GOVERNMENT EXPENDITURE AND ECONOMIC GROWTH IN NIGERIA: COINTEGRATION ANALYSIS AND CAUSALITY TESTING

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ABSTRACT

This study investigates the relationship between government expenditure (disaggregated into capital and recurrent) and economic growth in Nigeria over the period (1961-2010). It employs the Bounds Test approach to co-integration based on unrestricted Error Correction Model and Pair wise Granger Causality tests. The results from the Bounds Test indicate that there exists no long-run relationship between government expenditure and economic growth in Nigeria only when real GDP is taken as dependent variable. In addition, the causality results reveals that government capital expenditure granger causes economic growth. While no causal relationship was observed between government recurrent expenditure and economic growth. Therefore, the policy implication of this findings is that any reduction in capital expenditure would have a negative repercussions on economic growth in Nigeria.

Keywords: Bounds Test, Causality, Capital expenditure, Recurrent expenditure

INTRODUCTION

Public expenditure is an important instrument for a government to control the economy. Economists have been well aware of its effects in promoting economic growth. The general view is that public expenditure either recurrent or capital expenditure, notably on social and economic infrastructure can be growth-enhancing although the financing of such expenditure to provide essential infrastructural facilities-including transport, electricity, telecommunications, water and sanitation, waste disposal, education and health-can begrowth-retarding (Olukayode, 2009).

The relationship between government expenditure and economic growth has continued to generate series of controversies among scholars in economic literature. The nature of the impact is in conclusive while some authors believed that the impact of government expenditure on economic growth is negative or non-significant (Taban, 2010; Vu Le and Suruga, 2005), others believed that the impact is positive and significant (Alexiou, 2009; Belgrave and Craigwell, 1995).

The purpose of this study is to empirically re-examine the effect of government spending on the economic growth in Nigeria. Though the goal of the study is similar to those of previous studies in this area of research (Omor, 2004; Olukayode, 2009; Ighadaro and Okriakhi, 2010; Loto, 2011), the method of analysis is different at least in two ways. First, the study examines the disaggregate of government capital expenditure and recurrent government expenditure on economic growth. Second, the model uses time series data, and has been estimated by Autoregressive Distributed Lag (ARDL) bound estimation technique, which is fairly new and advanced estimation method of time series.

Following the introduction, the rest of the paper is organized into four sections. Section two presents the literature review. In section three, the data and methodology are presented. Results and discussions are done in section four and the paper concludes in section five with concluding remarks.

LITERATURE REVIEW

There have been quite a number of empirical studies analysing the impact of public expenditure on economic growth so far. The results, however, are varied as different analysis techniques and data samples are adopted.
The first school can be named for those who support the idea that public expenditure has a negative impact on economic growth. Taban (2010) examined government spending and economic growth for the period 1987:Q1 to 2006:Q4 and applied bounds testing approach and MWALD Granger causality test. The author found that the share of government spending and share of investment to GDP are negative impacts on economic growth in the long run. Similarly, Ighodaro and Okiakhi (2010) used time series data for the period 1961 to 2007 and applied cointegration test and Granger causality test to examine government expenditure disaggregated into general administration and community and social services in Nigeria. The results revealed negative impact of government expenditure on economic growth.

Moreover, Vu Le and Suruga (2005) investigated the simultaneous impact of public expenditure foreign direct investment (FDI) on economic growth from a panel of 105 developing and developed countries for the period 1970 to 2001 and applied fixed effects model and threshold regression techniques. Their main findings were categorized into three: FDI, public capital and private investment play roles in promoting economic growth. Secondly, public non-capital expenditure has a negative impact on economic growth and finally, excessive spending in public capital expenditure can hinder the beneficial effects of FDI.

The findings above, however, have been challenged by numerous other works. Alexiou (2009) using pooled time series and cross-section data for 7 countries in the South Eastern Europe (SSE) spanning from 1995 to 2005. The results indicates that out of five variables used in the estimation, government spending as dependent variable on capital formation, development assistance, private investment and a proxy for trade-openness all have positive and significant effect on economic growth, in contrast of population growth whose found to be statistically insignificant. Their inconsistent relationship between public expenditure and economic growth is also supported by the findings of Olukayode (2009) investigated the impacts of government expenditure on economic growth in Nigeria using time series data from 1977 to 2006 and adapting Ram (1986) model in which government expenditure is disaggregated in private investment, human capital investment, government investment and consumption spending at absolute levels. The results showed that all the expenditures have positive effect on economic growth.

Another study by Jiranyakul and Brahmasrene (2007) investigated the relationship between government expenditures and economic growth in Thailand for the period 1993 to 2006 and employed Standard Granger Causality test and Ordinary Least Square (OLS) method. The results showed a unidirectional causality from government to economic growth without feedback. Furthermore, estimation from the ordinary least square confirmed the strong positive impact of government expenditure on economic growth during the period of investigation. Bose et al. (2003) also examined the effects of government expenditure for a panel of 30 developing countries over the decades of 1970s and 1990s with a particular focus on sectoral expenditures and employed Seemingly Unrelated Regression technique. Their results revealed that the share of government capital expenditure in GDP is positively and significantly correlated with economic growth with the exception of current expenditure which is insignificant. Furthermore, Dilrukshini (2002) analyzed the relationship between public expenditure and economic growth in Sri Lanka over the period 1952 to 2002 and applied Johansen cointegration technique and Granger causality test. The findings suggests that the growth of public expenditure in Sri Lanka is not directly dependent and determined by economic growth.

Some studies also found mixed results on the impact of government expenditure on economic growth, for instance, Deverajanel et al. (1996) shed light on the composition of public expenditure and economic growth for the panel of 43 developing countries from 1970 to 1990 and applied Ordinary Least Squares. The findings suggests that increase in the share of current expenditure has positive and statistically significant growth effects. By contrast, capital as a component of public expenditure has a negative impact on economic growth. These results implies that developing countries governments’ have been misallocating public expenditure in favor of capital expenditures at the expense of current expenditures. Also, Belgrave and Craigwell (1995) examined the impact of government expenditure on economic growth disaggregating the level of government on economic growth into functional and economic categories of Barbados for the period 1969-1992 and employed Augmented Dickey Fuller
and Engle and Granger cointegration technique. Their results revealed that there is a positive relationship between capital expenditure, agriculture, housing and community, road, communication and health expenditures on economic growth respectively. However, the effects of education and current expenditure are negative.

A recent study using time series data for the period 1962 to 2007 for Lebanon and applied Johansen cointegration technique to examined the nature of government expenditure and its impact on economic growth, Saad and Kalakech (2009) found that government spending on education has a positive impact in the short run. While, expenditure on defence and health are negatively correlated in the long run and insignificant in the short run. Finally, expenditure on agriculture is found to be insignificant in both cases. In a more recent study, Loto (2011) investigated the impact of sectoral government expenditure on economic growth in Nigeria for the period 1980-2008 and applied Johansen cointegration technique and error correction model. The results inferred that in the short run expenditures on agriculture and education were negatively related to economic growth. However, expenditures on health, national security, transportation, and communication were positively related to economic growth, though the impacts were not statistically significant.

DATA AND METHODOLOGY

Annual time series data were collected on real GDP proxied for economic growth and government expenditure disaggregated into government capital expenditure and recurrent expenditure. The annual data covers the period 1970 to 2010. The choice of this period was guided by data availability considerations. The data were obtained from the Central Bank of Nigeria Statistical Bulletin 2011.

Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001) for testing the existence of a cointegration relationship has certain econometric advantages in comparison to other single cointegration procedures (Engle and Granger, 1987; Johansen and Juselius, 1990). Firstly, endogeneity problems and inability to test hypotheses on the estimated coefficients in the long-run associated with the Engle-Granger (1987) method are avoided. Secondly, the long and short-run parameters of the model in question are estimated simultaneously. Thirdly, the econometric methodology is relieved of the burden of establishing the order of integration among the variables and of pre-testing for unit roots. The ARDL approach to testing for the existence of a long-run relationship between the variables in levels is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1), or fractionally integrated. Finally, as for the small samples, the bounds testing approach are far superior to that of multivariate cointegration. The approach, therefore, modifies the Auto-Regressive Distributed Lag (ARDL) framework while overcoming the inadequacies associated with the presence of a mixture of I(0) and I(1) regressors in a Johansen-Juselius technique.

The bounds testing approach to cointegration involves investigating the presence of a long-run equilibrium relationship using the following UECM frameworks:

\[
\Delta \ln \text{RGDP}_t = \alpha + \sum_{j=1}^{4} \beta_j \Delta \ln \text{RGDP}_{t-j} + \sum_{j=1}^{4} \gamma_j \Delta \ln \text{CEXP}_{t-j} + \sum_{j=1}^{4} \delta_j \Delta \ln \text{REXP}_{t-j} + \phi_{1} \ln \text{RGDP}_{t-1} + \phi_{2} \ln \text{CEXP}_{t-1} + \phi_{3} \ln \text{REXP}_{t-1} + \epsilon_{1t}
\]

\[
\Delta \ln \text{CEXP}_t = \alpha + \sum_{j=1}^{4} \beta_j \Delta \ln \text{RGDP}_{t-j} + \sum_{j=1}^{4} \gamma_j \Delta \ln \text{CEXP}_{t-j} + \sum_{j=1}^{4} \delta_j \Delta \ln \text{REXP}_{t-j} + \phi_{1} \ln \text{RGDP}_{t-1} + \phi_{2} \ln \text{CEXP}_{t-1} + \phi_{3} \ln \text{REXP}_{t-1} + \epsilon_{2t}
\]

\[
\Delta \ln \text{REXP}_t = \alpha + \sum_{j=1}^{4} \beta_j \Delta \ln \text{RGDP}_{t-j} + \sum_{j=1}^{4} \gamma_j \Delta \ln \text{CEXP}_{t-j} + \sum_{j=1}^{4} \delta_j \Delta \ln \text{REXP}_{t-j} + \phi_{1} \ln \text{RGDP}_{t-1} + \phi_{2} \ln \text{CEXP}_{t-1} + \phi_{3} \ln \text{REXP}_{t-1} + \epsilon_{3t}
\]

where \( \Delta \) is the first difference operator, \( \ln \text{RGDP}_t \) is the natural logarithm of economic growth, \( \ln \text{CEXP}_t \) is the natural logarithm of capital expenditure, and \( \ln \text{REXP}_t \) is the natural logarithm of recurrent expenditure. The residuals \( \varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t} \) are assumed to be normally distributed and white noise. From Eqs. (1)–(3), the F-test can be used to examine whether long-run equilibrium relationship exists between the variables, by testing the significance of the lagged level variables \( H_0: \phi_1 = \phi_2 = \phi_3 = 0 \). The computed F-statistics for cointegration are denoted \( F_{\text{RGDP}}(\text{CEXP}/\text{RGDP}, \text{REXP}) \), \( F_{\text{CEXP}}(\text{RGDP}/\text{CEXP}, \text{REXP}) \), and \( F_{\text{REXP}}(\text{RGDP}/\text{CEXP}, \text{CEXP}) \) for each equation, respectively. Pesaran et al. (2001) tabulated two sets of critical values. The first set of critical values is called lower bounds critical values, and the second set of critical values is known as upper bounds critical values. According to Pesaran et al. (2001), the null hypothesis of no cointegration is rejected if the calculated F-statistic is
more than the upper-bound critical values. On the other hand, if the calculated F-statistic is less than
the lower-bound critical values, we cannot reject the null hypothesis and hence the variables are not
cointegrated. Finally, the decision about cointegration is inconclusive if the calculated F-statistic falls
between the lower and upper-bound critical values.

‘Granger-causality’ indicates causality in the prediction sense rather than in a structural sense. It begins
with an assumption that ‘the future cannot cause the past’; if event X occurs after event Y, then X
cannot Granger cause Y (Granger 1969). Therefore, in order to test whether government expenditure
causes economic growth, the following bivariate equation is estimated

\[ \Delta y_i = \alpha + \sum_{j=1}^{m} \beta_j \Delta y_{i-j} + \sum_{j=1}^{n} \lambda_j \Delta x_{i-j} + \nu_t \]  

where \( y_i = \log(RGDP); \ x_i = \log(GOVEX); \ y_i \) is the economic growth proxied by RGDP; \( x_i \) is the
government expenditure disaggregated into capital and recurrent expenditure; and \( \Delta \) is the first
difference operator. The presence of Granger-causality depends on the significance of the \( \Delta x_{i-j} \) terms
in Equation (4) government expenditure causes GDP if the current value of \( \Delta y \) is predicted better
by including the past values of \( \Delta e \) than by not doing so.

**EMPIRICAL RESULT**

**Unit Root Test Results**

Prior to analyzing the estimated results using ARDL approach to cointegration, we first begin by
investigating the non-stationarity (the presence of unit roots) in all variables by applying the
Augmented Dickey–Fuller (ADF) test. These tests examine the null hypothesis that the considered
variable has a unit root versus the alternative hypothesis that the variable is stationary. However,
necessary but not sufficient condition for co integration is that each of the variables should be
integrated of the same order, and the order must be greater than or equal to one. The ADF tests results
presented in Table (1) clearly reveal that all the government expenditure variables along with the
selected growth variable are integrated at order 1, I(1), i.e., they become stationary after first
differencing.

**Table 1. Unit Root Test Results**

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF Test</th>
<th>First Differenced</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRGDP</td>
<td>-1.119608</td>
<td>-5.068260*</td>
</tr>
<tr>
<td>LCEXP</td>
<td>-0.646905</td>
<td>-4.250762*</td>
</tr>
<tr>
<td>REXP</td>
<td>-0.239493</td>
<td>-5.561145*</td>
</tr>
</tbody>
</table>

Source: author’s calculation using EViewS, * indicates 1% level of significant

**Results of Bounds Tests**

The results of the bounds test for cointegration, are reported in Table 2. The bounds test indicates that
cointegration is absent only when LRGDP is the dependent variable. This is because \( F_{RGDP}(RGDP/CEXP,REXP) \) is lower than the lower bound critical value at the 5% level of significance and this is true only when there is no constant and time trend. However, the bounds tests indicate that when LCEXP and LREXP are the dependent variables, \( F_{CEXP}(CEXP/RGDP,REXP) \) and \( F_{REXP}(REXP/RGDP,CEXP) \) are higher than the higher bound critical value at the 5% level. Therefore, there is cointegration when these variables are treated as the dependent variable.
Table 2. Bounds Test Results

<table>
<thead>
<tr>
<th>F-Statistic</th>
<th>Critical Values at 5%</th>
<th>Lower bound</th>
<th>Upper bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>( F_{RGDP}(RGDP/CEXP,REXP) = 1.8098 )</td>
<td>2.8812</td>
<td>4.0250</td>
<td></td>
</tr>
<tr>
<td>( F_{CEXP}(CEXP/RGDP,REXP) = 7.0098 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( F_{REXP}(REXP/RGDP,CEXP) = 5.1306 )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: author’s calculation

Results of Granger Causality Tests

The Granger causality tests conducted is reported in table 3, the results show an evidence of unidirectional causality that runs from government capital expenditure to economic growth proxied by RGDP. The decision on the direction of causality was made from probability values of the tests. However, the Granger causality of the government recurrent expenditure and economic growth reveals that there is no causal relationship between government recurrent expenditure and economic growth. This may be attributed to inappropriate recurrent expenditure by Nigerian Government which makes it to have insignificant impact on economic growth.

Table 3. Pairwise Granger Causality Tests

<table>
<thead>
<tr>
<th>Null Hypothesis:</th>
<th>Obs</th>
<th>F-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEXP does not Granger Cause RGDP</td>
<td>49</td>
<td>3.04184</td>
<td>0.08782</td>
</tr>
<tr>
<td>RGDP does not Granger Cause CEXP</td>
<td>0.00025</td>
<td>0.98736</td>
<td></td>
</tr>
<tr>
<td>REXP does not Granger Cause RGDP</td>
<td>49</td>
<td>1.42305</td>
<td>0.23902</td>
</tr>
<tr>
<td>RGDP does not Granger Cause REXP</td>
<td>0.00199</td>
<td>0.96463</td>
<td></td>
</tr>
</tbody>
</table>

Source: author’s calculation

CONCLUSION

In this study, we set out to empirically investigate the empirical relationship between government expenditure (disaggregated into capital and recurrent) and economic growth proxied by real GDP in Nigeria, using annual time series data from 1961 to 2010. Some econometric tools are employed to explore the relationship between these variables. The study examines stochastic characteristics of each time series by testing their stationarity using Augmented Dickey Fuller (ADF) test. Then, the relationship between government expenditure and economic growth is examined using Bounds Test proposed by Pesaran et al. (2001) and Pairwise Granger causality tests. The results from the Bounds Test indicate that there exists no long-run relationship between government expenditure and economic growth in Nigeria only when real GDP is taken as dependent variable. In addition, the causality results reveal that government capital expenditure granger cause economic growth. While no causal relationship was observed between government recurrent expenditure and economic growth.

According to empirical findings of this study, one may tentatively suggest that the growth of public expenditure in Nigeria is not directly dependent on and determined by economic growth as Wagner’s Law indicates. However, causality results reveal that reduction in government capital expenditure would have a negative repercussion on economic growth in Nigeria.
REFERENCES


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