GOVERNMENT SPENDING AND NATIONAL INCOME NEXUS FOR NIGERIA

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ABSTRACT

The paper investigates Wagner's law, the nexus between government spending and national income in Nigeria over the period 1961-2009 in multivariate framework incorporating population size variable. The results provide support for Wagner's law in Nigeria. Moreover, there is a long-run relation among real government spending, real GDP and population size. A unidirectional causality runs from both real gdp and gdp per capita to government spending implying that expenditure rationalization policies may not necessarily have adverse effect economic growth. Finally, population has significant positive impact on government spending.

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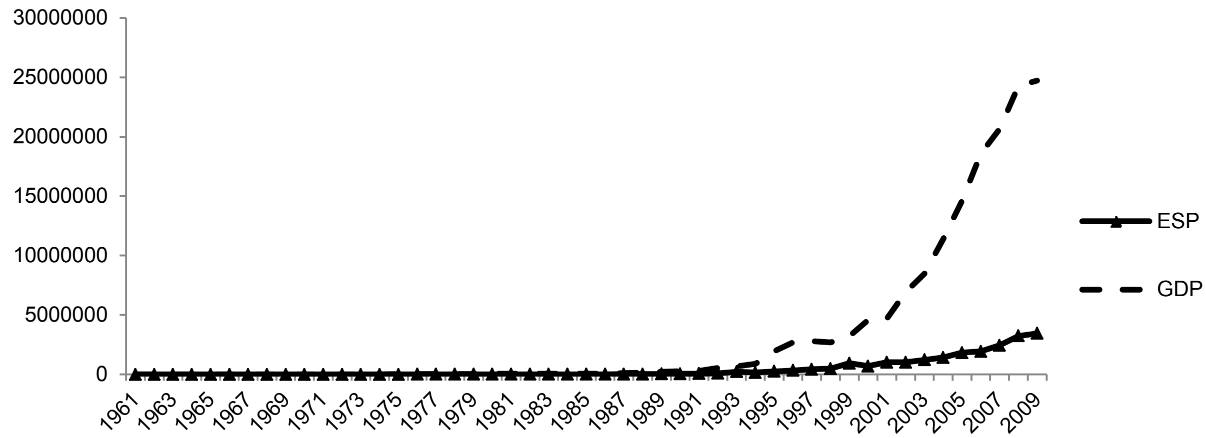
INTRODUCTION

The relationship between public expenditure and national income has been debated quite extensively in the literature, yet the direction of the causality relationship remains unresolved. The debate has centered on whether public expenditure causes national income or national income causes public expenditure; or whether a two-way relationship exists. From a policy point of view, the direction of causality between these variables has important implications. As an illustration, a finding that supports positive unidirectional causality running from national income to public expenditure is a strong justification for government expenditure rationalization or cut for this finding suggest that the country is not dependent on public expenditure for growth and development. On the other hand, if unidirectional causality runs from public expenditure to national income then reducing government expenditure could precipitate a fall in income. What this implies is that the country's growth is driven by public expenditure and any negative shock leading to lower government expenditure will adversely impact national income.

As shown in figure 1, both government spending and gross domestic product increased sharply in Nigeria between 1961 and 2009. Government expenditure increased from ₦163.9 million in 1961 to ₦903.9 million in 1970. In 1980, the total government spending increased to ₦14,968.5 million. This figure increased sharply from ₦701,059.4 million in 2000 to ₦3,456,925.0 million in 2009. In the same way, gross domestic product used as proxy for national income experienced significant increase over the period 1961-2009. It increased from ₦2,361.2 in 1961 to ₦5,281.1 million in 1970. The figure increased to ₦49,632.3 million in 1980. In 1987, the total GDP was ₦105,222.8 million. However, the figure increased sharply to ₦4,582,127.0 million in 2000 and further to ₦ 24,712,670.0 million in 2009.

However, government has embarked on several reforms to reduce the huge government spending over the years. Government has announced several expenditure reduction measures with a view to reducing government fiscal deficits while encouraging increased private spending. To fully understand the implication of such policies, it is imperative to understand the relationship between government expenditure and economic growth. The purpose of this paper is to investigate the causal relationship between government spending and economic growth for Nigeria. This empirical exercise is important for Nigeria because it will allow us to deduce

Figure 1: Government Spending (ESP) and Gross Domestic Product (GDP)1961-2009



This figure shows the aggregate government spending and gross domestic product from 1961 through 2009.

whether or not the Wagner's law, that is, the long-run tendency for public expenditure to grow relative to some national aggregates such as the national income, holds in the country. On the basis of this knowledge, we will be able to recommend whether or not the policy of rolling back the government through reduced government expenditure is a viable option for the country.

The remainder of this paper is organized as follows: In section 2, we provide a brief overview of previous empirical studies on nexus between government spending and national income. Section 3 describes the methodology and data employed in estimation. Section 4 estimates and presents empirical results of the study. Section 5 provides the conclusion.

LITERATURE REVIEW

The relationship between government spending and national income has important policy implications, as explained earlier. Hence, several studies have attempted to establish the relationship between government spending and national income. A general observation from these studies is that the results from both country-specific-time-series analyses and cross-country studies with reference to Wagner's law are so diverge and conflicting that they virtually constrain any valid conclusion with acceptable degree of generality to be made. The purpose of this section is to provide a brief overview of the findings of related studies on the relationship between government spending and income.

Henrenkson (1993) tested the Wagner's law for Sweden, using data spanning 1861 and 1990.He found that real government size and per capita income were not co-integrated implying that no long run relationship could be established for Sweden and hence that it was unlikely that growth is real income per se caused the growth of government. Bohl (1996) tested for the Wagner's law on G7 countries employing post-world II data. He found among other things, no evidence of a long run relationship between the variables in G7 countries except for Canada and the UK. The granger causality test for Canada and UK showed that real per capita income granger caused government size. Payne and Ewing (1996) study on a sample of 22 countries provided evidence in support of the Wagner's law in Australia, Columbia, Germany, Malaysia, Pakistan, and the Philippines. However, bi-directional causality was found for India, Peru, Sweden, Switzerland, UK, US and Venezuela, while granger causality was not found in Chile, Finland, Greece, Honduras, Italy and Japan.

Islam (2001) reported evidence in support of the Wagner's law for US during the period 1929-1996 applying co-integration and exogeneity tests. In the same way, Sideris (2007) provided support for Wagner's law for Greece during the period 1833-1938. However, Chletsos and Kollias (1997) found that Wagner's law was valid only in the case of military expenditure in their analysis based on disaggregated Greek data over the period 1958-1993.

Demirbas (1999) examined the Wagner's law for Turkey using Engle and Granger co-integration and granger causality test. Their study found no evidence of causality in either direction. However, study by Oxley (1994) for Britain for the period 1870-1993 provided clear support for Wagner's law just as Courakis et al (1993) found support for the hypothesis for Mexico during the period 1925-1976.

The study by Ram (1987) for 115 countries showed that 60% of the countries analyzed individually provided support for Wagner's law whereas the cross-section analysis on the whole, rejected the hypothesis. However, Kolluri et al (2000) provided evidence in support of the Wagner's hypothesis for the G7 countries over the period 1960-1993 which was also supported by Chang (2002). The same applies for Loizides and Vamvoukas (2005) who provided support for Wagner's law in the short run for UK, Ireland and Greece. The study by Kalam and Aziz (2009) for Bangladesh over the period 1976-2007 provided support for the Wagner's hypothesis. Also, the results showed that both real GDP and GDP per capita granger caused total government expenditure; while population size served as stimulus for public spending both in the short-and-long run.

Similar studies in Sub-Saharan Africa include Ansari et al (1997) and Olomola (2004). The former found support for Wagner's hypothesis for Ghana but not in Kenya and South Africa; the latter study found clear support for Wagner's hypothesis in Nigeria over the period 1970-2001. Moreover, Olomola (2004) showed that economic growth granger-caused public expenditure, both in the short and long run.

METHODOLOGY

Model Specification

In analyzing the relationship between government spending and national income, we followed the approaches of Courakis et al (1993), Kalam and Aziz (2009) among others; by specifying a function in which government spending depends on national income. Formally stated:

$$esp_t = f(gdp_t, e_t) \quad (1)$$

However, incorporating population (pop) as argument and given a specific functional form, eq. (1) can be stated as:

$$esp_t = f(gdp_t, pop_t, e_t) = e_t gdp_t^{\alpha} pop_t^{\beta} \quad (2)$$

where esp_t is real government spending at time t, gdp_t is the national income measured as real gross domestic product at time t, e_t is error term assumed to constant, α and β are parameters to be estimated. It is assumed that the sum of α and β are equal to one, meaning that β = 1- α. Therefore, taking the logarithms of Eq. (2) we obtain:

$$lnesp_t = lne_t + \alpha lngdp_t + (1- \alpha)lnpop_t \quad (3)$$

Equivalently, eq. (3) can be written as:

$$lnesp_t = \xi_t + \alpha lngdp_t + (1- \alpha)lnpop_t \quad (4)$$

In the same way, dividing eq. (4) by pop_t it can be expressed either as:

$$ln(esp/pop)_t = \xi_t + \alpha ln(gdp/pop)_t \quad (5)$$

or

$$ln(esp/gdp)_t = \xi_t + (\alpha\text{-}1)ln(gdp/pop)_t \quad (6)$$

where $(esp/pop)_t$ is real per capita government spending, $(esp/gdp)_t$ is the share of real government spending in the real gross domestic product, (gdp/pop)t is real per capita gdp and other variables are as earlier defined.

To provide support for the Wagner's hypothesis, the elasticity of real gdp coefficient must be greater than one (i.e. $\alpha > 1$) and the causal relation must flow from gdp to government spending in eq.(3). However, in eqs. (4) and (5), Wagner's hypothesis is established if $\alpha > 1$ and $(\alpha\text{-}1) > 0$ and the casual flows from (gdp/pop) to either (esp/pop) or (esp/gdp).

In estimation, Engle-Granger (1987) two-step procedure was adopted and to examine the short run relationships among the variables, the Granger (1969) causality test was adopted. However, for robustness check, Johanse-Juselius (1990) cointegration approach was equally adopted.

Data Measurement, Description and Sources

The data are annual Nigerian observations on real gross domestic product (GDP), population size and real government spending. Annual data on all the variables are available from 1061 to 2009. They were obtained from the Central Bank of Nigeria, Annual Statistical Bulletin (2009). All data are expressed in logarithm. Real GDP series are obtained by deflating the nominal GDP by GDP deflator. Likewise, the nominal government spending expressed in millions of domestic currency were deflated by consumer price index to obtain the real values. The descriptive statistics of the variables are as shown in Table 1. The descriptive statistics of the data series are as shown in Table 1. Table 1 shows that all the series display a high level of consistency as their mean and median values are perpetually within the maximum and minimum values of the series.

Table 1: The Descriptive Statistics of the Variables

	ESP	GDP	POP	ESP/POP	GDP/POP	ESP/GDP
Mean	440561	3184556	87.08	3260.366	23235.87	0.173
Median	14968.5	67908.6	80.70	195.466	833.096	0.171
Maximum	3456925	24712670	153.90	22462.15	162953.2	0.341
Minimum	163.9	2361.2	41.80	3.913	53.769	0.064
Std.Dev.	838189.2	6486252	33.63	5748.032	44479.14	0.067
Skewness	2.250	2.283	0.365	2.005	2.119	0.427
Kurtosis	7.41	7.067	1.866	6.209	6.289	2.716
Jarque-Bera	81.06***	76.329***	3.717	53.852***	58.789***	1.657
Probability	0.00	0.00	0.156	0.00	0.00	0.437
Sum	21587491	1.56E+08	4266.75	159757.9	1138558	8.497
Sum Sq. Deviations	3.37E+13	2.02E+15	54280.73	1.54E+09	9.50E+10	0.217
Observations	49	49	49	49	49	49

Table 1shows the results from descriptive statistics and the Jarque-Bera normality test. The asterisk denotes significance at 1% level. This is established by the p-values under the Jarque-Bera values.

Likewise, the deviations of the actual data from their mean values are very small as shown by the low standard deviations for most the series. The statistics in Table 1 reveal that the series except population (pop) and expenditure-gross domestic product (esp/gdp) ratio are leptokurtic (peaked) relative to normal as the kurtosis value exceeds 3. Lastly, the probability that the Jarque-Bera statistic exceeds (in absolute value) the observed value is generally low for all the series suggesting the rejection of the hypothesis of normal distribution at 5per cent level of significance.

EMPIRICAL RESULTS

Unit Root Test

To obtain the international properties of the data series, we apply the Augmented-Dickey Fuller (Dickey and Fuller, 1979) and the KPSS (Kwiatkowski-Phillips-Schmidt-Shin, 1992) tests. The results reported in Table 2 show that all variables are integrated of order one or *I*(1).

Cointegration

Next, we investigate whether or not real gdp, real government spending and population share common long run relationships. To achieve this, we use the Engle-Granger two-step procedure. At the first step, the static Ordinary Least Square (OLS) regression was estimated. The results obtained are reported in Table 3. In the second step of the Engle-Granger cointegration test, we examined the unit roots of residuals by using the ADF statistic. The results showed that the residuals are stationary at 5% level of significance (t – ADF values are: -4.899***, -4.631***, -4.898*** and -3.203** for eqs. (1), (4), (5) and (6) respectively. This shows that there is long run cointegration relation among the variables.

Table 2: Unit Root Test

	ADF		KFSS	
	Level	1st difference	Level	1st difference
espy (constant)	-0.522	-3.703	0.911	0.051
(costant & linear)	-2.258	-3.666	0.055	0.051
gdp (constant)	0.505	-3.185	0.906	0.223
(constant & linear)	-2.519	-6.272a	0.168	0.089
pop(constant)	-0.768	-3.197	0.926	0.152
(constant & linear)	-1.369	-3.266	0.144	0.119
esp/pop(constant)	-0.534	-3.737	0.907	0.050
(constant & linear)	-2.257	-3.696	0.056	0.050
gdp/pop(constant)	0.489	-3.203	0.901	0.241
(constant & linear)	-2.487	-6.335a	0.172	0.086
esp/gdp(constant)	-2.701	-4.903	0.260	0.027
(constant &linear)	-2.344	-5.393	0.206	0.050

Critical values for ADF are -3.581, -2.927, and -2.601 (constant only at level); -3.585, -2.928 and -2.602 (constant only at 1st difference); -4.171, -3.511, and -3.186 (constant & linear at level), -4.176, -3.513 and -3.187 (constant & linear at 1st difference) at 1%, 5% and 10% level of significance respectively. The critical values for KPSS test are: 0.739, 0.463 and 0.347 (constant); 0.216, 0.146 and 0.119 (constant& linear) at 1%, 5% and 10% respectively.

The results in Table 3 show that the growth of government spending is directly linked with the size of the real gross domestic product (1.025 in eq. (1) and gdp per capita (1.026 and 0.026 in eqs. 5 and 6 respectively). The values of the elasticities obtained in eqs. 1, 5 and 6, clearly provide strong evidence in support of the Wagner's law in Nigeria. This result is quite consistent with the findings of Olomola (2004) for Nigeria, Sideris (2007) for Greece, Islam (2001) for USA and Kalam and Aziz (2009) for Bangladesh. The results equally show that population is a major factor influencing government spending in the long run. The coefficient of population is high and significant.

However, for robustness check, we employed the Johansen-Juselius (1990) cointegration testing technique using the trace and the maximum eigenvalue statistics. The results of the tests are as shown in Table 4. The third and fourth columns report maximum eigenvalue statistics and critical values respectively, while the fifth and the sixth columns show the trace statistics and its critical values at 95 per cent respectively.

Table 3: Engle-Granger First Step

	Coefficients			
	Eq. (1)	**Eq. (4)**	**Eq. (5)**	**Eq. (6)**
constant	-2.125(-0.24)***	-14.981(-2.15)***	-2.027(0.18)***	-2.027(0.18)***
gdp_t	1.025(0.01)***	0.446(0.09)***	-	-
pop_t	-	4.494(0.75)***	-	-
$(gdp/pop)_t$	-	-	1.026(0.023)***	0.026(0.023)***

*The table shows the regression estimates of the following equations: $ln(esp)_t = \xi + \alpha ln(gdp)_t$ for eq.1; $ln(esp)_t = \xi, + \alpha ln(gdp)_t + (1-\alpha)ln(pop)_t$ for eq.4; $ln(esp/pop)_t = \xi + \alpha ln(gdp/pop)_t$ for eq.5; and $ln(esp/gdp)_t = \xi + (\alpha-1)ln(gdp/pop)_t$ for eq.6. The figure in each cell is the regression coefficient while those in parenthesis are standard errors. *** denotes significance at 1% level.*

The results in Table 4 show that the null hypothesis of no cointegration cannot be rejected at the 5 per cent level for the maximum eigenvalue test. However, using the trace test, the null hypothesis of no cointegration relationship can be rejected at the 5 per cent level. The trace test suggests one cointegrating vector meaning that long run relationship exists amongst the three variables. According to Cheung and Lai (19930, the trace test shows more robustness to both skewness and excess kurtosis in the residuals than does the λ-max test; therefore, we adopted the trace statistics in this study.

Table 4: Johansen Cointegration Test (with a Linear Trend) Where R Is the Number of Cointegrating Vectors

Null	Alternative r	λ-max	Critical values	Trace	Critical values
0	1	19.94	21.13	32.02**	29.79
≤ 1	2	11.34	14.26	12.08	15.49
≤ 2	3	3.84	3.84	0.74	3.84

*Table 4 shows the Johansen cointegration test using λ-maximum and trace tests. The third and fourth columns show λ-max statistics and critical values while fifth and sixth column show the trace statistic and critical value. The r implies the number of cointegrating vectors and the critical values are from the MacKinnon-Haug-Michelis table (1999). ** reject null hypothesis at 5% level of significance.*

Granger Causality

The existence of a cointegrating relationship among real gdp, population and government spending suggests that there must be Granger causality in at least one direction, but it does not indicate the direction of temporal causality between the variable. The short run causal effects are obtained by the F-test of the lagged explanatory variables. The results obtained are reported in Table 5 below.

Table 5: Granger Causality Test

	$\Delta ln(esp)_t$	$\Delta ln(gdp)_t$	$\Delta ln(pop)_t$	$\Delta ln(esp/pop)_t$	$\Delta ln(esp/gdp)_t$	$\Delta ln(gdp/pop)_t$
$\Delta ln(esp)_t$	-	9.043(0.00)**	6.414(0.004)**	-	-	-
$\Delta ln(gdp)_t$	2.941(0.06)	-	6.71(0.003)**	-	-	-
$\Delta ln(pop)_t$	0.197(0.82)	0.296(0.75)	-	-	-	-
$\Delta ln(esp/pop)_t$	-					8.532(0.00)**
$\Delta ln(esp/gdp)_t$	-					0.263(0.77)
$\Delta ln(gdp/pop)_t$	-			2.739(0.08)	2.739(0.08)	

*Table 5 shows the results of the bivariate regression for Granger- causation of the form: $ln(esp)_t = \alpha_0 + \sum\alpha_i ln(esp)_{t-i} + \sum\beta_i ln(gdp)_{t-i} + \varepsilon_t$ and $ln(gdp)_t = \alpha_0 + \sum\alpha_i ln(gdp)_{t-i} + \sum\beta_i ln(esp)_{t-i} + v_i$. The F-statistic values of overall significance are given in the table. Number of lags are 2. The values in parenthesis are the p-values. **reject the null hypothesis that horizontal variable does not Granger cause respective vertical variable at 5% level of significance.*

The Granger causality test statistics show that real gdp and population size granger cause real government spending in Nigeria. In the same way, population size granger causes real gdp, while gdp per capita granger causes per capita government spending. The results clearly support the Wagner's hypothesis for Nigeria and population size equally influences government spending growth in the short run.

However, we extended the analysis by performing long run causality test and the short run adjustment to re-establish long run equilibrium-the joint significance of the sum of lagged terms of each explanatory variable and the ECT by joint F-test. The results obtained are reported in Table 6. Short run causality is found from real GDP to real expenditure. The significance of the joint test in the government spending equation is consistent with the presence of Granger-causality from real GDP to real government spending.

Table 6: Estimation Results of Error Correction Model for the Logarithmic Series

Sources of Causality Short run Variables	**Δesp**	**Δgdp**	**Δpop**	**ECT**	**Joint test**
F-statistics				*t*-statistics	*F*-statistics
Δesp	-	4.69(0.01)***	0.67(0.52)	-1.02	2.34(0.05)**
Δgdp	2.11(0.13)	-	0.10(0.94)	0.36	0.09(0.48)
Δpop	1.11(0.11)	0.04(0.96)	-	- 1.01	0.85(0.52)

Table 6 shows the error correction causality estimates based on the equation: $\Delta ln(esp)t = \alpha_0 + \sum\alpha_{1i}\Delta ln(esp)_{t-i} + \sum\beta_{1i}\Delta ln((gdp)_{t-i} + \sum\delta_{1i}\Delta ln(pop)_{t-i} + \gamma ecm_{t-1} + \varepsilon_{it}$ *specified each of the three variables. The values in parenthesis are the p-values. **' ***denote significance at 5% and 1% critical level respectively*

CONCLUSION

The goal of this paper is to model the relationship between government spending and national income i.e. verifies the validity of Wagner's law for Nigeria. We achieved this goal by undertaking a multivariate modeling strategy through including population in the analysis. Our main findings were as follows. First, we found long run relationship among the variables at both bivariate and trivariate levels. Second, the coefficients of the explanatory variables have the expected sign and magnitude confirming the Wagner's hypothesis for Nigeria. Third, Granger causality test showed a unidirectional causality running from real gdp and real per capita gdp to government spending (both aggregate and per capita) affirming Wagner's hypothesis in Nigeria. Also, a unidirectional causality running from population size to government spending and real gdp was established. Fourth, the importance of population size cannot be overemphasized in analyzing the government spending-national income nexus in the developing economies like Nigeria.

Our findings lead to the following policy implications. One, increase in government spending is a natural consequence of economic growth arising from increase industrialization. This suggests that increase in government spending might not necessary means inefficiency on the part government as some economists have argued. Also, effort at rolling back the government through rationalization of government spending might not necessarily have adverse effects on economic growth. Two, as population size causes economic activity which in turn causes government spending, government must ensure that the appropriate population is adopted in the country.

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