Journal of Economic and Social Research Vol 15(1) 2013, 1-30

Public Expenditure and Economic Growth: An Application of Cointegration and Granger Causality Tests on Nigeria[1]

Tukur Garba[*] and Sabi'u Ya'u Abdullahi[**]

Abstract. This study aims at investigating the long run and causal relationships between public expenditure and economic growth in Nigeria. The study uses annual time series dataset for a sample of 39 years from 1970 to 2008, on the basis of data availability. To achieve this objective, Johansen (1988) cointegration approach and Granger causality test have been applied. The results indicate a significant long run positive relationship between public expenditure and economic growth in Nigeria. Similarly, from the results, it is concluded that there is a significant positive long term relationship between population growth rate and economic growth in Nigeria. Furthermore, the results of Granger causality test indicate a weak significant bidirectional causality at 10% level, running from public expenditure to economic growth and in turn, from economic growth to public expenditure. This has the implication that, policies that will promote sustainable economic growth and public expenditure may be pursued concurrently.

JEL Classification Codes: H50
Keywords: Public Expenditure, Economic Growth, Wagner Law, Keynesian Theory.

[1]This paper is an output of M.Sc. Economics research work conducted by the second author.

[*] Usmanu Danfodiyo University Sokoto, Nigeria. Email: ttukurus@yahoo.com
[**] Hassan Usman Katsina Polytechnic Katsina, Nigeria. Email: sabiu_yau@yahoo.com

1. Introduction

Sustainable economic growth and development are macroeconomic objectives pursued competitively by all nations of the world irrespective of their differences in history, natural resources endowment, economic and political systems, as well as geographical locations. These goals are indeed pursued by all nations even though the extent to which each country attains growth and development may differ from that of another. This perhaps, is not unconnected with different approaches adopted in managing and monitoring government programmes vis-a-vis its budgetary process.

However, the ability of a nation to achieve sustainable growth may depend on the resources it expends and full utilization of such resources to towards achieving the target. Nonetheless, the ability of the government to spend more on meaningful projects may depend on sufficient revenue it generates especially from global connections and intercontinental trade. For instance, the oil price in the world oil market has been rising, hence, creating opportunity for oil exporting countries to double and triple their revenues and expenditures. Nigeria is one of such countries that produce and export crude oil. After fifty years of its independence, Nigeria has been generating about 90% of its revenues from oil especially after 1970s, and has been spending heavily on the economy for sustainable economic growth and development.

Despite the huge spending, the budgetary outcomes have remained far off the mark. The country has been spending year after year yet the performance of the economy remains below the target. Therefore, the country has stagnated in the past 50 years as a nation with only 2.8% GDP growth in 1990s and 70% incidence of poverty in 1999 (Soludo, 2007). Furthermore, only 1700MHW of electricity has been managed against 50,000MHW needed for maximum growth (Soludo, 2007). Therefore, the root of the problem cannot be traced by mere discussion unless an empirical research is carried out.

For example, Okeke (2008:1) laments that "Over the years, federal budgets in Nigeria, whether under the military or democratic/civilian administration, have turned out to a mere ritual rather than the driver of economic growth and development that they ought to be. Consistently, budgetary outcomes have remained far off the mark vis-a-vis the planned targets. This may be because budget implementation monitoring mechanisms are either not put in place or are left to function in a perfunctory manner, leading to the usual below the target outcomes from year to year".

However, Obi (2007) observes that public expenditure seems to be the most potent tool for effective poverty reduction. He therefore suggests that fiscal policy should be designed so that government expenditure is properly focused to ensure that goods required by poor households are provided.

Although much research has been conducted to empirically investigate the nature of the relationship between public expenditure and economic growth, not much has been done on a specific country like Nigeria. In view of this, Morrissey (2000) concludes that most of empirical studies on the effect of public expenditure on economic growth are cross-country, and specific country studies are rare. Therefore, country specific study is more potential and informative, even though the findings cannot be generalized to other countries. However, even those conducted based on specific country are full of limitations. For instance, in Nigeria, a study conducted by Ahmad (2007) on this area uses disaggregated data set instead of aggregated. A similar study by Genevesi (1995) uses a small sample of twenty three years contrary to central limit theorem which suggests the number of observations not be less than thirty. In addition, the findings on the relationship between public expenditure and economic growth are inclusive. For instance, a study by Ogiogio (1995) reveals a long run relationship between government expenditure and economic growth while Grier and Hullock (1989) find that the mean growth of government share of GDP generally has a negative impact on economic growth. Furthermore, Ram (1987) finds a unidirectional causality from economic growth to public expenditure, supporting Wagner's law, while Abu-Bader and Abu-Qarn (2003) find that overall government expenditures and growth exhibit bidirectional causality. However, Reinhart (1990) cited in Genevesi (1995) concludes that public investment has no effect whatsoever on growth. Therefore, the main contribution of this paper is its contribution to the debate on the direction of causality between economic growth and public expenditure, and the finding that the causality between public expenditure and economic growth is bidirectional in Nigeria, instead of unidirectional.

The paper has been divided into six sections. After the introductory part of the paper, section **2** discusses the theoretical framework. Section **3** reviews the related literature. Section **4** deals with the methodology that has been adopted in data collection and analysis, while section **5** focuses on results and discussions. Finally, section **6** concludes the paper and gives policy implications.

2. Theoretical Framework

Over one hundred years ago a German economist, Wagner (1863) in his classic book *Grunlegung der Politischen Okonomie* formulated a law of expanding state activity. He asserts that there is a long run propensity for the scope of government to increase with higher level of economic development. This assertion comes to be known as "Wagner's Law". The theory is often called "law of increasing expansion of public and particularly state activities" which is referred to as "law of increasing expansion of fiscal requirements". The law suggests that, the share of public sector in the economy will rise as economic growth progresses, owing to the intensification of existing activities and extension of new activities. This law therefore, indicates that it is the economic growth that leads to an increase in government expenditure not the other way round. According to Ahmad (2007), Wagner's Law was probably the first of its kind that recognizes the positive correlation between economic growth and the growth of government expenditure.

However, Keynes (1936) cited in Ahmad (2007) considers public expenditure as exogenous factor which can be utilised as a policy instrument to spur economic growth. He explained the linkage between public expenditure and economic growth in his Macroeconomic Theory, commonly known as Keynesian Theory. The theory suggests the use of public expenditure as an alternative mechanism for sustainable economic growth. This theory has been widely accepted and applied particularly in the United States of America, following the failure of classical theories to address the economic crisis in the 1930s. The relationship between public expenditure however, has its theoretical basis from the Keynesian investment multiplier. The theory states that whenever there is an increase in investment expenditure either by public or private sector, there will be multiple increases in national income (Jhingan, 1997). Therefore, Keynesian Theory suggests that it is the public expenditure that influences economic growth not the other way round, unlike the way Wagner's Law suggests. Although part of the empirical literature reviewed in this research is in favour of Keynesian theory, some of the findings reviewed confirmed Wagner's law.

Population growth rate as a control variable in this study and a determinant of growth has attracted a lot of interest particularly over the last years. Yet many demographic aspects remain today unexplored. Population growth seems to play a major role in economic growth (Kormedi and Meguire, 1985). High population growth, for example could have a negative impact on economic growth by influencing the dependency ratio, investment and saving behavior, and quality of human capital. In addition, the composition of population has important implication on growth. A large working age population is deemed to accelerate growth, whereas population with many young and elderly dependents is considered as impediment (Grier and Hullock, 1989).

3. Review of Literature

This section deals with the review of literature on the relationship between public expenditure and economic growth. It also reviews the influence of population on economic growth, as a control variable.

The findings on the relationship between public expenditure and economic growth are inclusive. For instance, in an earlier empirical study, Grier and Hullock (1989) used pooled regression on five-year averaged data for 113 countries to analyse the relationship between cross-country growth and various macroeconomic variables. The authors found that the mean growth of government share of GDP generally had a negative impact on economic growth. This finding implies that an increase in government size as measured by a share of government expenditures to GDP hampers economic growth. On the contrary however, using data from 43 developing countries, over 20 years period, Davarajan *et al.* (1996) found a significant positive relationship between government expenditure and economic growth.

Nonetheless, Abizadeh and gray (1985) used pooled regression for fifty five countries for the period, 1963-1974. The countries were categorised into three groups according to their level of development. The Wagner's law appeared to hold for the wealthier groups, but not for the poorest group. Ram (1987) used data for the period 1959- 1980 for one hundered and fifteen (115) countries. His findings indicate unidirectional causality from economic growth to public expenditure supporting Wagner's law.

Bose et al. (2003) further examine the growth effect of government expenditure for a panel of thirty developing countries over 1970-1990 with a particular focus on sectoral expenditure. However, they find that the share of government capital expenditure to GDP is positively and significantly correlated with economic growth. Nonetheless, using a sample of states and local governments, Schaltegger and Benno (2006) find a negative relationship between government size and economic growth. Similarly, Laudau (1983), examined the effect of government expenditure on economic growth for a sample of 96 countries, and discovered a negative effect of government expenditure on growth of real output. But on the contrary, a study by Khan and Reinhart (1990) cited in Genevesi (1995) estimates a cross-country growth equation for 24 countries which include public and private investment separately. The results indicate that public investment has no effect whatsoever on growth.

Furthermore, some studies in the literature are case studies that focus on specific country. For instance, Demirbas (1999) investigates the existence of long run relationship between public expenditure and economic growth using time series aggregate data for turkey over the period, 1950-1990. The findings of the research indicate no empirical support for Wagner's law. Nevertheless, Jackson *et al.* (1998) cited in Ahmad (2007) investigates the causal relationship between economic growth and government spending in northern Cyprus by using time series data from 1977 to 1996. Their findings indicate mixed evidence, i.e., some results support Wagner's law while others verify Keynesians theory. But Park (1996) applies Granger causality test to test Wagner's law and Keynesian effective demand principle in Korea. He finds that all the results are consistently in support of Wagner's law with exception of those in only 2 out of 6 models which are compatible with Keynesian theory. In addition, Khan (1990) tests Wagner's law for Pakistan using time series data covering a period from 1959 to 1984. On the whole, the results of the test confirm the validity of Wagner's law in Pakistan as do those of Nagarajan and Spears (1990) in Mexico. However, Pluta (1979) tests Wagner's Law on Taiwan, and the findings of his research negate the applicability of Wagner's Law in Taiwan.

For the purpose of finding the direction of causality, Islam and Nazemzadeh (2001) examined the causal relationship between government size and economic growth using long annual data of the United States. The authors found that the causal linkage was running from economic growth to relative government size. But on the contrary, Abu-Bader and Abu-Qarn (2003) investigate the causal relationship between government expenditure and economic growth for Egypt, Israel, and Syria. They find that overall government expenditures and growth exhibit bidirectional causality. However, a unidirectional negative short-run causality from economic growth to government spending was discovered in Egypt.

In another study by Olugbenga and Owoye (2005), using Granger causality test on thirty OECD countries over a period, 1970-2005, the authors find a unidirectional causality running from public expenditure to economic growth in 16 countries while in other countries; bidirectional relationship exists between public expenditure and economic growth. They further find that there is a long run relationship between public expenditure and economic growth.

In another related study, Komain and Brahmasrene (2007) apply Granger causality test to investigate the association between government expenditure and economic growth in Thailand. The results reveal that government expenditure and economic growth are not cointegrated. But the results indicate unidirectional relationship, as causality runs positively and significantly from government expenditure to economic growth. Similarly, Loizides and Vamvoukas (2005), employ the trivariate causality test to examine the relationship between government expenditure and economic growth, using datasets on Greece, United Kingdom and Ireland. The authors find that government size granger causes economic growth in all the countries they studied. The findings are true for Ireland and the United Kingdom both in the long run and short run. The result also indicated that economic growth granger causes public expenditure for Greece and United Kingdom. In addition, Gregorious and Ghosh (2007) used heterogeneous panel to investigate the impact of public expenditure on economic growth. The authors employ Generalised Method of Moment (GMM), and discover that the countries with large government expenditure tend to experience higher growth, but the effect varies from one country to another.

In Saudi Arabia for instance, Abdullah (2000) analyses the relationship between public expenditure and economic growth. The author reports that the size of public expenditure is important in the performance of an economy. However, Mitchell (2005) argues that the American public expenditure has grown too much in the last couple of years and has contributed to the negative growth. In Sweden, Peter (2003) examines the effect of public expenditure on economic growth during 1960-2001 periods. The author argues that government spends too much and it may slowdown economic growth. Another study by Ogiogio (1995) reveals a long term relationship between government expenditure and economic growth.

Moreover, many studies have investigated a wide range of factors influencing economic growth. Using different conceptual and methodological view point, these studies have placed emphasis on population growth and public expenditure as the major determinants of economic growth and offered various insights to the source of economic growth. Some of the studies use cross-country regression to analyse the relationship between population and economic growth while others use time series regression analysis. In addition, some of the studies find no statistically significant relationship between population growth rate and economic growth while others find a statistically significant relationship.

In a study conducted using data from 29 provinces, municipalities, and autonomous regions from 1978 to 1989, Chen and Yi, (1999), find that population growth rate increases economic growth in china. Similarly, Simon (1981) argues that the population growth is positively correlated with economic growth. His assertion is however supported by the findings of Yan et al. (1999) in a study based on China, using data from 1950 to 1970. The findings of the study suggest that population growth has a significant positive effects on economic growth. However, Remin (2005) investigates the effect of population growth rate on economic growth in less developed countries in Asia, using data for the period 1972-1992. The results of the study reveal that a negative relationship exists between population growth rate and economic growth in Asian economies.

Dowson and Tiffin (1998) also use annual time series data over the period, 1950-1993, to analyse the long run relationship between population growth and economic growth in India. The study employs cointegration and granger causality methods and reports that there is no long run relationship between population and economic growth. Moreover the results indicate that population growth neither Granger causes economic growth nor is it caused by economic growth. Similarly, Thornton (2001) conducts a similar research on the long run relationship between population and economic growth rate in seven Latin American countries, namely Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. The study uses annual time series data generally over the period 1900-1994 and employs the same methods of analysis as Dowson and Tiffin (1998). The study concludes that there is no long run relationship between the two variables in any of the seven countries. Furthermore, population growth neither Granger causes economic growth nor is it caused by economic growth.

Fumitaka (2005) also investigates the relationship between population growth rate and economic growth in Asian economies. He applies Granger causality test and cointegration method. The results of the causality test are mixed. For Japan, Korea and Thailand, there is a bi-directional causality between population and economic growth. For China, Singapore and the Philippines, population is found to Granger cause economic growth and not vice versa. For Taiwan and Indonesia, there is no evidence of Granger causality between population and economic growth.

4. Methodology

This section deals with method of data collection, sample size and sampling techniques adopted, variables measurements and method of data analysis applied.

4.1. Method of Data Collection

For the purpose of this paper, only secondary data have been used owing to the nature of the research problem under investigation. However, the data on per capita GDP and public expenditure were sourced from Central Bank of Nigeria (CBN) Statistical Bulletin (2008) and those on population growth rates were sourced from African Development Bank (ADB) Selected Statistics on Africa 2008 Vol. XXVII. Non-probability sampling method in the form of availability sampling technique has been used in selecting the number of years that constitutes the sample size of this study. This technique has been applied due to availability of the relevant data for the selected years only. Therefore, the study uses annual time series data set for a sample of 39 years, 1970 to 2008. For the years not selected into the sample, the data on the same variables were not available.

4.2. Variables Measurements

The variables captured in the models specified for this study are measured as follows:

Natural log of real GDP per capita has been used as a proxy for economic growth, which serves as the dependent variable. This proxy has been used by Genevesi (1995) in investigating the relationship between education expenditure and economic growth in Nigeria from 1975 to 2005. Similarly, Ariyo (1998) uses real GDP per capita as a proxy for economic.

Public Expenditure as the explanatory variable in this study has been measured as the natural log of total public expenditure (capital plus recurrent expenditure of the federal government) following the work of Genevesi (1995).

As a control variable in this study, large working age population is deemed to accelerate growth, whereas population with many young and elderly dependents is seen as impediment. Here we have followed the work of Kormedi and Meguire (1985) in using annual population growth rate as a proxy for population. In this regard population growth rate is expected to have a positive long run relationship with economic growth.

4.3. Method of Data Analysis

The data collected for this research have been analysed using Johansen (1988) cointegration approach, with help of STATA version 12.1 econometric package. Indeed, there are many different methods used in testing for causal relationship between two or more series variables. Such methods include: Engle-Granger (1987) 2-step procedure; Johansen (1988) and Johansen and Juselius (1990) Full Information Maximum Likelihood approach; Toda-Yamamoto (1995) augmented VAR approach; Davidson and Hinkley (1999) and Hacker and Hatemi-J (2006) Leveraged Bootstrap approach; Hsiao's (1981) Granger Causality approach; Baek and Brock (1992) and Chiou-Wei et al. (2008)'s Non-linear Causality test; and Pesaran et al. (2001) and Pesaran and Shim (1999) Autoregressive Distributed Lag (ARDL) Bounds Testing approach. However, Aktas and Yilmaz (2008) assert that the most widely applied method is that of Johansen (1988) and Johansen and Juselius (1990). For this reason, this study adopts Johansen (1988) approach.

To apply this approach certain diagnostics have been carried out. First, the series variables have been plotted in order to identify whether constants or trends should be included in the tests of nonstationarity. Both the levels and differences are normally plotted. If the series appear to be trending together, trend variable should be added to the unit root test regression. However, if the series variables show no obvious trend, but the mean of the series appears to be greater than zero, a constant only should be included in the unit root test regressions. If a series variable is difference-stationary, detrending it, i.e., adding a trend in the model is inappropriate (Dougherty, 2007). However, only public expenditure exhibits trend. Thus, trend has been included in the unit root regression of this variable. But other variables prove not trending together, therefore only constant and lag values of a series have been included in the unit root test regression of each of them.

Second, unit root tests have been conducted. The Elliott et al. (1996)'s Dickey-Fuller Generalised Least Squares (DF-GLS) and Kwiatkowski *et al.* (1992)'s KPSS unit root tests may both be applied, with hope that the verdict of one will confirm that of the other (Baum, 2001). The two families of unit root tests may be used in conjunction to establish the nature of the data generating process for a given time series, and in particular to signal the presence of fractional integration in the series (Wooldridge, 2006). If inference from the DF-GLS test rejects its null hypothesis of unit root behavior, or nonstationarity, while the KPSS test also rejects its null of stationarity, then we might conclude that both I(1) and I(0) are rejected by the data (Baum, 2001). This study therefore applies both DFGLS and KPSS approaches in testing for unit roots.

We have tested that the variables are non-stationary but have the same order of integration, that is, they are both I(1). This has been performed with the DF-GLS unit-root tests described as:

$$\Delta Y_t = \hat{\beta}_0 + \hat{\beta}_1 Y_{t-1} + \Sigma \hat{\alpha}_i \Delta Y_{t-i} + \hat{\mu}_t \qquad (1)$$

Where:

ΔY	The first differenced value of a measure of a series.
$\hat{\beta}_0$	Estimated constant parameter or intercept.
$\hat{\beta}_1$	Estimated parameter of the first level lag value of a series
Y_{t-1}	First level lag value of a series
$\hat{\alpha}_i$	Vector of the estimated parameters of the lagged values of the differenced value of a series.
ΔY_{t-i}	Vector of the lagged values of the differenced value of a series.
$\hat{\mu}_i$	Error term.

Third, we specify a VEC rank test model at level values of the integrated variables to conduct cointegration test in order to determine the number of cointegrating vectors. If there are exactly k cointegrating relations, i.e., r = 0, when series variables are integrated of the same order, then there is no cointegration, and the Vector Autoregression (VAR) may be specified in terms of the first difference of the integrated variables to run a simple Granger causality test (Acaravci, 2010; Chiou-Wei et al., 2008; Pradhan, 2010; Tehranchian, 2006; Altinay and Karagol, 2005; Omotor, 2008; and Esso, 2010). But if r < k, i.e., r = k-1, then there is at least one cointegrating vector. In this case, the residuals of cointegrating equation should be estimated and the first lag value of the residuals be added to the next VAR model to form VEC model (Acaravci, 2010).

If two nonstationary but integrated series variables are cointegrated, the estimated residuals will be stationary. Therefore, the cointegration regression has been specified as:

$ecogrowth_t = \hat{\beta}_0 + \sum\hat{\beta}_1 pubexp_{t-i} + \sum\hat{\beta}_2 popgrr_{t-i} + \hat{\mu}_t$, where $\hat{\mu}_t \sim 1(0)$ ______(2)

Where:

$ecogrowth_t$ = Economic growth

$\hat{\beta}_0$= Estimated constant parameter

$pubexp_{t-i}$ = Vector of lag values of public expenditure

$\hat{\beta}_1$= Estimated coefficient vector of lag values of public expenditure

$\hat{\beta}_2$ = Estimated coefficient vector of lag values of population growth rate

$popgrr_{t-i}$ = Vector of lag values of population growth rate

That is, there will be a linear combination such that:
$\hat{\mu}_t = ecogrowth_t - \sum\hat{\beta}_1 pubexp_{t-i} - \sum\hat{\beta}_2 popgrr_{t-i} - \hat{\beta}_0$ _______ (3) will be stationary.

Optimal lag length has also been considered during the test for the number of cointegrating vectors. There are two suggested approaches to choosing lag order. We may use a likelihood ratio test to verify the lag order. We can also use information criteria to choose the lag order that is most pragmatic. But among the information criteria, the best information criterion according to Hoxha (2010) is Hannan-Quinn Information criterion (HQIC). Therefore, STATA command which provides each of the information criterion, such as final prediction error (FPE) through *varsoc* command with the *lutstats* option has been applied to ascertain the optimal lags to be included in the cointegration regression.

However, there are two statistics in Johansen's procedure that test for possible cointegrating vectors, i.e., the maximum Eigen value and the trace statistic. The trace statistic evaluates the null hypothesis that there are no more than r cointegrating vectors while the maximal Eigen value test evaluates the null hypothesis that there are exactly r cointegrating vectors (Amin, 2011) In a situation where there are differences in the results of the two statistics, the trace statistic is preferred (Spyridis *et al.,* 2010) because it shows more robustness to skewness and kurtosis in the residuals (Cheung and Lai, 1993).

From our analysis, it has been discovered that there is Cointegration among public expenditure, population growth rate and economic growth, hence vector error correction (VEC) model has been applied to get the normalised cointegrating coefficients and test for short run relationships among the variables as follows:

$$\ln ecogrowth_t = \hat{\alpha}_0 + \sum \hat{\alpha}_1 \mathrm{lnpubexp}_{t-i} + \sum \hat{\alpha}_2 \mathrm{popgrr}_{t-i} + ECt\text{-}_1 + \varepsilon_t \quad (4)$$

After running the VEC and normalization imposed, the cointegrating regression will be:

$$EC_t = \ln ecogrowth_t + \sum \hat{\beta}_1 \mathrm{lnpubexp}_{t-i} + \sum \hat{\beta}_2 \mathrm{popgrr}_{t-i} + \hat{\beta}_0 \quad (5)$$

Then we display the normalised cointegrated coefficients estimated for the variables from the cointegrating regression, which are the long run equilibrium coefficients for the detected relationships, as well as their t statistics (Fernandes, 2009). Therefore, after normalization of the dependent variable (the measure of economic growth) to 1, whatever is the sign of a given coefficient in the cointegrating regression will change by making the actual dependent variable as the subject of the formula. That is, if it is negative, it will become positive and if positive, it will become negative by crossing the equal sign. For e.g., the EC equation will now turn to $\ln ecogrowth_t$ equation as:

$$\ln ecogrowth_t = - \hat{\beta}_0 - \sum \hat{\beta}_1 \mathrm{lnpubexp}_{t-i} - \sum \hat{\beta}_2 \mathrm{popgrr}_{t-i} + ECt \quad (6)$$

In addition, Vector autoregressive (VAR) model has been applied to test for causality among these variables. Post analysis tests have been carried out to test for the properties of the models used. The VAR model has been expressed as:

$$\ln ecogrowth_t = \hat{\alpha}_0 + \sum\hat{\alpha}_1 \ln ecogrowth_{t-i} + \sum\hat{\alpha}_2 \text{lnpubexp}_{t-i} + \sum\hat{\alpha}_3 \text{popgrr}_{t-i} + \varepsilon_t \quad (7)$$

Certain tests, such as autocorrelation, normality and stability have been conducted to ascertain the adequacy of the econometric models applied. Lagrange Multiplier test has been conducted to ascertain the existence or otherwise of autocorrelation. The null of Lagrange Multiplier test is, there is no autocorrelation at a give lag order. Lutkepohl (2007) suggests using the multivariate generalization of the Jarque-Bera test [Jarque and Bera (1987)] on $\hat{\mu}_t$ to test the multivariate normality of the $\hat{\mu}_t$. This gives room to test the skewness and kurtosis properties of the $\hat{\mu}_t$ against those of a multivariate normal distribution of the appropriate dimension. The Jarque-Bera test, a type of Lagrange multiplier test, was developed to test normality, heteroscedasticy, and serial correlation (autocorrelation) of regression residuals (Park, 2008). The null hypotheses of the tests are that the residuals are not statistically different from the theoretical normal distribution, i.e., they are normally distributed, no hereteroscedaticity and no serial correlation.

To check that a VAR process is stable, we make use of eigenvalue. We check whether the eigenvalues of the matrix are less than one. If they are less than one, then the VAR process is stable, satisfying the stability condition. This indicates that all the eigenvalues lie inside the unit circle.

5. Results and Discussions

This section contains the results of diagnostics tests, regression models and discussion of the results.

Figure 1: Time series plot for per capital real GDP

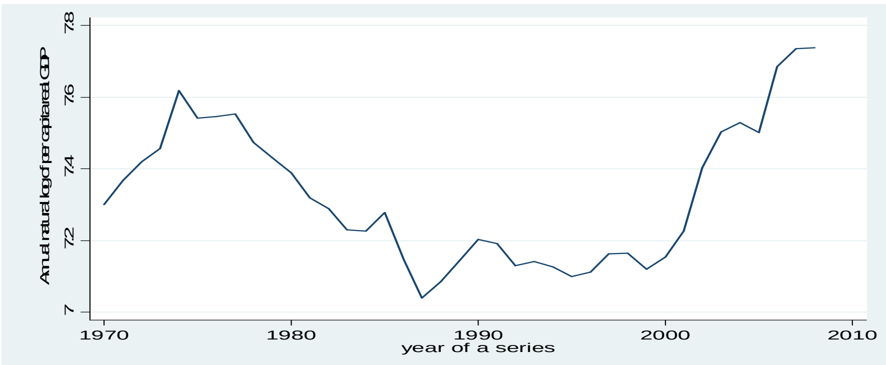

Figure 1 presents the time series plot for the natural log of real GDP, which clearly indicates that real gdp does not exhibit a trend. Therefore, trend has not been added in the dfgls unit root regression for this variable.

Figure 2: Time series plot for Public expenditure

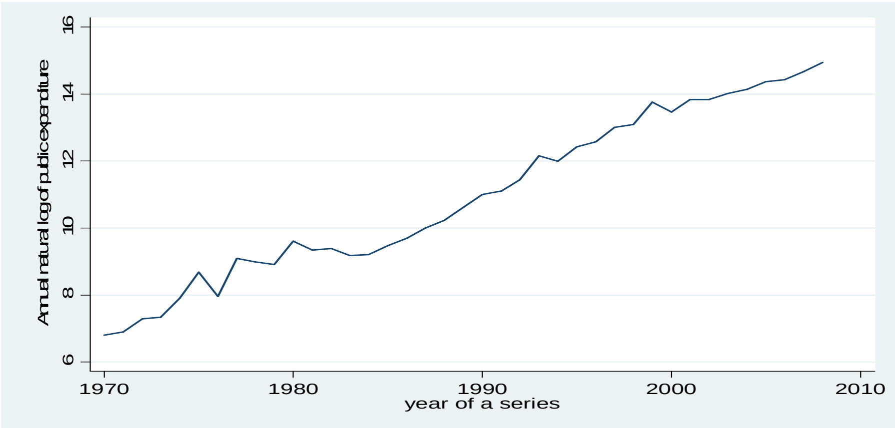

Figure 2 presents the time series plot for natural log of public expenditure, which clearly indicates that public expenditure exhibits a trend. Therefore, trend has been added in the dfgls unit root regression for this variable.

Figure 3: Time series plot for population growth rate

Figure 3 presents the time series plot for population growth rate, which clearly indicates that population growth rate does not exhibit a trend, therefore, trend has not been added in the dfgls unit root regression for this variable.

Table 1 presents the results of DF-GLS and KPSS unit root tests on the variables at their level and differenced values. The DF-GLS unit root test results indicate that all the variables are not stationary in their level values even at 5% level of significance, suggesting the acceptance of the null hypothesis that states a series variable is not stationary.

However, the results of the test indicate that all the variables are stationary in their first difference values at either 5% or 1% level of significance. Similarly the KPSS unit root tests results indicate the acceptance of alternative hypothesis which states that a series variable is not stationary in the level values of all the variables with exception of one variable (population growth rate). But in the first difference value of the variables, the results indicate the acceptance of the null hypothesis which states that a series is stationary. The implication of the results of both tests is that the variables are integrated of the same order at their difference values. According to Eagle and Granger (1987), to conduct cointegration analysis, all variables must be integrated of the same order. Therefore, this gives us room for cointegration test.

Table 1: Results of DF-GLS and KPSS Unit Root Tests

Variables	**DF-GLS** H0: a series is not stationary		**KPSS** H0: a series is stationary. Critical values:10%: 0.119 5% : 0.146 1% : 0.216	
	Level Value	Difference Value	Level Value	Difference Value
	Test statistic		Test statistic	
Per capita Real GDP	-2.016(8)	-3574(1)**	0.749(0) ***	0.203(0)
Public Expenditure	-3.001(7)	-4.070(1)***	0.274(0) ***	0.031(0)
Population Growth Rate	-3.173(1) *	-6.816(1)***	0.121(0)	0.174(0)

Source: authors' calculation using STATA software, version 12.1
Note: *, **, and *** indicate levels of significance at 10%, 5% and 1% respectively. In addition figures in parenthesis indicate the number of lags.

Table 2 presents the results of the test for optimal lags to be included in the cointegration regression.

Table 2: Results of the Test for Optimal Lags to be included in Johansen Tests for the Number of Co-integrating Ranks

ag	LL	LR	f	p	FPE	AIC	HQIC	SBIC
0	-65.8507				.010262	-4.75074	-4.75074	4.75074
1	40.7423	13.19		.000	.000039	-10.3275	-10.1894	9.92753*
2	52.3607	3.237		.006	.000034	-10.4771	-10.201	9.6772
3	65.2151	25.709		.002	.000028	-10.6974	-10.2832	9.49751
4	77.1039	23.778*		0.005	.000025*	-10.8624*	-10.3102*	-9.26264

Source: authors' calculation using STATA software, version 12.1
Note: * Indicates the corresponding optimal Lags to be Selected

From the results, all the criteria, including HQIC are in favour of inclusion of four lags in the cointegration regression with exception of SBIC criterion. Therefore, four lags have been included in the cointegration regression. This is because, according to Hoxha (2010) the best information criterion is Hannan-Quinn Information criterion (HQIC).

Table 3: Results of Johansen Tests for the Number of Cointegrating Ranks

Maximum rank	arms	LL	Eigen value	Trace Statistic	5% Critical Value
0	0	55.110042	.	43.9878	29.68
1	5	71.104329	0.59907	11.9992*	15.41
2	8	75.361397	0.21593	3.4850	3.76
3	9	77.103921	0.09478		

Source: authors' calculation using STATA software, version 12.1
Note: * Indicates that Trace Statistic value is not significant at 5% level, suggesting no more than one cointegrating rank.

Results of Johansen tests for the number of cointegrating ranks are presented in Tables 3. The results of the test indicate the rejection of the null hypothesis which states there is no cointegrating vector, since the trace statistic (43.9878) is greater than its critical value (29.68) at 5 percent level of significance. This suggests the acceptance of alternative hypothesis, that there exists cointegration among the variables captured in the cointegration regression. The results further indicate that there is no more than one cointegrating vector, suggesting that there is one cointegrating rank. This is because the value of the trace statistic at one rank is 11.999, which is less than its critical value of 15.41 at 5% level of significance. This gives room for running VEC regression to get the normalised cointegrating coefficients.

Table 4: Normalised cointegrating coefficients

Beta	Coefficient	Standard Error	Z	P>|z|	[95% Conf. Interval]
Error Correction Term					
Log of per capita rgdp	1	.	.	.	.
Log of Public Expenditure	-.0748745	.0182559	4.10	.000	-.1106554 -.0390937
Log of Population Growth Rat	-1.124997	.1533807	7.33	.000	-1.425618 -.8243766
Constant	-3.80693	.			.

Source: Authors' calculation using STATA software, version 12.1.

Table 4 presents the normalised cointegrating coefficients. After normalization imposed, the cointegrating regression will be:

$$EC_t = lrgdp_t - 0.075 lpubexp_{t-i} - 1.125 popgrr_{t-i} - 3.807$$

Since per capita real GDP (lrgdp) as a measure of economic growth has been normalised to 1, it then becomes the dependent variable. Thus, the long run economic growth equation will now be:

$$lrgdp_t = 3.807 + \underset{(3.54)^{***}}{0.075 lpubexp_{t-i}} + \underset{(6.60)^{***}}{1.125 popgrr_{t-i}} + ECt$$

Note: *** Indicates significant statistical value at 1% level and the figures in the parentheses are the t ratios.

From the results of the long run economic growth equation, it is clear that there is a significant long run positive relationship between public expenditure and economic growth in Nigeria. The positive sign of the coefficient of public expenditure (0.075) and t ratio of 3.54 indicate that public expenditure has a significant and positive long run impact on economic growth at 1 percent level. These findings fail to support those of Schaltegger and Benno (2006) and Laudau (1983) who find a negative relationship between total government size and economic growth, using panel dataset. However, the findings confirm those of Abdullah (2000) in Saudi Arabia and Ogiogio (1995) in Nigeria who report a long term relationship between government expenditure and economic growth.

The results of long run equation also suggest a significant positive long-term relationship between population growth rate and economic growth in Nigeria. The coefficient of population growth rate has a positive sign (1.125) with t ratio of 6.60, suggesting a significant and positive influence of population growth on economic growth in Nigeria. These findings concur with those of Chen and Yi, (1999) and Yan et al. (1999) who find that population growth rate increases economic growth in China. However, the findings do not tally with those of Remin (2005) who investigates the effect of population growth rate on economic growth in less developed countries in Asia, and find that a negative relationship exists between population growth rate and economic growth in Asian economies. The conflicting findings in Nigeria and Asian countries between population and economic growth may be as a result of a specific nature of Nigeria. Nigeria is highly endowed with both natural and human resources, therefore, coupled with underutilization of the natural resources, as population increases in the long run, economic growth is expected to increase.

The results for the robustness of the model have been generated but not presented. However, the results of the test indicate no autocorrelation at four lags and the residuals are normally distributed, suggesting that the model is statistically adequate. In addition, Vector Autoregressive (VAR) model has been applied to test for the direction of causality among the variables captured in our analysis. Post estimation tests have been carried out to test for the robustness of the model too.

Table 5 presents the summarised results of Granger causality test. The results indicate a significant feedback causality running from public expenditure to economic growth and *vice versa*, rejecting both Wagner's Law and Keynesian Theory at 10% level of significance. Although the findings are weakly significant at 10% level and not in conformity with the existing theories, they concur with some previous studies such as those of Abu-Bader and Abu-Qarn (2003) who find that overall government expenditures and growth exhibit bidirectional causality in Israel and Syria, Olaiya, and Babalola (2012), and Cheng and Lai (1997) who find similar scenario in Nigeria and South Korea respectively. However, the findings go contrary to those of Islam and Nazemzadeh (2001) who finds that the causal linkage was running from economic growth to relative government size in the United States of America, and those found by Olugbenga and Owoye (2005) and Khan (1990).

Table 5: Summarised Results of the Granger Causality Tests

Dependent Variables	**Independent Variable**	**Chi-Square Test Statistic**	**Remarks**
Per Capita Real GDP	**Public Expenditure**	3.051 (0.081)*	Causality running from public expenditure to economic growth
Per Capita Real GDP	**Population Growth Rate**	0.137 (0.712)	Causality not running from population growth to economic growth
Public Expenditure	**Per Capita Real GDP**	3.290 (0.070)*	Causality running from economic growth to public expenditure (bidirectional causality)
Public Expenditure	**Population Growth Rate**	4.243 (0.039)**	Causality running from population growth to public expenditure
Population Growth Rate	**Per Capita Real GDP**	12.343 (0.000)***	Unidirectional causality running from economic growth to population growth
Population Growth Rate	**Public Expenditure**	11.247 (0.001)***	Bidirectional causality running from public expenditure to population growth and *vice versa*

Source: Authors' calculation using STATA software, version 12.1.
Note: Figures in the parentheses are *P-Values*. *, ** and *** indicates significant level at 10%, 5% and 1% respectively.

Similarly, the findings show a bidirectional causality running from public expenditure to population growth and *vice versa* at 5% level of significance. However, the findings indicate a unidirectional causality running from economic growth to population growth at 1% level of significance. These findings run counter to those of Thornton (2001) and Dowson and Tiffin (1998) who find no causality between population growth rate and economic growth. The reason may be, Nigeria is an African country, the citizens of which adhere to African norms and values that cherish and consider children as assets.

The results for the robustness of the model have been generated but not presented. The results indicate the residuals are normally distributed and the model satisfies the stability condition.

6. Conclusions and Policy Implications

This study aims at investigating the long run and causal relationships between public expenditure and economic growth in Nigeria. The study uses annual time series data set for a sample of 39 years from 1970 to 2008 on the basis of the data availability. To achieve the objective of this study, Johansen (1988) cointegration approach and Granger causalty test have been applied.

From the results, it is clear that there is a significant long run positive relationship between public expenditure and economic growth in Nigeria. Similarly, from the results, it is concluded that there is a significant positive long term relationship between population growth rate and economic growth in Nigeria.

Furthermore, the results of Granger causality test indicate a weak significant bidirectional causality running from public expenditure to economic growth and in turn, from economic growth to public expenditure at 10% level, negating both Wagner's Law and Keynesian Theory. This has the implication that, policies that will promote sustainable economic growth and public expenditure may be pursued concurrently in Nigeria. Therefore, the government can expend more money for the provision of social infrastructure and welfare and ensure steady economic growth by paying much attention to important factors that promote growth. However, the findings indicate a unidirectional causality running from economic growth to population growth. Since the pursuit of economic growth is inevitable, and it turns to influence population growth rate, government should ensure the growth of productive population through provision of health facilities and qualitative education from the proceeds of economic growth. Failure to do this may lead to growth of unproductive population as economic growth increases, which may, in the long run, retard economic growth in turn. In addition, the findings show a bidirectional causality running from public expenditure to population growth and *vice versa*. This suggests that public expenditure promotes population growth rate and at the same time, population growth rate also in turn, promotes public expenditure.

However, these findings may be taken with caution due to some limitations associated with this study that may warrant further investigation.

First, the bidirectional causal relationship between public expenditure and economic growth is weakly significant at 10% level. Second, using aggregate population growth rate without separating working age population from dependent population may distort the results. Therefore, a study that will disaggregate population in its analysis should further be conducted. Third, since population growth rate is stationary, both at its level and difference values, though weakly stationary at its level value, and coupled with just 39 annual observations for this study, applying Pesaran *et al.* (2001) Autoregressive Distributed Lag (ARDL) bounds test approach may be more appropriate for further investigation.

References

Abdullah, H. A. (2000) "The Relationship between Government Expenditure and Economic Growth in Saudi Arabia". *Journal of Administrative Science*, 12(2): 173-191.

Abizadeh, S. and Gray, J. (1985) "Wagner's Law: A Pooled Time Series Cross-Sectional Comparison". *National Tax journal,* 38: 209- 218.

Abu-Bader, S. and Abu-Qarn, A. S. (2003) "Government Expenditures, Military Spending and Economic Growth: Causality Evidence from Egypt, Israel, and Syria". *Journal of Policy Modelling*, 25:567-583.

Acaravci, A. (2010) "Structural Breaks, Electricity Consumption and Economic Growth: Evidence from Turkey". *Romanian Journal of Economic Forecasting*, 2:140-154.

African Development Bank (ADB) (2008) "Selected Statistics on Africa",27.

Ahmad, M. T. (2007) "An Examination of the Causal relationship Between Education Expenditure and Economic Growth in Nigeria". *Journal of Social and Management Sciences*. Bayero University Kano, 12: 92-93.

Aktas, C. and Yilmaz, V. (2008) "Causal Relationship Between Electricity Consumption and Economic Growth in Turkey". *ZKU Sosyal Billimler Dergisi*, 4(8):45-54.

Altinay, G. and Karagol, E. (2005) "Electricity Consumption and Economic Growth: Evidence from Turkey". *Energy Economics,* 27: 849-856.

Amin, S. I. (2011) "Causal Relationship between Consumption Expenditure and Economic Growth in Bangladesh". *World Journal of Social Sciences*, 1(2):158-169.

Ariyo, A. (1998) "Investment and Nigeria's Economic *Growth*". *In Investment in the* Growth Proceeding. Nigerian Economic Society's Annual Conference Ibadan Nigeria, 389-415.

Baek, E. and Brock, W. (1992) "A General Test for Nonlinear Granger Causality: Bivariate Model". Working Paper. Iowa State University, USA.

Baum, F. C. (2001) "Stata: The language of choice for time series analysis?" *The Stata Journal*, 1(1):1–16.

Bose, N., Haque, M., and Denise, R. O. (2007) "Public Expenditure and Economic Growth: A Disaggregated Analysis for Developing Countries". *Applied Economics Journa*l, 75: 533-556.

Central Bank of Nigeria. (2008) *Statistical Bulletin.* Abuja, Nigeria: Central Bank of Nigeria

Chen, B. and Yi, F. (1999) "Determinants of Growth in China: Private Enterprise, Education and". *China Economic Review*. 17: 55-62.

Cheng, S. B. and Lai, T. W. (1997) "Government Expenditures and Economic Growth in South Korea: A VAR Approach". *Journal of Economic Development*, 22(1): 11-24.

Cheung, Y.W. and Lai, K.S. (1993) "Finite Sample Sizes of Johansen's Likelihood Ratio Tests for Cointegration". *Oxford Bulletin of Economics and Statistics*, 55(3):313-328.

Chiou-Wei, S. Z.; C. Chen; and Z. Zhu (2008) "Economic Growth and Energy Consumption Revisited-Evidence from Linear and Nonlinear Granger Causality". *Energy Economics*, 30:3063-3076.

Davarajan, S.; P. Swaroop; and H. Zou (1996) "Co-integration and Error Correction on Public Expenditure and Economic Growth". *Journal of Monetary Economics*, 37:313-344.

Davidson, A. C. and Hinkley, D. V. (1999) "*Bootstrap Methods and their Application*". Cambridge, UK: Cambridge University Press.

Demirbas, S. (1999) "Co-integration Analysis, Causality Testing and Wagner's Law: the Case of Turkey 1950-1990". *http://www.econturk.orgsafaabi.pdf*

Dougherty, C. (2007) "Introduction to Econometrics 3e: Study Guide". www.londonexternal.ac.uk

Dowson, P. J. and Tiffin, R. (1998) "Is There a Long run Relationship between Population Growth and Living Standard? The Case of India". *Journal of Development Studies*, 34: 149-156.

Elliott, G., Rothenberg, T. J., and Stock, J. H. (1996) "Efficient Tests for an Autoregressive Unit Root". *Econometrica*, 64(4):813-836.

Engle R. and Granger, C. (1987) "Co-Integration and Error Correction: Representation, Estimation, and Testing." *Econometrica*, 55(2): 251-276.

Esso, L. J. (2010) "Cointegration and Causal Relationship Between Financial Development and Economic Growth in ECOWAS Countries". *Journal of Economics and International Finance*, 2(3):036-048.

Fajingbesi, A. A. and Odusola, A. F. (1999) "Public Expenditure and Growth". Paper presented at Training Programme on Fiscal Policy Planning Management in Nigeria, Organized by NCEMA, Ibadan, Oyo State.

Fernandes, A. C. (2009) "Explaining Government Spending: A Cointegration Approach". FEP Working Papers No. 311. University of Porto, Portugal.

Fredenco, J. J. (2009) "Public Expenditure on Infrastructure and Economic Growth across Brazilian States". www.allacademic.com

Fumitaka, F. (2005) "The Relationship between Population and Economic Growth in Asian Economies". *ASEAN Economic Bulletin*, 8: 46-67.

Garba, T.,and Abdullahi, A. S. (2010) "Effects of Trade Union on Economic Growth and Welfare of the Members in Nigeria: A Test for Cointegration". *International Journal of Administration and Development Studies*, 1(1): 82-120.

Genevesi, O. O. (1995) "Government Expenditure and Economic Growth in Nigeria". *Journal of Economic Management and Administration, Nigeria*, 2(1):2-17.

Granger, W. J. (1986) "Development in the Study of Co-integrated Economic Variables". *Oxford Bulletin of Economics and Statistics*, 48:213-22.

Gregorious, A. and Ghosh, S. (2007) "The Impact of Government Expenditure on Growth: Empirical Evidence from Heterogeneous Panel". *Journal of Applied Economics,* 12: 79-93.

Grier, K. B., and Hullock, G. (1989) "An Empirical Analysis of Cross National Economic Growth 1951-1980". *Journal of Monetary Economics*, 24:259-276.

Gurajati, D. N. (1995), Basic Econometrics, Third Edition. USA: McGraw-Hill, May.

Hacker, R. S. and A. Hatemi-J. (2006) "Tests for Causality Between Integrated Variables Using Asymptotic and Bootstrap Distributions: Theory and Application". *Applied Economics*, 38(13):1489-1500.

Hatemi-J, A. (2003) "A New Method to Choose the Optimal Lag Order in Stable and Unstable VAR Models". *Applied Economics Letters*, 10(3):135-137.

Hatemi-J, A. and Irandoust, M. (2005) "Energy Consumption and Economic Growth in Sweden: A Leveraged Bootstrap Approach, (1965-2000)". *International Journal of Econometrics and Quantitative Studies*, 2(4):87-97.

Hoxha, A. (2010) "Causality Between Prices and Wages: VECM Analysis for EU-12". *Theoretical and Applied Economics*, 17(5):27-48.

Hsiao, C. (1981) "Autoregressive Modelling and Money Income Causality Detection". *Oxford Bulletin of Economics and Statistics*, 7:85-106.

Islam, A. and Nazemzadeh, A. (2001) "Causal Relationship Between Government Expenditure Size and Economic Development: An Empirical Study of the U.S". *South Western Economic Review*, 28: 75-88.

Jackson, P. M., Meryem, D. F., and Sami, F. (1998) "Co integration, Causality and Wagner's Law: A Test for Northern Cyprus, 1977-1996."*Journal of Social and Management Sciences* 12:93-99.

Jarque, M. Carlos, and Anil K. Bera. (1987) "A test for normality of observations and regression residuals". *International Statistical Review*, 55(2): 163–172.

Jhingan, M. L. (1997) "*The Economics of Development and Planning*, *32nd Revised and Enlarged Edition"*. Delhi: Vrinda Publications (p) ltd.

Johansen, S. (1988) "Statistical Analysis of Cointegrating Vectors." *Journal of Economic Dynamics and Control*, 12: 231-54.

Johansen, S. and Juselius, K. (1990) "Maximum Likelihood Estimation and Inference on Cointegration: With the Application to the Demand for Money". *Oxford Bulletin of Economics and Statistics*, 52:169-209.

Keynes, J. M. (1936) "*The General Theory of Employment, Interest and Money"*. York: Harcourt Brace Jovanovich.

Khan, A. H. (1990) "Wagner's Law and the Developing Economy: A Time Series Evidence from Pakistan". *Indian Economic journal*, 38: 115-123.

Khan, M. S. and Reinhart, C. (1990) "Private Investment and Economic Growth in Developing Countries". *World development*, 8: 56-68.

Komain, J. and Brahmasrene, T. (2007) "The Relationship between Government Expenditure and Economic Growth in Thailand". *Journal of economic and economic education research,* 87: 341-352. www.findarticles.com

Kormedi, R. and Meguire, P. (1985) "Macro Determinants of Growth: Cross Country Evidence". *Journal of Monetary Economics*, 16:41-63.

Kwiatkowski, D., Phillips, P.C.B. , Schmidt, P. and Shin, Y. (1992) "Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?" *Journal of Econometrics*, 54:159-178.

Laudau, D. (1983) " Public Expenditure and Economic Growth: A Cross Country Study." *Southern Econometric Journal*, 49: 783- 792.

Loizides, J. And Vamvoukas, G. (2005) "Government Expenditure and Economic Growth: Evidence from Trivariate Causality Testing". *Journal of Applied Economics*, 8(1) 125-152.

Lutkepohl, H. (2004) "Recent Advances in Cointegration Analysis" EUI Working Paper ECO No. 2004/12. Department of Economics, European University Institute, Badia Fiesolana, Italy.

Mitchell, J. D. (2005) "The Impact of Government Spending on Economic Growth". *Backgrounder*, 8:18-31. www.heritage.org/reseach/budget

Morrissey, L. (2000) "Foreign Direct Investment (FDI), Public Expenditure and Economic Growth: the Empirical Evidence for the Period 1970-2001". *Applied economic letters*. 12:45-49.

Nagarajan, P. and Spears, A. (1990) "An Economic Test of Wagner's Law for Mexico: A Re- Examination." *Public Finance*, 45: 165-168.

Ng, H. T. (2006) **"**Foreign Direct Investment and Productivity: Evidence from the East Asian Economies". *Staff Working Paper 03*, United Nations Industrial Development Organization, Research and Statistics Branch.

Ogiogio, G. O. (1995) "Government Expenditure and Economic Growth in Nigeria". *Journal of Economic Management*, 2:56-72.

Okeke, M. (2008) "Budget as Growth Driver". *Zenith Economic Quarterly*. 1:1-2 www.zenithbank.com.

Olaiya, S. A. and J. A. Babalola. (2012) "A Trivariate Causality Test among Economic Growth, Government Expenditure and Inflation Rate: Evidence from Nigeria". *Research Journal of Finance and Accounting*, 3(1):65-73.

Olugbenga, A.O. and O. Owoye. (2005) "Public Expenditure and Economic Growth: New Evidence from OECD Countries". Paper presented at 67th International Conference. Department of Economics, Susquehanna University of Business, Silinsgrove. White Street Danbury. *http:/www./iaes.confex.com/iaes/techprogram/S1888.htm.*

Omotor, G. D. (2008) "Causality Between Energy Consumption and Economic Growth in Nigeria". *Pakistan Journal of Social Sciences*, 5(8):827-835.

Park, W. K. (1996) "Wagner's Law Versus Keynesian Paradigm: The Korean Experiences". *Public Finance*, 51: 71-91.

Park, H. M. (2008) "Univariate Analysis and Normality Test Using SAS, Stata, and SPSS". The Trustees of Indiana University (4/13/2008), http://www.indiana.edu/~statmath

Pesaran, M. H. and Shin, Y. (1999) "An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis". In Strom S. (ed.) *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch.* Cambridge, UK: Cambridge University Press.

Pesaran, M. H.; Y. Shin; and R. J. Smith. (2001) "Bounds Testing Approaches to the Analysis of Level Relationships". *Journal of Applied Econometrics*, 16: 289-326.

Peter, S. (2003) "Government Expenditures Effect on Economic Growth: The Case of Sweden. A Bachelor Thesis Submitted to the Deparrment of Business Administration and Social Sciences, Lulea University of Technology, Sweden.

Phillips, P.C.B and Perron, P. (1988) "Testing for a Unit root in Time Series Regression," *Biometrika,* 75:335-346.

Pluta, J. E. (1979) "Wagner's Law, Public Sector Patterns, and Growth of Public Enterprises in Taiwan". *Public Finance Quarterly*, 7: 25-46.

Pradhan, P. Rudra (2010) "Transport Infrastructure, Energy Consumption and Economic Growth Triangle in India: Cointegration and Causality Analysis". *Journal of Sustainable Development*, 3(2):167-173, June.

Ram, R., (1987) "Wagner's Hypothesis in Time Series and Cross- Section Perspectives: Evidence from Real Data for 115 Countries". *Review Economics and Statistics*, 69: 359-393.

Remin, T. (2005) "New Evidence of Population Growth and Economic Development in Less Developed Countries". *International Advanced in Economic Research*, 2: 21-98.

Schaltegger, C. A. and Benno, T. (2006) "Growth Effect of Public Expenditure at the State and Local Levels: Evidence from a Sample of Rich Countries". *Applied Economics*, 38: 1181-1192.

Simon, K. (1981) "Home Planning Policy, Population Growth and Chinese Economic Take-up". Paper presented at Annual National Conference. Chicago. The Palmer House Hilton, www.allacademic.com.

Soludo, C. C (2007) "Nigerian Economy: Can We Achieve Vision 20: 2020?" *Brief Series,* Research and Statistics Department, Central Bank of Nigeria,. 25: 16-28. www.cenbank.org

Spyridis, T.; Zeljko Sevic; and N. Theriou (2010) "The Long run Relationship between Stock Indices and Economic Factors in the ASE: An Empirical Study between 1989 and 2006". *International Journal of Business,* 15(4):425-443.

Tehranchian, M. A. (2006) "On the Relationship Between Energy Consumption and Real GDP in Iran: An Application of VEC Model". *Iranian Economic Review*, 22(16):141-147, Spring.

Thornton, J. (2001) "Population Growth and Economic Growth: Long run Evidence from Latin America". *Southern Economic Journal*, 68:464-468.

Toda, H. Y. and T. Yamamoto. (1995) "Statistical Inference in Vector Autoregressions with Possibly Integrated Processes". *Journal of Econometrics*, 66:225-250.

Vanegas, S. M. and R. Croes. (2007) "Tourism, Economic Expansion and Poverty In Nicaragua: Investigating Cointegration and Causal Relations". Staff Paper P07-10, Staff Paper Series, Department of Applied Economics, College of Food, Agricultural and Natural Resource Science, University of Minnesota.

Wagner, A. (1863) " *Die Ordnung des österreichischen Staatshaushalts* (The System of the Austrian State Budget)". Wien: Gerold.

Wooldridge, M. J. (2006) "Introductory Econometrics: A Modern Approach". 3rd Edition. Cincinnati, OH: South-Western College Publishing.

Yan, Q.; Y. Xin; and J. Zhang (1999) "Chinese Home Planning Policy, Population Growth and Economic Take-up in 1979". *National Conference Paper*, Chicago.