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IMPACT OF GOVERNMENT INVESTMENT EXPENDITURE ON ECONOMIC GROWTH IN GHANA

[1]Abdulai, A-M and [2]Alhassan, A.

[1]Department of Applied Economics, University for Development Studies, Ghana.
[2]Department of Mathematics, C.K. Tedam University of Technology and Applied Sciences- Navrongo, Ghana.

Corresponding author: abdulai.abdul-malik@uds.edu.gh

Abstract

The paper investigated the impact of government investment expenditure on economic growth in Ghana using secondary data spanning from 1975 to 2018. The Autoregressive Distributed Lag (ARDL) and the Granger Causality test were adopted to examine the objectives. The results showed that government investment expenditure related positively to economic growth in the long run, but has no statistically significant effect on growth in the short run. Other variables such as foreign direct investment, labour force, gross capital formation, debt service, interest rate, inflation rate, and foreign aid influenced growth positively or negatively. A unidirectional causal relationship ran from Government investment expenditure to growth. The study, therefore, recommends that to attain a sustainable future economic growth, the government should pay more attention to its investment expenditure; by providing the necessary resources and the enabling environment for education, health and technology.

Keywords: Government Investment Expenditure, Growth, ARDL, Granger Causality, Human capital

Introduction

After the epoch of the Mercantilists, economists understood that the wealth of nations is not only restricted to the abundance of mineral reserves (precious metals) and natural resources a country can possess. People constitute an integral part of the wealth a country can boast of due to the unparalleled and productive role of human beings in accelerating the overall output of nations (Shultz, 1961). Thus far, all sorts of human capacity builders (education, healthcare and technology advancements) have since been pursued by both developed and developing countries. However, the subtle differences accounting for the huge development gap between these two countries are the failure of the latter to make upfront investment expenditures and give more attention to the education, health and technology advancement needs of the citizens.

The socio-economic benefits associated with a healthy, well-educated and technologically advanced population are far-reaching. The endogenous growth model anchored by Romer (1994) & Lucas (1988) has underscored the need for countries to invest in human capital (education and health) and technology. According to the model, technology and human capital endogenously determine growth; thus, counties that aim to spur economic growth should invest in human capital and technology; because human capital serves as the powerhouse for the workforce of a country. By extension, a healthy and educated workforce propels a productive economy (Churchill et al., 2015; Zerihun, 2014). Shultz (1961) emphasized that investing in human capital (education and health) justifies the remarkable rise in real per-capita earnings of the labour force. Also, in

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line with Teixeira (2014) and the World Bank (2018), investing in human capital increases individuals' productivity and earnings, and the absence of human capital investment will degrade a country's economy since it will not be able to supplement the highly-skilled jobs with productive labour. This is confirmed by studies conducted on the economies of China, Nigeria and India (Chandra, 2010; Ibrahim, 2016; Whalley & Zhao, 2014).

Likewise, technology efficiently reduces the workload of the labour force. With technology, a nation can outperform its peers in economic growth; because, the government can seamlessly strategize and plan policies for development (United Nations Conference on Trade and Development [UNCTD], 2019). However, the variation in the efforts of countries' investment in science and technology accounts for the great disparities in the speed of development between the More Developed Countries (MDC) and the Less Developed Countries (LDC) (Çalışkan, 2015). LDCs experience a slow development pace because little attention is given to technology. The reason behind this is not far-fetched, as a study positioned that investing in education and health exerts positive externalities on technology (Grant, 2017). Grant argued that a healthy and well-educated population leads to a productive human resource which automatically leads to advancement in technology. Arguably, it is also worth stating that a healthy and well-educated labour force will be incapacitated if the government does not provide the enabling environment for technology to thrive; because human capital and technology are inseparable (Amavilah, 2014). In the same way, Gruzina et al., (2021) contend that the recent approach for countries who wish for an increase in productive labour force is through the introduction of technological innovations and industries.

Ghana over the years has made strides in its investment in human capital and technology. The country has taken keen steps to provide universally free healthcare and education, and a digitized economy. Prominent policies such as the School Feeding Programme, capitation grant, National Health Insurance Scheme, and many others have been implemented by successive governments (Abukari et al., 2015). Other recent initiatives include the Digital Address System, Mobile Money Interoperability, Free Senior High School, Paperless ports and Drone medical delivery system. Some of these interventions have yielded results because O'Connell & Ndulu (1970) used the TFP growth model to investigate the impact of Human capital on the economy of Ghana compared with that of South Saharan Africa (SSA), their study discovered that human capital accounted for 0.34% growth in Ghana, which is above that of the regular growth of the SSA. On the foregoing, government expenditure on education increased by 20.9% from GH¢9.26billion in 2018 to GH¢ 11.26 billion in 2019 (Ministry of Finance [MoF], 2019). The World Bank (2018) indicated that Ghana's average spending on education is above 6% of its GDP (above 5% global GDP average). However, the budget for the health sector is different. It decreased in 2017 and 2018 from 7.8% to 7.1%. This fell short of the 15% of total budgetary allocation as contained in the Abuja Declaration (SEND-GHANA, 2018). On science and technology expenditure, the government's budget and investment from the private sector have been insufficient (Al-Bader et al., 2010; Amankwah-Amoah, 2016; Aryeetey & Fosu, 2014). The 2010 World Bank data on research and development puts Ghana's expenditure on R&D at 0.38% of GDP (World Bank, 2022). This is far below the target of 1% of GDP as contained in the Lagos-AU Plan of Action. In 2017 and 2018, the budget was GH¢349 million and GH¢361 million respectively. Despite this nominal increase in budget, the ministry witnessed about 60% and 33% decrease in its Goods and Services as well as its Capital expenditures respectively (MESTI, 2018); thus, limiting its operations.

Notwithstanding the prospects of human capital and technology on the growth of countries, the accompanying dilemma faced by countries is how to avoid a situation where the majority of the educated people cannot fit in the labour market or a situation where there is a shortage of educated or healthy people (Odonkor, 2017). Likewise, the adoption of new technologies is accompanied by the negative effects of "creative destruction", leading to a

situation of structural unemployment (Nathan & Ahmed, 2018). As the country strives to enroot its development path anchored by the investment in education, health and technology, it faces challenges regarding funds mismanagement, academics-and-industries demand mismatch, a weak standard in policy implementation, and low budgetary allocation, especially to R&D (Yawson, 2004) and healthcare. These among other factors, contribute to placing Ghana among the last five lowest-ranked countries with a paltry human capital index of 44% in the 2018 World Bank human capital index report (World Bank, 2018). This report further alarmed that due to the low quality of the country's education output, 56% of Ghana's human capital risks being a waste.

As a result, several empirical studies have centred around the relationship between education, health and technology outlay on the economic growth; however, the outcomes are mixed. Bosupeng (2015), Muktdai-Al-Mukit (2012), Owusu-Nantwi, (2015); Douanla & Abomo (2015), and Urhie (2015) for example revealed a positive effect of education expenditure on economic growth while Alamin et al. (2015), Chandra (2010), and Pritchett (1996) found that public education expenditure has a negative and insignificant impact on growth. Also, studies that looked into the impact of health expenditure and human capital on growth (Akintunde & Satope, 2013; Gruzina et al., 2021; Usman & Adeyinka, 2019; Bloom & Canning, 2008; Grossman, 2007; Gyimah-Brempong & Wilson, 2004; Katz, 2004; Nasiru & Usman, 2012) found the existence of a positive relationship with economic growth. However, Churchill et. al (2015) unveiled two-pronged results, while education expenditure exerts a positive influence on growth; health outlay poses a negative effect on growth. Conversely, Nurudeen & Usman (2010) and Gisore et al. (2014) revealed an insignificant impact of education spending on the national output level; however, there existed a positive link between health expenditure and growth. Similarly, Eggoh et al. (2015) found that human capital expenditure impacts economic growth negatively; whereas, human capital stock impacts economic growth positively.

Indicatively, the pool of studies have failed to give a clear-cut answer on the exact effects of government investment expenditure on economic growth. Also, the unit measure of human capital and technology remains the biggest issue among researchers in growth accounting. While Skare & Lacmanovic (2015) downplayed the expenditure approach of measuring human capital, Ibrahim (2016) adopted education, health expenditure and tertiary enrolment in Nigeria to proxy technology investment in his study. The current study adopts expenditure on imports of communication and ICT tools to proxy technology expenditure. These inconclusive backdrops call for holistic research on the Ghanaian economy. Therefore, to contribute to the pool of available literature, and the fact that of late, education, health and digitization have become the centre-stage of the development plan of Ghana, the thrust of this paper is to determine the short and long run effects of government investment expenditure on economic growth and also determine the causality between economic growth and government investment expenditure for 1975-2018.

Research Methodology

Theoretical Model

The theoretical model is underpinned by the Neoclassical and the Endogenous growth models. The Neoclassical production function presupposes that output depends on capital stock, labour supply and technology and presumes technology is exogenuos. Whereas human capital and technology are the crucial factors of economic growth under the endogenous growth theory, the model regards technology and human capital to have an internal effect on growth. Therefore, the combined Cobb-Douglas-Endogenous growth model similar to the model used by Benhabib & Spiegel (1994) and Chen (1997) is presented in equation (1)

$$Y_t = A_t K_t^{\alpha} (L_t H_t)^{\beta} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Y_t, L_t, K_t and H_t are output, labour, physical capital and human capital at time t respectively. A_t represents the exogenous level of technology. α and β are capital, labour and human capital elasticities respectively. Making a substitution for A_t implies, $Y_t = A_0 e^{\lambda t} K_t^{\alpha} (L_t H_t)^{\beta}$ ..... (2)
where $A_t = A_0 e^{\lambda t}$.
Taking the natural logarithm of equation (2), the resultant model is now:
$\ln Y_t = \ln A_0 + \lambda t \ln e + \alpha \ln K_t + \beta_1 \ln L_t + \beta_2 \ln H_t$ ..... (3)
The data used for this research is sourced from the World Bank Development Indicators while data on inflation is obtained from the Ghana Statistical Service (GSS).

Econometric Specification
Following equation 3 above, the effects of government investment expenditure on the economic growth of Ghana are specified using the log-linear model:
$\text{LnRPCGDP} = \alpha_0 + \alpha_1 \text{GIEX}_t + \alpha_2 \text{LF}_t + \alpha_3 \text{GCF}_t + \alpha_4 \text{INT}_t + \alpha_5 \text{INF}_t + \alpha_6 \text{DEBT}_t + \alpha_7 \text{FDI}_t + \alpha_8 \text{FAID}_t + \varepsilon_t$ ..... (4)
Where α_i is the regression coefficient that determines the amount of influence that the right-hand side variables have on the left-hand side variable. Also, α_0 denotes the constant term and ε_t is the error term (Biswas & Saha, 2014; Darko, 2016).
However, government investment expenditure (GIEX) varies proportionately based on priority levels. GIEX is calculated by making do with the weight government attaches to the individual expenditure components. This is illustrated as follows:
$\text{GIEX} = \frac{8}{15}\text{EDU} + \frac{6}{15}\text{HE} + \frac{1}{15}\text{TECH}$ ..... (5)
Due to data unavailability on R&D expenditure in Ghana over the studied period, government expenditure on the imports of ICT tools and communication was used as a proxy for government investment in technology (TECH).

Table I: Variables Description

Variable	Definition	Unit of Measurement	A priori
RPCGDP	Real per capita gross domestic	Ghana Cedi	
GIEX	Government Investment	Ghana Cedi	+
INF	Inflation rate	Annual Percentage of CPI	-
LF	Labour Force	Percentage of the total	+
GCF	Gross Capital Formation	Ghana Cedi	+
EDU	Government Education	Percentage of GDP	+
HE	Government Health Expenditure	Percentage of GDP	+
TECH	Government Technology	Percentage of GDP	+
INT	Interest rate	Annual Percentage	-
FAID	Foreign Aid	Percentage of BoP	+
FDI	Foreign Direct Investment	Percentage of GDP	+
DEBT	Total debt service	Percentage of gross national	-

Source: *Authors' construct (2021).*

Estimation Technique
The econometric approach that was applied to this research includes the following steps: firstly, the study checked for the existence of unit roots of the time-series data to make sure that none of the variables is stationary of order two (Giles, 2013). Again, it tested the variables for the existence of cointegration. The lag selection was done using the three information selection criteria. If variables are

cointegrated, the ECM is used to simultaneously determine the long-run relationship and the short-run parameters. However, if the variables are not cointegrated, only the short-run model is specified. Further, to find out the robustness and stability of the model, the diagnostic test and stability tests were employed (Giles, 2013). Finally, the test for causality between target variables was carried out by performing the Engel-Granger causality test.

Results and Discussions

Unit Root Test

Regression analysis with non-stationary variables produces spurious outcomes which cannot be used for analysis, forecasting or policymaking (Bashar, 2015; Yule, 1926), thus the Augmented Dickey-Fuller (ADF) test was employed to test the unit roots.

Table II: Results of Unit Root Test (ADF)

Level Form					First Differenced			
Variable	Intercept	Prob.	Trend	Prob.	Intercept	Prob.	Trend	Prob.
RPCGDP	0.901	0.995	-1.458	0.828	-3.903	0.004***	-4.557	0.004***
GIEX	-2.764	0.072*	-3.857	0.023**				
LF	-0.770	0.817	-2.537	0.310	-3.907	0.004***	-3.332	0.075*
GCF	-2.537	0.310	-2.393	0.378	-6.365	0.000***	-6.693	0.000***
INT	-1.807	0.372	-1.611	0.772	-6.194	0.000***	-6.321	0.000*
INF	-4.188	0.002***	-4.218	0.009***				
DEBT	-1.991	0.290	-1.965	0.603	-7.409	0.000***	-7.315	0.000***
FDI	-1.378	0.584	-2.496	0.329	-6.370	0.000***	-6.241	0.000***
FAID	-1.606	0.471	-1.573	0.787	-7.445	0.000***	-7.680	0.000***

Source: *Authors' construct (2021).*

Table II indicates that when intercept and trend are considered, Government investment expenditure (GIEX) and inflation (INF) are stationary at levels, whereas RPCGDP, LF, GCF, INT, DEBT, FDI and FAID are stationary after first differencing. This shows that only I(0) and I(1) variables are present. Hence the Autoregressive Distributed Lag (ARDL) method is appropriate.

Bounds Test for Cointegration

The prognosis for testing the existence of long-run relationship is anchord by the bounds-test for cointegration. This is required when using the ARDL model.

Table III: Results of Bounds Test for Cointegration

F-bounds Test				
Null Hypothesis: No levels relationship				
Test Statistic	Value	Sig.	I(0)	I(1)
F-stat.	10.95	10%	1.95	3.06
K	8	5%	2.22	3.39
		2.50%	2.48	3.7
		1%	2.79	4.1

Source: *Authors' construct (2021).*

Table III shows that the value of the F-statistics is greater than the values of the upper bounds, that is I(1); hence, the study rejects the null hypothesis of no levels relationship and concludes that there is a long-run joint cointegration.

Long-Run Coefficient

Having established the existence of a long-run relationship between economic growth and the explanatory variables, (using Bounds Test for Cointegration) the ARDL framework is used to further estimate the long-run coefficients.

Table IV: Long-Run Effect of Government Investment Expenditure on Economic Growth

Levels Equation Case 3: Unrestricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Probability
GIEX	0.0470	0.0251	1.8733	0.0738*
LF	0.0767	0.0130	5.8808	0.0000***
GCF	0.0064	0.0024	2.6566	0.0141**
FDI	0.0065	0.0071	0.9130	0.3707
INF	-0.0011	0.0005	-2.1357	0.0436**
INT	-0.0050	0.0019	-2.6846	0.0132**
FAID	-0.0072	0.0040	-1.7844	0.0876*
DEBT	0.0144	0.0132	1.0889	0.2875

Note: *, ** and *** denote significance at 10%, 5% and 1% levels respectively.

Source: *Authors' construct (2021).*

Table IV establishes that the variables that have a relationship with the growth of the economy in the long run are Government Investment Expenditure (GIEX), Labour Force (LF), Gross Capital Formation (GCF), Interest rate (INT), Foreign Aid (FAID) and Inflation (INF). The coefficient of government investment expenditure is positive and significant at 10%, hence there is a positive long-run relationship between economic growth and government investment expenditure. A unit increase in government investment expenditure will lead to a 4.7% rise in the per capita growth of the Ghanaian economy, holding other variables constant. This result is expected; given that government investment expenditure is supposed to increase the social and economic wellbeing, knowledge base and innovation stock in the country, and therefore increasing economic growth.

Similarly, the labour force (LF) and gross capital formation (GCF) are found in the long run to also

positively influence economic growth. This implies that an increase in LF and GCF by one unit each, leads to 7.67%, and 0.64% increase in growth respectively. These positive results are highly expected since the labour force, which constitutes the workforce of the country contributes significantly to production output. This positive impact of the labour force is consistent with Jayaraman & Singh (2007), who unveiled that there cannot be economic growth without the participation of the labour force. Also, GCF constituting the firms' inventories and fixed capital have long term services to the economic wellbeing of the citizens. A well-developed gross capital formation crowds in more private sector investments since good infrastructure eases business activities (Makuyana, 2019).

Meanwhile, interest rate, inflation and foreign aid are found to relate negatively with the long-run growth of the economy. These results, (except that of foreign aid) have attained the expected signs, and it is economically understood that when interest rate increases, businesses borrow less and it leads to credit crunch on the part of the private sector. This eventually results in long-run economic crisis due to the crowding-out effect on the private sector. Hence, a unit increase in interest rate leads to a 0.50% decrease in economic growth over the studied period. Also, inflation (INF) has a negative relationship with growth because higher rate raises the cost of living and cost of factors of production; hence impacting negatively on economic growth. Thus a unit increase in the inflation rate decreases the economic growth by 0.11%. Foreign aid which is expected to benefit the economy in the long run, as revealed by Ho & Iyke (2018), rather decreases growth by 0.72%. This may be attributable to the fact that many economies, including Ghana, believe that foreign aid degrades the economic sovereignty of the recipient nation (Ifeoma, 2008; Tang & Bundhoo, 2017). Therefore, the current government's resolution on a "Ghana beyond aid" could be due to the negative impact posed by foreign aid on long-run growth of the Ghanaian economy.

Short-run Dynamics

The ARDL has three components; the short-run, the long-run and the error-correction term (ECT). From Table V, ECT (CointEq) is -0.3889 and it is significant at 1% with the expected negative sign. This gives another confirmation of the existence of a long-run relationship, indicating that fluctuations in economic growth (that is; above or below its equilibrium level) are adjusted at a speed of 39% to ensure long-run convergence to equilibrium.

Table V: Short Run Effects of Government Investment Expenditure on Growth

ARDL Error Correction Regression

Dependent Variable: D(LRPCGDP)
Selected Model: ARDL (1, 1, 2, 2, 0, 0, 1, 2, 1)
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	1.4167	0.1211	11.6945	0.0000***
D(GIEX)	-0.0024	0.0037	-0.6688	0.5103
D(LF)	-0.1314	0.0502	-2.6176	0.0154**
D(LF(-1))	-0.1140	0.0534	-2.1338	0.0437**
D(GCF)	-0.0019	0.0011	-1.7599	0.0917*
D(GCF(-1))	-0.0035	0.0011	-3.1561	0.0044***
D(INT)	0.0006	0.0007	0.8415	0.4087
D(FAID)	0.0024	0.0014	1.6778	0.1069
D(FAID(-1))	0.0045	0.0014	3.1678	0.0043***
D(DEBT)	0.0012	0.0028	0.4228	0.6763
CointEq(-1)*	-0.3889	0.0337	-11.5233	0.0000***
Observation	41	Mean dependent var		0.0172

R^2	0.8622	S.D. dependent var	0.0370
Adjusted R^2	0.8177	Akaike info criterion	-5.2403
S.E. of regression	0.0158	Schwarz criterion	-4.7852
F-statistic	19.3916	Hannan-Quinn criterion	-5.0735
Prob(F-statistic)	0.0000***	Durbin-Watson stat	2.4477

Note: *, ** and *** denote significance at 10%, 5% and 1% levels respectively.
Source: *Authors' construct (2021).*

Mathematically, the ARDL model is specified as:

$$\text{LnRPCGDP} = 1.4167 - 0.131\Delta\text{L}_t - 0.114\Delta\text{L}_{t-1} - 0.002\Delta\text{GCF}_t - 0.004\Delta\text{GCF}_{t-1} + 0.005\Delta\text{FAID}_{t-1} + 0.047\text{GIEX}_t + 0.077\text{LF}_t + 0.006\text{GCF}_t - 0.001\text{INF}_t - 0.005\text{INT}_t - 0.007\text{FAID}_t - 0.389\text{ECT}_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

The model again revealed that government investment expenditure (GIEX) negatively affects economic growth in the short-run, though not statistically significant. Similarly, the present coefficients of the labour force (LF) and gross capital formation (GCF) relates negatively with the short-run growth of the economy, while the current interest rate, foreign aid and public debt service relate positively with economic growth in the short run; though, only the one-period lag of foreign aid presented a significant impact.

Diagnostic and Stability Test

The post-estimation result in Table VI indicates the model is free from serial correlation, heteroscedasticity, underfitting or overfitting, and it is normal.

Table VI: Outcome of Diagnostic and Stability Tests

Method	**LM Version**	**F-stat Version**
1. Serial correlation	$\chi^2(1) = 3.5322(0.0602)$	F (1,22) =2.0201 (0.0602)
2. Heteroscedasticity	$\chi^2(31) = 15.0902$ (0.6558)	F (8,23) =0.7165 (0.7627)
3. Normality (Jarque-Bera)	χ^2 =3.4907 (0.1746)	Normal
4. Functional Form (RESET)	$\chi^2(22) = 0.3299$ (0.7446)	F (1, 22) =0.1088 (0.7446)
5. CUSUM	Within 5% critical region	Stable
6. CUSUMSQ	Within 5% critical region	Stable

Source: *Authors' construct (2021).*

Results of Causality Test

The bounds test showed the existence of long-run relationship but it was silent on the direction of causality. Using the Pairwise Granger causality test, a significant F-statistic, the null hypothesis is rejected. GIEX granger-causes economic growth, as in Table VII.

Table VII: Pairwise Granger Causality Test

Null Hypothesis:	Observation	F-Statistic	Prob.
GIEX does not Granger Cause LRPCGDP	42	9.0897	0.0006
LRPCGDP does not Granger Cause GIEX		1.1604	0.3245

Source: *Authors' construct (2021).*

Conclusions and Recommendations

Technology and human capital are inseparable agents of economic development. Therefore, with a weighted sum of education, health and technology expenditure of the government of Ghana, the study revealed that in the long-run, foreign direct investment, government investment expenditure, labour force, gross capital formation and debt service related positively to economic growth. However, interest rate, foreign aid and inflation exerted a deleterious impact on growth. In the short run, GIEX has an insignificantly negative relationship with growth. The direction of causality exists from government investment expenditure to growth. The study, therefore, recommends that to maintain a sustainable long-run economic growth, the government should intensify its investment expenditure, while keeping the interest and inflation rates at reasonably low levels. Also, to achieve a positive and significant relationship between GIEX and growth in the short run, the government should provide infrastructure for the education and health sectors. The government should aim at meeting the Lagos-AU Plan of Action, where 1% of the country's budget is allocated for R&D.

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