Testing Augmented Wagner's Law for Nigeria Based on Cointegration and Error-Correction Modelling Techniques

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ABSTRACT
Wagner's Law is the first model of public spending in the history of public finance. The study tests the validity of Wagner's Law that there is a long-run tendency for public expenditure to grow relative to national income. This implies that public expenditure can be treated as an endogenous factor, not a cause of growth in national income. In contrast, Keynesian hypothesis treats public expenditure as an exogenous factor. "Augmented" version of Wagner's Law, where public deficit appears as further explanatory variable, is also investigated. Assessing the empirical evidence of these hypotheses in Nigeria, for the period 1970-2012, the study employed Johansen Cointegration Techniques with its associated Error Correction Model for the short run dynamics. We found bi-directional causal relation for the short run dynamics for five out of seven formulations while the long run empirical evidence seems to be most favourable to Wagner's hypothesis rather than the Keynesian one, therefore suggesting that causality run from real income to government expenditure.

Keywords: public spending; economic growth; Wagner's Law; error correction model
JEL Codes: C32; E01; H50; H60

1. Introduction

The relationship between government expenditure and economic growth has continued to generate series of debate among scholars. Broadly, government performs two functions - protection (security) and provisions of certain public goods (Abdullah, 2000 and Al-Yousif, 2000). Protection function consists of the creation of rule of law, enforcement of property rights and protection of life and property while provision of public goods include defense, roads, education, health, power and so on. A point of debate among economists is whether the public sector should intervene or not in the short-term fluctuations in economic activity. The classical economists believed that market forces were able to quickly bring economies to long-run equilibrium, through adjustments in the labor market; therefore they always opposed public sector intervention. However, the Keynesians took the fallibility of such self-regulatory mechanisms proposed by the classical economist, precisely because of rigidities in the labor market and thus prescribed Keynesian expansionary fiscal policies to support the economy during recessions (Magazzino, 2010). To this end we have two propositions on the relationship between public sector expenditure and national income - Wagner's law and Keynesian hypothesis. According to Wagner (1883) when the economic activity grows there is a tendency for the government activities to increase in long-run while in Keynesian hypothesis, government spending is an exogenous policy instrument that cause changes in aggregate level of real output in the short-run. Keynes therefore posits that the causality of the relationship between public expenditure and national income runs from expenditure to income.

Extensive empirical analysis of the Wagner's law has produced mixed results in the literature. While some studies (Wagner and Weber, 1977; Al-Faris, 2002; Chang, 2002; Aregbeyen, 2006; Omoke, 2009; Abizadeh and Gray, 1985) have found support for the Wagner's Law, some other studies (Ram, 1986; Afxentiou and Serletis, 1996; Abizadeh and Yousefi, 1998; Burney, 2002; Huang, 2006; Ergun and Tuck, 2006; Babatunde, 2007) have found a non-existence or weak support for the Law. The empirical studies such as Abu-Bader and Abu-Qarn (2003) found a bidirectional causality between the public spending and national income. Some studies yet found no support for neither Wagner nor Keynes (e.g Muhlis and Hakan, 2003; Singh and Sahni, 1984; Dakurah, Davies and Sampath, 2001).

The main aim of this paper is to re-investigate the Wagner's hypothesis for Nigeria using more specification of the model. Earlier studies are limited in scope and their results are mixed. For instance, Essien (1997) considered only three specifications of the model of Wagner's hypothesis, Aregbeyen (2006) considered only a single specification of the model and Babatunde (2007) used the five different versions of the Wagner's law. This study contributes to knowledge by considering the seven specifications of the Wagner's model common in the literature for Nigeria.

The remainder of this paper is structured as follows: the next section we present the trend of public expenditure in Nigeria while section three discusses the analytical framework on which the models are predicated. The data and methodology is presented in section four and it is followed by results and interpretation in section five. Finally, section six concludes this study.

2. Trend of Public Expenditure in Nigeria

The magnitude of public expenditure is one of the applied ways to measure the size of government in the whole economy. Hence, it is necessary to compare the magnitude with something else that can enable us to get a glance idea about its size of public sector. In Figure 1, we introduce a time series data of public expenditure in a real term for the period of 1970-2012.

Figure 1: Real Public Expenditures, 1970 - 2012

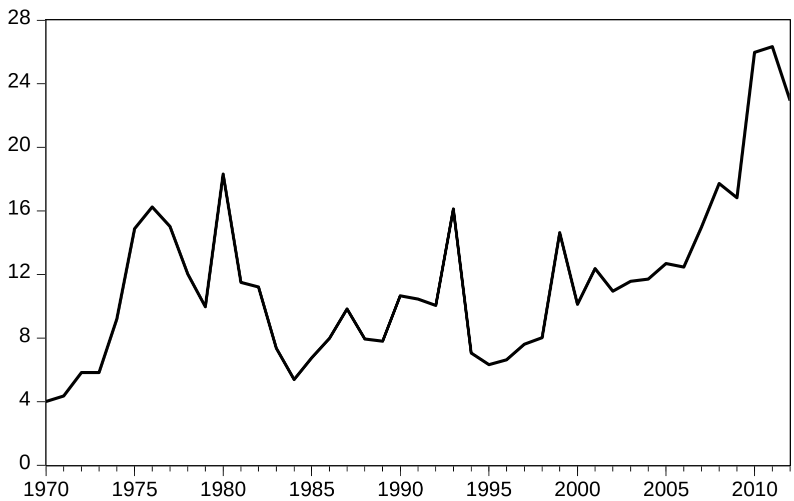
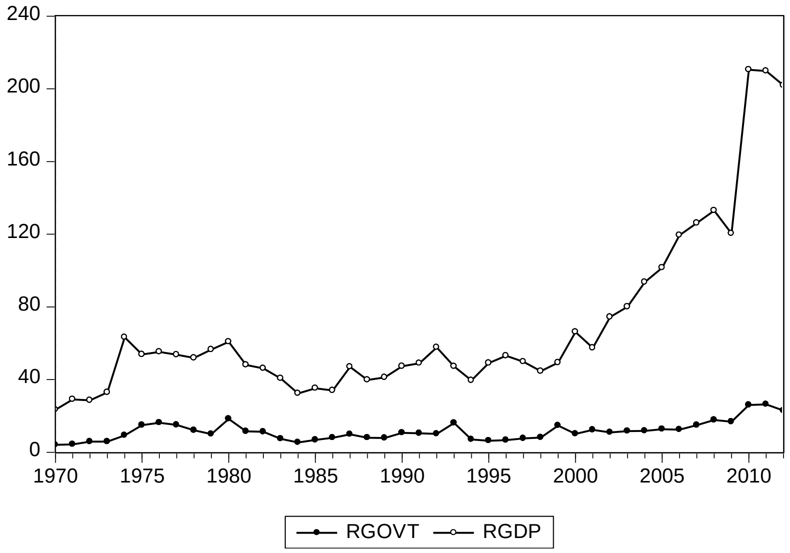


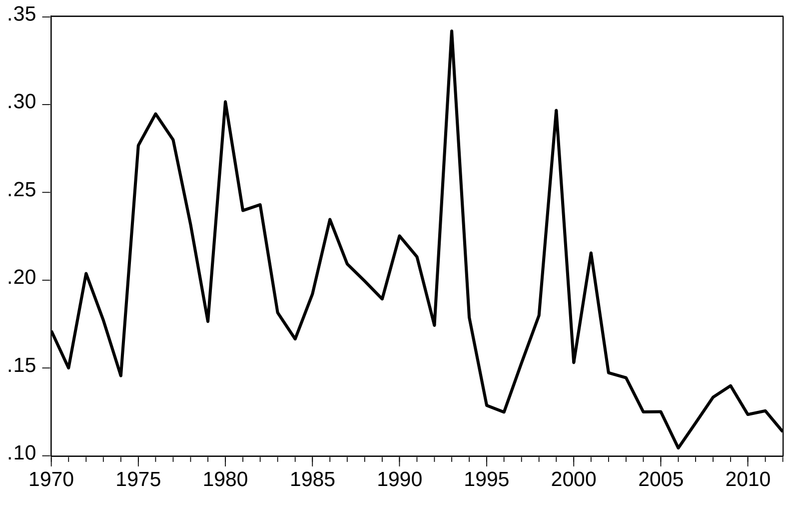
Figure 2 presents magnitude of both public expenditure and GDP in real terms.

Figure 2: Real Public Expenditure and Real GDP, 1970 - 2012



Comparing long-run increases in public expenditure with the trend of real gross domestic product, it seems that the variables of interest have a one-way directional trend which gives the impression of what Wagner's law suggests. However, this is an early assumption and cannot be ascertain yet. Therefore, we need to measure in percentage the ratio of public expenditure to GDP, which would provide us an indication of resources the whole economy can make available to the public sector. These ratios are presented with Figure 3.

Figure 3: Public Expenditures as a ratio of GDP, 1970 -2012



As seen in the figure 3, public expenditure as a ratio to GDP reached peaks of 20.4% in 1972, 29.5% in 1976, 30.2% in 1980, 23.5% in 1986, 22.5% in 1990, 34.2% in 1993, 29.7% in 1999 and 21.5% in 2001. During the period of 1970 – 2012, public expenditure was on average 18.7 percent of GDP, lowest at 10.4 % in 2006 and highest at 34.2% in 1993. The ratio of public expenditure to GDP depicted in Figure 3 provides yet inconclusive analysis with regard to which hypothesis actually fit into Nigeria economy – Wagnerian or Keynesian.

3. Wagner's Law

Wagner Law investigates the long-run relationship between government expenditure and economic growth. However, alternative strands of the literature have tested several versions of Wagner's Law, using different variables to approximate the theoretical variables of government expenditure and economic growth. There are six broad versions of Wagner's Law, which define the relationship between economic growth and public expenditure. In all the six, some variant of the measure of national income explains alternate measures of public sector expenditure. The causation, however, could be in the reverse direction in each of these six models. There is no objective criterion to decide which of the six versions is the most suitable and convincing test of the Law. Here, in table 1, six alternative functional forms of the law are being examined, plus the modified Musgrave's version of Wagner's Law:

Number	Function of Form	Version
1	$LRGex = \phi + \Psi LRGDP$	Peacock and Wiseman (1967)
2	$LRGex = \phi + \psi L(RGDP/P)$	Goffman (1968)
3	$LRGCex = \phi + \Psi LRGDP$	Pryor (1968)
4	$L(RGex/RGDP) = \phi + \psi L(RGDP/P)$	Musgrave (1969)
5	$L(RGex/P) = \phi + \psi L(RGDP/P)$	Gupta (1967)
6	$L(RGex/RGDP) = \phi + \psi LRGDP$	Modified P-W version by Mann (1980)
7	$L(RGex/RGDP) = \phi + \psi L(RGDP/P) + \theta L(BD/RGDP)$	Amplified Musgrave (1969) version by Murthy (1994)

Where;

LRGex => is the logarithm of real total government expenditure

LRGCex => is the logarithm of real government consumption expenditure

LRGDP => is the logarithm of real gross domestic product

L(RGDP/P) => is the logarithm of per capita real gross domestic product

L(RGex/RGDP)=> is the logarithm of the ratio of real total government expenditure to real gross domestic product

L(RGex/P)=> is the logarithm of the per capita real total government expenditure

L(BD/RGDP)=> is the logarithm of the ratio of budget deficit to real gross domestic product and P is the population.

The first formulation was adopted by Peacock and Wiseman (1967), who interpreted the Wagner's law as follows: "public expenditures should increase by a higher rate than GDP". Goffman (1968) expressed the law in the following way: "during the development process, the GDP per capita increase should be lower than the rate of public sector activities increase" (see Model II). Pryor in 1968 developed the third version of the Law, which states that the consumption component of government expenditure increases with the rise in national income. Musgrave (1969), in the fourth specification, says the government expenditure share to GDP is increasing as the real GDP per capita rises, during the development process. The fifth version of the model, which is per capita total public sector expenditure rising with per capita national income, was tested by Gupta (1967). While, Mann (1980) defined the law as rise in the share of total government expenditure in the national income as a result of growth in national income. Of the six versions of Wagner's Law, the last formulation is often used and is considered to be most appropriate one (Halicioglu, 2005). The last formulation of Wagner's Law suggested by economic literature, is an amplified Musgrave (1969) version tested by Murthy (1994). The inclusion of the last explanatory variable into the specification is justified on the basis that it reduces the omitted variable bias and misspecification in econometric estimations and more so, the addition of budget deficit variable does not contradict the tenet of the law. The existence of long run relationship among the variables in the models is a confirmation of the Wagner law.

4. Data and Methodology

The empirical analysis was presented by time series model. The study uses long and up-to-date annual time-series data (1970-2012), with a total of 43 observations for each variable. The data for the study are obtained from Central Bank of Nigeria Statistical Bulletin and Annual Report and Statements of Account for different years. We employ Fully Modified ordinary least square (FMOLS) method. The software application utilized was E-views 7.0.

Granger causality test

The Granger causality test was developed by Granger (1969), and according to him, a variable (in this case RGex) is said to Granger cause another variable (RGDP) if past and present values of real total government expenditure (RGex) help to predict real national income (RGDP). To test whether RGex Granger cause RGDP, this paper applies the causality test developed by Granger (1969). A simple Granger causality test involving two variables, RGex and RGDP is written as:

$$RGex_t = \sum_{j=1}^{p} \alpha_j RGex_{t-j} + \sum_{j=1}^{p} \beta_j RGDP_{t-j} + \mu \qquad (1)$$

$$RGDP_t = \sum_{j=1}^{p} \eta_j RGex_{t-j} + \sum_{j=1}^{p} \Upsilon_j RGDP_{t-j} + \gamma \qquad (2)$$

The null hypotheses to be tested are:

H_1: $\eta_j = 0$: j=1...... p,this hypothesis mean that government expenditure does not Granger cause national income.

H_2: $\beta_j = 0$: j=1...... p, this hypothesis means that national income does not Granger cause government expenditure.

If none of the hypothesis is rejected, it means that RGex does not Granger cause RGDP and RGDP also does not Granger cause RGex. It indicates that the two variables are independent of each other. If the first hypothesis is rejected, it shows that RGex Granger causes RGDP. Rejection of the second hypothesis means that the causality runs from RGDP to RGex. If all hypotheses are rejected, there is bi-directional causality between RGex and RGDP. We re-specify equation (1) as (2) and estimate the models as;

$$RGex_t = \theta + \delta RGDP_t + u_t \qquad (3)$$

$$RGDP_t = \lambda + \eta RGex_t + \mu_t \qquad (4)$$

We start this analysis by first examining the stationarity of our variables, nominal interest rate and expected inflation. A non-stationary time series has a different mean at different points in time, and its variance increases with the sample size (Harris and Sollis (2003). A characteristic of non-stationary time series is very crucial in the sense that the linear combinations of these time series make spurious regression. In the case of spurious regression, t-values of the coefficients are highly significant, coefficient of determination (R2) is very close to one and the Durbin Watson (DW) statistic value is very low, which often lead investigators to commit a high frequency of Type 1 errors (Granger and Newbold, 1974). In that case, the results of the estimation of the coefficient became biased. Therefore it is necessary to detect the existence of stationarity or non-stationarity in the series to avoid spurious regression. For this, the unit root tests are conducted using the Augmented Dickey-Fuller (ADF) test and Philips-Perron (PP). If a unit root is detected for more than one variable, we further conduct the test for cointegration to determine whether we should use Error Correction Mechanism.

Cointegration Analysis

Cointegration can be defined simply as the long-term, or equilibrium, relationship between two series. This makes cointegration an ideal analysis technique to validate the Wagner law: by ascertaining the existence of a long-term relationship between real total government expenditure (RGex) and real national income (RGDP). Cointegration analysis can thereby establish if RGex variables are cointergrated with RGDP variables. The cointegration method by Johansen (1991; 1995) has become the almost always cited cointegration technique used in Wagner Law's studies, and is used in this study. The Vector Autoregression (VAR) based cointegration test methodology developed by Johansen (1991; 1995) is described as follows;

The procedure is based on a VAR of order p:

$$y_t = A_1 y_{t-1} + ... + A_p y_{t-p} + Bz_t + \varepsilon_t \quad (5)$$

where y_t is a vector of non-stationary I(1) variables (interest rate and expected inflation), z_t is a vector of deterministic variables and ε_t is a vector of innovations. The VAR may therefore be reformulated as:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} + \Gamma_i \Delta y_{t-p} + Bz_t + \varepsilon_t \quad (6)$$

$$\text{Where } \Pi = \sum_{i=1}^{p} A_i - I \quad (7)$$

$$\text{and } \Gamma_i = \sum_{j=i+1}^{p} A_j \quad (8)$$

Estimates of Γ_i contain information on the short-run adjustments, while estimates of Π contain information on the long-run adjustments, in changes in y_t. The number of linearly dependent cointegrating vectors that exist in the system is referred to as the cointegrating rank of the system. This cointegrating rank may range from 1 to n-1 (Greene 2000). There are three possible cases in which $\Pi y_{t-1} \sim I(0)$ will hold. Firstly, if all the variables in y_t are I (0), this means that the coefficient matrix Π has r=n linearly independent columns and is referred to as full rank. The rank of Π could alternatively be zero: this would imply that there are no cointegrating relationships. The most common case is that the matrix Π has a reduced rank and there are $r<(n-1)$ cointegrating vectors present in β . This particular case can be represented by:

$$\Pi = \alpha\beta' \quad (9)$$

where α and β are matrices with dimensions n x r and each column of matrix α contains coefficients that represent the speed of adjustment to disequilibrium, while matrix β contains the long-run coefficients of the cointegrating relationships.

In this case, testing for cointegration entails testing how many linearly independent columns there are in Π , effectively testing for the rank of Matrix Π (Harris, 1995).If we solve the eigenvalue specification of Johansen (1991), we obtain estimates of the eigenvalues $\lambda_1 > \ldots > \lambda_r > 0$ and the associated eigenvectors $\beta = (\nu_1, \ldots \nu_r)$. The co-integrating rank, r, can be formally tested with two statistics. The first is the maximum eigenvalue test given as:

$$\lambda\text{- max} = -T \ln (1- \lambda_{r+1}), \quad . \qquad (10)$$

Where the appropriate null is r = g cointegrating vectors against the alternative that r ≤ g+1. The second statistic is the trace test and is computed as:

$$\lambda\text{-trace} = -T\sum_{i=r+1}^{n} \ln (1 - \lambda i), \qquad (11)$$

where the null being tested is r = g against the more general alternative r ≤ n. The distribution of these tests is a mixture of functional of Brownian motions that are calculated via numerical simulation by Johansen and Juselius (1990) and Osterwald-Lenum (1992). Cheung and Lai (1993) use Monte Carlo methods to investigate the small sample properties of Johansen's λ-max and λ-trace statistics. In general, they find that both the λ-max and-λ trace statistics are sensitive to under parameterization of the lag length although they are not so to over parameterization. They suggest that Akaike Information Criterion (AIC) or Schwarz Bayesian Criterion (SBC) can be useful in determining the correct lag length.

Granger (1988) demonstrates that causal relations among variables can be examined within the framework of ECM, with cointegrated variables. While the short run dynamics are captured by the individual coefficients of the lagged terms, the error correction term (ECT) contains the information of long run causality. Significance of lagged explanatory variable depicts short run causality while a negative and statistical significant ECT is assumed to signify long run causality (Bannerjee and Newman, 1998). We specify the general error correction term as follows;

$$LGex_t = \delta + \gamma_1 LGex_{t-1} + \gamma_2 LRGDP_t + \mu_t \qquad (12) \quad \text{(from equation 1)}$$
$$\mu_t = LGex_t - \delta - \gamma_1 LGex_{t-1} - \gamma_2 LRGDP_t \qquad (13)$$

where μ_t is the residual term and γ is a cointegrating coefficient. From equation (13), we can formulate a simple ECM as:

$$\Delta LGex_t = \varphi_1 + \varphi_2 \Delta LGex_{t-1} + \varphi_3 \Delta LRGDP_t + \Omega\mu_{t-1} + \nu_t \qquad (14)$$

Specifically from the ECM expressed in equation (14), φ captures any immediate, short term or contemporaneous effect that the real income has on the government expenditure. The coefficient γ_i reflects the long-run equilibrium effect of current income and previous government expenditure on current government expenditure and the absolute value of Ω decides how quickly the equilibrium is restored.

5. Results and Interpretation

Stationary Test

Appropriate tests have been developed by Augmented Dickey and Fuller (ADF) and Phillips and Perron (1988) to test whether a time series has a unit root. Tables 1 therefore provide the results of the unit root tests.

Table 1: Results of (ADF) and (PP) unit root test

	Constant and Linear Trend	
Variable level	ADF Test	PP
LRGDP	0.8019	0.8328
LGex	0.2027	0.2123
L(RGDP/P)	0.8046	0.8355

L(RGex/RGDP)	0.0035***	0.0051***
LRCex	0.9627	0.9559
L(RGex/P)	0.2072	0.2167
BD/RGDP	0.1814	0..1814
ΔLRGDP	0.0000***	0.0000***
ΔLGex	0.0000***	0.0000***
ΔL(RGDP/P)	0.0000***	0.0000***
ΔL(RGex/RGDP)	-	-
ΔLRCex	0.0001***	0.0001***
ΔL(RGex/P)	0.0000***	0.0000***
Δ(BD/RGDP)	0.0036***	0.0000***

1% (***), 5% (**), 10% (*)

ADF and PP tests result with constant and linear trend, shows that all the variables is stationary at first differences except the logarithm of the ratio of real government expenditure to real gross domestic product. Hence, we conclude that these variables are integrated of order 1.

Cointegration Test

Table 2: Results for Johansen and Juselius cointegration test.

Model	Null Hypothesis	Alternative Hypothesis	P – Value of Trace Statistics	P – Value of Max-Eigen Statistics
I	r=0	r=1	0.1240	0.0871*
	r=1	r=2	0.8094	0.8094
II	r=0	r=1	0.1105	0.0989*
	r=1	r=2	0.3739	0.3739
III	r=0	r=1	0.7214	0.6424
	r=1	r=2	0.9370	0.9370
IV	r=0	r=1	0.4615	0.4216
	r=1	r=2	0.5056	0.5056
V	r=0	r=1	0.4615	0.4216
	r=1	r=2	0.5056	0.5056
VI	r=0	r=1	0.1240	0.0871*
	r=1	r=2	0.8094	0.8094
VII	r=0	r=1	0.1925	0.1884
	r=1	r=2	0.5175	0.5111

*, ** Denotes rejection of the null hypothesis at 0.05 and 0.10 levels

Following from the results presented in tables 1, the Johansen and Juselius cointegration test on the 7 models show no evidence of long run relationship between the variable of interest under trace statistic test, which partly confirms the findings of Essien (1997) who could not establish a long run relationship between government size and economic growth in Nigeria. However models I, II and VI show that show a cointegration rank of one in under max-eigen value test at 10% significance level. This suggests that real income and government expenditure move together in those models. Since the existence of a long-run relationship has been established, the short-run dynamics of the model can be established within an error correction model.

Error Correction Mechanism (VECM):

In order to check the stability of the model, we estimated the vector error correction model (VECM). The results of VECM are presented in Table 3.

Table 3: Result of Vector Error Correction Model (VECM)

	Model I		Model II		Model III	
Variable	D(LRGex)	D(LRGDP)	D(LRGex)	D(LRGDP/P)	D(LRCex)	D(LRGDP)
C	0.0251 (0.5066)	0.0513* (0.0894)	0.0366 (0.3149)	0.0108 (0.6971)	0.0142 (0.7572)	0.0480 (0.1268)
$D(LRGex)_{t-1}$	0.0590 (0.6606)	-	-0.0069 (0.9563)	-	-	-
$D(LRGDP)_{t-1}$	-	-0.2797* (0.0926)	-	-	-	-0.1362 (0.4097)
$D(LRGDP/P)_{t-1}$	-	-	-	-0.1742 (0.2965)	-	-
$D(LRCex)_{t-1}$	-	-	-	-	0.1293 (0.4159)	-
$D(LRGex)_{t}$	-	0.2692** (0.0191)	-	0.3235*** (0.0033)	-	-
$D(LRGDP)_{t}$	0.4071** (0.0431)	-	-	-	0.3562 (0.1397)	-
$D(LRGDP/P)_{t}$	-	-	0.5405*** (0.0070)	-	-	-
$D(LRCex)_{t}$	-	-	-	-	-	0.1721 (0.1170)
ECM(-1)	-0.6839*** (0.0001)	-0.0044 (0.9687)	-0.6130*** (0.0000)	-0.2210 (0.1444)	-0.1831** (0.0489)	-0.0733 (0.4133)
R2 S.E of equation Pro(F-statistic)	0.4369 0.2295 0.0000	0.1899 0.1767 0.0482	0.4567 0.2254 0.0000	0.2353 0.1720 0.0180	0.1447 0.2806 0.1185	0.0946 0.1868 0.2925

	Model IV		Model V	
Variable	D(L(RGex/RGDP))	D(L(RGDP/P)	D(L(RGex/P))	D(L(RGDP/P)
C	0.0079 (0.8374)	0.0190 (0.5119)	0.0107 (0.7847)	0.0237 (0.4053)
$D(L(RGex/RGDP))_{t-1}$	-0.1645 (0.2980)	-	-	-
$D(L(RGDP/P)_{t-1}$	-	0.0166 (0.9229)	-	-0.2480 (0.1547)
$D(L(RGex/P))_{t-1}$	-	-	-0.0087 (0.9509)	-
$D(L(RGDP/P)_{t}$	-0.5599** (0.0106)	-	0.4149** (0.0558)	-
$D(L(RGex/P))_{t}$	-	-	-	0.2803*** (0.0095)
$D(L(RGex/RGDP))_{t}$	-	-0.2051* (0.0649)	-	-
ECM(-1)	-0.4017** (0.0152)	-0.1432 (0.1326)	-0.4862*** (0.0016)	-0.0553 (0.6785)
R2	0.3460	0.1500	0.3442	0.1939

S.E of equation F-statistics	0.2444 0.0011	0.1810 0.1071	0.2480 0.0012	0.1765 0.0443

	Model VI		Model VII		
Variable	D(L(RGex/RGDP))	D(LRGDP)	D(L(RGex/RGDP))	D(L(RGDP/P))	D(BD/RGDP)
C	0.0264 (0.4821)	0.0464 (0.1279)	0.0151 (0.6452)	0.0176 (0.5481)	0.4892 (0.6191)
$D(L(RGex/RGDP))_{t-1}$	-0.0674 (0.6600)	-	0.0066 (0.9617)	-	-
$D(LRGDP)_{t-1}$	-	-0.0053 (0.9749)	-	-	-
$D(L(RGDP/P))_{t-1}$	-	-	-	-0.0512 (0.7797)	-
$D(BD/RGDP)_{t-1}$	-	-	-	-	0.1000 (0.5699)
$D(LRGDP)_t$	-0.5866*** (0.0048)	-	-	-	-
$D(L(RGDP/P))_t$	-	-	-0.4640** (0.0120)	-	5.2603 (0.3604)
$D(L(RGex/RGDP))_t$	-	-0.2420** (0.0405)	-	-0.1342 (0.2443)	-8.0331* (0.0507)
$D(BD/RGDP)_t$	-	-	-0.0092* (0.0811)	0.0053 (0.2702)	-
ECM(-1)	-0.6148*** (0.0012)	-0.1105 (0.1473)	-0.8546*** (0.0000)	-0.1427 (0.1928)	-0.3934** (0.0140)
R2 S.E of Eq F-statistics	0.4231 0.2295 0.0001	0.1473 0.1813 0.1127	0.5474 0.2061 0.0000	0.1602 0.1827 0.1674	0.2042 6.1068 0.0765

The results presented in table 3 shows that the short run dynamics of Models I, II, IV, V and VI suggest that causality run from real income to government expenditure and vice versa i.e there is feedback mechanism between the variables. In spite of the different measures used to capture government expenditure and national income in the models of Peacock and Wiseman (1967), Goffman (1968), Musgrave (1969), Gupta (1967) and Mann (1980), the associated relationship between government expenditure and national income is the same. These results are in consonance with Aigbokhan (1996) who investigated the impact of government size (measured as expenditure share of GDP) on economic growth between 1960 and 1993 for Nigeria;

In the third version of the Wagner Law developed by Pryor (1968), the result revealed that there is no short run relationship between the consumption component of government expenditure and national income in Nigeria. This wagner's law formulation posit no empirical support either for the Wagner's Law or the Keynesian hypothesis.

However, Augmented Musgrave (1969) version by Murthy (1994), suggested a bi-directional causal relationship between government expenditure and budget deficit variables. Also model VII revealed a uni-directional causality that causality run from real income to government expenditure, thus supporting Wagner's law for Nigeria. Our finding is similar to the outcome of a study by Aregbeyen (2006), using Johansen cointegration and standard causality tests found a unidirectional causality from national income to total public expenditure i.e. a support for Wagner's Law.

The insignificance of the lagged residual term (ECM) in the national income equations and its significance in the government expenditure equations for all the models (I -

VII) conclusively settles the question of long run causality, regardless of the joint significance of the cross-terms (Granger, 1988). There is only one cointegrating equation and Granger-causality runs in only one direction. This result is in consonance with Ziramba (2008), Narayan et al. (2008) and Halicioğlu (2005) whose studies established the presence of a long run relationship between national income and public expenditure.

Thus, economic growth leads to a larger share of government expenditures, but not the reverse. The empirical evidence seems to be most favourable to Wagner's hypothesis rather than the Keynesian one. In fact, we can conclude that aggregate income Granger-causes public expenditure. This finding is consistence with other studies that have found support for the Wagner's law such as Wagner and Weber, 1977; Abisadeh and Gray, 1985;Chang, 2002; Aregbeyen, 2006,

6. Summary and Conclusion

This paper has examined the empirical evidence of Wagner's Law, which stated a long-run tendency for public sector to grow relative to aggregate income - and that of Augmented Wagner's Law, according to which subsists a long-term relationship among public expenditure on one side and aggregate income and public deficit on the other side. We applied causality tests within an error-correction framework for data over the period 1970 - 2009 with seven formulations of Wagner's Law for Nigeria. The unit root properties of the data were examined using the Augmented Dickey Fuller test(ADF) and Phillip Perron (PP) after which the cointegration test was conducted. The error correction models were also estimated in order to examine the short –run dynamics.

The major findings include the following; The unit root tests shows that all the variables is stationary at first differences except the logarithm of the ratio of real government expenditure to real gross domestic product. Hence, we conclude that these variables are integrated of order 1. The cointegration test suggested that government expenditure and economic growth are cointegrated under max-eigen value test at 10% significance level, indicating an existence of long run equilibrium relationship between the two key variables.

We found bi-directional causal relation for the short run dynamics of Models I, II, IV, V and VI, model III result revealed that component of government expenditure and national income are independent of each other (neutral effect on each other). More so, the study found a bi-directional causal relationship between government expenditure and budget deficit variables and also a unidirectional causality that causality run from real income to government expenditure, thus supporting Wagner's law for Nigeria.

The long run empirical evidence seems to be most favourable to Wagner's hypothesis rather than the Keynesian one, therefore suggesting that aggregate income Granger - causes public expenditure. These findings are favourably consistence with results obtained in the literature (such as Omoke, 2009). In conclusion, non-establishment of Keynesian view has indicated that the growth of public sector was not efficient policy. Therefore, policy makers should give more attention to private sector driven policy and adopt policies that will reduce unnecessary costs incurred by government's involvement in economic activity, since government expenditures do not play a significant role in promoting economic growth.

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