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The Causality between Government Expenditure and Economic Growth in Nigeria: A Toda-Yamamoto Approach

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Abstract
The relationship between government expenditure and economic growth has been an issue of debate over the years. This study investigates the causality between government expenditure and economic growth in Nigeria between 1985 and 2014. Following the Toda-Yamamoto non-Granger causality testing approach, it finds that government expenditure and economic growth have no causal effect on each other. This offers evidence to invalidate Wagner's law and the Keynesian proposition in Nigeria. This study recommends that government should strengthen its efforts to curtail corruption as well as introduce stricter checks and controls to reduce or eliminate the profligacy of public funds.
Keywords: Government expenditure, Economic growth, Wagner's law, Keynesian proposition, Nigeria.

Introduction

Government (public) expenditure is a fiscal policy that reflects the size of government in the economy. It still remains a debatable issue

among economists whether increasing government expenditure fosters economic growth. Government expenditure has a dominant role to play in reducing regional inequalities, improving social overheads, provision of infrastructural facilities, education and training, growth of industries and research and development among others (Bhatia, 2002). However, increase in government expenditure may be a hindrance to overall performance of the economy, if it comes at a cost of increased taxes and/or borrowing to fund government activities (Alshahrani and Alsadiq, 2014).

The two schools of thought that explain the relationship between government expenditure and economic growth are Wagner's law and the Keynesian proposition. The Wagner's law also referred to as "law of increasing public activities" postulates that government expenditure is endogenous of national income which measured economic growth. In other words, public sector expansion is as a result of growth in the economy. The Wagner's law argues that economic growth is an essential determinant of public sector growth (Loizides and Vamvoukas, 2004). The Keynesian proposition opposes the Wagner's law and it argues that increase in national income is as a result of increase in government expenditure. It suggests that economic growth is endogenous of government expenditure. Keynes (1936) states that government expenditure is a policy measure used by the government to solve economic downturns, by borrowing money from the private sector of the economy, and then distributing it back to them through spending programmes, hence leading to economic growth.

In a developing country like Nigeria, understanding the causality between government expenditure and economic growth is pertinent for the economic policy decision making. The extant literature on the causality between government expenditure and economic growth in Nigeria has provided mixed evidence. Therefore, it is apparently ambiguous whether public sector growth determines economic growth or economic growth determines public sector growth in Nigeria. Also, previous studies on Nigeria have focused on the causal link between government expenditure and economic growth without considering the role of public debt. The failure to control for public debt may lead to misleading result because the Nigerian government often implement the

budget deficit which is mostly financed through either internal or external borrowing. It is on this backdrop that this study examines the causal link between government expenditure and economic growth

along with public debt in a trivariate framework using the causality test developed by Toda and Yamamoto (1995). The rest of the paper is organised as follows: Section 2 reviews empirical literature, Section 3 focuses on the methodology, Section 4 presents the results and discussions and Section 5 provides the conclusion.

Literature Review

Empirical Evidence from Developed and Developing Countries

Hsieh and Lai (1994) examined the impact of government spending on the growth of the G-7 countries (Canada, France, Germany, Italy, Japan, United Kingdom and United States). The study found that there is lack of consistent evidence to show that government spending can enhance economic growth as well as to support the negative argument. Also, it found that the impact of government spending is not substantial in the most countries. Cheng and Lai (1997) found bidirectional causality between government expenditures and economic growth in South Korea between 1954 and 1994. Sinha (1998) did not find causal relation evidence between government expenditure and economic growth in Malaysia between 1950 and 1992. However, it showed evidence of long-run relation between government expenditure and economic growth.

In a study of Greece, United Kingdom and Ireland, Loizides and Vamvoukas (2004) observed that government size measured by share of total government expenditure in Gross National Product (GNP) drives economic growth in the three countries in the short-run and in the long-run for Ireland and United Kingdom. Also, economic growth causes increases in the size of government in Greece, and, when inflation is included, in the United Kingdom. Jiranyakul (2007) assessed the causal relation between government expenditures and economic growth in Thailand using quarterly data between 1993 and 2004. It found that causality only exists from government expenditures to economic growth. Arpaia and Turrini (2008) analysed the short-run and long-run relation between government expenditure and potential output in 15 European Union (EU) countries from 1970 to 2003. The study failed to accept the hypothesis of a common long-run elasticity between cyclically-adjusted primary expenditure and potential output close to one. However, over the decades, the long-run elasticity greatly reduced and it is significantly higher than one in catching-up countries, fast-

ageing countries, low debt countries and in countries with weak numerical rules for the control of government spending.

Cooray (2009) investigated the role of government on the growth of 71 economies by extending the neo-classical production function to include size (measured by expenditure) and quality of government. The study discovered that size and quality of government are crucial factors to promote economic growth. Mulumba (2009) assessed the long-run relationship and causality between government expenditure and economic growth in 13 Southern African Development Community (SADC) countries from 1998 to 2004. It found that there is evidence of a long-run relationship. Also, it showed that economic growth predicts government expenditure in the short-run and long-run. Wu, Tang and Lin (2010) examined the causal relationship between government expenditure and economic growth using a panel dataset consisting of 182 countries. The results offered support for both the Wagner's law and Keynesian view irrespective of how government size and economic growth are measured.

Ebaidalla (2013) investigated the causal direction between government expenditure and national income in Sudan and observed that in both, the short and long run, government expenditure cause national income. Srinivasan (2013) based on an error correction model discovered that in both the short and long-run, causality runs only from economic growth to public expenditure in India from 1973 to 2012. Medhi (2014) found a unidirectional causality from economic growth to government expenditure in India for the period 1974 to 2014.

Odhiambo (2015) examined the dynamic causal relationship between government expenditure and economic growth in South Africa. The study showed there is short-run bidirectional causality between government expenditure and economic growth, however, in the long-run, causality runs from only economic growth to government expenditure. Using a panel dataset consisting of 9 Asian countries, Lahirushan and Gunasekara (2015) inquired whether government expenditure causes economic growth between 1970 and 2003. It found two-way causality between government expenditure and economic growth.

Empirical Evidence from Nigeria

Chiawa, Torruam and Abur (2012) examined the relationship between government expenditure and economic growth between 1970 and 2008.

The study found one-way causality from economic growth to total capital expenditure and total recurrent expenditure. Also, it found that total capital expenditure, total recurrent expenditure, total expenditure on health and total expenditure on defence have positive and significant impact on economic growth. Nasiru (2012) observed that capital expenditure drives economic growth between 1961 and 2010, while recurrent expenditure does not. Also, economic growth does not drive both capital and recurrent expenditures. Olaiya, Nwosa and Amassoma (2012) conducted a trivariate causality test among government expenditure, inflation and economic growth from 1970 to 2011 within a vector error correction model. The study found that there is a bidirectional causal relationship between government expenditure and economic growth.

Sevitenyi (2012) observed that causality moves from government expenditure to economic growth only between 1961 and 2009. Oyinlola and Akinnibosun (2013) evaluated the causal link between public expenditure and economic growth in Nigeria from 1970 to 2009 and found that economic growth has a causal effect on public expenditure, thus validating Wagner's law. Dada and Oguntegbe (2013) found that Wagner's law holds in Nigeria between 1961 and 2011. Udo and Effiong (2014) offered evidence to support the Wagner's law and Keynesian hypothesis for the period 1970-2012. Aregbeyen and Kolawole (2015) did not find evidence of causality between government spending and economic growth from 1980 to 2012.

Methodology

Data Issues

This study aims to determine the causality between government expenditure and economic growth in Nigeria between 1985 and 2014. Data were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin (2014). The data include gross domestic product (GDP) at current basic prices (Nominal GDP) (which is proxy for economic growth), government expenditure (GE) and public debt (PD)(i.e. sum of outstanding domestic and external debts). For over 70 years, GDP has been the widely used measure of economic growth. GDP became

recognised as the primary tool for measuring economic progress after the Bretton Woods conference in 1944 (Li, Li, An, Wang and Yu, 2014). National income (NI) and GDP per capita (GDPC) were sourced from the World Development Indicators (WDI) database to perform the robustness check.

Model Specification and Estimation Procedure

The causality test among gross domestic product (GDP), government expenditure (GE) and public debt (PD) was done in a Vector Auto regression (VAR) framework. The trivariate causality test was performed using the Toda-Yamamoto (T-Y) Granger non-causality test. This test is based on a modified Wald statistic which allows valid parameter estimates to be produced even when variables are not co-integrated. The T-Y model in VAR framework is stated as:

$$lnGDP_t = \propto + \sum_{n=1}^{k} \gamma\, lnGDP_{t-1} + \sum_{p=k+1}^{k+d_{max}} \beta lnGDP_{t-p} + \sum_{n=1}^{k} \sigma lnGE_{t-1} + \sum_{p=k+1}^{k+d_{max}} \tau lnGE_{t-p} + \sum_{n=1}^{k} \rho lnPD_{t-1} + \sum_{p=k+1}^{k+d_{max}} \theta lnPD_{t-p} + \varepsilon_t \quad ..(1)$$

$$lnGE_t = \propto + \sum_{n=1}^{k} \sigma lnGE_{t-1} + \sum_{p=k+1}^{k+d_{max}} \tau lnGE_{t-p} + \sum_{n=1}^{k} \gamma\, lnGDP_{t-1} + \sum_{p=k+1}^{k+d_{max}} \beta lnGDP_{t-p} + \sum_{n=1}^{k} \rho lnPD_{t-1} + \sum_{p=k+1}^{k+d_{max}} \theta lnPD_{t-p} + \varepsilon_t \quad ..(2)$$

$$lnPD_t = \propto + \sum_{n=1}^{k} \rho lnPD_{t-1} + \sum_{p=k+1}^{k+d_{max}} \theta lnPD_{t-p} + \sum_{n=1}^{k} \gamma\, lnGDP_{t-1} + \sum_{p=k+1}^{k+d_{max}} \beta lnGDP_{t-p} + \sum_{n=1}^{k} \sigma lnGE_{t-1} + \sum_{p=k+1}^{k+d_{max}} \tau lnGE_{t-p} + \varepsilon_t \quad ..(3)$$

Results and Discussions

Unit Root Test

The T-Y Granger non-causality test does not consider the presence of unit root in time series data. However, unit root test is

performed so as to determine the maximum order of integration (d_{max}) among the series. The MZa and MPT statistic in the NG-Perron unit root test was used to determine the order of integration – I(d) of each series. The Perron unit root test with structural break was performed in an innovative outlier model to establish the order of integration of each series in the presence of structural changes.

Table no. 1. Unit Root Test Results

1A: Ng-Perron Unit Root Test					
	Level		First difference		
Series	MZa	MPT	MZa	MPT	I(d)
lnGDP	6.53459[b]	13.9495[b]	-13.7419**[a]	1.79075**[a]	I(1)
lnGE	-112.169*[b]	1.10143*[b]	----------	----------	I(0)
lnPD	-2.74470[b]	31.2729[b]	-12.0637**[a]	2.06977**[a]	I(1)
lnNI	-4.16670[b]	20.8883[b]	-13.7311**[a]	1.80333**[a]	I(1)
lnGDPC	-3.54565[b]	23.9306[b]	-13.1482**[a]	1.89859**[a]	I(1)
1B: Perron Unit Root Test with Structural Break					
	Level		First difference		
Series	Break date	Coefficient	Break date	Coefficient	I(d)
lnGDP	1993	-0.767989	2012	-1.118566*	I(1)
lnGE	1994	-0.918253	2012	-1.624954*	I(1)
lnPD	2003	-0.468007**	----------	----------	I(0)
lnNI	1991	-0.661823**	----------	----------	I(0)
lnGDPC	1991	-0.733938**	----------	----------	I(0)

Source: Authors' analysis

Notes: * and ** imply series has no unit root at 1% and 5% asymptotic critical value, respectively and[a] and[b] indicate intercept only and trend and intercept respectively. Asymptotic critical values for Perron unit root test with structural break were obtained from Table 1(e) in Perron (1997).

It can be deduced from Table no. 1 that the maximum order of integration among the series is 1 whether structural break is ignored or not in the unit root test.

T-Y Granger Non-Causality Test

The existence of co-integration is not a pre-requisite to employ the T-Y Granger non-causality test unlike the Pairwise Granger non-causality test. Therefore, the test for co-integration was ignored. The optimal lag length (k) was first determined using the VAR lag length

selection criteria with the maximum lag set at 4. The sequential modified LR test statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQ) selected *k* to be 2 while Schwarz Information Criterion (SC) chose *k* to be 1. A *k* of 2 was used for the VAR model.

Table no. 2. VAR Lag Length Selection Results

Lag	LR	FPE	AIC	SC	HQ
0	NA	0.035751	5.182340	5.327505	5.224142
1	129.2723	0.000202	-0.001368	0.579292*	0.165841
2	18.38803*	0.000159*	-0.276851*	0.739304	0.015765*
3	9.903514	0.000186	-0.203513	1.248137	0.214510
4	6.284548	0.000271	0.005368	1.892513	0.548797

Source: Authors' analysis

Notes: * indicates lag length selected by criterion. Also, each test is performed at 5% significance level.

After estimating the VAR model with a *k* of 2, VAR residual serial correlation test was performed and AR Roots graph was plotted so as to ensure that the VAR model is ideal for the study.

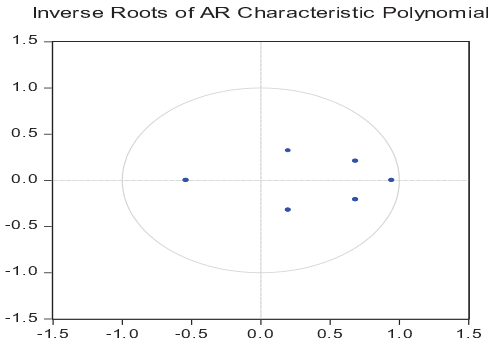
Table no. 3. VAR Residual Serial Correlation Test Result

K	LM-Stat	p-value
1	9.335565	0.4069
2	11.68648	0.2316
3	7.151908	0.6213
4	5.686568	0.7708

Source: Authors' analysis

It can be seen from Table no. 3 that the null hypothesis of no serial correlation was accepted at the selected optimal lag length of 2. Also, the AR Roots graph shows that the VAR model is dynamically stable and not wrongly specified because no roots lie outside the unit circle. Fig. no. 1 depicts the graph of the AR Roots.

Fig. no. 1. AR Roots Graph



Source: Authors' analysis

The T-Y Granger non-causality test is based on a modified Wald (MWALD) statistic. In the T-Y VAR model, the lag length (p) is sum of $k + d_{max}$. The lag length for the T-Y VAR model is 3.

Table no. 4. T-Y Granger Non-Causality Test Results

Null Hypothesis	MWALD statistic
lnGE does not Granger cause lnGDP	2.922341
lnGDP does not Granger cause lnGE	0.362340
lnPD does not Granger cause lnGDP	0.522891
lnGDP does not Granger cause lnPD	1.342657
lnGE does not Granger cause lnPD	0.736947
lnPD does not Granger cause lnGE	5.433663***

Source: Authors' analysis

Note: *** implies rejection of null hypothesis at 10% significance level.

From Table no. 4, it can be inferred that there is no causal link between government expenditure and gross domestic product, as well as between public debt and gross domestic product. It can also be observed that there is a unidirectional causal flow from public debt to government expenditure.

Robustness Check

The rationale for the robustness check is to confirm the consistency of findings when economic growth is represented with other measures of economic growth, other than gross domestic product. The

robustness check was performed by replacing GDP with two economic growth measures in the T-Y VAR models. The growth measures are GDP per capita (GDPC) and national income (NI). A lag length of 3 was used in the T-Y VAR models after an optimal lag length of 2 was chosen based on the Schwarz Criterion.

Table no. 5. Robustness Check Results

5A: NI as proxy for economic growth	
Null Hypothesis	MWALD statistic
lnGE does not Granger cause lnNI	0.125836
lnNI does not Granger cause lnGE	0.082763
lnPD does not Granger cause lnNI	0.505964
lnNI does not Granger cause lnPD	3.702842
lnGE does not Granger cause lnPD	3.207486
lnPD does not Granger cause lnGE	4.095891
5B: GDPC as proxy foreconomic growth	
Null Hypothesis	MWALD statistic
lnGE does not Granger cause lnGDPC	0.252222
lnGDPC does not Granger cause lnGE	0.250801
lnPD does not Granger cause lnGDPC	0.182964
lnGDPC does not Granger cause lnPD	6.263001**
lnGE does not Granger cause lnPD	2.856777
lnPD does not Granger cause lnGE	4.342673

Source: Authors' analysis

Note: ** implies rejection of null hypothesis at 5% significance level respectively.

From Table no. 5, it can be seen that causality is absent between government expenditure and the economic growth measures (national income and GDP per capita). This finding is consistent with the observed causal link between government expenditure and gross domestic product.

Conclusion

There are two contrasting views on the relationship between government expenditure and economic growth. The Wagner's law states that causality is from economic growth to government expenditure while the Keynesian proposition is that causality is from government expenditure to economic growth. Therefore, this study examined the

causality between government expenditure and economic growth in Nigeria using an augmented version of the Granger causality test introduced by Toda and Yamamoto (1995). It found that there is no causality between government expenditure and economic growth. This finding suggests that the Wagner's law and the Keynesian proposition are not valid for Nigeria. This implies that expansion in the public sector or increase in government size/activities in the economy is not a determinant of economic growth and economic growth does not cause public sector growth. The inconsequential impact of government expenditure on the economic growth of Nigeria may be due to high incidence of corruption and embezzlement of public funds and continuous excess of recurrent expenditure over capital expenditure over the years. This study recommends that government should strengthen its efforts to curtail corruption as well as introduce stricter checks and controls in its parastatals and agencies to reduce or eliminate the profligacy of public funds. Also, government should increase its investment in the productive sector and invest more on capital projects.

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