



## **Economic Growth in Ghana: An Empirical Investigation**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author SA collected the data, designed the research and wrote the manuscript. Author YJ made a contribution to the analysis of the results and author NEY contributed to the review and interpretations of results. The authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/AJEBA/2016/29556

#### Editor(s):

(1) Gerasimos T. Soldatos, American University of Athens, Athens, Greece.

#### Reviewers:

(1) Nurulizwa Rashid, Universiti Teknikal Malaysia Melaka, Malaysia.

(2) António Bento Caleiro, Universidade de Évora, Portugal.

Complete Peer review History: <http://www.sciencedomain.org/review-history/17036>

**Original Research Article**

**Received 17<sup>th</sup> September 2016**  
**Accepted 17<sup>th</sup> November 2016**  
**Published 26<sup>th</sup> November 2016**

### **ABSTRACT**

Factors influencing economic growth are relevant to both developed and developing nations. To our knowledge, current literature on the factors influencing Ghana's economic growth is limited. Therefore, to bridge this gap, this study examines the effect of foreign aid, foreign direct investment, physical capital, inflation, labor force and government expenditure on real GDP growth in Ghana between the years 1980 and 2010. The paper shows that, the long-run economic growth in Ghana is mainly explained through government expenditure, foreign aid, physical capital, inflation and foreign direct investment. In addition, a change in labor force in the short-run does not affect the economic growth in Ghana. It was found that, macroeconomic factors have both positive and negative correlation with gross domestic product. This paper therefore advocate that, government should invest in important projects that would add positive value to the country's economic growth such project could be aiming, for instance, at improving labor force productivity by setting up a

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strong and high quality research and development sector that will mobilize and take into consideration all researches and to create favorable atmosphere to attract foreign investors. In addition, instead of government relying on foreign aid, it should rather create avenues that would domestically generate revenue.

*Keywords: Economic growth; Ghana; gross domestic product.*

## 1. INTRODUCTION

Ghana as a lower middle income country has been struggling for the past decade to overcome poverty. In view of this, a vision 2020 program was launched in 1991 with a motive to attain upper middle income country status with an average growth rate of 8% by the end of 2020 [1]. From 1996 to 2015, the gross domestic product was expected to grow between 7.1% and 8.3% to keep Vision 2020 on track. However, the growth during that period was only within 4.2% and 5%. Ghana has four years to come to realize the vision 2020 program. Therefore, there should be a high sustainable growth rate above 8% if the country is expected to achieve the vision 2020's goal. Even though Ghana registered comparatively creditable economic growth within 2014, the progress of the economy was slowed down in the form of energy crisis, macroeconomic instability, rise inflation and currency reduction as well as high interest rate. However, the economy has been projected to recover, bolstered strongly by high oil and gas production, increase private sector and public infrastructure investment and to get better macroeconomic structure and political stability above the average period at the end of 2016 [2]. Meanwhile, Ghana is currently facing numerous problems emanating from the 2016 all-time low oil prices in the international market coupled with high interest rate and weaker currency, which is a situation discouraging both local and foreign investment from borrowing and investing.

The contribution of this research is twofold. First, the outcome of this research reviews the factors that influence economic growth in Ghana, aiding thereby policymakers and investors in critical decision-making. Secondly, the result adds to the existing literature in relation to economic growth.

## 2. LITERATURE REVIEW

Economic growth is the increase in the inflation-adjusted market value of the goods and services created by an economy over time (Godwin, 2007). According to Baily [3], while factors such as government spending, direct taxes have

negative effect on economic growth, factors such as investment in human and physical capital, government expenditure, macroeconomic policies, financial market as well as international trade have positive impact on economic growth. Military expenditure had negative economic growth in Sub-Saharan African countries [4]. Salisu and Ogwumike [5], studied the role of macroeconomic policy environment in aid-growth nexus. The paper concluded that, the continuous socio-political crisis, policy inconsistencies, bad governance and macroeconomic instability evident in many Sub-Sahara Africa countries, have stalled the efficiency of aid in these countries. Easterly and Levine [6], studied the direct and indirect influence of ethnic diversity on Sub-Sahara Africa's growth. The results show that high level of ethnic diversity is highly linked to black market, political instability within some countries, poor financial development, low provision of infrastructure, and low level of education having negative effect on economic growth.

Chengsi Zhang, Yueteng Zhu and Zhe Lu et al. [7], investigated trade openness, financial openness, and financial development in China. They found out that both trade and financial openness are statically significant determinants of financial efficiency and competition; however, openness has negative impact on the size of financial development. Khungwa [8], studied the determinants of economic growth in Malawi. The paper found out that trade openness and human capital had significant effect on economic growth in the country.

In this vein of research, the present study seeks to critically analyze key macroeconomic factors such as foreign direct investment, inflation, foreign aid, labor force, physical capital and government expenditure that may influence the economic growth in Ghana. The analytical method chosen is the Johansen cointegration approach [9].

### 2.1 Source of Data

This study adopted time series data (GDP, physical capital, foreign direct investment, foreign

aid, inflation and government expenditure) between the periods of 1970-2010 from the World Bank Development Indicators (WDI, 2011). Labor force is considered according to the International Labor Organization (ILO) of the active population of the economy that includes both the employed and the unemployed. The secondary information provided sufficient data to experiment the hypotheses [9].

## 2.2 Model Specification

From the neoclassical, classical and the new growth theories of macroeconomic theory, investment, natural resources, human capital, technology, innovation, economic policies, foreign aid, government expenditure, trade openness, institutional framework, foreign direct investment, political factors, socio-cultural factors, demography and others can influence economic growth [10,11,12,13,14,15,16].

Using Lucas [17], economic growth functions approach.

$$RPCGDP=f(K, L, FDI, FA, INF, GE) \quad (1)$$

The function of Real Gross Domestic Product (RGDP) is physical capital (K), labor force (L), foreign direct investment (FDI), foreign aid (FA), inflation (INF) and government expenditure (GE).

The growth function is expected to be as follows:

$$\ln RPCGDP_t = \beta_1 K_t + \beta_2 L_t + \beta_3 FDI_t + \beta_4 FA_t + \beta_5 INF_t + \beta_6 GE_t + \epsilon_t \quad (2)$$

Where

$\ln RPCGDP_t$  = the log of Real Gross Domestic Product per capita.

$K_t$  = the Physical Capital

$L_t$  = the total Labor Force

$FDI_t$  = Foreign Direct Investment

$FA_t$  = Foreign Aid

$INF_t$  = Inflation; thus the log of Consumer Price Index

$GE_t$  = Government expenditure

$t$  = time

$\epsilon_t$  = error which is assumed to be normally and independently distributed with constant variance and zero mean that captures all additional descriptive variables that power economic growth however this model did not captured them.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5,$  and  $\beta_6$  are the partial elasticity of Real Gross Domestic Product per capita growth.

## 2.3 Variables of Interest

The main variables of interest are economic growth (RPCGDP<sub>t</sub>), Physical capital ( $K_t$ ), Labor force ( $L_t$ ), Foreign direct investment (FDI<sub>t</sub>), Foreign aid (FA<sub>t</sub>), Inflation (INF<sub>t</sub>) and government expenditure (GE<sub>t</sub>)

**Table 1. Explanatory variables and expected signs**

Explanatory variables	Expected signs
Physical capital	+
Labour force	+
Foreign direct investment	+
Foreign aid	+
Inflation	-
Government expenditure	-

Source: *Macroeconomic determinants of economic growth in Ghana*

Error correction term lagged in one period integrates short-run dynamic in the long run growth function. See the error correction model below (ECM).

$$\begin{aligned} \Delta \ln RPCGDP_t = & \alpha_1 + \sum_{j=1}^p b_{2j} \Delta \ln RPCGDP_{t-1} + \\ & \sum_{j=0}^p c_{3j} \Delta K_{t-1} + \sum_{j=0}^p d_{4j} \Delta L_{t-1} + \\ & \sum_{j=0}^p e_{5j} \Delta FDI_{t-1} + \sum_{j=0}^p f_{6j} \Delta FA_{t-1} + \\ & \sum_{j=0}^p g_{7j} \Delta INF_{t-1} + \sum_{j=0}^p h_{8j} \Delta GE_{t-1} + \\ & \lambda_9 ECM_{t-1} + \epsilon_{2t} \end{aligned} \quad (3)$$

Where:

$ECM_{t-1}$  = error correction term. That is the residuals that are obtained from the anticipated cointegrating model of equation (3). The comment and modification result indicates how much of the disequilibrium has been corrected. It additional proves the constancy of the long-run affiliation when it is extremely statistically significant [18].

$\Delta$  = the change of the variables in the model. The coefficient of the various explanatory variables  $b_{2j}, c_{3j}, d_{4j}, e_{5j}, f_{6j}, g_{7j}, h_{8j}$  are the impart multipliers that measure the instant change in the explanatory variable and the dependent variable. Therefore,  $\epsilon_{2t}$  from equation (3) is similar to that of  $\epsilon_t$ .

$\lambda$  = the speed of adjustment parameter which have to be statistically significant. ( $-1 \leq \lambda \leq 0$ )

## 2.4 Unit Root Test

Dickey and Fuller [19], create a technique for official testing of non-stationarity. The Dickey –

Fuller (DF) technique is suitable, if the error term ( $\varepsilon_t$ ) is not correlated and it becomes unsuitable if error terms ( $\varepsilon_t$ ) are correlated. Since the error term is improbable to be white noise, Dickey and Fuller had comprehensive their testing formula signifying an improved description of the test that incorporates further lagged term of dependent variable in order to work out the autocorrelation dilemma.

To test if a series  $X_t$  is stationary using the ADF test, the following equation is estimated:

$$Dx_t = \beta + Px_{t-1} + e_t \quad (4)$$

The following decision rules are used;

- If the ADF test statistic is larger than the critical value, then the sequence is stationary.
- If the ADF statistic is a smaller amount than the critical value, the sequence is non-stationary. If the sequence is non-stationary on level form, then the test is carried out consecutively on the differenced sequence until it become stationary. Below is the arrangement of the integration.

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 t + \sum_{j=1}^p Y_j \Delta Y_{t-j} + \varepsilon_t; \\ H_0: \beta_1 = 0; H_1: \beta_1 > 0 \quad (5)$$

Where,  $\beta_0$  and  $t$  are the constant and the time trend, respectively.  $\varepsilon_t$  is the error term. The ADF test is principally concerned with the estimate of  $\beta_1$ , that is, the study test the hypothesis  $H_0: \beta_1 = 0$ . The refusal of the null hypothesis in support of the option hypothesis implies that,  $Y_t$  is stationary and included of order zero, that is  $I(0)$ . If the null hypothesis of unit root for the first difference is rejected, then the first difference is stationary and the variable is integrated of the order one, so as to  $I(1)$  [20,21].

The Argument Dicky Fuller experiment assumes that, the errors are statistically independent and have a stable variance. As a result, an error term ought to be uncorrelated by means of the others and has a stable variance. The test is first carried out with a constant and trend on the variable in level form. Secondly, it is carried out with a constant only and finally without constant or trend, on the differenced variable depending on which significant level. However, if the dependent and independent variables failed the stationary experiment, the information generating processes of these variables are non-stationary. These tests are performed on both level form

and first differences of both variables. In a situation where all the variables are stationary at  $I(0)$ , the OLS method is used in the estimation. Implications of the unit root test result on the estimation procedures are; if all variables in the equation are found to be non-stationary at level form  $I(0)$  but stationary on first dissimilarity  $I(1)$ , after that cointegration test is carried out to find the existence of a long-run (L-R) symmetry affiliation.

## 2.5 Johansen Cointegration Test

Johansen method of cointegration gives two statistics; Long-Run experiment based on the utmost Eigen-significance and on the outline significance of the stochastic matrix. The Johansen test uses the probability ratio to test for cointegration. The hypothesis of cointegration is accepted if the figure of cointegrating affairs is larger than or equivalent to 1. The decision rules compare the probability percentage to the critical value for a hypothesised figure of cointegrating affairs. If the probability proportion is larger than the critical value, the hypotheses of cointegration is accepted if not it is rejected. Therefore, based on data at hand, the study uses Johansen [9] cointegration utmost likelihood approach which was applied by Johansen and Juselius [22] to find out the figure of cointegrating vectors. However, we applied the trace and maximum eigen-value experiment whereby if the variables are found to be incorporated of dissimilar category should be incorporated of the same category by differencing them before determining vector number of cointegration.

## 2.6 Analysis and Results

The Johansen Cointegration method of evaluation was used to observe the key macroeconomic factors in Ghana's economy from 1970 to 2010. The stationary properties of all the variables of interest were established using Argument Dicky Fuller test (ADF). Different forms of the models were estimated to find the accurate model for estimation. Firstly, none of the variables were logged; the results were dropped because the coefficients were too large and are not economical and statistical logic. Secondly, all the variables of interest were logged and that was also challenging because the results did not have sensible interpretation and once percentage of foreign aid is of GDP, it should not be logged again. Lastly, only the dependent variable was logged and this was more sensible.

## 2.7 Unit Root Test Results

The time series properties of the variables were explored to determine the order of integration of each variable in the model. As matter of fact, the standard procedure of the time series literature suggested that, the researcher should check for unit roots in each series before estimating any equations. If a unit root exists in any variable, then that particular series is considered to be non-stationary. Judgment based on non-stationary variables might lead to false results by means of high R2 because the R2 justify the amount of variance in the dependent variable through the sample from regression model and t-statistics, however without any logical economic significance and not in agreement limitation figure [23]. The stationary test was performed to keep away from false regression problematic that usually connected with econometric time series modeling.

## 2.8 Johansen Maximum Likelihood Cointegration Test (Result)

This study applies the (Johansen and Juselius) [22], utmost probability technique to inspect whether there is additional than a single cointegration relationship between the variables of interest. At 5% level of significance, the trace experiment indicates 2 cointegrating equations at the same time as the utmost eigen value test indicates 1 cointegrating equation among the variables. We therefore concluded that, there is one cointegrating equation between the variables based on the maximum eigen-value experiment [24].

From the model in Table 4, not even one of the coefficients of descriptive variables of Ghana's economic growth is greater than unit coefficient, showing clearly low reactivity of growth to economic change in those variables used for this research.

**Table 2. Augmented dickey-fuller (ADF) constant and trend test**

Variables	Level		First Difference I(1)			Decision
	ADF-stat	Critical value(5%)	ADF-stat	Critical value(5%)	Order of integration	
LnRPCGDP	-1.562907	-3.535601	-5.192665	-3.540327	1	I(1)
K	-2.962846	-3.540428	-5.092124	-3.550328	1	I(1)
L	-2.255898	-3.544284	-4.255898	-3.544285	1	I(1)
FDI	-2.679187	-3.536602	-4.788470	-3.568378	1	I(1)
FA	-2.949800	-3.536602	-8.874855	-3.540327	1	I(1)
INFL	0.096456	-3.536602	-4.437087	-3.540329	1	I(1)
GE	-2.095501	-3.536602	-6.327221	-3.540329	1	I(1)

*The outcome of the ADF test in table 2 shows that all the variables LnRGDP, K, L, FDI, FA, INFL and GE are all non-stationary in levels, I (0), become stationary after the first differencing, otherwise included of order one, I(1), which is essential, except not sufficient underlying principle for estimating cointegration and correction error models*

**Table 3. Johansen Cointegration Test**

Hypothesized No. of CE(s)	Trace test				Max-Eigen Value Test		
	Eigen value	Trace stats	0.05 Critical value	Prob**	Max-eigen stats	0.05 Critical value	Prob**
None	0.808291	171.0571	134.5780	0.0002	59.56371	47.08897	0.0014
At most 1	0.654747	111.5932	103.8573	0.0148	38.28533	40.95681	0.0971
At most 2	0.593202	73.30791	76.9737	0.0921	32.37185	34.81587	0.0952
At most 3	0.414055	40.93716	54.07913	0.4250	19.24237	28.58817	0.4722
At most 4	0.254472	21.69460	35.19266	0.6150	10.56708	22.29951	0.7875
At most 5	0.160074	1.22754	20.36183	0.5288	6.379521	15.89230	0.7561
At most 6	0.125982	4.848026	9.164547	0.3004	4.848026	9.164547	0.3004

*Trace experiment indicates 2 cointegrating eqn(s) on 0.05 levels*

*\*denotes refusal of the hypothesis on 0.05 level. \*\*Mackinnon-Haug-Michelis (1999) p-values. Mackimmon (1996) rejected the null hypothesis after the ADF test on critical values at 5 or 10 percent. However, no cointegration of the null hypothesis in Table 3 is rejected, meaning that, the cointegration has a long-run relationship within the variables when the unit coefficient is normalized on LnRPCGDP (Ref to Table 4)*

**Table 4. The cointegration regression**

Variables	Coefficient	standard error	T-statistics
K	0.036681	0.00865	4.18847
L	0.208844	0.18357	1.13820
FDI	-0.067778	0.02666	-2.55060
FA	-0.037643	0.00976	-3.82245
INF	0.001121	0.00072	1.36374
GE	-0.037101	0.00821	-4.57011
Trend(2)	-0.106678	0.06528	-1.62129

### 3. DISCUSSION OF RESULTS

#### 3.1 Capital

The outcome shows that physical capital has a positive coefficient and significant impact on economic growth in Ghana. This result in line with the work of Bakare [25], by means of the H-D model; he proved that, the growth rate of national income in Nigeria is absolutely linked to saving ratio and capital creation.

Distinctively, 1% growth of physical capital can affect real GDP to go up by 0.037%. It can be deduced that physical capital has an optimistic collision on real GDP in Ghana. Meaning that in the long-run, an increase in physical capital is essential to Ghana's economic growth. This outcome hold up with the assumptions of Danquah [26] and Oteng-Abayie, et al. [27] initiate it to be statistically considerable at 1% significance level while Aryeetey and Fosu [28] found it to be statistically immaterial.

#### 3.2 Labor Force

From the findings, there is a positive relationship between the dependent variable (Economic growth) and labor force in Ghana despite the fact that it is statistically insignificant at the 5% level of significance. The result of the labor force indicates that, 1% increment of labor force can occurred real GDP to rise about 0.209%. This result is consistent with economic assumption and the results of (Danquah 2006) [26]. However, this outcome is incoherent with the results of (Aryeetey and Fosu ) [28] and E.F. (Oteng-Abayie, et al.) [27].

#### 3.3 Foreign Direct Investment

It was found that, foreign direct investment (FDI) does not play positive role on economic growth in

Ghana. Statistically, it is considerable at 5% level of significance. Distinctively, 1% increase in Foreign Direct Investment (FDI) will show a decrease in real GDP by 0.068%. This pessimistic correlation linking FDI and real GDP in Ghana is reliable with a preceding revision by (Frimpong, and Oteng-Abayie) [28], other than incoherent with assumption and other experimental results of Asheghian [29] and Vu, et al. [30], Balasubramanyam, et al. [31]. (Frimpong, and Abayie) [28], came out that, FDI at the mining zone does not produce straight growth impact on the economy. It would be understandable that some stipulations which are frequently attached to FDI to developing countries base on its agreement terms might not be encouraging for establishing greater levels of manufacturing operations as well as economic expansion [32].

#### 3.4 Foreign Aid

Foreign aid was found to be pessimistic. However, it is statistically significant at 5% level of significance. Distinctively, 1% increment of foreign aid can occurred real GDP to reduce by 0.038%. Implying that, foreign aid does not have any significant effect on Ghana's real GDP growth in the long-run that is within the study period. While this outcome holds up with Griffen & Eno, [33],

#### 3.5 Inflation

It was found that, there is an upbeat correlation among inflation and real GDP, even though it is irrelevantly at 5% level of significance. However, it is statistically considerable at 10% level of significance. The outcome indicates that whenever inflation is increase by 1%, real GDP will drastically boost as a result of 0.001%. This means that, Ghana's level of inflation is good for its economic growth within the study period.

**Table 5. Dynamic error correction model**

Variable	Dependent variable		
	Coefficient	Standard error	T-statistic
Constant	0.066075	0.05086	1.30138
D(LnRPCGDP)(-1)	0.190935	0.19452	0.98216
D(LnRPCGDP)(-2)	-0.159911	0.20014	-0.79921
D(K)(-1)	-0.001052	0.00331	-0.30731
D(K)(-2)	0.001075	0.00358	0.30777
D(L)(-1)	-1.079216	1.99052	-0.54211
D(L)(-2)	0.799864	1.88381	0.42468
D(FDI)(-1)	0.019574	0.01057	1.86764
D(FDI)(-2)	0.008274	0.00711	-1.17741
D(FA)(-1)	0.00864	0.00496	1.75668
D(LnFA)(-2)	0.004724	0.00446	1.07951
D(LnINFL)(-1)	-0.000112	0.00035	-0.39376
D(LnINFL)(-2)	-0.000271	0.00034	-1.11112
D(LnGEXP)(-1)	-0.012271	0.00422	-2.97436
D(LnGEXP)(-2)	0.008722	0.00361	-2.34784
ECM(-1)	0.203758	0.08265	-2.46883
R-Squared	0.623912		
Adj. R-squared	0.326971		
Sum. Sq. resides	0.026933		
S.E. equation	0.037633		
F-statistic	2.101248		
Log likelihood	75.81375		
Akaike	-3.417944		
Schwarz SC	-2.706928		
Mean dependent	0.002957		
S.D. dependent	0.045895		

### 3.6 Government Expenditure

The study found that, government expenditure is negative and it is statistically important at 5% level of significance. Distinctively, 1% increment of government expenditure can occurred real GDP to reduce by 0.037%. This outcome prevailed that, government spend less on innovative areas such as water system, accommodation, health, electricity and education in the country.

From the predictable model above, a year lagged foreign aid, a year lagged FDI and 1&2 years lagged government expenditure in the short run has been found significant to Ghana's economic growth.

## 4. CONCLUSIONS, RECOMMENDATIONS AND FUTURE RESEARCH

### 4.1 Conclusions

The study examined the effect of foreign aid, foreign direct investment, physical capital,

inflation, labor force and government expenditure on real GDP growth in Ghana between the years 1980 and 2010. The results suggest that the long-run economic growth in Ghana is mainly explained by government expenditure, foreign aid, physical capital, inflation and foreign direct investment. In addition, a change in labor force in the short-run does not affect the economic growth in Ghana. It was also found that macroeconomic factors have both positive and negative correlation with gross domestic product.

### 4.2 Recommendations

Government should invest in important project that would add positive value to the country's economic growth; such as labor force and by setting up strong and high quality research and development sector that will mobilize and take into consideration all researches. The government also has to create favorable atmosphere to attract foreign investors who obviously would migrate new technology into the country. In addition, instead of government

relying on foreign aid, he should rather create avenues that would domestically generate revenue. Government should also rely more on local contractors when it comes to building of houses and roads since that will be more economical. Lastly, if Ghana really wants to move from lower middle to upper level income, the government should invest more into the country since investment is the basic economic growth for any country.

### 4.3 Future Research

In view of this, further research into the subject should be carried out by comparing factors of economic growth in Ghana (lower middle income) to factors of economic growth of any other developing country (upper middle income) to find out whether or not they rely more on foreign aid and FDI for economic growth or rely more on domestic generated revenue. Why both countries are 'developing countries' but one is lower middle income and the other one is upper middle income? What are the measures the government in the upper middle income country is putting in place to move the country forward and why is Ghana still a lower income country even though it has all the resources it takes to move from lower middle income to upper middle income level.

### ACKNOWLEDGEMENT

The authors would like to thank the two anonymous reviewers for their valuable comments and suggestions to improve the quality of the paper. They would also like to thank the Editors for their generous corrections, patience and support during the review process.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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