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Fiscal Policy Variables-Growth Effect: Hypothesis Testing

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This study investigated the fiscal policy variables that contributed to growth in Nigeria for the period of 1981 to 2010 in view of hypothesizing the fiscal policy variables-growth effect. Secondary annual time-series data were used. Data on Productive expenditure, Unproductive expenditure, distortionary taxes, non-distortionary taxes, fiscal deficit and real growth rate of GDP were analyzed using cointegration and ordinary least square techniques. Cointegration results show a long run relationship among the variables. Results of fiscal-growth effect model invalidate the claim that only productive expenditure, distortionary taxes and fiscal deficit contribute to growth in case of Nigeria. These results draw attention towards the significance of non-distortionary taxes as addition to three fiscal policy variables that contribute to growth and government should reduce expenditure on recreational-cultural-religious affairs and other functions like political administrative expenses in order to achieve stabilization policies in Nigeria.

Keywords: fiscal policy variables, endogenous growth theory, cointegration, error correction mechanism, ordinary least square method, CUSUM test

Introduction

The use of fiscal policy instruments for the attainment of the desired economic growth has been subjected to different economic views. The Keynesian view argued that government should fine-tune the economy by allowing economic forces to allocate factors of production and investment as well as intervening occasionally in regulating the working of the macroeconomic variables with the objectives of realizing a steady and development of all sectors of the economy. But as opposed to the Keynesian view, the present system postulated the direct control of all economic factors of production and this is bound to be less successful because of its authoritarian nature, which stultifies the interplay of macroeconomic variables and causes distortions as well as market failures. For instance, the relationship between government expenditure and economic growth has continued to generate series of debate among scholars. Government performs two functions- protection (and security) and provisions of certain public goods. Protection function consists of the creation of rule of law and enforcement of property rights which helps to minimize risks of criminality, protect life and property, and the nation from external aggression. Under the provisions of public goods are defence, roads, education, health and power, to mention in few.

Some scholars argued that increase in government expenditure on socio-economic and physical infrastructures encourage economic growth likewise expenditure in health and education raise the productivity of labour and increase the growth of national output (see Barro & Sala-i- Matins, 1995). Similarly, expenditure on infrastructure such as roads, communications, power, etc, reduces production costs, increases private sector investment and profitability of firms, thus fostering economic growth. Supporting this view, scholars concluded that expansion of government expenditure contributes positively to economic growth.

Conversely, some scholars claim that increasing government expenditure deters economic growth, instead they asserted that higher government expenditure might slowdown overall performance of the economy. For instance, in an attempt to finance rising expenditure, government may increase taxes and/or borrowing which might affect her spending behaviour. Thus, higher income tax discourages individual from working for long hours or even searching for jobs and this reduces income and aggregate demand. In the same vein, higher profit tax tends to increase production costs and reduces investment expenditure as well as profitability of firms. Moreover, if government increases borrowing (especially from the banks) in order to finance its expenditure; it will compete away the private sector, thus reducing private investment.

The study conducted in Kenya by Amanja and Morrissey (2006), contribute to a theoretical and

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empirical debate on the question whether or not fiscal policy stimulates growth in the long run. They believe that government involvement in economic activity is vital for growth, but an opposing view holds that government operations are inherently bureaucratic and inefficient and therefore stifles rather than promotes growth. They used time series annual data to investigate the relationship of various measures of fiscal policy on growth. Categorising government expenditure into productive and unproductive and tax revenue into distortionary and non-distortionary, and found out that unproductive expenditure and non-distortionary tax revenue do not contribute to growth as predicted by economic theory. However, contrary to expectations, productive expenditure has strong adverse effect on growth whilst there was no evidence of distortionary effects on growth of distortionary taxes. On the other hand, government investment was found to be beneficial to growth in the long run. The results prove useful to policy makers in the country including other developing nations with similar fiscal structure in formulating expenditure and tax policies to ensure unproductive expenditures are curtailed while at the same time boosting public investment.

Some studies admitted that many fiscal policy variables are highly correlated with initial income levels and fiscal variables are potentially endogenous (see Easterly & Rebello (1993). Another study found a positive relationship between government transfers, public investment and growth and a negative one between distortionary taxes and growth from panel data for 23 developed countries between 1971 and 1988 (Cashin, 1995). Similarly, Devarajan et al (1996) showed that public current expenditures increase growth, whilst government capital spending decreases growth in 43 developing countries over 1970-1990. Kneller et al. (1999, 2001) showed that the biases related to the incomplete specification of the government budget constraint present in previous studies are significant and after taking them into account, they found for a panel of 22 OECD countries for 1970-1995 that: distortionary taxation hampers growth, while non-distortionary taxes do not; productive government expenditure increases growth, while non-productive expenditure does not; and; long-run effects of fiscal policy are not fully captured by five-year averages commonly used in empirical studies.

The literature has also reported that most studies conducted found empirical support for the negative effect of taxes on growth as well as a positive link between growth and education spending, while the evidence on the negative growth impact of defense spending is moderately strong. It therefore seems that there is widespread non-robustness of coefficient signs and statistical significance even within similar specifications for similar variables. There are some possible explanations for these differences. Literatures show that several studies devoid the framework that pin down the important fiscal policy variables that contribute to the growth of a nation. Although, some studies argued that the structure of a nation determines the kind of fiscal variables that has a significant effect on growth but while some against the notion. However, the growth theory postulated that only three fiscal policy variables (such as productive expenditure, distortionary taxes and fiscal balance) contributed to growth while others like unproductive expenditure, non-distortionary taxes, other revenue and other expenditure have no significant effect on growth. Another problem of most empirical studies on growth and fiscal policy was based on the misspecification of the growth equation in relation to the government budget constraint.

Also, the dynamic effects of fiscal policy are either ignored completely or not modelled carefully in existing empirical work, i.e. no sufficient attention is paid on distinguishing the transitional from the long-run effects of fiscal policy. More so, it is likely that there is dependence between explanatory variables and the rate of growth (Wagner’s law) and correlation of the fiscal variables with initial GDP. Furthermore, the linear structure imposed on most empirical models is convenient but not necessarily realistic and consistent with the underlying theory.

One of the fiscal parameters that are considered to have a negative impact on economic growth is the size of government budget deficit. The standard explanation in the literature is that government deficit crowd-out private capital formation by increasing interest rate and reducing the amount of savings available for private investors. To the extent that deficits are used for investment purposes, the country’s total capital formation might not necessarily decline. However, the relative productivity of public and private capital can affect the pace of economic growth and as long as the return to public capital is below that of private capital, deficits will negatively affect the GDP growth rate.

Contrary to this view, the Ricardian equivalence proposition suggests that government deficit has no effect on economic growth. Because current government deficits must eventually be paid with higher taxes in the future, households will save more now to pay the higher taxes in the future. Another element of fiscal policy that influences the rate of economic growth is the level of government spending.

Based on the aforementioned arguments, the results from the literatures on the fiscal policy variables that contribute to growth of a nation are mixed. Some studies believed that fiscal policy variables that induce growth are far from only variables identified by Kneller et al (1999) (that is, productive expenditure, distortionary taxes and fiscal balance). Even, among these variables, the Ricardian equivalence argued that the fiscal balance does not affect economic growth. Therefore, this study intends to investigate whether the fiscal policy variables that contribute to growth in Nigeria are more or less than those identified by economic theory.

Theoretical Framework

The recent literature on endogenous economic growth model has provided some insights into the reason why some countries grow at different rate over long periods of time. In most of these models, fiscal variables which are capable of yielding predictions of long-run or steady state growth effects arising from changes have been incorporated into the models. Most such models have focused on one side of the government budget or the other – usually the tax side. Barro (1990) and Cashin (1995) analyze both taxes and expenditures simultaneously, though both models preclude deficit finance. This study discusses fiscal effects within the context of the Barro (1990) and Barro and Sala-i-Martin (1992) models that provide a long term growth endogenously. The model found reliable by adopting the standard Ramsey framework in which the consumption path of a representative consumer is obtained by maximizing an inter-temporal utility function over an infinite horizon. There are *n* producers each producing output (*y*) according to the production function:

$$y = Ak^{\alpha} g^{\beta} \quad (1)$$

Where k represents private capital and *g* is a publicly provided input (per capita). There are therefore constant returns to total (public plus private) 'capital' inputs, $k + g$. The government also produces consumption ('unproductive') goods, g_c, which enter consumers' utility functions but have no effect on production. The government balances its budget in each period by raising a proportional tax on output at rate τ and lump-sum taxes of L, giving the constraint:

$$ng + C = L + \tau ny \quad (2)$$

Where n is the number of producers in the economy and C is government consumption, which is assumed unproductive. Theoretically, a proportional tax on output affects private incentives to invest but lump sum tax does not. Subject to a specified utility function, Barro (1990) and Barro and Sala-i-Martin (1992) derive the long run growth rate (γ) in this model as:

$$\gamma = \varphi(1-\tau)(1-\alpha)A^{\frac{1}{\beta}}(\frac{g}{y})^{\frac{\alpha}{\beta}} - \mu \quad (3)$$

Where φ and μ are parameters in the utility function. Equation (3) show that the growth rate is decreasing function of distortionary tax rates (τ) and increasing function of government productive expenditure (*g*), but is unaffected by non-distortionary taxes (*L*) and unproductive government expenditure (*C*). The specification above assumes the government balances its budget each period, an assumption that is unlikely to hold in reality especially in the less developed countries. This study follows the empirical model of Kneller et al (1999) and Bleaney et al (2000) in which they take a more practical view by assuming a non-balancing government budget constraint in some periods. Taking this into account, we can re-write (eq3) to obtain the following expression.

$$ng + C + b = L + \tau ny \quad (4)$$

Where b is the budget deficit/surplus in a given period. Since g is productive, its predicted sign is positive, but τ is negative as it distorts incentives of private agents. C and L are hypothesized to have zero effects on growth. Similarly, the effect of b is expected to be zero as long as Ricardian equivalence holds, but may be non-zero otherwise. We specify our growth equation in the spirit of Kneller et al (1999) by considering both fiscal (f_{it}) and non-fiscal (nf_{it}) variables so that the growth equation becomes,

$$y_t = \alpha + \sum_{i=1}^{k} \beta_i nf + \sum_{j=1}^{m} \psi_i f_{jt} + \varepsilon_{it} \quad (5)$$

Where y_t the growth rate of output is, f is the vector of fiscal variables, nf is the vector of non-fiscal variables, and ε_{it} are disturbance terms. In theory, if the budget constraint is fully specified, then $\sum_{j=1}^{m} f_{jt} = 0$ because expenditures must balance revenues. To avoid this, we need to omit at least one element of f (say f_m) to avoid perfect collinearity. Theoretically, the omitted element has no effect on growth, thus, in order to select any other, we introduce a substantial bias in parameter estimates. Consequently, we can re-write equation 5 in the following form.

$$y_t = \alpha + \sum_{i=1}^{k} \beta_i nf + \sum_{j=1}^{m-1} \psi_i f_{jt} + \psi_m f_{mt} + \varepsilon_{it} \text{.........} (6)$$

Omitting f_{mt} from equation 6, we obtain the new growth equation as follows:

$$y_t = \alpha + \sum_{i=1}^{k} \beta_i nf + \sum_{j=1}^{m-1} (\psi_i - \psi_m) f_{jt} + \varepsilon_{it} \text{.........} (7)$$

The growth equation denoted by (7), as specified in Kneller et al (1999), constitutes the relationship between $y_t; nf; and; f_{jt}$. The correct interpretation of each estimated fiscal parameter is the effect of a unit change in the relevant fiscal variable offset by a unit change in the element or elements omitted from the regression. In terms of the fiscal categories described above, for example, the parameter on productive expenditure would be expected to be higher if it is implicitly financed by omitting non-distortionary taxation rather than by omitting distortionary taxation-because $\psi_j = \psi_j - \psi_m$ is expected to be less negative, or zero. The problem is not solved by omitting many elements of the government budget constraint from the regression instead of just one; rather it becomes harder to identify precisely what is the assumed implicit financing. More precisely, if the null hypothesis is rejected, parameter estimates can be obtained if the neutral elements are eliminated from the model.

Model Specification and Data

Most studies on growth usually model economic growth (y) as a function of number of growth determinants. This study employs the popular endogenous growth model as propounded by Barro (1990) and Barro and Sala-i-Martin (1991, 1992) using Ak model. This study is a prototype of Norman et al (2002), Nikos (2004) in his study of OECD countries, Amanja & Morrissey (2006) and Yasar et al (2006). Based on equation (7) above, this study estimated the model below:

$$In(Y_t) = In(A_t) + \mu In(unpr_t) + \psi In(PR_t) + \varphi In(DIS_t) + \rho In(fis_t) + \beta In(ord_t) + \eta In(ndis_t) + \omega(Inorv_t) + e_t \text{....} (8)$$

where: $In(A_t)$ = constant; $unpr_t$ =unproductive expenditure; PR_t = productive government expenditure; DIS_t = distortionary tax; fis_t = budget deficit/surplus; ord_t = other expenditure; Orv_t = other revenue
$ndis_t$ = non-distortionary tax; Y_t = real GDP

Thus, equation (8) is used to analyze the theoretical relationship between fiscal policy variables and economic growth in Nigeria, the signs and magnitude of the sizes of the estimated parameters in the model equation must tend towards the same direction. Annual time-series data on Productive expenditure, Unproductive expenditure, distortionary taxes, non-distortionary taxes, fiscal deficit and real growth rate of GDP were used for this study and obtained from Central Bank Statistical Bulletin, 2010.

Results and Discussions

It is very important to check the long run and short run dynamics among the variables, before the estimation of any time series model. In econometric literature there are lots of univariate and multivariate techniques to check the cointegration among the variables. Before applying any cointegration technique, firstly we have to detect order of integration. Mostly time series data is non-stationary and in order to beware spurious regression results researchers used different unit root test.

Unit Root Test

Augmented Dickey Fuller (ADF) unit root test

Dickey and Fuller, after Dickey Fuller unit root test, suggested a new test to check unit root, ADF. In order to remove the autocorrelation this test includes additional lagged terms of the dependent variable as a one of the independent variable. Mostly the time series data have a trend, but ADF test give following three possibilities:

$$\Delta Z_t = \alpha Z_{t-1} + \sum \beta_i \Delta Z_{t-1} + u_t \quad (14)$$
$$\Delta Z_t = \theta_0 + \alpha Z_{t-1} + \sum \beta_i \Delta Z_{t-1} + u_t \quad (15)$$
$$\Delta Z_t = \theta_0 + \alpha Z_{t-1} + \mu_2 t + \sum \beta_i \Delta Z_{t-1} + u_t \quad (16)$$

Equation (14) states the possibility when no trend and no intercept found in the data, equations (15) states the possibility when data has intercept only (16) states the possibility when data has both intercept and trend. Deterministic elements θ_0 and $\mu_2 t$ differentiate the above three equations from each other. While using ADF test there are two important things which a researcher has to keep in his mind. Specify the lagged first difference terms. If we select zero lagged difference this will be DF test. In ADF, in order to remove serial correlation among residuals, sufficient lags are included. Secondly, when we choose the different possibilities of ADF, discussed above, their critical values also changed. McKinnon (1991) table of critical values is used to check the acceptance or rejection of null hypothesis.

The Phillips-Perron unit root test

The Dickey-Fuller test is based on the assumption that the error terms are statistically independent and have a constant variance. Phillips and Perron (1988) introduced a new test of unit root in which they used mild assumptions as compared to Dickey and Fuller.
Consider AR(1) process:

$$\Delta Z_{t-1} = \alpha_0 + \beta Z_{t-1} + u_t \quad (17)$$

PP test is the modification of ADF test it just make a correction of the t-statistic of Z's coefficient by using comparatively less restrictions than ADF, in order to remove serial correlation. McKinnon (1991) critical values are also used for this test. Moreover, this test also has the same three possibilities which ADF has; intercept, intercept and trend and no intercept and no trend.

Johansen Co-Integration approach

After the pioneer work of Granger (1981) about cointegration, many studies9 elaborated this concept. Johansen (1988) introduced a new approach of checking the cointegration between more than two series. It removes all the drawbacks, which Engle-Granger approach has. In case of Johansen approach the ECM also extended into Vector Error Correction Model (VECM). Now suppose that we have three endogenous variables, L, M and N. In matrix form this can be written as:

$$Y_t = [L_t, M_t, N_t] \quad (18)$$

$$Y_t = \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \cdots + \alpha_k Y_{t-k} + e_t \quad (19)$$

In the context of VECM we can write as:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \cdots + \Gamma_{k-1} \Delta Y_{t-k-1} + \Pi Y_{t-1} + e_t \quad (20)$$

Whereas,

$$\Gamma_i = (1 - \alpha_1 - \alpha_2 - \cdots - \alpha_k)(i = 1,2,\ldots,k-1) \quad (21)$$

and $\Pi = -(1 - \alpha_1 - \alpha_2 - \cdots - \alpha_k)$ (22)

Π shows the 3X3 matrix, which depicts the true long run relationship between $Y_t = [L_t, M_t, N_t]$. The $\Pi = \phi\chi'$, in which ϕ shows the speed of adjustment towards equilibrium and long run coefficients matrix is χ'. In single equation case $\chi' Y_{t-1}$ is error correction term. To find out for multivariate case now assumes k = 2. So the model is:

$$\begin{bmatrix} \Delta L_t \\ \Delta M_t \\ \Delta N_t \end{bmatrix} = \Gamma_1 \begin{bmatrix} \Delta L_{t-1} \\ \Delta M_{t-1} \\ \Delta N_{t-1} \end{bmatrix} + \Pi \begin{bmatrix} \Delta L_{t-1} \\ \Delta M_{t-1} \\ \Delta N_{t-1} \end{bmatrix} + e_t \quad (23)$$

Or we can say that:

$$\begin{bmatrix} \Delta L_t \\ \Delta M_t \\ \Delta N_t \end{bmatrix} = \Gamma_1 \begin{bmatrix} \Delta L_{t-1} \\ \Delta M_{t-1} \\ \Delta N_{t-1} \end{bmatrix} + \begin{bmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \\ \phi_{31\phi} & \phi_{32} \end{bmatrix} \begin{bmatrix} \chi_{11} & \chi_{21} & \chi_{31} \\ \chi_{12} & \chi_{22} & \chi_{32} \end{bmatrix} \begin{bmatrix} L_{t-1} \\ M_{t-1} \\ N_{t-1} \end{bmatrix} + e_t \quad (24)$$

For simplicity just analyze the first equation's error correction part. The first row of Π matrix is:

$$\Pi_1 Y_{t-1} = ([\phi_{11}\chi_{11} + \phi_{12}\chi_{12}][\phi_{11}\chi_{21} + \phi_{12}\chi_{22}][\phi_{11}\chi_{31} + \phi_{12}\chi_{32}]) \begin{bmatrix} \begin{bmatrix} L_{t-1} \\ M_{t-1} \\ N_{t-1} \end{bmatrix} \end{bmatrix} + e_t \quad (25)$$

Equation clearly express the two cointegrating vectors and the terms of their speed of adjustment ϕ_{11} and ϕ_{12}.
Regarding the rank of matrix, there are three cases which are as follow;
i. The variables in Y_t are I(0), if Π has a full rank.
ii. There are no cointegrating relationships, when the Π is zero.
iii. There are $r \le (n-1)$ cointegrating relationships, when Π has a reduced rank.

To check the goodness of fit, diagnostic test like Serial correlation, functional form, normality and heteroskedasticity tests and stability test like Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUMsq.) are performed.

Empirical Result

Unit root results

To ward off the spurious results the study tested the variables for unit root. Two methods of unit root are adopted, ADF and PP. The study check the stationarity of the variables under two models, with intercept and trend and secondly with intercept and no trend. All the variables are I(1) under ADF test when considering intercept and trend. The same results also occurred in PP test.

Prior to the estimation of the main model it is necessary to check that whether the said variables have long run or short relationship or not? For this purpose different cointegration techniques are used in literature. After checking the stationarity of data we come to know that all the variables are I(1), so Johansen and Juselius (1990) cointegration technique is applied.

Table 1. Unit root test results.

Variables	Augmented Dickey Fuller (ADF)				Phillips-Perron			
	Without Trend		With Trend		Without Trend		With Trend	
	Level	Difference	Level	Difference	Level	Difference	Level	Difference
DIS	-3.98*	-4.35*	-1.06	-4.33*	-3.53*	-4.36*	-1.16	-4.34*
FIS	-1.84	-5.63*	-3.30	-5.51*	-1.82	-9.33*	-3.26	-9.06*
NDIS	-0.82	-9.15*	-1.15	-9.02*	-2.71	-9.50*	-3.02	-9.02*
PR	1.55	-3.50**	-3.83**	-4.74*	0.58	-3.59*	-3.92**	-4.82*
UNPR	-0.02	-5.40*	-3.06	-5.41*	0.62	-7.32*	-2.94	-9.51*
Y	2.08	-1.76	1.26	-3.21**	5.51	-1.53	1.38	-3.22**

Note: ** (*) shows 5 %(1%) significance level.

The result of the cointegration test reveals that there is three cointegrating vector, based on the Eigen values and Trace statistics since the hypotheses of no cointegration were rejected at 5% level for both tests using Mackinnon-Haug-Michelis (1999) p-values

Table 2. Johansen maximum likelihood test for cointegration.

Hypotheses	Trace test	5%Critical values	Max-Eigen Statistic	5%Critical values
R = 0	188.35	95.75	76.88	40.08
R ≤ 1	111.47	69.82	56.06	33.88
R ≤ 2	55.40	47.86	29.83	27.58
R ≤ 3	25.58	29.80	17.22	21.13
R ≤ 4	8.36	15.49	8.07	14.26
R ≤ 5	0.28	3.84	0.28	3.84

After investigating the long run relationship among variables, it is important to investigate the short run dynamics. Error correction term shows the speed of convergence towards equilibrium. It is significant and negative in sign. The speed of correction towards equilibrium depends upon the value of error correction term.

Table 3. ECM regression results.

Variables	Coefficients	Standard Error	t-Statistic
Constant	-5.26	2.13	-2.47
ΔECM(-1)	-0.86	0.37	-2.31**
ΔDIS(-2)	0.11	0.04	3.07*
ΔNDIS(-1)	-0.27	0.10	-2.79*
ΔPR(-2)	-0.19	0.09	-2.19**
ΔFIS(-1)	-8.40E-07	2.85E-07	-2.95*
ΔY(-1)	1.76	0.30	5.90*

Note: ** (*) represents 5% (1%) significance level ΔY is dependent variable.

Brown et al. (1975) proposed two tests Cumulative Sum and Cumulative Sum of Square, to check the structural stability. CUSUM test captured the systematic changes in regression coefficients, while CUSUMSQ detain the departure of parameters from constancy. Hence, parameter consistency is checked by using these two tests. Following graphs shows the stability of model for whole sample because the residuals are within 5% critical bonds.

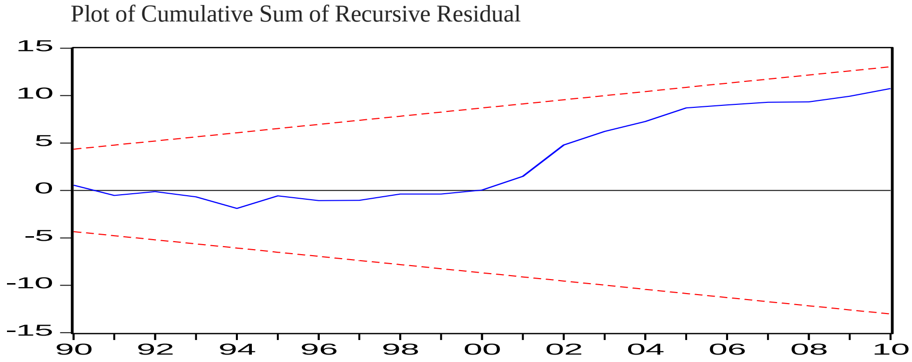

Figure 1. Cumulative Sum of Recursive Residual
The straight line represents critical bond at 5% significance level

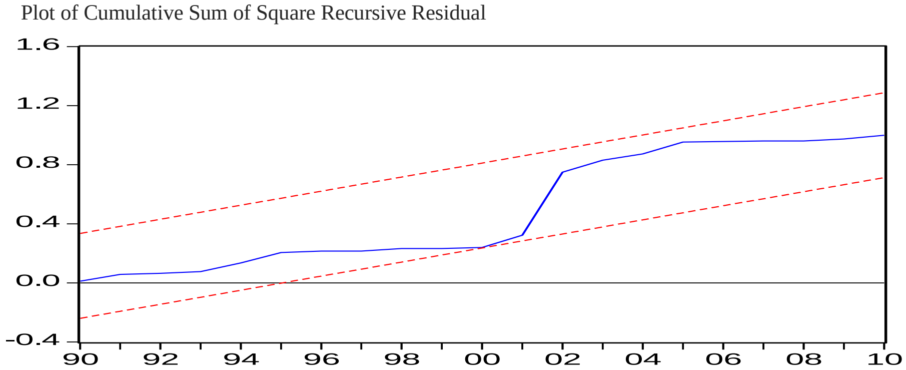

Figure 2: Cumulative Sum of Square Recursive Residual
The straight line depicts critical bonds at 5% significance level

Basically, the motive of this study was to test the fiscal-growth effect hypothesis which was pioneered in the study of Kneller et al (1999) and supported with endogenous growth model that only three fiscal variables contributed to growth among the functional classification of fiscal variables in developed countries and this study intended to test this hypothesis using a developing country data precisely- Nigeria. In hypothesizing this statement, this study employed step by step ordinary least square technique until there were stable significance fiscal-growth effect variables. Two model equations were estimated. The first model estimated five fiscal variables and only four were significance at 1, 5 and 10 percent level. These variables were distortionary tax, non-distortionary tax, productive expenditure and government budget deficit while unproductive expenditure was not statistically contributed to growth in Nigeria. In the second model, only those variables that were initially significance in the first model were included and the result confirmed that all these variables contributed to growth in Nigeria since they were all statistically significance at 5 percent level. This result indicated that non-distortionary tax that was not contributing to growth in developed country contributed to growth in Nigeria in addition to Kneller et al (1999) fiscal- growth effect variables (Distortionary tax, Productive expenditure and Fiscal deficit) as shown below:

Table 4. Fiscal variables-growth effect results.

Variables	Model 1	Model 2
Constant	7.51 (1.27) [5.91]	7.50 (0.97) [7.76]
ΔDIS	-0.10*** (0.06) [-1.73]	-0.10** (0.04) [-2.21]
ΔNDIS	0.28* (0.07) [4.02]	0.28* (0.06) [5.01]
ΔPR	0.25*** (0.12) [1.98]	0.25** (0.10) [2.45]
ΔFIS	0.26** (0.11) [2.36	0.26** (0.10) [2.48]
ΔUNPR	-0.00 *insignificant* (0.08) [0.99]	*Removed*
R-square	0.96	0.96
Adjusted R-square	0.95	0.95
Durbin-Watson stat	1.77	1.77
F-statistic	102.75*	133.78*

Note: Standard error (), t-Statistic [], * represents significance at 1%, ** shows significance at 5% and *** stands for significance at 10%. ΔY is dependent variable

The correlation matrix in the table below describes the degree of association between the variables. It is assumed that two variables will be highly correlated if the correlation coefficient is greater than 0.5, or it lies between 0.3 and 0.49. Moreover, if this value lies 0.2 to 0.29 than it is moderate correlation and if it lies 0.1 to 0.10 it is weak correlation. Thus, this result showed that there were strong association among all the variables.

Table 5. Results of correlation matrix.

Variables	DIS	FIS	NDIS	PR	UNPR	Y
DIS	1.00					
FIS	-0.81	1.00				
NDIS	0.84	-0.69	1.00			
PR	0.79	-0.61	0.93	1.00		
UNPR	0.97	-0.80	0.86	0.79	1.00	
Y	0.86	-0.71	0.91	0.91	0.89	1.00

Summary and Conclusion

The aim of this study is to test the argument that only three fiscal variables (productive expenditure, distortionary tax and fiscal deficit) contribute to growth by using annual time-series data of Nigeria from 1981 to 2010. The study used variables, productive government expenditure, unproductive government expenditure, distortionary taxes, non-distortionary taxes, government budget deficit and real growth rate of GDP to meet the objectives of the study. Results of ADF and PP unit root tests show that all the variables are I(1). JJ approach of cointegration shows a long run relation among the variables.

The findings of the study invalidate the Kneller et al (1999) hypothesis that only three fiscal variables contribute to growth using endogenous growth model. Thus, in Nigeria case, four fiscal variables contribute immensely to growth either positively of negatively. Thus fiscal policies should be used as major policy instruments in order to boost growth most especially monitoring of non-distortionary taxes like taxes on domestic goods and services; productive expenditure and fiscal deficit so as to achieve prime goal of stabilization policies in Nigeria. Government also should reduce its expenditures on recreational-cultural-religious affairs and other functions like political administrative expenses.

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