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Nexus between public expenditure and economic growth by testing Wagner's law time series: Evidence from Nigeria

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Abstract

The focus of this paper is to investigate the linkages between the different components of government expenditure and real gross domestic product for Nigeria. Using Granger causality, Error correction model and Cointegration techniques, the result of the findings is rather mixed. The total capital expenditure and real gross domestic product support Wagner's law through the granger causality test showing a unidirectional causality. While total recurrent expenditure and real gross domestic product are bi-directional causality, but the link from total recurrent expenditure to real gross domestic product is stronger.

Keywords: Wagner's law; Public Expenditure and Real Gross Product

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1. Introduction

Public Expenditures have exact a significant role in the emerging sub-Saharan Africa countries in providing basic social services, most especially in the areas of education and health care services. It equally promotes the welfare and productivity of both the rich and the poor segments of the society. Most governments in less developed countries spend 26 percent of their GDP on average on goods and services, a figure which have moved up to 8 percent points over the last fifteen years (World Bank, 1992). The trends and growth of this figure have encouraged in attracting attention and the need for a fair amount of studies and research on the relationship between the size of public expenditure and economic growth.

There has been a controversy as to which of the economic variables causes each other i.e. whether public expenditure causes economic growth or whether the reverse is the case. Some scholars have argued that the expansion in public spending may not necessarily propel economic growth and that higher spending may reduce the overall performance of the economy. They further argue that in an attempt for government to expand the size of public spending, they may be compelled either to increase in tax rates or to engage in borrowing. The increase in tax rate may serve as a disincentive to work and this may have a negative impact on the productivity. While equally engaging in borrowing may also put the county into debt crisis and with attendance cost that goes into the servicing of the debt. More so, for government to engage in borrowing, crowding-out private sector borrowing becomes inevitable and leading to negative consequences on the economic growth and development.

The issue of public sector expenditure in Nigeria has been a serious concern for scholars and the situation has been so politicized to the extent that money are spent on projects that can be better provided by private sector more efficiently. Nigeria being the most populous country in the continent with about 167million based on the Nigeria population commission's estimate and this in fact shows that having a large population to feed and basic infrastructures like hospitals, schools, roads etc to provide. But unfortunately, the country has a huge infrastructure deficit, which has impacted negatively on its economic and social well-being of its people. This situation has been largely attributed to the large scale corruption and increasing size of the government's administration. This upward trend in the size of government administration has necessitated the need to spend 78percent of its annual budget on recurrent expenditure, while not more than 22 percent were left for the capital expenditure.

After independence in 1960, Nigeria government encouraged both local and foreign investors to be actively involved in the development process in Nigeria through the massive provision of basic social infrastructures, so as to kick-start the development of the country. The oil boom era of 1970s coincided with the formulation of Second Development plan of 1970-1974. This oil boom provided much needed financial resources to fully implement the development plan. This period further ushered in large scale public spending by different tiers of government in Nigeria and they actively involved in the economic emancipation plan. This oil boom period witnessed a tremendous increased in public expenditure in the provision of basic and social infrastructure. But with the collapse of oil prices in 1980s and with attendant consequences on public expenditure, Nigeria faced serious financial challenges and dwindling in government revenue. This situation is so serious that the government has to resort to external borrowing in order to finance public

expenditure. The fact that Nigeria economy is purely import dependency, and crude oil as a major source of income, further confirmed the serious weakness associated with the economy. This structural deficiency already associated with the economy in term of the pattern and trends of production, consumption and exchange of the Nigerian economy, Serves as a barrier for the country's development in most of the vital sectors of the economy.

In the efforts to sustain the level of consumption and investment trends, massive importation of commodities continues unabated and far exceeds exports and to ensure fiscal balances, government have to resort to external debts. Thus, government's expenditures continue to rise far more than revenue and this create overvaluation effect of domestic currency and unemployment becomes more pronounced.

1.1. Trends in public expenditure

Public expenditure experience an upsurge in the last three decades and which can be largely be attributed to huge in receipts from the production and sale of crude-oil and with the need to provide basic infrastructure like roads, power, education, health and security. The statistics made available from central bank of Nigeria shows that total expenditure (both capital and recurrent) and its components have moved #14,968m in 1980 to #60,268.20m in 1990 and rose #3,452,990m in 2009. In the same vein, the composition of recurrent expenditure shows that expenditure on its various components further showed that public expenditure have increased over the years.

Table 1. Trends in Real Gross Domestic Products and Public Expenditure in Nigeria (1970-2010)

	Real GDP	***Total Recurrent expenditure***	***Total Capital expenditure***	***Total expenditure***
Year	**(#m)**	**(#m)**	**(#m)**	**(#m)**
1970-1974	35057	5032.6	2601.9	7634.5
1975-1979	146999.21	16356.7	21673.1	38029.8
1980-1984	805615.16	25736.2	32133.3	57869.5
1985-1989	1068419.5	76323.1	28704.1	1052027.2
1990-1994	1354578.5	354199.2	217572.9	571772.1
1995-1999	1500248.5	1038444.8	1410759.5	2449204.3
2000-2004	2119485.5	3754700	1592513.8	5347213.8
2005-2010	3958709.7	11831072	4991337.8	1682241

SOURCE: Central Bank of Nigeria Statistical Bulletin (Various Issues)

From the above, the trend in the total spending and the real GDP mirrored above, shows that both the real GDP and total expenditure increase significantly from 7634.5m naira in 1970-1974 to 57869.5m naira in 1980-1984 indicating about over 600% increase in public expenditure and since the country continued to

experience expansion in public expenditure. In the case of real GDP, the real GDP of the country has experienced an upsurge in the volume from 35057m naira in 1970-1974 to all time rise of 805615.16m naira in 1980-1984 indicating over 2000% rise in growth rate still then, the country continues to experience an astronomical rise in real GDP and this was more than the increase in public expenditure.

This study intends to examine the Wagner's law of public expenditure and to justify whether the law is applicable to Nigeria in view of the rising profile of public expenditure coupled with the fact that the country equally experiencing a rise growth rate, moving from $850 in the per capita income in 1980 to $1091 in 2009 (world bank indicator). The data used for this study covered the periods 1970-2010. The sources of the data include central bank of Nigeria statistical bulletin, National Bureau of statistics and World Bank Indicators. The rest of the paper is organized into four sections. Following the introduction is the section two which presents the review of theoretical and empirical literature. Section 3 presents the theoretical framework and methodology. Section 4 focuses on the results and analysis of the estimated models. Section 5 presents summary and conclusion.

2. Theoretical and empirical literature

There has been a controversy as to which of the two variables drive the other. This controversy started since the introduction of Wagner's law in 1890. It has even been acknowledged in Wagner's law that public sector's spending is regarded as endogenous factor which is being influenced by the rise in national income and not a factor that causes the growth in national income. The law further argues that a rise in public expenditure can be attributed to the rise in growth in national income and that a rise in national income only can be used to explain an upsurge in public spending. The proposition is that national income drives public expenditure and not the way round. The law further explained that public expenditure could be regarded as an endogenous variable, not an exogenous and it is the outcome, not the cause of the economic growth (Wagner's, 1883, 1890).

But to Keynes (1936), in his work, believed that for the government to drive the economy size of public expenditure must be increased i.e to Keynes, public expenditure is seen as an exogenous variable, which principally determine the size of national income. The public expenditure is regarded as a major policy instrument that can be used to affect the size national income to bridge the gap between aggregate demand and aggregate supply in the economy. To Keynesians, it is the public expenditure that drives the national income i.e the causation move from public expenditure to national income and the resultant effect is that such increase in national income will be more than the initial increase in public expenditure through the multiplier effect.

The Phillip curve of 1958 illustrates an inverse relationship between growth rate in money wages and unemployment rate further reinforce the need for massive intervention of the government in the economic and social programme, so as to reduce problem of unemployment and accelerate economic and social development. The expansion in public spending in provision of social amenities to people and to overcome negative externalities that prevent the private provision of goods, further lead to maximization of social

welfare for the people. But the intervention of the government in the business venture has succeeded in crowding-out the private investment and which in turn would minimize the effect of government expenditure on national income (Bairam, 1995).

It has even been argued that the massive government expenditure may even have a long-term negative effect on private investment and consequently on national income (Ghali, 1998). More so, the expansionary fiscal and monetary policies are capable of creating distortion in national income and move it from equilibrium. Also continued increasing in public expenditure are capable to generate structural changes, which favour the relative growth in the service sector, at the expense of the real sector and which in fact, should be the main target for sustainable economic growth to be achieved (Bacon and Eltis, 1987). Furthermore, expansion in public spending may be financed through public borrowing or through the imposition of high taxes on people, thereby resulting to heavy burden on the future generation (Barro, 1989).

Moreover, there have been a series of empirical literature that tends to identify the relevance of public expenditure in promoting economic growth. According to the work of Musgrave (1969) conducted a research on the steady rise in public expenditure and concluded that, at the initial stage of economic development, the rate of growth in public spending will increase astronomically, because the government needs to provide basic infrastructure to kick-start development and most of the expenditures are capital intensive, therefore public spending are expected to be high. The expenditure on health, education, basic infrastructure, etc, is very essential to launch the country into take-off stage and expansion in public spending is inevitable in order to develop an egalitarian society.

Peacock-Wiseman's model (1961), this theory examined the rising in public spending from the socio-political angle. They believed that public spending will increase as income increases but since political leaders will want to be re-elected, hence public spending will be increased in order to convince the electorate that they can always be relied upon, when voting into power. But people may not be willing to pay higher tax and hence, translate to lower revenue for the government and by implication; the cost of providing basic infrastructure to the people will be borne by the government.

Devarajan et al. (1996) examines the impact of different component of public expenditure on economic growth. The study is for the periods of 1970-1990 and covered 43 rich countries; the study shows that capital expenditure extract positive influence on economic growth, but in a situation of the sample of developing countries shows that reversed was the case. The impact of capital expenditure exacted negative influence on economic growth in the developing countries and this could be attributed to the level of corruption and inefficiency in the fund application as to the implementation of capital projects.

Haque and Kim (2003) studied the effect of public investment on economic growth in 15 developing countries using dynamic panel data techniques. The result of the research shows that public investment on transportation exact influence on economic growth. Sutherland et al. (2009) also examined the impact of infrastructure on economic by running a cross country growth regression. The study indicates that public expenditure on basic infrastructure, especially on energy generation and telecommunication exact significant influence on economic growth.

Ghosh and Gregoriou (2007) using a heterogeneous panel to examine the effect of government expenditure on economic growth, using the GMM technique and its findings shows that countries with the enormous public spending tends to experience higher growth, but the impact varies from one country to another. He opined that the size of government is very vital in the performance of the economy. He further submitted that the government should raise the level of expenditure on basic infrastructure, social and economic activities. In addition, the impact of private sector in accelerating the pace of economic growth cannot be discounted.

Oyinlola (1993) in explaining the effects of public spending on economic growth in Nigeria, he pointed out that the effect of public expenditure on defense exact a positive influence on economic growth. While Fajingbesi and Odusola (1999), examine the relationship between public spending and economic growth in Nigeria, the findings show little impact of recurrent expenditure. Akpan (2005) using disaggregated approach to study the components of the government expenditure that influences economic growth. The components of government expenditure used in the study include capital, recurrent, administrative, economic services, social and community services and transfers. The result shows that there is no significant association between these components and economic growth.

Arghyrou (1999) examine the presence and feature of long-run relationships between Greek's national income and different components of public expenditure. The result shows the presence of positive long-run relationship between GDP and public expenditure on one side and GDP and "productive" public consumption on the other hand and causality drives on both ways. But the result further shows that there is no long-run relationship between GDP and public expenditure on personnel and GDP and expenditure incurred on debt servicing. He concluded in his study that in terms of GDP growth, the fiscal policy pursued by the Greece during the periods of 1975-1990, has not shown any sign of being effective.

Thornton (1999) analyses the impact of the long-run effect of government expenditure to relative growth in GNP i.e examining Wagner's law, using six European countries as a case study. The study employed data from mid-19th century to 1913. Apart from a few countries that shown some exceptions, the findings show that nominal and real GNP, nominal and real government spending and population were non-stationary in their levels, but stationary at the first difference, while nominal GNP and real government spending were co integrated in five countries and that these variables were co integrated with the population in the remaining country. The study concluded that Granger causality shows unidirectional i.e move form income to government expenditure.

Singh and Weber (1997) examine the connection between public spending and economic growth in Switzerland by regressing growth on public expenditure on the six components of expenditure like education, health, social welfare, transport, justice and national defense, using the data for the periods of 1950-1994 and estimating the data using OLS method, they found out that the fiscal spending can exact pressure on long-term growth. But the finding further shows that out of the six components of expenditure, only two, i.e education and health shown to have a permanent growth impact. The impact of education was positive, while that of health was negative.

Some scholars have attempted to distinguish between productive and unproductive government expenditure. These include the studies of Aschauer, 1989, Barro, 1990, 1991 and in their work, they discovered a negative relationship between output growth and the share of government consumption in GDP. Ashauer and Barro (1990) concluded that a positive correlation exists between public investment and GDP growth rate.

Sharma 2008 conducted a study on the impact of government spending on economic growth for the period of 1950-2007. He submitted that there is a significant positive relationship between government spending and economic growth. He equally established Co-integration relationship between the two variables.

Aregbeyen (2006) analyse the validity of Wagner's in Nigeria use data from 1970-2003, the varieties of the models for investigation includes total public expenditure and national income and non-transfer public expenditure and national income. Using Cointegration and causality techniques, his findings show a unidirectional causality moving from national income to total public expenditure, while non-transfer public expenditure show a bi-directional causality with the national income, but concluded that causality from national income to non-transfer public expenditure is stronger than the reverse i.e from non-transfer public expenditure to national income.

Al-Qudair (2002) the paper examine the linkage between different measures of real government spending and real gross domestic product for the Kingdom of Saudi Arabia over the period 1970-1999. With the use of Engle-Granger Cointegration technique, the result of the study shows clear evidence in support of Wagner's law that real government expenditure is largely influenced by the real gross domestic product.

3. Empirical and methodological framework

The empirical framework employed in this includes real national income (measured by real gross domestic product (GDP)), total recurrent expenditure (TRE) and total capital expenditure (TCE) over the periods of 1970-2010. The variables are in logarithmic form and using the annual data for the period, we examine the evidence of Wagner's law. The formulations are given in the following equations:

$$LTRE_t = \alpha_0 + \alpha_1 LGDP_t + \mu_t \qquad (1)$$

$$LTCE_t = \beta_0 + \beta_1 LGDP_t + \gamma_t \qquad (2)$$

where,

$LTRE_t$ = the natural logarithm of total recurrent expenditure in million naira.

$LTCE_t$ = the natural logarithm of total capital expenditure in million naira.

$LGDP_t$ = the natural logarithm of real gross domestic in million naira.

To begin with the analysis, we test each time series for their orders of integration using Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) tests. On the basis of the result obtained from the test, we can then proceed to conduct Johansson's method to establish whether or not a long-run equilibrating

relationship exists between the series or variables in our empirical equations. Johansson Co integrating test is performed, assuming a co-integrating relationship as specified by Equations 3 and 4.

$$LTRE_t = \alpha LGDP_t + c = e_t \quad (3)$$

$$LTCE_t = \beta LGDP_t + d = e_t \quad (4)$$

If a long-run relationship is established or presence of Co-integrating variable is found, then we conduct a Granger causality test in the context of an error correction model. This can be shown in Equations 5 and 6.

$$\Delta LTRE_t = \gamma_0 + \Delta\alpha_1 LTRE_{t-1} + \Sigma\alpha_2 \Delta GDP_t + \alpha_3 ECT_{t-1} + \mu_t \quad (5)$$

$$\Delta LTCE_t = \Upsilon_0 + \Delta\beta_1 LTCE_{t-1} + \Sigma\beta_2 \Delta GDP_t + \beta 3 ECT_{t-1} + \mu_t \quad (6)$$

The above ECM equations in 5 and 6 will be estimated using OLS with first difference of total recurrent expenditure and capital expenditure as dependent variables, while real gross domestic product (LGDP), Error correction term ECT_{t-1} and time trend (t) are the independent variables.

4. Result and analysis of the estimates

Table 2. ADF UNIT-ROOT TEST

Variables	*ADF test statistics*	*Critical Values*	*Level of Significant*	*Order of integration*
LTRE	8.012794	-3.605593	1%	1(0)
LTCE	-5.767151	-3.610453	1%	1(1)
LGDP	-3.3852246	-2.938987	5%	1(1)
PP UNIT-ROOT TEST				
Variables	*PP test statistics*	*Critical Values*	*Level of Significant*	*Order of integration*
LTRE	8.012794	-3.605593	1%	1(0)
LTCE	-5.767151	-3.610453	1%	1(1)
LGDP	-3.130958	-2.941145	5%	1(2)

Source: Author's Computation

The above are unit-root tests for all variables using both the ADF and PP, the tests confirmed that all the variables are stationary at different level of significance and also in a different order of integration. While the LTRE is confirmed to be stationary at the level of both tests at the 1% level of significance. The LTCE is also confirmed to be at stationary by both tests at first different with a 1% level of significance, while the LGDP is confirmed to be stationary by ADF at the first different with a 5% level of significance, but PP confirmed it at second level with also 5% level of significance.

Having established the stationary of the variables, then we proceed with the Co-integration test, using Johansson test for Co-integration in order to establish the long-run relationship among the variables.

Table 3. Johanssen Cointegration Test

Series: GDP TRE

Lag = 1 to 1

Johansen Co-integration test (Trace Value)

Null hypothesis	**Alternative hypothesis**	**Maximum trace Statistics**	**Critical value**	**P- value**
r=0	r=1	55.46888	15.49471	0.0000
r=1	r=2	4.146412	3.841466	0.0147
Trace test indicates 2 cointegrating equations at 0.05%				
Johasen cointegration test (Eigen value)				
Null hypothesis	**Alternative hypothesis**	**Maximum eigen value statistics**	**Crical value**	**P-value**
r =0	r >1	51.32246	14.26460	0.0000
r= 1	r>2	4.146412	3.841466	0.0147
Maximum Egien value indicates 2 cointegration equations at 0.05%				
Series: GDP TCE Lag = 1 to 1				
Johasen Cointegration test (Trace Value)				
Null hypothesis	**Alternative Hypothesis**	**Maximum trace statistics**	**Critical Value**	**P- value**
r = 0	r = 1	7.906215	15.49471	0.4755
r = 1	r = 2	1.002794	3.841466	0.3166
Trace indicates no cointegration at 0.05%				
Johasen Cointegration (Eigen value)				
Null hypothesis Value	**Alternative hypothesis**	**Maximum eigen statistics**	**Critical Value**	**P-**
r = 0	r = 1	6.903421	14.26460	0.5006
r = 1	r = 2	1.002794	3.841466	0.3160
Maximum Eigen value indicates no Cointegration at the 0.05%				

Source: Author's Computation

Our Co-integration test results show that Co-integrating relationship only exist in Equation 1 i.e between LTRE and LGDP. The implication of this is that long-run relationship exists between LTRE and LGDP and hence, Wagner's law holds for LTRE. For the fact that we found Cointegrating relationships between total recurrent expenditure and Gross domestic product, we can further conduct granger causality in the context of Error correction model (Table 4).

Table 4. Causality test based on Error Correction Model 1

	ΔLTRE	ΔLGDP
ECTt-1	0.390331 (3.12006)	0.271861(4.30951)
ΔLTREt-1	-1.026541 (-3.01384)	-0.322712 (-1.87893)
ΔLGDPt-1	-0.016788 (-0.04259)	0.105601 (0.53126)
C	143236.2	124535.4 (4.82432)

Note: t ratios are parenthesis

Source: Author's computation

The above shows the coefficient of LGDP is positive and but ECT does not show appropriate sign, which to be negative and we are compelled to test further for the confirmation of the validity of Wagner's law in respect of total recurrent expenditure in Nigeria between the periods of 1970-2010 through the Granger causality test. More so, it has equally been established in literature that even in the absence of a Co-integrating relationship as it established in LTCE and LGDP as in the case of Equation 2 (Aregbeyeni, 2006), it has still remained important to examine the short-run linkages between LTCE and LGDP (for which we found no Co-integrating relationship) and LTRE and LGDP for which error correction is not showing appropriate sign. Then, we can conduct standard Granger causality test to establish their relationship.

Table 5. Granger-Causality Test: F Values

			No of lags	
Null hypothesis	**1**	**2**	**3**	**4**
ΔTCE does not granger causes ΔGDP	0.77	0.5	6.19	4.99
ΔGDP does not granger causes ΔTCE	1.67	2.36	1.26	o.43
ΔTRE does not granger cause ΔGDP	2.48	1.46	6.06	5.52
ΔGDP does not granger cause ΔTRE	0.69	1.13	1.50	1.05

Source: Author's Computation

The above standard grander causality result shows unidirectional causality from GDP to total capital expenditure indicating that Wagner's law holds and this further confirms the study of Aregbeyeni (2006). But

in the case of total recurrent expenditure, the finding shows a bi-directional causality. However, the associated level of significant shows that the relationship runs from total recurrent expenditure to gross domestic product is stronger and while this outcome further confirmed the study of Aigbokhan (2000). The study as pointed out above confirm the Wagner's law of public expenditure showing that there is a long run tendency for public expenditure to grow in response to the growth in the GDP and this has strong evidence in Nigeria between 1970-2010.

5. Conclusion and policy implication

The cardinal aim of the paper is to examine the linkages between different components of public expenditure and the real gross domestic product to test the validity of Wagner's law in Nigeria. Cointegration, error correction model and granger causality test were used to test the long-run as well as short-run relationships between different components of public expenditure and the real gross domestic product. Based on the outcome of the test, cointegrating relationship is found between total recurrent expenditure and real gross domestic product and but which was not confirmed by the error correction model, but bi-directional causality is found between LTRE and LGDP but the link from total recurrent expenditure to gross domestic product is stronger. But in the case of total capital expenditure, though Cointegration could not be found, but granger causality test confirms the unidirectional relationship between the total capital expenditure and gross domestic product, and therefore confirming the Wagner's law.

In the light of the above analysis, it clearly shows that public expenditure in Nigeria is driven largely by gross domestic product. It can safely be said that public expenditure in Nigeria is endogenous variable and not the cause of real gross domestic product. This assertion is clear contradict Keynesian's view, where public expenditure is regarded as exogenous variable and the Keynesians are advocating for effective role for the government in raising level public spending in order to alter levels of real gross domestic product.

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