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Causality between Government Expenditure and Economic Growth in Nigeria: Applying the Granger Causality Test

[1]Tsenba Wummen Soemunti Bako & [2]Gushibet Solomon Titus PhD
[1]*Department of Business Administration, University of Jos*
[2]*Department of Economics, University of Jos*

Abstract

The paper examines the causal relationship between government expenditure and economic growth in Nigeria from 2000 to 2014. Secondary data sourced from the Central Bank of Nigeria was used. Econometric modelling was adopted and Granger causality model was used to test the direction of causality between government expenditure and economic growth in Nigeria. The study revealed a unidirectional causation from government expenditure to economic growth in the country. Since government expenditure causes economic growth in Nigeria, the paper recommends that government expenditure should be directed to priority sectors such as infrastructure, education and power so as to accelerate the rate of growth in the economy, amongst other recommendations.

Keywords: *Government Expenditure, Economic Growth, Causality, Model, Analysis*

JEL Classification: E62, C22, C32, H50

Background to the Study

The causal relationship between government expenditure and economic growth has been a subject of debate among economists and policymakers across the world. Achieving sustained economic growth is a principal objective of government expenditure policy and the relationship between government expenditure and economic growth is an important subject of analysis and debate (Mitchell, 2005). It has been noted that despite several years of huge government expenditures in Nigeria, the country has not been developed up till now, and even the growth rates recorded in the past have not been translated into poverty reduction in the country (Gushibet, 2015; World Bank, 2014). This study has attempted to empirically investigate whether or not government expenditure has actually caused economic growth in Nigeria between 2000 and 2014. The period under consideration signifies the period of stable democracy which has experienced rising and fluctuating government revenues, fiscal shocks, falling oil prices in international market and frail implementation of budget.

The objective of the paper is to examine the causal relationship between government expenditure and economic growth in Nigeria. The foregoing is section one. Section two explains the literature review. Section three states the hypothesis of the study and describes the methodology and sources of data. Section four presents the result and summary of findings, and section five concludes with policy recommendations.

Literature Review

Conceptual Clarifications

Government expenditure refers to spending made by the government of a country on collective needs and wants such as pension, health services, salaries, provision of infrastructure, etc. Government expenditure is usually broadly categorized into recurrent expenditure and capital expenditure. While the former refers to government's purchase of current goods and services (labour, consumables, wages and salaries, etc.), the latter would ideally include not merely investments in infrastructure (roads, schools, hospitals, etc) but also all other expenditures that might contribute to development. In other words, while the recurrent expenditure refers to financial outlays necessary for the day-to-day running of government businesses, the capital expenditure refers to investment outlets that increase the assets of the state (Agbonkhese and Asekome, 2014).

According to Solow (1956), economic growth is a term used to indicate the increase of per capita gross domestic product (GDP) or other measures of aggregate income. In the words of Begg, Fischer and Dornbusch (1994), economic growth is the percentage increase in the growth rate of GDP per annum, used in measuring the total output and total income of an economy resulting from production function or factors – capital, labour, land, raw materials and technical knowledge or skills.

Causality or causation can be defined as the connection between two events or states or variables such that one produces or brings about the other; where one is the cause and the other its effect. In this case, for instance, causality tries to find out if government expenditure causes economic growth or economic growth causes government expenditure, or both causing each other bilaterally with each as cause and effects of the other.

Theoretical Review

There are two conventional views on the relationship between government expenditure and economic growth. First is Wagner (1883) who observed that as the real income per capita of an industrializing nation increases, the share of government expenditure in total expenditure also increase. It implies that economic growth leads to increase in government expenditure. This observation led to the so called Wagner's law, which assumes a unidirectional causality running from economic growth to government expenditure. On the other hand, Keynes (1936) argued that government expenditure is an exogenous factor and important fiscal policy instrument that affect national income or economic growth. In other words, according to the Keynesian thought changes in government expenditure cause changes in income, implying that the direction of causality runs from government spending to economic growth without any feedback. The study has attempted to verify this assertion empirically. This means that Keynesian macroeconomics puts the emphasis upon the role of government to stimulate economic growth, implying that Keynesian scholars pay attention on the effect of the general flow of government services on economic growth. As a result of such debate, there are extensive empirical studies on the relationship between government expenditure and economic growth or national income, which used different model specifications, different sample periods, and data from different countries. However, all these findings have failed to reach a definite answer for the question of causality between government expenditures and economic growth. This paper has contributed to this debate by investigating this relationship empirically in Nigeria. Some empirical studies confirmed the Wagnerian view rather than the Keynesian hypothesis, while other findings advocated the Keynesian proposition. This paper would show the direction of this relationship with evidence from Nigeria's data. Therefore, the lack of consensus both in theoretical and empirical literature on the nature of the relationship between government expenditure and economic growth has motivated this research paper.

Empirical Review

Given the increasing size of government in both developed and developing economies after the World War II, a large body of empirical literature has grown; aimed at testing the causality between government expenditure and increase in national income or economic growth. Most of these studies used individual countries time series data, employing co integration and Granger causality techniques; whereas, a few others approached the subject by adopting cross-section and panel data regressions. Findings from these studies are inconclusive regarding the causality between government spending and economic growth, and the results differ from one country to another. This paper has added on the body of literature in this area of study.

Singh and Sahni (1984) examined the direction of causality between national income and public expenditures in India, using annual data covering the period 1950-1981. They employed Granger causality test, and found no evidence of causality between government spending and national income. Therefore, their finding neither confirmed the Wagner's law nor the Keynesian view. Abizadeh and Yousefi (1998) investigated the Wagner's law in South Korea over the period 1961-1992 using Granger causality test, and then estimated a government expenditure-growth equation. They found that economic growth causes increase in government expenditure thereby satisfying the Wagner's law, and the result of the

expenditure-growth equation revealed that government expenditure did not contribute to economic growth in South Korea. Islam (2001) explored the relationship between government expenditure and real GDP per capita for the USA, using annual data for the period 1929-1996. He found that there is a long-run relationship between the two variables using Johansen-Juselius's cointegration approach. Moreover, Wagner's hypothesis is strongly supported by their results of Engle-Granger (1987) error correction approach.

Tang (2001) investigated the causal relationship between national income and government expenditures in Malaysia during the period from 1960 to 1998. Tang found that there was no long-run relationship among the variables, as indicated by cointegration test, but however discovered that there exists a unidirectional causality running from national income growth to government expenditure growth. The study concluded that Wagner's law is supported only in the short-run. In the context of cross-section approach, many studies such as Ansari, Gordon, and Akuamoah (1997), Al-Faris (2002), Dogan and Tang (2006) have investigated the casual relationship between government expenditure and national income cross-sectionally. For example, Ansari, Gordon, and Akuamoah (1997) examined the causality between government expenditure and national income for three African countries (Ghana, Kenya, and South Africa) using standard Granger test and its modified version; the Holmes-Hutton (1990) causality test. The study used annual data on per capita government expenditure and national income for the period from 1957 to 1990. The study discovered that for the three countries under investigation, there was no long-run equilibrium relationship between government expenditure and national income over the sample period. Again, for these countries, there was no evidence of Wagner's hypothesis or the reverse being supported in the short-run, except for Ghana where Wagner's law is satisfied.

Dogan and Tang (2006) studied the direction of causality between national income and government expenditure for five south East Asian Countries (Indonesia, Malaysia, Philippines, Singapore, and Thailand). Using Granger causality test, a unidirectional causality runs from government expenditure to national income has been found only in the case of Philippines while results of the remaining countries have rejected the hypothesis of causality from government expenditure to national income but the reverse. Furthermore, Al-Faris (2002) used a multivariate cointegration and Granger causality tests to examine the causality between government expenditure and Growth for Gulf Cooperation Council (GCC) countries. Al-Faris found the existence of a long-run relationship between national income and total spending, capital spending and current spending. Moreover, for the majority of the gulf countries, the Wagner's law is satisfied, while the Keynesian hypothesis is rejected. Al-Faris argued that despite the huge size of government in Gulf countries as a result of oil wealth, government expenditure does not cause economic growth and could not be considered as an important fiscal policy tool.

Abu-Bader and Abu-Qran (2003) probed the causal relationship between government expenditure and economic growth for Egypt, Israel and Syria. They found long-run bidirectional causality (bilateral causation) between government expenditure and economic growth in Israel and Syria. A unidirectional short-run causality from economic growth to government expenditure was found in the case of Egypt. Abu-Bader and Abu-Qran concluded that these countries have suffered the burden of military spending. The above

discussion has made it clear that the literature on causality between government expenditure and national income is extensive and diverse. However, there is a dearth of studies on such issue in Nigeria and this paper has contributed in this area.

Methodology, Hypothesis and Data Sources

The data used in this paper are annual time series data on GDP and total government expenditure covering the period 2000 to 2014. This period was chosen because since May 1999 Nigeria has witnessed relatively stable democracy accompanied by fiscal shocks, budget imbalance and increase in government size. The data were sourced from various issues of the Central Bank of Nigeria (CBN) and the world development indicators of the World Bank. The paper is based on the understated hypothesis:

Ho: Government expenditure does not Granger cause economic growth in Nigeria

H1: Government expenditure does Granger cause economic growth in Nigeria

The paper uses Granger causality test to investigate the direction of causality between government expenditure and economic growth in Nigeria. The starting point in the causality test is to determine the order of integration of each variable. It is well known that when dealing with time series data, stationarity tests are pre-tests to avoid the problem of spurious regression (Engle and Granger, 1987).

Causality Modelling

The purpose of causality modelling is to determine the nature of causality between the dependent and independent variables. It is necessary to determine the nature of causality or causal relationship between government expenditure and economic growth in Nigeria using Granger causality test. According to Granger (1969; 1988), two series, say government expenditure and economic growth are said to be mutually dependent (display two-way causality); if government expenditure causes economic growth and vice-versa. As such is the case, there exists a feedback between government expenditure and economic growth. This means that government expenditure can cause economic growth in an economy, or economic growth can cause increase in government expenditure, or both could influence each other as cause and effects.

Let economic growth be the dependent variable proxied by gross domestic product = GDP, and Government expenditure = TGExp (the explanatory variable). This can be modelled as shown below:

$$GDP_t = \sum_{i=1}^{n} \alpha_i^1 TGExp_{t-i} + \sum_{i=1}^{n} \beta_j^1 GDP_{t-j} + U_{1t} \quad \ldots (1)$$

$$TGExp_t = \sum_{i=1}^{n} \lambda_i^2 TGExp_{t-i} + \sum_{j=1}^{n} \partial_j^2 GDP_{t-j} + U_{2t} \quad \ldots (2)$$

It is assumed that the disturbances U_{1t} and U_{2t}, are uncorrelated. The equations (1) and (2) postulate that current GDP is related to past values of GDP as well as those of TGExp, and that current TGExp is also related to past values of TGExp and GDP. Note that α_i^1, β_j^1 and $\lambda_i^2\ \partial_j^2$ are the parameters to be estimated. The a priori expectation here is that the sets of individual explanatory variables and GDP_t would be statistically and significantly different from zero in the regression of the models. Thus, if $\sum \alpha_i \neq 0$ and $\sum \partial_j \neq 0$, it implies a feedback or a bilateral causality between economic growth (GDP) and TGExp. Where $\sum \alpha_i = 0$ and $\sum \partial_j = 0$,

it signifies a unidirectional causality between TGExp and economic growth in Nigeria. It should be pointed out that causality model includes the use of lagged variables since the use of lagged models has gained prominence in applied econometric research in recent times. This means that these models allow for the estimation of long-run elasticities and other parameters of economic relationship (Koutsoyiannis, 1977).

Granger Causality Test Procedure

Granger causality method is applied to provide the statistical evidence of the direction of causality between variables. Causality testing is a useful tool in empirical economics because it makes the otherwise "static economic theory a dynamic one" by taking into account explicitly the role of time (Gujarati and Sangeetha, 2007:718). The causality model that emerges in this study is based on the assumptions of autoregressive behaviour in time series. Causation or relationship between government expenditure and economic growth as indicated by the subscript $_{t-1}$ is assumed to take place with a lag. This is consistent with econometric theory. It suggests that many variables exhibit lags in their effects on others, as it is the case with most economic phenomena (Koutsoyiannis, 1977). In view of the nature of economic behaviour, any realistic formulation of economic models should involve some lagged variables among the set of explanatory variables to determine the direction of causation between these variables. To ascertain the causal relationship between government expenditure and economic growth, the study therefore adopts the use of distributed lagged models as used by Granger (1969). The Granger definition exploits time series relationships to identify causality. Lagged variables are one way of taking into account the length of time in the adjustment process of economic behaviour, and perhaps the most efficient way of rendering them dynamic (Gujariti and Sangeetha, 2007).

Granger proposed that for a pair of linear covariance stationary time series say; X and Y; X causes Y if the past values of X can be used to predict Y more accurately than simply using the past values of Y. Formally, X is said to cause Y if: $\sigma^2_1 (Y_t: Y_{t-j}, X_{t-i}) < \sigma^2_2 (Y_t: Y_{t-j})$, where σ represents the variance of forecast error and i, j =1 and 2 of the variables lagged with time. The Granger causality test requires the use of F-statistic or p-value to test whether lagged information on a variable say "Y" provides any statistical information about another variable "X"; if not, then, "Y" does not Granger cause "X". In other words, the Granger causality tests will indicate whether a set of lagged variables has explanatory power on the other variables. If the null hypothesis that says lagged values of the explanatory variable do not belong in the regression is rejected, then it can be concluded that one variable does Granger cause the other variable. The hypotheses are presented below using the Granger technique of estimating the equations (1) and (2). Therefore, as a pair wise test, the null hypotheses for the causality model become:

H_0: $\sum \alpha^1_i = 0$, that is, lagged TGExp terms do not belong in the regression

H_0: $\sum \sigma^1_j = 0$, that is, lagged GDP terms do not belong in the regression

Where $_i$ and $_j$ = 1 and 2

This implies that the alternate hypothesis in each case is that the lagged terms belong in the regressions. To test these hypotheses, we either use p-value or apply the F-test given as:

$$F = \frac{(RSS_R - RSS_{UR})/t\text{-}1}{RSS_{UR}/n\text{-}k} \quad \ldots (3)$$

Where RSS_R= the restricted residual sum of squares and RSS_{UR}= the unrestricted residual sum of squares which follows the F-distribution with (t-1) and (n-k) degree of freedom; t= the number of lagged terms and k= the number of parameters estimated in the unrestricted regression. This follows that when we regress current GDP on all lagged GDP terms and other variables if any but do not include say, the lagged TGExp variable, we obtain the RSS_R. While when we regress including the lagged TGExp terms, we obtain the $RSS_{UR.}$

Decision Rule: If the p-value is less than the 5% level of significance we reject the null hypothesis and accept the alternate hypothesis in each case. Otherwise we accept the null and reject the alternate hypothesis. It is pertinent to point out here that the Granger causality test is sensitive to the number of lags used in the analysis. That is why Davidson and Mackinnon (1975) suggested using more than fewer lags. This enables us to have more confidence in our conclusions.

Unit Root Test Procedure

Time series data are often characterized by unit root problem. According to Granger and Newbold (1974), most time series variables are non-stationary and using non-stationary variables in models might lead to spurious regressions. Unit root test is therefore used to assess whether the data is stationary or not which helps to avoid spurious regressions. To avoid spurious results, the study adopts the Augmented Dickey Fuller (ADF) test to carry out the unit root test in order to ascertain the stationary state of the data. The ADF is chosen due to stability of its critical values as well as its power over different sampling experiments. The equations used for the test for the GDP data series run in the following forms:

$? GDP_t = \partial_{t-1} + U_t$ ... (4) (without intercept)

$? GDP_t = \beta_{1t} + \partial GDP_{t-1} + U_t$ ... (5) (with intercept)

$? GDP_t = \beta_{1t} + \beta_{2t} + \partial GDP_{t-1} + U_t$ ... (6) (with intercept and trend)

Where't' is the time and trend variable. In each case the null hypothesis (Ho) is that $\partial = 0$, which is the same as saying that there is a unit root. The difference between equation (4) and the next two equations (5 and 6) lies in the inclusion of the intercept (constant) and the trend. That is, the stationarity of the data series of the explanatory variable was tested using the equations (4), (5) and (6). If the data series is not stationary at either of these levels, then we take the end differencing to show the stationarity of the data on the order of the difference as the case may be. This is in consonance with the view expressed by Ramanathan (1992) who corroborated that the first or second differenced term of most variables will usually be stationary, and this is different from non-stationary time. Fumey (2012) substantiated that a stationary series is one whose absolute value of its coefficient is less than or equal to one, and that a non-stationary series is one whose absolute coefficient value is greater or equal to one.

Interpretation of Results and Summary of Findings

This section interprets the results of the unit root pre-investigation and Granger causality test, and econometrically explains the direction of causality as given by the Granger regression result.

Unit Root Test Result

Time series characteristics of the data were explored by testing the data for stationarity at levels or in an order of differencing and integration. The Augmented Dickey-Fuller test was used for the unit root analysis. The decision rule is that stationarity is attained if the absolute ADF value is higher than any of the absolute Mackinnon critical values at 1%, 5% and 10% levels of significance. The purpose of this is to avoid spurious regression which cannot allow precise prediction. Table 1 presents the unit root result:

Table 1: Unit Root Test Result

Variable	Level of Stationarity	ADF-Statistic	Significant Values (1%, 5% and 10%)
GDP	I(0)	4.59	-4.89, -3.82*, -3.36*
TGExp	I(0)	2.84	-2.78*, -1.97*, -1.63*

Note: Dickey-Fuller regressions include an intercept and a linear trend
Where: *= Depicts stationarity
Source: E views output of data in Appendix A

From table 1 the data sets of the variables were stationary at level; implying that the variables were integrated of the same order. While GDP is stationary at level with trend and intercept at 5% and 10% level of significance, total government expenditure was stationary at level without intercept and trend at 1%, 5% and 10% level of significance. This means that the linear combination of the variables in the model is good for analysis.

Table 2: Granger causality result

Hypothesis	No of Obs.	F-Stat.	P-value	Decision
TGExp does not Granger cause GDP TGExp does Granger Cause GDP	13	5.3989	0.03	Reject Null
GDP does not Granger Cause TGExp GDP does Granger cause GDP	13	2.71303	0.13	Accept Null

Remark: A unidirectional causality from TGExp to GDP was reported in this study

Source: Researchers' computation from E views output of data in Appendix A.

Table 2 provides the result of the pair-wise Granger causality test. It has revealed the existence of causal relationship between government expenditure and economic growth. The table reports a unidirectional causality from government spending to economic growth. It clearly shows that TGExp Granger causes GDP, and GDP does not Granger cause TGExp. Since the p-value of 0.03 is less than 0.05 level of significance, the null hypothesis is rejected in favour of the alternate. This implies that TGExp Granger causes GDP in Nigeria and not the reverse. This is a negation of Wagner's law; meaning that Wagner's law does not apply in the case of causal relationship between government expenditure and economic growth in so far as a unidirectional causality was reported from TGExp to GDP in Nigeria. The finding is in agreement with the Keynesian proposition that public expenditure leads to economic growth.

Conclusion and Policy Implication

This paper has examined the causality between government expenditure and economic growth in Nigeria using Granger causality technique. The result of the Granger causality test indicated a one directional causation running from government expenditure to economic growth. The significance of this result is that increase in government spending would result in expansion of output or lead to economic growth. This paper supports the Keynesian proposition that public expenditure is an exogenous factor and important policy instrument for facilitating economic growth in the country. Thus, this study does not advocate the Wagner's law since no evidence of causation running from economic growth to government spending was reported. The interpretation of this result is that government spending in Nigeria is a decisive component of growth. This finding is consistent with the actual situation in most developing countries, where public sector largely stimulates economic growth and development, while the private sector is weak.

Recommendations

In terms of policy implication, this paper has shown that government expenditure is one of the important policy tools to achieve economic stabilization in Nigeria. It implies that policymakers should use government expenditure to expand the national income while keeping inflation at low levels. To avoid the unfavourable impact of public expenditure on growth, the paper recommends that government spending should largely be allocated to infrastructures, education and power. This will promote the development of the productive sectors or the real economy such as agriculture and manufacturing. Moreover, the private sector should be enhanced through liberalization and privatization policies to play its effective role in the economy. To further understand the origin of causality between government expenditure and growth, an empirical study needs to be conducted to identify more channels through which government spending causes increase in domestic output or national income in Nigeria.

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Appendix A: Nigeria's GDP and Government Expenditure Data from 2000 to 2014

Year	GDP	Total Govt Revenue	Total Govt Expenditure	Recurrent Expenditure	Capital Expenditure	Total Public Debt
2000	4,582,127.29	1906.16	701.05	461.60	2394.45	3995.64
2001	4,725,086.00	2231.60	1018.00	579.30	4387.70	4193.27
2002	6,912,381.25	1731.84	1018.18	696.80	3213.80	5098.89
2003	8,487,031.57	2575.10	1225.99	984.30	2416.79	5808.01
2004	11,411,066.91	3920.50	1461.89	1110.64	3512.55	6260.59
2005	14,572,239.12	5547.50	1840.70	1321.23	5194.67	4220.98
2006	18,564,594.73	5965.10	1942.49	1390.10	5523.49	2204.72
2007	20,657,317.67	5727.50	2348.55	1589.27	75920.8	2608.53
2008	24,296,329.29	7866.59	3078.25	2117.36	9608.09	2843.56
2009	24,794,238.66	4844.59	3280.76	2127.97	11528.00	3818.47
2010	29,205,782.96	7303.67	3993.31	3109.44	8838.77	5241.66
2011	37,754,394.00	11116.85	4232.98	3314.44	9185.05	6519.69
2012	41,179,874.10	10654.75	4200.00	3325.16	8748.54	7564.44
2013	4920578333.84	9759.79	4797.47	3689.08	9108.19	8492.56
2014	6789651142.50	10068.85	5211.42	2530.34	9681.28	9535.54

(**?** 'Million)

Source: Central Bank of Nigeria (various issues), World Bank Reports/African Development Indicators

Appendix B: Pairwise Granger Causality Tests
Date: 11/20/15 Time: 15:06
Sample: 2000 2014
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
TGEXP does not Granger Cause GDP	13	5.33989	0.03364
GDP does not Granger Cause TGEXP		2.71303	0.12606