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Article

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Cogent Economics & Finance

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Suggested Citation: Poku, Kwasi; Opoku, Emmanuel; Ennin, Priscilla Agyeiwaa (2022) : The influence of government expenditure on economic growth in Ghana: An Ardl approach, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 10, Iss. 1, pp. 1-16, <https://doi.org/10.1080/23322039.2022.2160036>

This Version is available at:

<https://hdl.handle.net/10419/303901>

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To cite this article: Kwasi Poku, Emmanuel Opoku & Priscilla Agyeiwaa Ennin (2022) The influence of government expenditure on economic growth in Ghana: An Ardl approach, Cogent Economics & Finance, 10:1, 2160036, DOI: [10.1080/23322039.2022.2160036](https://doi.org/10.1080/23322039.2022.2160036)

To link to this article: <https://doi.org/10.1080/23322039.2022.2160036>



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Received: 09 July 2022
Accepted: 14 December 2022

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DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

The influence of government expenditure on economic growth in Ghana: An Ardl approach

Kwasi Poku¹, Emmanuel Opoku^{1*} and Priscilla Agyeiwaa Ennin¹

Abstract: The relationship between public sector expenditure and economic growth for several decades past is still relevant today and continues to be a topic of debate among policy-makers and researchers. We examine the impact of government expenditure on economic growth in Ghana using data from 1970 to 2016, employing ARDL econometric estimation technique. The empirical findings indicate that, government expenditure has a positive relationship with economic growth in the short-run. The results further show that, Gross Capital Formation and Foreign Direct Investment show a significant positive relationship with economic growth in both the short-run and long-run. However, population growth reveals a significant negative relationship with economic growth (GDP Growth). We recommend government to increase public expenditure on profitable projects since it promotes economic growth.

Subjects: Economics; Econometrics; Development Economics

Keywords: government expenditure; economic growth; Foreign Direct Investment; ARDL; Ghana

1. Introduction

The relationship between public sector expenditure and economic growth for several decades past is still relevant today and continues to be a topic of debate among policy-makers and researchers (Ibrahim, 2019). Generally, researchers have agreed that public sector expenditure is important and a major instrument through which the performance of the economy could be greatly influenced (Adu et al., 2013). Thus, public expenditure is the surest means upon which the collective needs of the citizens can be fulfilled by public authorities. Basically, public expenditure involves government spending revenues generated from taxes and other sources (Mallick et al., 2016). These expenditures are mostly geared towards government itself for maintaining stability and speedy growth of the economy (Antwi et al., 2013). Additionally, it is a fiscal tool that holds and makes appropriate use of all the revenues collected to benefit the country. Government mostly spends on different areas of the economy, not excluding roads, infrastructure, capital investment, pensions, and so on. Owusu-Nantwi and Erickson (2016) assert that public expenditure is the beginning and end of the collecting of revenues by the government.

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The evolution of public expenditure is as a result of the perceived failure of market economies to efficiently and equitably allocate economic resources for social and economic infrastructural development (Okoye et al., 2019). The failure creates exigencies of welfare economics, which subsequently leads to the expansion of government sector and public expenditure growth (Owusu-Nantwi & Erickson, 2016). Government expenditure is usually grouped into two folds: current expenditure and recurrent expenditure. Current expenditure is made up of expenses on salaries, wages, labor, consumables, and so on, while the items on the capital expenditure include hospitals, schools, roads, and any other expenditure that may contribute to the growth and development of a country (Akanbi et al., 2019).

There is a direct association between the degree of public sector expenditure and the economic growth of a country (Aziz & Asadullah, 2017). Hence, so much attention is placed on the role of public expenditure in the economy to resolve major challenges like unemployment, exchange rate instability, inequality, inflation, oil prices, balance of payment stability, and most especially economic growth (Aziz & Asadullah, 2017). In its ideal sense, the economic growth of a country is expected to improve living standards through the provision of education, access to health care, infrastructure, housing, availability of quality foods, better roads, and so on. In addressing human capital development problems, and promoting key economic activities in the country, these improvements are necessary and desired by every country.

Globally, the subject of government expenditure continues to attract the attention of researchers and policy-makers. In Europe, particular attention is paid to public expenditure following the European sovereign debt crisis. In fact, one of the primary targets of the Euro Plus Pact in 2011 is the sustainability of public finances within the European Union (Asimakopoulou & Karavias, 2016). European institutions now encourage member countries to increase “productive spending” (education, research and development, public investment) and decrease nonproductive expenditures in order to change the composition of public expenditure and arrive at an optimal common level in all member states (Lupu et al., 2018). In many sub-Saharan African countries, the comprehensive use of public spending as a fiscal policy tool and its impacts on economic growth are still questionable. In Nigeria, Onifade et al. (2020) note that public expenditure has been growing in the last two decades; however, there are questions on whether the increments have translated into desired economic growth. Government expenditure in Botswana averaged 40% of GDP between 2000 and 2016, and still continues rise (Amusa & Oyinlola, 2019). The influence of government expenditure on growth still remains unclear in Botswana.

There are too well-versed theories widely used by economists as the foundation for the debate on the impact of public spending and economic growth. Thus, the Wagner’s law and the Keynesian hypothesis. Whereas the Wagner law suggests that economic growth raises government expenditure, the Keynesian hypothesis regards government expenditure as a driver of economic growth. More so, it is believed that production can be increased through public sector expenditure. However, it can also be seen as a major hindrance to development based on its funding (Maingi, 2010). In financing public expenditure through borrowing, the government competes with private businesses, and this results in a significant reduction of investments in the economy (Aydin & Esen, 2019). The proponents of the neoclassical public expenditure theory stress that, government should not be so much involved in the economy in the performance of its roles in the economy (Wang et al., 2019).

Many researchers in the literature have agreed that, the influence of public sector expenditure on economic growth is indirect but can serve as a stimulus to economic growth (Odhiambo & Nyasha, 2018). The Wagner’s law though propounded a century ago, continues to gain much attention in the field of public expenditure. This law postulates that, there is a significant association between public spending and economic growth. Notwithstanding Wagner’s position, it is very difficult to examine this point (Iheanacho, 2016). The nature and influence of government expenditure on economic growth depends on its form. Government expenditure on investment and

productive activities in the area of state-owned production contributes positively to economic growth, while government expenditure on consumption is expected to impact growth negatively (Havi et al., 2013). According to Bose et al. (2007), public sector expenditure can cause economic growth indirectly, through increasing marginal productivity of government and private factors of production. Government spending on research and development, for instance, can facilitate increase in production levels. Mostly, in high-crime countries, the increase in government spending on security can facilitate lower cost of production, by decreasing the necessity to protect physical assets and employees, as a result, attracting more private investment in terms of physical assets investment and increasing productivity of workers (Nketiah-Amponsah, 2009).

In a country where the government is small, an expansion in the size of government increases returns and economic output (Afonso & Ibraimo, 2020). The influence of government expenditure on economic growth may affect development in the country. In this regard, production of goods and services which are of public nature and used as inputs in the private sector production processes, improving both physical and human capital investment may positively affect economic growth (Chandio et al., 2016). A country's economy is adversely affected when the size of government is so large to such an extent, due to financing government expenditure through tax increments, borrowing, and printing more money to finance the economy (Afonso & Ibraimo, 2020). In addition, it is explicitly argued in the literature that, the expansion of government size may breed grounds for lobbying, corruption, and other rent seeking activities. These activities can cause serious macroeconomic challenges like decreasing standards and quality of public infrastructural services, such as justice, health, education, defense, unattractive foreign investment and causing unfair income distribution (Wang et al., 2019).

In Ghana, despite the continuous increase in government expenditure, there have been several deviations in terms of growth for some time now (Iheanacho, 2016). Government spends huge sums of money in areas like health, education, public order, infrastructure, justice, national security, defense, and administration in general. Theoretically, the economy is expected to grow positively anytime government increases expenditure in these areas; however, this is not the case in Ghana. This may be as a result of government embarking on non-growth expenditures that do not stimulate growth. Hence, the matter of government expenditures to speed up permanent growth in an economy is very crucial and needs to be assessed (Nketiah-Amponsah, 2009). Ghana for some time now, has experienced a number of instabilities in terms of economic growth; however, the causes of these instabilities are not properly understood. In particular, the impact of government expenditure on economic growth is not properly evaluated. Studies have made an attempt to critically analyze the channels through which variant forms of government expenditure can impact the economy (Barro, 1990; Colombier, 2011; Landau, 1983). From these investigations, the influence of government expenditure on economic growth stands inconclusive. Notwithstanding these uncertainties, there exist well-grounded theories, which suggest that government expenditure can influence the growth of the economy positively (Barro, 1990; Keynes, 1936).

The influence of government expenditure on economic growth remains inconclusive as there is no consensus in the literature regarding the short-run and long-run effects. Available empirical evidence on how government expenditure influences economic growth shows that the subject is open to more discussion as empirical results remain inconclusive and vary from place to place. For instance, whereas studies such as Al-Fawwaz (2016), Balaj and Lani (2017), Kunwar (2019), and Nyarko-Asomani et al. (2019) find government expenditure to positively influence economic growth, others have found the relationship to be insignificant (Ogar et al., 2019) or negative (Aydin & Esen, 2019; Barlas, 2020; Iheanacho, 2016; Okoye et al., 2019). The variations in findings could be a result of peculiarity in fiscal reforms implemented over a period of time by specific countries. It is as a result of this that this study seeks to investigate the short-run and long-run effects of government spending on the economic growth of Ghana. This study contributes to the literature in the following ways. First, the study contributes to the literature by providing insights

on the short-run and long-run effects of public expenditure on the economic growth of Ghana. The few studies that have considered public expenditure (Nyarko-Asomani et al., 2019) have only investigated how government expenditure affects economic growth without examining the short-run and long-run dynamics. We therefore contribute to the literature by providing empirical evidence on the relationship between government expenditure and economic growth in both the short-run and long-run. We also contribute to policy making by providing insights on the short- and long-run effects of government expenditure on the economy in Ghana.

This study presents these results; government expenditure has a positive relationship with economic growth in both the short-run and long-run. However, the positive long-run relationship is insignificant. Our results further show that, Gross Capital Formation and Foreign Direct Investment show a significant positive relationship with economic growth in both the short-run and long-run.

The study is organized as follows: the first section provides an introduction, while the second section, section 2, provides a review of the theoretical and empirical literature. The methodology is presented in section 3. Section 4 and section 5 provide the discussion of the results and conclusion of the study, respectively.

2. Literature review

We draw on Keynes' theory of government expenditure to explain the theoretical relationship between government expenditure and economic growth. Whereas Wagner's organic theory and the Peacock-Wiseman hypothesis regard public expenditure as an endogenous variable to growth, Keynes regards government expenditure as an exogenous factor that can be used as a policy instrument to influence economic growth (Keynes, 1936). According to the Keynesian theory, an increase in government expenditure leads to an increase in economic growth via an expansionary fiscal policy. When government spending increases, production also increases, and this leads to an increase in aggregate demand, which ultimately leads to an increase in gross domestic product (GDP). Therefore, if government spending increases, all things being equal, output increases. Drawing on this notion, we expect government expenditure to be positively related to economic growth in Ghana.

Theoretically, the Keynesian theory generally argues that government intervention can smooth fluctuations in economic growth. Governments influence the economy by promoting social welfare by implementing appropriate economic, political, social, and legal programs (Jibir et al., 2019a). Public expenditures can therefore be used as an exogenous fiscal policy tool to generate more growth through their various aggregate demand effects, especially during recessions (Aluthge et al., 2021). The multiplier effect of government expenditures usually has two aspects (Alshammary et al., 2022). The first part shows that, an increase in the size of government will be offset by an increase in tax revenue if the multiplier effect is equal to one, which eventually tends to sustain the fiscal balance. The second part is when diminishing taxes offset the expansion of government expenditure. In this situation, the value of the multiplier will be greater than one. Therefore, if the government size is optimum, aggregate demand will grow, which tends to increase output of a country. According to Keynes, government expenditures represent a policy instrument to increase GDP, and causality runs from government expenditures to GDP (Alshammary et al., 2022). Keynesian economists believe that the role of government is to smooth business cycle fluctuations (Jibir & Aluthge, 2019b). Based on these theoretical arguments, we propose a model in equation 1 where economic growth is a function of government expenditure, while controlling for other key macroeconomic conditions.

Empirically, numerous studies have been conducted to examine the relationship between government expenditure and economic growth. However, discussion on the subject still remains open as results vary from country to country. While some studies observe a positive relation (Al-Fawwaz, 2016; Balaj & Lani, 2017; Kunwar, 2019; Nyarko-Asomani et al., 2019), others find an

insignificant (Ogar et al., 2019) or negative relation (Aydin & Esen, 2019; Barlas, 2020; Iheanacho, 2016; Okoye et al., 2019). For instance, in Ghana, Nyarko-Asomani et al. (2019) investigate the relationship between public expenditure and economic growth from 1980 to 2017. The study uses the Stock-Watson Dynamic OLS estimation. The authors find capital expenditure to be a growth-enhancing variable while non-interest and interest-payments recurrent expenditures are detrimental to the growth of the economy. Kunwar (2019) investigates the relationship between government expenditure and economic growth in Nepal. Using annual time series data covering 1975 to 2018, and an ARDL econometric technique, the empirical findings show that, government expenditure has a positive and significant association with economic growth. Barlas (2020) also evaluates the influence of government expenditure on economic growth in Afghanistan. The study employed secondary data spanning from 2004 to 2019, using an autoregressive distributed (ARDL) lag model. The findings indicate that, government expenditure is significantly and negatively associated with economic growth in Afghanistan.

Using data from 10 selected Central and Eastern European countries, Lupu et al. (2018) analyze the relationship between public expenditure and economic growth from 1995 to 2015. Employing an ARDL approach, the authors find that public expenditure on education and health positively influences economic growth. Sáez et al. (2017) investigate the relationship between government spending and economic growth in European Union countries using data from 1994 to 2012. Using panel data techniques, the authors find government expenditure to negatively influence economic growth. Further, Ogar et al. (2019) examine the relationship between government expenditure and economic growth in Nigeria, using annual time series data, ranging from 1980 to 2017. The empirical results show that, government expenditure has a positive but insignificant relationship with economic growth in Nigeria. Similarly, Ebong et al. (2016) evaluates the influence of government expenditure on economic growth in Nigeria. Using annual time series data, the authors indicate that government expenditure on agriculture has a significant impact on economic growth in both the short-run and long-run. Al-Fawwaz (2016) also uses annual time series data to examine the effect of government expenditure on economic growth in Jordan from 1980 to 2013. The findings show that, government expenditure has a positive relationship with economic growth.

Ibrahim (2019) uses a Vector Autoregression approach to examine the relationship between government expenditure and non-oil economic growth in the UAE. The author shows that an increase in government expenditure, by intensifying current and development public expenditure, induces an increase in non-oil economic growth in the UAE. Additionally, Aydin and Esen (2019) examine the association between the size of government and economic growth and determine the optimum level of expenditure to increase economic growth. The study uses a dynamic panel data estimation technique based on the threshold model. Based on the empirical findings, government spending has a threshold impact on growth in the economy. They again indicate that, economic growth is negatively affected where government spending is above the threshold level. However, where government size is below the threshold level, government spending has a positive effect on economic growth.

Moreover, Okoye et al. (2019) analyze the relationship between economic growth and government expenditure to assess how output growth is affected by government expenditure using secondary data from 1981 to 2017. The results show a negative and significant short-run lagged impact on current expenditure for the growth of the economy. The study further shows a significant positive influence of lagged capital expenditure on economic growth. However, the findings could not prove long-run relationship between government expenditure and growth. Also, Balaj and Lani (2017) examine the impact of public expenditure on economic growth in Kosovo. The study uses secondary data from 2000 to 2016. The empirical results indicate that public expenditure and economic growth are positively related; however, economic growth does not depend directly on public expenditure. The authors further find that public expenditure in Kosovo has not achieved its intended goal, since funds are spent inappropriately on projects that do not

drive economic growth. Iheanacho (2016) assesses the short-run and long-run association that exists between public expenditure and economic growth in Nigeria from 1988 to 2014. The study employs the Johansen cointegration and error correction econometric approach. The findings of the study indicate that; the most significant driver of the Nigerian economic growth is current expenditure. The study further indicates that, in the long-run, there is a negative relationship between economic growth and recurrent expenditure. Again, capital expenditure also reveals a significant long-run negative impact on economic growth. The study concludes that, public expenditure heavily influences economic growth.

Akanbi et al. (2019) determine the influence of government agricultural expenditure on economic growth of Nigeria. The study employs time series data from 1981 to 2015 sourced from the central Bank of Nigeria and the Bureau of National statistics. They adopt a VECM approach in analyzing the estimations. The results from the vector error correction model indicate that in the long-run, government agriculture expenditure influences economic growth. They further find that in the short-run, government spending on agriculture and agricultural output are positive and significantly related to the growth of the economy. Using time series data on Kenya from 1970 to 2017, Odhiambo and Nyasha (2018) critically assess the impact of public expenditure on economic growth. Employing an ARDL econometric technique. The results found are consistent with the Keynesian concept as the evidence proved that the granger causality is unidirectional, running from government spending size to economic growth for both the long-run and short-run.

3. Methodology

3.1. Data

Based on the availability of data, we use annual time series data from 1970 to 2016. The study variables include GDP growth (GDPG), Gross Fixed Capital Formation (GFCF), Government Expenditure (GEXP), Population Growth (POP), and Foreign Direct Investment (FDI). All the data are taken from the World Development Indicators. In line with literature, GDP growth is proxied with the annual GDP growth rate (Onifade et al., 2020), while Gross Fixed Capital Formation is measured as Gross Fixed Capital Formation as a percentage of GDP (Van et al., 2021). We proxy government expenditure with annual percentage growth in government final consumption expenditure. Further, population growth is proxied with the annual population growth rate (Peter & Bakari, 2018), whereas net inflows for foreign direct investment as a percentage of GDP is employed as the measure of FDI (Osei & Kim, 2020).

3.2. Model specification

Using economic growth as our dependent variable, we employ a growth model for this study with GDP growth modeled as a function of Gross Fixed Capital Formation (GFCF), Government expenditure (GEXP), Population Growth (POP), and Foreign Direct Investment (FDI). The general model for the study is as follows:

$$GDP_t = \beta_0 + \beta_1 GFCF_t + \beta_2 GEXP_t + \beta_3 POP_t + \beta_4 FDI_t + \varepsilon_t \quad (1)$$

From equation 1, the log-linear form of the model specified becomes

$$\ln GDP_t = \beta_0 + \beta_1 \ln GFCF_t + \beta_2 \ln GEXP_t + \beta_3 \ln POP_t + \beta_4 \ln FDI_t + \varepsilon_t \quad (2)$$

where β_1 , β_2 , β_3 , and β_4 represent the elasticities of the variables in the model with respect to GDP. t represents time and ε is the error term. The log form safeguards the removal of likely outliers as well as large coefficients. Elasticities are of importance as they bring to bear the actual responses of GDPG as the dependent variable, against Gross Fixed Capital Formation, GFCF, government Expenditure, GEXP, Population Growth, POP, and Foreign Direct Investment, FDI.

3.3. Estimation technique

In analyzing time series data, preliminary tests on the variables are very important to make sure the estimated parameters from the specified model are reliable. In this study, we first examine the stationarity properties of all the variables to ensure that the estimated results are not spurious. We then test the relationship between the variables employed using the Autoregressive distributed Lag (ARDL) estimation approach, following Onifade et al. (2020). The ARDL approach is known to be widely applicable for the analysis of time-series data regardless of the order of integration, provided that none of the underlying variables are integrated in the second order. The ARDL approach can therefore be applied regardless of whether the underlying regressors are integrated of order one $I(1)$, order zero $I(0)$, or fractionally integrated. The technique is also found to be suitable even if the sample size is small (Odhiambo, 2015). These advantages of ARDL make it suitable and efficient for our study.

3.3.1. Stationarity test

3.3.1.1. Augmented Dickey-Fuller (ADF) test. The ADF test is the modified and improved version of the Dickey-Fuller test. Because the DF test assumed that the error terms should be uncorrelated and white noise, the ADF was used for situations where the error terms may be correlated; this follows the idea that most macroeconomic variables may be correlated and also usually trended. The ADF test adds extra lagged terms of the dependent variable to the equation which helps to deal with the problem of autocorrelation. A simple ADF stationarity test may be specified as

$$\Delta X_t = \alpha_1 + \alpha_2 t + \alpha_3 X_{t-1} + \sum_{i=1}^p \beta_1 \Delta X_{t-i} + \varepsilon_t \quad (3)$$

where X represents the time series variable; t is the time/trend variable; α_1 , α_2 , and α_3 are the estimated parameters; Δ is the first difference operator; β_1 is the various estimated parameters of the differenced values of the lagged variables; and ε_t is the white noise error term. From equation (3), we test the null hypothesis of the presence of unit root against the alternative hypothesis of no unit root. The series is stationary if the study rejects the null hypothesis. Should the study fail to reject the null hypothesis, then the series possesses a unit root and is thus nonstationary.

3.3.1.2. Phillips-Perron (PP) test. The PP test was advanced by Phillips and Perron (1988) as a more robust test for the stationarity of time series data. It modifies the ADF test by making non-parametric modification to the test statistics which is able to correct for the possibility of autocorrelation and heteroscedasticity in the error terms. It is also able to make sure that the deviations are white noise in the estimated regression. A simple PP test may be expressed as

$$\Delta X_{t-1} = \alpha_0 + \beta X_{t-1} + \varepsilon_t \quad (4)$$

From equation (4), we test the null hypothesis of the presence of unit root ($\beta = 0$), against the alternative hypothesis of no unit root. The series possesses a unit root if the study fails to reject the null hypothesis. On the other hand, the series is stationary if the null hypothesis is rejected.

3.3.2. Autoregressive distributed lag (ARDL) model

The ARDL estimation technique is employed to examine the short-run and long-run effects of inflation, government expenditure, GDP growth, exchange rate, and budget deficit. The ARDL is preferred because of its numerous advantages; first, Pesaran et al. (2001) note that it can be applied to time series data irrespective of whether the series is stationary at first difference $I(1)$ or at the levels $I(0)$, or a mixture of both. Also, it is suitable for a small sample size analysis and also more flexible because it can be used even when the order of integration of the variables is not known before the cointegration test.

A general ARDL model may be expressed as

$$\Delta Y_t = \beta_0 + \gamma_0 Y_{t-1} + \gamma_1 X_{t-1} + \gamma_2 Z_{t-1} + \sum_{i=1}^p \beta_i \Delta Y_{t-i} + \sum_{j=0}^p \alpha_j \Delta X_{t-j} + \sum_{k=0}^p \delta_k \Delta Z_{t-k} + \varepsilon_t \quad (5)$$

From equation (5), Y is the dependent variable, X and Z are the independent variables in the model. β , δ , and γ are the coefficients to be estimated, and ε is the error term. From the general ARDL model in equation (6), the ARDL model for the study can be specified as

$$\begin{aligned} \Delta \text{GDPG}_t = & \beta_0 + \gamma_0 \text{FDI}_{t-1} + \gamma_1 \text{GFCF}_{t-1} + \gamma_2 \text{POP}_{t-1} + \gamma_3 \text{GEXP}_{t-1} + \sum_{i=1}^p \beta_i \Delta \text{FDI}_{t-i} \\ & + \sum_{i=0}^p \alpha_i \Delta \text{GFCF}_{t-i} + \sum_{i=0}^p \theta_i \Delta \text{POP}_{t-i} + \sum_{i=0}^p \beta_i \Delta \text{GEXP}_{t-i} + \varepsilon_t \end{aligned} \quad (6)$$

From equation (6) the ARDL bounds test can be employed to establish the existence of any long-run relationship among the variables.

3.3.3. ARDL bounds testing approach

The ARDL bounds test for cointegration (long-run equilibrium relationship) is established from the overall test of significance of the lag of all the variables in their levels form. The study thus tests the significance of the F-statistic. From equation (7), the study tests the hypothesis of the existence of no long-run equilibrium relationship against the alternative hypothesis of the presence of a long-run equilibrium relationship among the variables.

$$H_0 : \gamma_0 = \gamma_1 = \gamma_2 = \gamma_3 \quad (7)$$

$$H_1 : \gamma_0 \neq \gamma_1 \neq \gamma_2 \neq \gamma_3$$

The study then compares the estimated F-Statistic value to the lower and upper bounds critical values generated by Pesaran et al. (2001); the lower bound values are generated on the assumption that all the variables are integrated of order zero; $I(0)$, while the upper bound is by the assumption that all variables are integrated of order one; $I(1)$. The null hypothesis is rejected if the F-statistic falls above the upper bound; this indicates the existence of a long-run equilibrium relationship among the variables. If the F-statistic falls below the lower bound, then the study fails to reject the null hypothesis, thus there is no long-run relationship among the variables.

3.3.4. The short-run and long-run estimates from the ARDL model

Because the ARDL model specifies both the long-run and short-run impacts of the independent variables on the dependent variables, the study can estimate the long-run coefficients after a long-run relationship has been established among the variables.

$$Y_t = \beta_0 + \gamma_0 Y_{t-1} + \gamma_1 X_{t-1} + \gamma_2 Z_{t-1} + \varepsilon_t \quad (8)$$

From equation (8) the long-run coefficients; $\gamma_0, \gamma_1, \gamma_2, \gamma_3, \gamma_4$ are generated.

The short-run dynamics coefficients from the model may be expressed by finding the error correction model associated with the long-run estimates. Thus, from equation (8), the short-run regression model may be expressed as

$$\Delta \text{GDPG}_t = \beta_0 + \sum_{i=1}^p \beta_i \Delta \text{FDI}_{t-i} + \sum_{i=0}^p \alpha_i \Delta \text{GFCF}_{t-i} + \sum_{i=0}^p \theta_i \Delta \text{POP}_{t-i} + \sum_{i=0}^p \beta_i \Delta \text{GEXP}_{t-i} + \zeta E_{t-1} + \varepsilon_t \quad (9)$$

where E_{t-1} shows the error correction factor and ζ represent the speed of adjustment. $\beta_i, \alpha_i, \theta_i, \omega_i$ are the short-run parameters to be estimated. From equation (9), the error correction tells the speed of adjustment of the variables to the long-run equilibrium, should there be any disequilibrium. The error correction factor is thus expected to be negative and significant. The negative suggests that with any deviation from the long-run, the variables would return to equilibrium. On the contrary, a positive error correction term indicates an explosive state, thus the possibility that the variables may not return to their equilibrium point.

4. Results and discussion

The results from the empirical analysis are discussed in this section. Table 1 shows the descriptive statistics of the obtained data.

Table 1 illustrates the descriptive statistics of the study. GDP growth rate has maximum and minimum values of 9.723 and -12.432 , respectively. GDP also recorded a mean value of 3.036 and a standard deviation of 4.570. Foreign Direct Investment (FDI) as an independent variable recorded a standard deviation and a mean value of 1.186 and 0.962, respectively. FDI recorded a low standard deviation. However, its maximum and minimum values recorded 4.280 and -0.660 . Meanwhile, Gross Fixed Capital Formation (GFCF) also portrays a higher mean value, thus 14.913. The variable further shows maximum and minimum values of 29.002 and 3.378, respectively. The population growth (POP) indicates the lowest standard deviation of 0.413. The variable recorded a maximum figure of 3.482 and a minimum value of 1.603. However, it portrays a mean value of 2.617. Lastly, Government Expenditure (GEXP) recorded a standard deviation value of 3.569. The variable also recorded a mean figure of 12.004. Again, it shows a maximum and a minimum value of 20.888 and 5.561, respectively.

4.1. Stationary test

The results from Table 2 illustrate the stationarity of the variables. Both the ADF and PP tests reveal that only GDP growth is stationary at level among the series. However, Foreign Direct Investment (FDI), Gross Fixed Capital Formation (GFCF), Population growth (POP), and Government Expenditure (GEXP) were all not stationary at level, even though all became stationary at 1% significance level after the series were differenced. The results imply that all the variables are $I(1)$ variables except GDP growth, which is an $I(0)$ variable.

4.2. ARDL bounds test cointegration results

We test the presence of long-run relationship between the series, through the Autoregressive Distributed Lag (ARDL) Bounds Test. The outcome of the test is presented in Table 3.

The ARDL Bounds test results from Table 3 with Model Selection Criteria of (2,0,1,1,2) and based on the Akaike info criterion generated reveal the existence of long-run relationship between the variables under study at 5% significance level. The F-Statistic computed (6.035) is higher than the Upper Critical Bound values of 3.52, 4.01, and 6.06 at 10%, 5%, and 1% significance level,

Table 1. Descriptive statistics

Variable	Mean	Std. Dev	Minimum	Maximum
GDPG	3.036	4.570	-12.432	9.723
FDI	0.962	1.186	-0.660	4.280
GFCF	14.913	7.579	3.378	29.002
POP	2.617	0.413	1.603	3.482
GEXP	12.004	3.569	5.561	20.888

Notes: GDPG = Annual GDP growth rate, FDI = Foreign Direct Investment, GFCF = Gross Fixed Capital Formation, POP = Population, GEXP = Government Expenditure.

Source: Author's compilation (2022)

Table 2. Stationarity results					
Variable	ADF Test		Philips-Perron Test		Order of Integration
Constant		Constant and Trend	Constant	Constant and Trend	
PANEL A: LEVELS					
GDPG	-4.488***	-5.496***	-4.483***	-5.728***	-
FDI	-0.740	-2.288	-0.597	-2.303	-
GFCF	-1.375	-3.085	-1.143	-3.085	-
POP	-1.525	-0.898	-2.533	-2.573	-
GEXP	0.554	-0.756	-1.410	-3.018	-
PANEL B: FIRST DIFFERENCE					
ΔFDI	-7.024***	-7.051***	-7.234***	-7.910***	I(1)
ΔGFCF	-6.813***	-6.676***	-7.974***	-7.895***	I(1)
ΔPOP	-13.131***	-13.258***	-3.114***	-3.065***	I(1)
ΔGEXP	-5.037***	-5208***	-6.538***	-6.457***	I(1)

Note: ***, **, * indicates significance at 1%, 5%, and 10%, respectively
Source: Author's Construct (2022)

Table 3. Results of bounds test cointegration

F-Statistics	Critical Values		
	Significance	Lower Bound	Upper Bound
	10%	2.45	3.52
6.035***	5%	2.86	4.01
	1%	3.74	5.06

Note: ***, **, * indicates significance at 1%, 5%, and 10%, respectively

Source: Author's Construct (2022)

Table 4. Estimated long-run results

Variable	Coefficient	Std. Error	t-Statistic
FDI	1.204**	0.554	2.171
GFCF	0.443***	0.102	4.347
POP	-5.561***	1.861	2.988
GEXP	0.145	0.172	0.845

Note: ***, **, * indicates significance at 1%, 5%, and 10%, respectively

Source: Author's Construct (2022)

respectively. There is the presence of long-run equilibrium relationship among the factors under consideration, since the F-Statistic value is higher than the lower and upper critical values (thus, at 1%, 5%, and 10%). In sum, there is a significant long-run relationship between the study variables.

4.3. Results from long-run estimates

To examine the influence of the variables employed in the study on GDP growth, we test the long-run impact of Foreign Direct Investment, Gross Capital Formation, Population growth, and Government Expenditure. Table 4 illustrates the results.

The results from Table 4 show that, the relationship between GDP growth and Foreign Direct Investment (FDI) is positive and also highly significant in the long-run. The result means that, a percentage point increase in Foreign Direct Investment will lead to 1.20 percentage point increase in GDP growth in Ghana, in the long-run. This result is in line with a priori expectation and also consistent with Dinh et al. (2019). Also, the results indicate that, Gross Fixed Capital Formation (GFCF) has a positive association with GDP growth, with the relationship being significant at the 1% significance level. This implies that, a percentage point increase in Gross Fixed Capital Formation will cause GDP growth to increase by 0.44 percentage point in the long-run. This finding is consistent with Meyer and Sanusi (2019) who also find a positive long-run association between GFCF and growth.

Furthermore, the findings reveal that, Population growth (POP) is highly significant and has a negative relationship with GDP growth. The result means that, a percentage point increase in population growth will cause GDP growth to decrease by 5.56 percentage point in the long-run. This finding is contrary to the findings of Rehman (2019). Lastly, the result indicates that there is a positive but insignificant relationship between Government Expenditure and GDP growth in the long-run. This finding is consistent with Ogar et al. (2019) who also find government expenditure to insignificantly influence economic growth in Nigeria. Our evidence, however, contradicts Barlas (2020) who find a negative long-run association between government expenditure and economic growth in Afghanistan. Our finding suggests that economic growth in Ghana cannot be sustained with government expenditure as the positive effect becomes insignificant in the long-run.

Table 5. Estimated short-run results

Variable	Coefficient	Std. Error	t-Statistic
D(FDI)	0.387**	0.177	2.183
D(GFCF)	0.379*	0.194	1.950
D(POP)	27.545**	12.475	2.208
D(GEXP)	0.764**	0.368	2.076

Note: ***, **, * indicates significance at 1%, 5%, and 10%, respectively

Source: Author's Construct (2022)

4.4. Results from short-run estimates

The Error Correction Model (ECM) term is incorporated in the short-run estimation analysis within the ARDL framework. This reveals the immediate impact of foreign direct investment, gross fixed capital expenditure, population growth, and government expenditure in Ghana. The ECM determines the speed of adjustment for the factors under consideration, thus the rate at which the variables return to equilibrium in the short-run.

The short-run results illustrated in Table 5 indicate that, the ECM is statistically significant at 1% and also negative, and this is in agreement with the long-run equilibrium relationship among variables from the cointegration test. It further shows that there is evidence of stability and robustness in the model. This implies that in the long-run, all variables in the model will converge to an equilibrium if there is a shock in the short-run. The results show that the variables' speed of adjustment to equilibrium is 41% when there is a shock. The short-run estimation results show that, Foreign Direct Investment (FDI) is statistically significant and positively related to GDP growth. This implies that, a percentage point increase in FDI will lead to 0.39 percentage point increase in GDP growth in the short-run. This is consistent with the findings of Dinh et al. (2019). The results also indicate that, Gross fixed Capital Formation (GFCF) is statistically significant and positively related to GDP growth. This means that, a percentage point increase in GFCF will result in 0.38 increase in GDP growth. This finding is consistent with Meyer and Sanusi (2019) and thus further suggests that an increase in gross fixed capital formation has significant spillover effects on economic growth in the short-run.

Population growth variable also reveals a positive relationship with GDP growth in the short-run. This means that a percentage increase in Ghana's population growth will lead to 27.55 percentage point increase in GDP growth in the short-run. All things being equal, in the short-run, the growing population will be able to meet available resources for production and thus cause growth in GDP. This finding is, however, contrary to the work of Thornton (2001). Lastly, the short-run results indicate that, government expenditure has a positive association with GDP growth, with the relationship being significant at the 1% significance level. Statistically, a percentage point increase in government expenditure will lead to 0.76 percentage point increase in GDP growth in the short-run. The result further confirms similar work carried out by Nyarko-Asomani et al. (2019). Our findings suggest that an increase in government expenditure in Ghana boosts immediate production, consumption, and investment in the country and results in a short-run increase in economic growth, confirming the Keynesian theory of government expenditure.

4.5. Diagnostic and stability tests

To further ensure the stability and robustness of the model, we test the stability of our model. Thus, the absence of autocorrelation, heteroscedasticity, normality, and correct specification of the model is necessary. The expectation from all the various tests statistics should be insignificant to secure the robustness of the econometric model. Table 6 presents the diagnostic results.

From Table 6, the test for autocorrelation based on the Breusch–Godfrey autocorrelation LM test among the residuals confirms that there is no autocorrelation since the F-Statistic is statistically

Table 6. Diagnostic and stability test results

Test	F-Statistic	Prob. Value
Autocorrelation	0.984	0.390
Heteroscedasticity	0.471	0.846
Normality	0.303	0.860
CUSUMQ	Stable	-

Source: Author's Construct (2022)

insignificant. The test of Heteroscedasticity based on the Breusch–Pagan–Godfrey test also shows a statistically insignificant F-statistics that indicate the nonexistence of heteroscedasticity among the error terms. Also, to ensure that the variables were normally distributed, the Jarque–Bera test for normality was conducted. Additionally, the CUSUM squares test shows that the estimation model is stable. The diagnostic tests performed show that the model in this study displays no evidence of heteroscedasticity and no evidence of serial correlation.

5. Conclusion

The purpose of this study is to investigate the influence of government expenditure on GDP growth in Ghana. We employ annual time series data spanning from 1970 to 2016, using ARDL econometric technique. We find that Foreign Direct Investment (FDI), Gross Fixed Capital Formation (GFCF), and Government Expenditure (GEXP) all have positive and significant impact on GDP growth in both the long-run and short-run. However, population growth showed a negative influence in the short-run and a positive effect in the long-run. Although the long-run positive influence of government expenditure is insignificant, government expenditure significantly drives economic growth in Ghana in the short-run. Our findings have important implications on policy. Government expenditure should be leveraged as a tool to boost short-run economic growth in Ghana. Government should increase expenditure on profitable ventures as this will promote short-run GDP growth in Ghana. Also, expenditure on long-term profitable projects can be used to realize the long-run positive effects of government expenditure on growth. We recommend that government create an enabling business environment to further attract more Foreign Direct Investment flows into the country to enhance GDP growth. We again recommend government to craft a viable policy in managing the country's population growth since it has a negative implication on economic growth. Future studies could explore how the established link between government expenditure and economic growth can be complemented with other key policy variables in order to engender positive effects of government expenditure on economic growth. Future studies can therefore employ interactive regressions to analyze the complementary role of other policy variables. Additionally, future studies may employ threshold techniques such as quadratic estimations to examine the threshold levels at which the government expenditure positively influences economic growth. This study is limited in the fact that it does not consider structural breaks over the period of the study, and future studies may consider this phenomenon.

Funding

The authors received no direct funding for this research.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Citation information

Cite this article as: The influence of government expenditure on economic growth in Ghana: An Ardl approach, Kwasi Poku, Emmanuel Opoku & Priscilla Agyeiwaa Ennin, *Cogent Economics & Finance* (2022), 10: 2160036.

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