector development.

Our findings further reveal that constitutional government has a stronger crowding in impact (or effect) on private investment in Ghana. This suggests that a constitutional environment ensures democratic and independent institutions to function properly, highlighting that there is protection of property and investment. This may reduce uncertainties and can provide fertile ground to boost private investment in the country. Thus, political and economic stability has a vital role to play in improving private sector investment, and government should implement policies that can preserve a constitutional government.

Contrary to above findings, net taxes, inflation rate, exchange rate, and deposit interest rate crowds out private investment. This confirms studies by Pahlavani and Bashiri (2013) that report similar findings. We therefore recommend that government should reduce the tax on products to make it more affordable to boost demand as a means to increase private investment in Ghana. Government must control the rise in inflation in the country by controlling credit rates, prices of goods and services, wage policies and budget deficit. Exchange Rate Act can be enacted to prevent unhealthy movements and practices by players in the exchange rate market to boost private investment.

Our study uses Ghana's time series data ranging from the year 1975 to 2014, neglecting other developing countries. Thus, generalising our findings beyond Ghana may be problematic. Future study may consider analysis across developing or emerging countries over a long period of time. Future study may also consider domestic debt as a proxy for government debt and other macroeconomic factors such as real interest rate, and domestic private investment figures. Crowding-in and crowding-out impacts of private investment and government spending or debts is a remarkable and debatable area in finance, and thus the topic must be replicated in other developing countries in order to add to the existing literature.

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Notes

- 1 To reduce the problem of heteroscedasticity, all the variables in model (1) are in natural logarithm except the dummy variable, constitutional government.
- 2 The constitutional rule periods in Ghana (dummy = 1) are 1975, 1980 to 1981, 1993 to 2014; and the unconstitutional periods (dummy = 0) are 1976 to 1979 and 1982 to 1992.