Fiscal Policy and Sectoral Output in Nigeria: A Multivariate Cointegration Approach

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Abstract

This study examines the impact of fiscal policy on sectoral output in Nigeria in a multivariate cointegration model over the period 1981-2011. Empirical evidence shows that the five subsectors and four fiscal policy variables are co-integrated and that the fiscal policy variables have significant impact on sectoral output. Also, the study reveals that the contribution of fiscal policy variables especially the productive expenditure to building & construction is below expectation despite huge amount allocated to the sector yearly. The paper recommends appropriate regulatory and pricing reforms in the all the sectors but most importantly building & construction

Keywords: Endogenous Model, Multivariate cointegration method, ECM, Fiscal policy, Sectoral output, Nigeria

JEL Classification: C32, C82, E62, O17

1. Introduction

The use of macroeconomic policies instruments for the attainment of the desired economic growth has been subjected to different economic views. The classical view argued that harmonizing the fiscal and monetary policies would either increase the pace of economic growth or reduce it depending on the direction of the policies, (Blanchard, 2006). For instance, the use of both expansionary fiscal and monetary policies will enhance growth while the use of both contractionary fiscal and monetary policies will deter growth. Meanwhile, the mixture of both policies will make growth unchanged (ISLM relations). The Keynesian view argued that increased in government expenditure would lead to increase in growth. Also, the theory argued that a change in money supply must influence or lead to a change in the interest rate; change in interest rate must lead to a change in the level of investment; and the change in the level of investment must have significant effect on national income (Afolabi, 1998). The Neo-classical economists argued that increased in government expenditure has small or little effect on economic growth, (Barro, 1990 and Cashin, 1995).

Furthermore, several empirical studies have supported the assertion of the existence of a relationship between fiscal policy and economic growth in several economies of the world following the Keynesian philosophy that pulled depressed economies out of depression during the great depression era of 1930's. In Nigeria, studies have found a positive correlation between public investment and economic growth as the former crowed in private investment, (Ekpo, 1994; Adeoye, 2006). In contrast to Keynesian policy prescription, Bailey (1980) and Feldstein and Iwata (1980) indicated a negative net effect between fiscal policy and economic growth. Based on these theoretical propositions, empirical questions have been raised on whether the effect of fiscal policy on the real output holds for the different sectors of the economy.

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In Nigeria, studies by Ekpo (1994); Omitogun and Ayinla, 2007; Ogunmuiwa, 2008; Nurudeen and Usman (2010); Oseni and Olomola, 2011; Ogunmuiwa, 2011; Oseni and Onakoya, 2012; 2013; among other studies, who had investigated the relationship between fiscal policy and real output growth, only concentrated on the aggregate output growth neglecting sector-specific analysis. The neglect of these important issues in the existing literature created an empirical gap for wish research can be carried out and indeed might have undermined the policy relevance of inferences from the empirical evidence from such studies especially on Nigeria. This study therefore intends to examine the empirical relationship between fiscal policy and sectoral output in Nigeria. Thus, this study covers all the activity sectors in Nigeria since these sectors serve as the main engine for growth in any developing countries particularly in Nigeria for the periods of 1981 to 2011.

Following the introductory aspect, this study is organized as follows. Section two discusses the review of related literature while section three presents the methodology and data. Section four encompasses the empirical results and section five concludes the study.

2. Literature Review

A countless of studies have examined the relationship between fiscal policy and growth in developed, developing and emerging economies of the world. However, one of the pioneer studies of fiscal policy and growth can be traced to the work of Kneller et al (1999) argued 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: (1) distortionary taxation hampers growth, while non-distortionary taxes do not; (2) productive government expenditure increases growth, while non-productive expenditure does not; (3) long-run effects of fiscal policy are not fully captured by five-year averages commonly used in empirical studies.

Nurudeen and Usman (2010) investigated the effect of government expenditure on economic growth, in a disaggregated analysis and observed that rising government expenditure has not translated to meaningful development as Nigeria still ranks among world's poorest countries. The study revealed that government total capital expenditure (TCAP), total recurrent expenditures (TREC), and government expenditure on education (EDU) have negative effect on economic growth. On the contrary, rising government expenditure on transport and communication (TRACO), and health (HEA) results to an increase in economic growth. The authors' recommendations include among others the following. Government should increase both capital expenditure and recurrent expenditure, including expenditures on education, as well as ensuring that funds meant for the development of these sectors are properly managed. Secondly, government should increase its investment in the development of transport and communication, in order to create an enabling environment for business to strive. Thirdly, government should raise its expenditure in the development of the health sector since it would enhance labour productivity and economic growth. Lastly, government should encourage and increase the funding of anti-corruption agencies in order to tackle the high level of corruption found in public office.

Peter and Simeon (2011) investigated the impact of fiscal policy variables on Nigeria's economic growth between 1970 and 2009. The study employed Vector Auto Regression (VAR) and error correction mechanism techniques. The study revealed that there exist a long-run equilibrium relationship between economic growth and fiscal policy variables in Nigeria. Consequently, it was recommended that government should formulate and implement viable fiscal policy options that will stabilize the economy. This could be achieved through the practice of true fiscal federalism and the decentralization of the various levels of government in Nigeria.

It further suggested that there should be consistency in macroeconomic policies implementation in the non-oil sectors of the economy by providing relevant incentives to foreigners wishing to invest in the agricultural sector and manufacturing sectors in Nigeria. More importantly, there should be appropriate macroeconomic policy mix in managing the economy.

Ogbole et al (2011) examined the impact of fiscal policy on economic growth in Nigeria during regulation and deregulation periods. Results obtained showed that there is a difference in the effectiveness of fiscal policy in stimulating economic growth during and after regulation periods. The impact was marginally higher (only N140 million or 14% contribution to GDP) during deregulation, than in the regulation period. The study recommended appropriate policy mix, prudent public spending, setting of achievable fiscal policy targets and diversification of the nation's economic base, among others.

Onuorah and Akujuobi (2012) examined the trend and empirical analysis of public expenditure and its impact on the economic growth in Nigeria. The study employed Johansen Co-integration and VEC and found that RGPE established long run relationship with RGDP. Finally, there is no statistical significance between public expenditure variables and the economic growth in Nigeria. The study recommended that government should embark on realistic policy implementation with sincere fiscal and monetary policies in place that can monitor to greater extend and help in the sustainability for remarkable growth to be recorded in the Nigeria.

Nathan, (2012) evaluated the causal relationship between money supply, fiscal deficits and exports as a means of analyzing the impact of policy on the growth of the Nigerian economy between 1970 and 2010. The study employed the Co-integration Error Correction Mechanism (ECM), a two band recursive least square to test for the stability of the Nigerian economy as well as determine the effect of money supply, fiscal deficits, and exports on the relative effectiveness of fiscal policies in the Nigerian economy. The study found that there was a significant causal relationship between gross domestic product (GDP) and the variables used in this study and concluded that there was a significant causal relationship between exports and gross domestic product and hence fiscal policies. The study recommended that fiscal policies had a significant influence on the output growth of the Nigeria economy.

Nworji et al (2012) examined the effect of public expenditure on economic in Nigeria for the period 1970 – 2009. The study analyzed the effect of public government spending on economic in Nigeria based on time series data on variables considered relevant indicators of economic growth and government expenditure using OLS multiple regression model based Nigerian time series data on gross domestic product (GDP), and various components of government expenditure. The study showed that capital and recurrent expenditure on economic services had insignificant negative effect on economic growth during the study period. Also, capital expenditure on transfers had insignificant positive effect on growth. But capital and recurrent expenditures on social and community services and recurrent expenditure on transfers had significant positive effect on economic growth. Consequently, the study recommended more allocation of expenditures to the services with significant positive effect.

Oseni and Onakoya (2012) 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.

Sikiru and Umaru (2012) investigated the impact of fiscal policy on economic growth in Nigeria. Annual data covering 1977 – 2009 were utilized. Unit roots of the series were examined using the Augmented Dickey-Fuller technique after which the cointegration test was conducted using the Engle-Granger Approach. Error-correction models were estimated to take care of short-run dynamics. The study found that productive expenditure positively impacted on economic growth during the period of coverage and a long-run relationship exists between them as confirmed by the cointegration test and recommended the improvement in government expenditure on health, education and economic services, as components of productive expenditure, to boost economic growth.

Vincent et al (2012) investigated the relationship between fiscal deficits and economic growth. Although macroeconomic theory postulates that fiscal deficits stimulate economic growth, empirical research has been less conclusive about this relationship and adopted a modeling technique that incorporates cointegration and structural analysis. The results indicated that (i) fiscal deficit affects economic growth negatively, with an adjustment lag in the system; (ii) a one percent increase in fiscal deficit is capable of diminishing economic growth by about 0.023 percent; and (iii) there is a strong negative association between government consumption expenditure and economic growth.

In summary, all the empirical studies reviewed focused on either the relationship between fiscal policy or fiscal policy variables and growth. None of these studies focuses on the effect of fiscal policy on sectoral output in Nigeria. This study intends to fill this vacuum.

3. Data and Methodology

3.1 Data and Data Sources

The study employed annual secondary time-series data on fiscal policy variables (such as productive government expenditure, distortionary taxes, fiscal deficit and non-distortionary taxes) since these fiscal policy variables contribute to growth in Nigeria (Oseni and Onakoya, 2012) and activity sectoral output (such as agriculture, industry, building and construction, wholesale & retail trade and services) from 1981 to 2011. The data are obtained from Central Bank Statistical bulletin for various years up to 2011.

3.2 Model Specification

Theoretically, this study adopted endogenous growth model framework in line with 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), Yasar et al (2006), Akinlo (2012) and Oseni and Onakoya (2012). Thus, since the study examined the empirical relationship between fiscal policy and sectoral output, the model is specified as follows in linear form:

$$\sum_{i=1}^{5} \boldsymbol{y}_{it} = \boldsymbol{a}_0 + \sum_{i=1}^{4} \boldsymbol{X}_{it} + \varepsilon_{it} \qquad 1$$

Where $\boldsymbol{y}_{it}$ is a vector of sectoral output at time t, $\boldsymbol{a}$ is the vector of the set of intercepts connecting both dependent and independent variables, $\boldsymbol{X}_{it}$ is a vector of fiscal variables at time t and ε_{it} is the vector of disturbance term at time t.

Let

$$\boldsymbol{y_{it}} = f(agr_t, ind_t, bc_t, wr_t, ser_t) \qquad 2$$

$$\boldsymbol{X}_{it} = f(pexp_t, dist_t, ndist_t, fis_t) \qquad 3$$

Substituting equations 2 and 3 into equation 1 above, we have the following sectoral output equations:

$$Lnagr_t = \beta_{11} + \beta_{12}Lnpexp_t + \beta_{13}Lndist_t + \beta_{14}Lnndist_t + \beta_{15}fis_t + \varepsilon_{11} \quad 4$$

$$Lnind_t = \beta_{21} + \beta_{22}Lnpexp_t + \beta_{23}Lndist_t + \beta_{24}Lnndist_t + \beta_{25}fis_t + \varepsilon_{21} \quad 5$$

$$Lnbc_t = \beta_{31} + \beta_{32}Lnpexp_t + \beta_{33}Lndist_t + \beta_{34}Lnndist_t + \beta_{35}fis_t + \varepsilon_{31} \quad 6$$

$$Lnwr_t = \beta_{41} + \beta_{42}Lnpexp_t + \beta_{43}Lndist_t + \beta_{44}Lnndist_t + \beta_{45}fis_t + \varepsilon_{41} \quad 7$$

$$Lnser_t = \beta_{51} + \beta_{52}Lnpexp_t + \beta_{53}Lndist_t + \beta_{54}Lnndist_t + \beta_{55}fis_t + \varepsilon_{51} \quad 8$$

Putting the above sectoral output equations in a conical form we have:

$$\begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} & \beta_{25} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} & \beta_{35} \\ \beta_{41} & \beta_{42} & \beta_{43} & \beta_{44} & \beta_{45} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & \beta_{55} \end{bmatrix} \begin{bmatrix} 1 \\ Lnpexp_t \\ Lndist_t \\ Lnndist_t \\ fis_t \end{bmatrix} + \begin{bmatrix} \varepsilon_{11} \\ \varepsilon_{21} \\ \varepsilon_{31} \\ \varepsilon_{41} \\ \varepsilon_{51} \end{bmatrix} = \begin{bmatrix} Lnagr_t \\ Lnind_t \\ Lnbc_t \\ Lnwr_t \\ Lnser_t \end{bmatrix} \quad 9$$

Equation 9 was estimated using multivariate cointegration as propounded by Johansen & Juselius (1990; 1992) in order to establish the long run relationship between fiscal policy and sectoral output in Nigeria.

4. Empirical Result

The results of the time-series properties were presented in Table 1 using Augmented Dickey Fuller Test (ADF). It shows that all the variables except the distortionary variable were stationary at first difference which was stationary at level. This indicated that these variables were I(1) series except distortionary tax which was I(0). Prior to the estimation of the main model it is necessary to check 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.

The results of λ – maximum and the trace tests are reported in Table 2a and 2b. The results showed that the null hypothesis of no cointegration relationship can be rejected at 5 percent level using either λ – maximum and the trace statistics. The trace test suggests two cointegrating vectors for agricultural sector, building and construction, industry and service while three cointegrating vectors for wholesale and retailer sector. Also, the λ – maximum test suggests two cointegrating vectors for agricultural sector, building and construction, and wholesale and retailer while three cointegrating vectors for industry and service sectors. This simply means that long-run relationship exists among the five sub-sectors and fiscal policy variables. The result suggests that fiscal policy variables and sub-sectors could not have moved too far away from each other, thereby displaying a co-movement phenomenon for fiscal policy variables and sub sectors in Nigeria over the sampled periods.

The cointegrating vectors (normalized coefficients to determine the impact of fiscal policy variables on sectoral output) are as shown in Table 3. The coefficients of the variables imply the elasticities of the variables, since all the variables are in logarithms. Some general observations are perceptible from the results in Table 3. One, it is attention-grabbing to notice that fiscal policy-sectoral output relationships can be either negative or positive. The coefficient of distortionary tax is positive in all the sectors but insignificant in industrial sector. This implies that the income and profit taxes in this sector have no significant impact on the growth of this sector. Also, the coefficient of non-distortionary taxes such as benefits, grant and pension are negatively signed and statistically significance at 1 percent in all sectors.

This shows that non-distortionary taxes in Nigeria have really helped in fostering the growth of the nation.

In addition, the coefficient of fiscal deficit has negative impact on all the sectors except agricultural sector. This shows that the use of deficit financing has helped agricultural sector to grow in the country. The coefficient of productive expenditure has positively impacted on all the sectors except the building & construction sector which has a negative relationship with productive expenditure. This indicates that the entire money channel to this sector has not been used effectively for the growth of the sector.

As argued by Engle and Granger (1987), cointegration variables must have an error correction representation whereby an error correction term is incorporated into the model. Essentially, such a formulation helps to reintroduce the information lost in the process of differencing and thus allowing for long-run equilibrium as well as short run dynamics. Therefore, a Vector Error Correction Model was formed and estimated to determine the short run relationship between fiscal policy variables and sectoral output in Nigeria. Table 4 presents the estimated results of ECM. Each of the error correction terms is negative and statistical significance at 5 percent level. The significance of ECM indicates the existence of short-run dynamics between fiscal policy and sectoral output in Nigeria.

5. Conclusion

This paper has examined the impact of fiscal policy on sectoral output in Nigeria. The study employed secondary annual time-series data from 1981 to 2011. The data obtained were analyzed using multivariate cointegration analysis via Johansen & Juselius (1990; 1992) method of analysis. The evidence from estimated econometric model suggests that the variables included are stationary at first differences. Hence, they are integrated of order one. The Johansen cointegration test shows that there is cointegration and hence, confirmed the existence of long run equilibrium relationship between the fiscal policy variables and sub sectors included in the model. This implies that the fiscal policy variables included in the model and the economic sectors tend to move together in the long run. The impact of fiscal policy on sectoral output in Nigeria has revealed by the normalized cointegrating coefficients indicates that each fiscal policy variable has different impact on each sectors has shown in Table 3.

For a policy perspective, the finding that the fiscal policy and five economic sectors are co-integrated is an indication that fiscal policy impacted on sectoral output. However, to ensure a continuous and better growth in the economy, there is need to increase allocations towards the development of the five economic sectors most importantly agricultural and industrial sectors. Also, in order to reduce the massive corruption in these sectors, there is need to deregulate the sector to allow the private initiatives. In addition, government should adopt the system of project monitoring for any contract awarded either to individual or corporate body to reduce waste in productive expenditure.

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Table 1: Unit Root Test Results

Variables	***Augmented Dickey Fuller (ADF)***		
	Level	**1st Diff.**	**Order of Integration**
DIST	-3.98*	-4.35*	I(0)
FIS	-1.84	-5.63*	I(1)
NDIST	-0.82	-9.15*	I(1)
PEXP	1.55	-3.50**	I(1)
AGR	-0.85	-3.76*	I(1)
BC	1.09	-4.02*	I(1)
IND	-1.28	-4.66*	I(1)
SER	-0.65	-4.55*	I(1)
WR	-0.37	-3.53**	I(1)

Note: ** (*) shows 5 %(1%) significance level
Source: Computed by the Authors, 2013

Table 2a: Johansen Maximum Likelihood Test for cointegration (Trace Test)

Hypotheses	**Trace test**					**5% Critical values**
	AGR	**BC**	**IND**	**SER**	**WR**	
R = 0	135.84	155.60	116.21	125.66	137.00	69.82
R ≤ 1	63.34	84.80	65.62	63.53	61.65	47.86
R ≤ 2	28.20	28.48	29.10	28.96	31.82	29.80
R ≤ 3	9.16	12.43	5.40	7.27	13.31	15.49
R ≤ 4	0.03	0.00	1.65	0.54	0.06	3.84

Source: Computed by the Authors, 2013

Table 2b: Johansen Maximum Likelihood Test for cointegration (Max-Eigen Statistic)

Hypotheses	λ - maximum					5% Critical values
	AGR	BC	IND	SER	WR	
R = 0	72.50	70.80	50.58	62.13	75.34	33.88
R ≤ 1	35.14	56.32	36.52	34.57	29.83	27.58
R ≤ 2	19.04	16.05	23.71	21.69	18.51	21.13
R ≤ 3	9.12	12.43	3.74	6.72	13.25	14.26
R ≤ 4	0.03	0.00	1.65	0.54	0.07	3.84

Source: Computed by the Authors, 2013

Table 3: Normalized cointegrating vector; coefficients normalized on Fiscal Policy Variables

	Fiscal Policy Variables			
Sectors	DIST	NDIST	FIS	PEXP
AGR	0.999	-0.688	49.593	10.077
1.000	(2.596)**	(-3.624)*	(14.757)*	(2.263)**
BC	0.166	-0.130	-1.587	-0.251
1.000	(14.395)*	(-23.639)*	(-15.772)*	(-1.852)**
IND	0.148	-1.419	0.261	0.741
1.000	(1.071)	(-7.819)*	(1.186)	(2.175)**
SER	0.812	-1.130	-9.750	0.518
1.000	(10.385)*	(-30.142)*	(-14.003)*	(0.534)
WR	0.861	-1.526	-14.043	1.667
1.000	(7.804)*	(-28.833)*	(-14.665)*	(1.278)

Note: The t ratios are in parenthesis

Table 4: ECM regression results

Variables	Agriculture	Building & Construction	Industry	Service	Wholesale & Retailer
ECM(-1)	-0.765	-0.720	-0.521	-0.627	-0.618
	(-3.005)*	(-3.672)*	(-2.172)**	(-2.553)**	(-2.141)**
Constant	-9.215	-3.447	10.093	4.930	10.170
	(-2.237)	(-0.925)	(3.199)	(1.878)	(2.528)
ΔDIST	0.236				
	(2.142)**				
ΔDIST(-1)		-0.002			
		(-0.029)			
ΔDIST(-2)			-0.192	-0.119	-0.290
			(-1.338)	(-1.802)	(-2.303)**
ΔNDIST(-1)	0.510	0.247	0.816	0.375	0.533
	(2.456)**	(1.668)	(2.872)*	(3.490)*	(2.842)*
ΔPEXP	1.027				
	(2.294)**				
ΔPEXP(-1)		1.463			
		(2.238)**			
ΔPEXP(-2)		-1.151	-1.029	-0.514	-0.023
		(-2.324)**	(-3.196)*	(-1.958)	(-2.621)**
Adj. R2	0.991	0.993	0.986	0.997	
F-statistic	437.227*	501.341	335.367	1550.467	
AIC	-0.140	-0.355	0.534	-1.234	
Durbin-Watson	2.072	1.722	2.371	1.924	

Note: ** (*) represents 5% (1%) significance level
The t ratios are in parenthesis.
Source: Computed by the Authors, 2013