PUBLIC FINANCE INSTRUMENTS AND OUTPUT GROWTH IN NIGERIA

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Abstract

This study investigates the empirical relationship between the aggregated and disaggregated components of fiscal policy variables and output growth in Nigeria using the vector error correction mechanism for the period of 1981 to 2021. This formulation was an improvement over previous empirical studies of the impact of public finance instruments on output growth in Nigeria. Our findings suggest that fiscal policy instruments (total expenditure, capital expenditure, recurrent expenditure, total revenue, primary fiscal balance, domestic debt, external debt, oil tax revenue, and non-oil tax revenue) exert significant impacts on output growth and most of the empirical results obtained support the hypothesised relationships between public finance instruments and output growth in Nigeria. However, aggregate federal government expenditure exerts a significant negative impact on output growth, while on the disaggregated scale, capital expenditure exerts a significant positive influence on output growth whereas recurrent expenditure exerts a significant negative impact on output growth. Given these findings, we recommend that the government of Nigeria, through its fiscal authorities, should adopt growth-enhancing fiscal policies that would engender macroeconomic stability and will be potent in refocusing recurrent expenditure towards ensuring productivity growth.

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Introduction

The role of fiscal policy in augmenting and stimulating the productive capacity of both developing and developed economies cannot be emphasised enough. This is because a myriad of economic research has identified fiscal policy as one of the most effective tools to smoothen the cyclical behaviour of key economic aggregates in the economy, and nations cannot enjoy sustainable macroeconomic stability without fiscal policy. The fiscal positions of Nigeria's government influence its growth experience. For instance, according to the Central Bank of Nigeria (CBN) economic report for 2011, the total federally – collected revenue rose by 52.2 per cent to ₦11, 116.9 billion in 2011 and constituted 31.4 per cent of the gross domestic product. In a related development, the fiscal operation of the government remained constrained in the fourth quarter of 2022 as a result of the low level of crude oil exports and the rising cost recovery payments. For the same period, aggregate expenditure fell for the third consecutive quarter, declining by 18.8 per cent and 47.6 per cent. However, total public debt at ₦46,250.37 billion (or 23.2% of GDP) in end-December 2022 remained within the statutory threshold, but it was observed that the economy rebounded in 2021, thus, reverting the COVID-19 induced contraction in 2020 with the real GDP growth of 3.4 per cent. This growth was largely driven by the performance of the non-oil sectors, particularly the service and agricultural sectors, which contributed 2.9 per cent points and 0.6 per cent points to overall growth in the nation's output respectively.

There is little or no empirical evidence about the macroeconomic effects of key fiscal policy instruments (and their disaggregated components) in Nigeria. An expansive theoretical and empirical literature audit has revealed that the nexus between fiscal policy instruments and economic growth has not been settled in the standard neoclassical model. This is not surprising because fiscal variables like government expenditure, taxation, and debt exhibit negligible impacts on economic growth in the long run. It was also established from the review of related and relevant extant literature that public expenditure, tax

revenue, and debt were considered as a whole, whereas the distinct components (that is, recurrent- and capital expenditures; and oil taxes and non-oil taxes; and domestic – and external debts) are likely to have different effects on output. For example, in most economies, recurrent federal government expenditure might have large short-term effects, while federal government capital expenditure may have a more substantial impact in the long run. Also, the different components of taxes and debts are likely to influence output differently since they differ in terms of nature and severity. Unlike most previous studies (for example, Aregbeyen, 2006; Ukwueze, 2015; and Abubakar, 2016), we employed the disaggregated components of public finance variables, and thus we can disentangle the effects of the components and empirically investigate their impacts on output, which may operate in opposite directions. In addition, the present study analytically assessed issues relating to the appropriate scope, nature, and conduct of fiscal policy in the context of macroeconomic factors by disentangling the complex interactions among the different components of fiscal policy instruments, taking into account the likely reverse causation between key fiscal variables and growth. This provides a novel pathway for this present study. However, in this study, we present a new empirical audit of the long-run impacts of the aggregated and/or disaggregated components of fiscal variables on the output growth rate in Nigeria.

The rest of the paper is structured as follows. Section 2 describes the relevance of fiscal data as they relate to output growth rate. Section 3 is the literature review. Section 4 is the methodology. Section 5 analyses, presents and discusses the results. The conclusion and recommendations are found in the last section.

Background Issues Related to Fiscal Policy and Growth of Output in Nigeria: 1985 – 2020

Table 1 shows the trend of critical public finance variables in Nigeria from 1985 to 2020. The total federal government expenditure has been on a rising trend from 1985 to 2020. For instance, it increased from as low as ₦13 billion in 1985 to about ₦ 1919.70 billion in 2005 and further grew to ₦ 10232.70 billion in 2020. It is evident that recurrent expenditure represents the largest share of total expenditure from about ₦ 7.60 billion in 1985 to about ₦ 3109.40 billion in 2010 and rose significantly to ₦ 8188.00 billion in 2020, while capital expenditure (or public investment) experienced a rise during the sample period from ₦ 5.50billion in 1985 to ₦ 1614.90 billion in 2020, and this was considerably lower than that of current expenditure.

On the revenue side, the total federally collected revenue grew from about ₦ 15.10 billion in 1985 to about ₦ 9276,10 billion in 2020. However, this revenue growth is not sufficient to accommodate the geometric growth in public expenditure during the period under consideration. Notably, oil tax revenue contributed very significantly to the country's revenue stance during the period compared to that of non-oil tax revenue. For instance, oil tax revenue contributed about ₦ 6.71 billion to the government's revenue in 1985, as opposed to the non-oil tax revenue of about ₦ 1.00 billion in the same year. In the wake of the democratic era in 2000, the oil tax revenue contributed a substantial sum of ₦ 334.50 billion to the federation account, compared to the ₦ 53.30 billion non-oil tax revenue and in 2020, oil tax revenue rose to about ₦ 1516.98 billion and non-oil tax revenue rose steadily above oil tax revenue, amounting to ₦ 1533.11 billion in 2020.

On the overall budget balance, it is observed that the government operates a deficit budget fueled by an expansionary fiscal policy adopted. For instance, the overall government budget balance in 1985 was about -1.6 as a percentage of GDP grew to -4.50 in 1990, and later witnessed an increase in 2000 to the tune of -1.50 per cent of the GDP, and then decreased further to -0.70 per cent of the GDP in 2005. However, it later rose to an all-time high of -4.00 per cent of GDP in 2020.

On the debt side, domestic debt represents the bulk of the government's total debt stock in 1985 when compared to the share of the government's external debt of the overall total debt in the same year. The country's domestic debt was about ₦ 27.94 billion in 1985 compared to the ₦ 17.30 billion external debt contracted the same year. However, external debt stock rose from about ₦ 298.91 billion in 1990 to the tune of ₦ 3097.38 billion in 2000, while domestic debt rose from ₦ 84.09 billion in 1990 to about ₦ 898.26 billion in 2000. The growth of external debt far outweighs that of domestic debt in the said period. Again, domestic debt rose from about $4551.82 billion in 2010 to ₦ 16023.89 billion in 2020,

while external debt had a decrease of about ₦ 689.84 billion in 2020 from about ₦ 2695.07 billion in 2005, but later rose significantly to ₦ 12705.62 billion in 2020.

Table 1: The Fiscal Policy Instruments in Nigeria, - Fiscal Data (₦ Bn)

Public Finance Instruments	1985	1990	1995	2000	2005	2010	2015	2020
Total Public Exenditure[1]	13.00	60.30	248.80	701.10	1919.70	4194.60	4988.90	10232.70
Current Expenditure[1]	7.60	36.20	127.60	461.60	1321.30	3109.40	3831.90	8188.80
Public Investment[1]	5.50	24.00	121.10	239.50	519.20	883.90	818.40	1614.90
Federal Collected Revenue[1]	15.10	98.10	460.00	1906.20	5547.50	7303.70	6912.50	9276.10
Oil Tax Revenue[2]	6.71	26.91	42.86	334.50	1352.20	1480.36	1289.96	1516.98
Non-Oil Tax Revenue[2]	1.00	2.99	21.88	53.30	170.20	666.13	1408.43	1533.11
Overall Budget Balance(%GDP[1]*)*	-1.60	-4.50	-	-1.50	-0.70	-2.00	-1.60	-4.00
Domestic Debt[1]	27.94	84.09	477.73	898.26	1525.91	4551.82	8836.99	16023.89
External Debt[1]	17.30	298.91	716.87	3097.38	2695.07	689.84	2111.51	12705.62

Source: [1] CBN Statistics, 2022 and [2]PRS Department FIRS, 2022

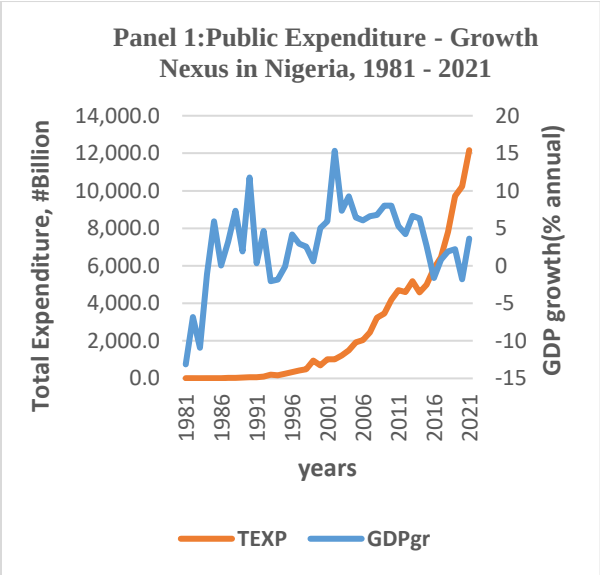
Figure 1 illustrates the interactive behaviour between fiscal instruments and output growth in Nigeria from 1981 to 2021. Panel 1 shows the relationship between aggregate expenditure and output growth; Panel 2 examines the interactions between total government revenue and output growth; Panel 3 shows the relationship between overall budget balance and output growth; Panel 4 examines the relationship between domestic debt and output growth, while Panel 5 analyses the relationship between external debt and output growth in Nigeria during the period under consideration.

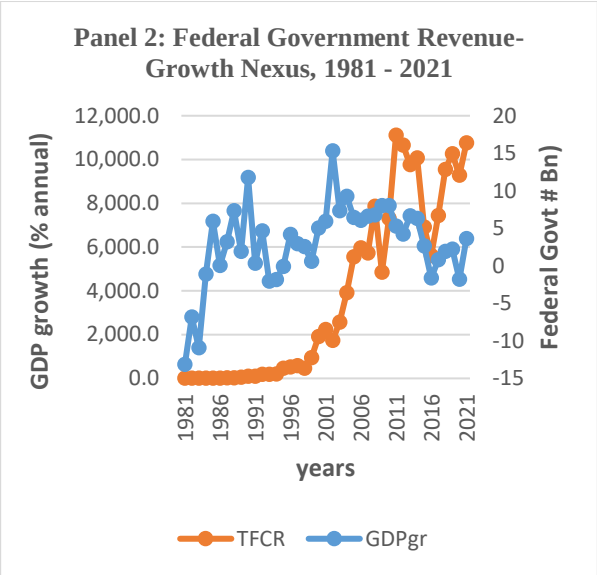
From Panel 1, it is evident that public expenditure increased substantially over the sample period (1981 through 2021), while output growth fluctuated around the rising trend of public expenditure. For instance, output grew significantly around 2021 but declined overwhelmingly between 2016 and 2018. This decline may not be unconnected with the economic recession that affected the country during that period. Output rose slightly in 2021 after the incidence of the COVID-19 pandemic.

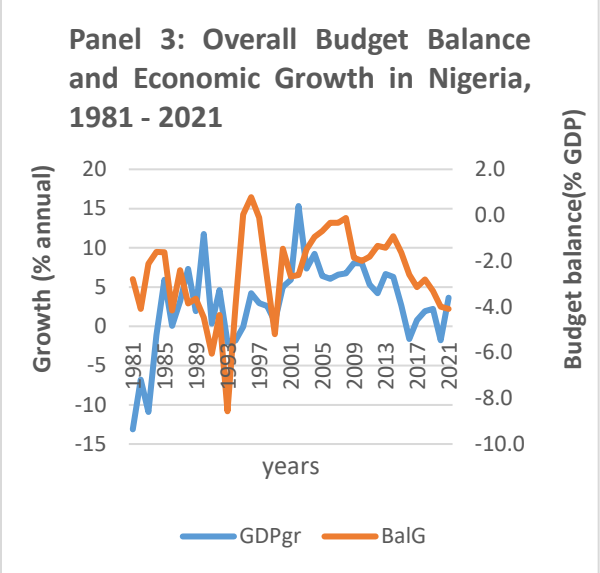
In Panel 2, it is observed that federal government revenue rose significantly from 1981 until 2006, and then fell slightly before rising again until 2015. However in the wake of 2016, there was a huge drop in revenue, and this was in sync with a corresponding drop in the growth rate of output between 2016 and 2017. This may be attributable to economic recession and the global financial crises witnessed during the said period. The noticeable decline in revenue and output growth in the last quarter of 2019 and early 2020 may not also be unconnected with the economic consequences of the COVID-19 pandemic.

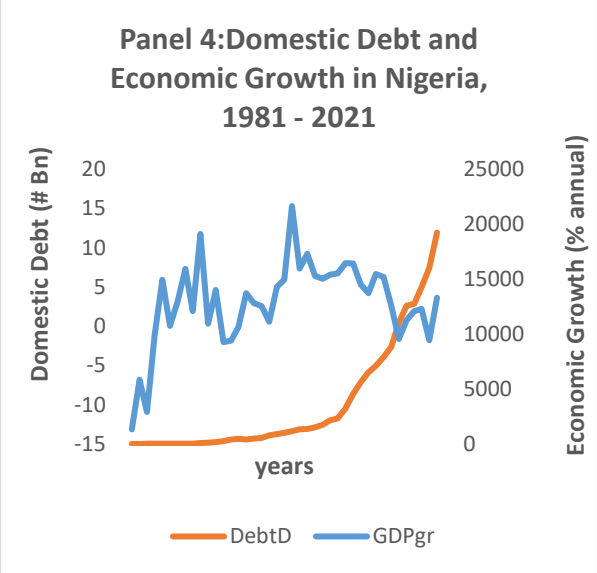
In Panel 3, there are noticeable fluctuations and cyclical oscillations between the overall budget balance and output growth. This is visible with the negative budget balance (i.e., budget deficit) evident in 1985, 1990, 2000, 2005, 2010, and 2020 respectively. The incidents of dwindling growth experiences coincide with these trends.

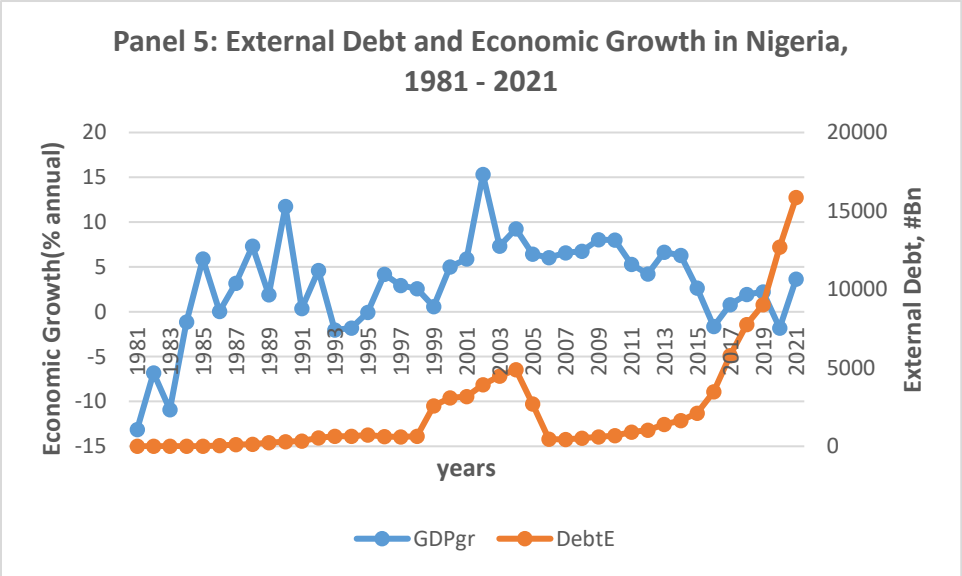
In a similar development, in Panel 4, domestic debt increased substantially over the sample period (1981 to 2021), with a corresponding increase or decrease in output growth. In Panel 5, there are expansive surges in external debt, especially from 2005 to 2021 with a relatively slow output growth.


Panel 1:Public Expenditure - Growth Nexus in Nigeria, 1981 - 2021
Total Expenditure, #Billion
GDP growth(% annual)
years
TEXP
GDPgr


Panel 2: Federal Government Revenue-Growth Nexus, 1981 - 2021
GDP growth (% annual)
Federal Govt # Bn)
years
TFCR
GDPgr


Panel 3: Overall Budget Balance and Economic Growth in Nigeria, 1981 - 2021
Growth (% annual)
Budget balance(% GDP)
years
GDPgr
BalG


Panel 4:Domestic Debt and Economic Growth in Nigeria, 1981 - 2021
Domestic Debt (# Bn)
Economic Growth (% annual)
years
DebtD
GDPgr



Review of Literature

Empirical literature review

The impact of government spending on economic growth cannot be downplayed, and numerous researchers have conducted extensive theoretical and empirical studies to unravel the relationships between aggregated (or disaggregated) government expenditure and economic growth. For instance, Oyinola and Akinnibosun (2013) and Aluthge, Jibir, and Abdu (2021) investigate the impact of the government disaggregated components of Nigeria's economic growth. Both studies employed the autoregressive distributed lag methodology. Oyinola and Akinnibosun found a positive and significant impact of capital expenditure on economic growth, while recurrent expenditure exhibited a negative and insignificant influence on output growth in both the short and long run. Aluthge, Jibir, and Abdu's study show that capital expenditure exerts a positive and significant effect on economic growth compared to recurrent expenditure which shows a negative and insignificant influence on output growth. These studies stand out by employing the structural break-controlled ARDL model to address the issues of likely structural breaks within the period of the study, such as the Structural Adjustment Programme of 1986; the 2008/2009 global economic crisis; and the oil boom of both 1970, and 2010 to 2014, etc. Both studies conclude that government capital expenditure exerts a positive and stronger influence on Nigeria's economic growth than recurrent expenditure, suggesting a need to further boost the budgetary allocations to capital investment to enhance the country's growth experience. The findings of the significant positive impact of capital expenditure on economic growth and the negative impact of recurrent expenditure on economic growth were also corroborated by the study of Awode and Akpa (2018) and Onifade, Cevik, Erdogan, Asongu and Bekun (2020). However, Devarajan and Swaroop (1996), find that capital expenditure exerted a significant negative impact on output growth while recurrent expenditure exerted a significant positive impact.

Some studies in Nigeria have paid extensive attention to the empirical assessment of the long-term determinants of government expenditure (as a key fiscal policy instrument) on the country's economy. Notable among them are the works of Aregbeyen and Akpan (2013), Aregbeyen (2006), and Ukwueze (2015). Aregbeyen and Akpan (2013) provide a critical analysis of the long-term determinant of the growing trends of government spending in Nigeria by employing a single equation estimation approach for the periods of 1960 to 2010. The study reveals that the inflows of foreign aid remain a strong factor that may be attributable to the enormous growth of government recurrent expenditure at the expense of capital spending. The other factors identified to have significantly contributed to the expansion in the aggregate government expenditure include rising urban population, debt servicing charges, etc. In addition, Aregbeyen (2006) examines the validity of Wagner's law against the contending Keynesian proposition in the context of the Nigeria economy from 1970 to 2003 using the cointegration and

causality econometric approach and the study confirms the validity of Wagner's law, indicating that unidirectional causality runs from national income to total public expenditure and that a bi-directional causality exists between non-transfer public expenditure and national income. In a related development, Ukwueze (2015) examines the determinants ovf the size of public expenditure in Nigeria by employing the short-run error correction model and long-run static equation. The empirical findings of the study show that the size of revenue and growth rate of national income and private investment significantly influence the size of public expenditure both in the short – and long runs. Also, Okpabi and Ijuo (2021) and Umeh, Ezudike, and Anyaegbunam (2022) examine the impact of government expenditure on economic growth in Nigeria, employing error correction mechanisms. The former ascertained from their empirical study that total government expenditure has a positive and significant impact on economic growth in the long run while negative and insignificant impacts were noticed in the short run. Umeh, Ezudike, and Anyaegbunam's findings reveal a bi-directional impact between government expenditure and economic growth. These studies are expansive and intriguing because they examine the multi-dimensional influence of varying fiscal policy instruments on output growth in Nigeria.

In terms of the impact of federal government revenue on economic growth in Nigeria, Onoja and Ibrahim (2021) studied the relationship between tax revenue and economic growth between 2003 and 2017 using a multivariate ordinary least square estimation technique. Their study reveals that tax revenue components like the petroleum profit tax and the value-added tax exert a positive and significant impact on economic growth in Nigeria. In a related study, Dauda, Alege, Ewetan, and Asemota (2023) analysed the relationship between oil revenue and sustainable economic growth in Nigeria from 1981 to 2021, employing the Granger causality test and the error correction mechanism. From their empirical findings, the study reveals that there are bi-directional causality between oil revenue and economic growth in Nigeria. In terms of the effect of non-oil revenue on economic growth in Nigeria, Adegboyo, Ajoje, and Agu (2023) assessed the impact of non-oil revenue on Nigerian economic growth from 1981 to 2021 employing the autoregressive distributed lag estimation technique, and their study revealed that mining revenue, agricultural revenue, manufacturing revenue, and the value-added taxes contribute positively and significantly to economic growth in Nigeria within the period under consideration.

Numerous studies have empirically evaluated the effects of fiscal policy instruments and the growth of countries' output. Among these studies are those of Tanzi and Zee (1997), Buffie (1992), and Ramos and Roca-Sagales (2008).

Tanzi and Zee (1997) empirically investigated the relationships between fiscal policy instruments (like public expenditure, taxation and aggregate budgetary balance) and long-run growth, and the study revealed that fiscal policy plays critical roles in affecting the long-term growth experiences and performances of countries.

Buffie (1992) assessed the short and long-run effects of fiscal policy by developing a dynamic, dual-economy general equilibrium model. The empirical outcomes from the study show that relatively high prices for publicly produced intermediate input and cutbacks in public spending on social infrastructure will retard the growth in the aggregate output (this may result from a reduction in private investment, real wages, and the share of the labour force).

Ramos and Roca-Sagales (2008) provide an expansive empirical investigation of the long-term impact of fiscal policies on the size and distribution of output in the United Kingdom, employing the Vector Autogressive (VAR) model. The study reveals that the long-term impact of GDP on increasing public spending and taxes is negative and especially strong in the case of current expenditure.

Apart from public expenditure as a fiscal policy instrument, Abubakar (2016) used the SVAR to analyse the dynamic effects of fiscal policy on output in Nigeria and his study reveals that government revenue exerts a significant positive impact on output growth. These studies collectively show the importance of fiscal policy instruments in shaping countries' long-term growth trajectories compared to some other macroeconomic variables.

Theoretical review

There is a need to examine the theoretical link between public finance variables and economic growth because fiscal policy variables exhibit negligible impacts on the rate of capital accumulation. The starting point of this theoretical nexus lies in the standard Keynesian perspective and the Neoclassical paradigm about the growth effects of fiscal policy. The former believes that fiscal policy should act in a stabilising manner and that fiscal policy should be countercyclical and assist the economy in adjusting to fluctuations, while the latter hinges its perspective on the tax-smoothing models – that fiscal policy should remain neutral over the business cycle, and stipulates that fiscal policy should be desirous of minimising possible distortions in the economy, also that the endogenous growth model asserts that investments in human capital, innovation, and knowledge are significant contributors to economic growth, and these investments are driven by either private or public expenditures. Arising from the aforesaid, several authors have adapted these perspectives with empirical evidence. For instance, Cashin (1995) modified an endogenous growth model to incorporate the effect of public investment (or capital government expenditure), public transfers, and discretionary taxation on the growth rate of the economy. This modified endogenous growth model addresses the growth-enhancing effect of capital expenditure and transfer payments, while also considering the growth-inhibiting influence of levying distortionary taxes to finance public investments. The position taken by the modified endogenous growth model slightly contradicts those of the standard neoclassical model, which does not account for the strategic role of government in enhancing economic growth. Interestingly, the modified endogenous growth model by Cushin (1995) gained momentum from the studies by Easterly (1989 and 1990), Barro, 1990, and Barro and Sala-i-Martin, (1992) and (1995).

The various components of key fiscal variables like expenditure, taxation, and debt are likely to have different effects on economic growth. Therefore, there is a need to discuss the theoretical model that addresses the link between these components and economic growth. For example, Devarajan, Swaroop, and Zou (1996) examine the theoretical nexus between the composition of public expenditure and economic growth. They assume that a typical aggregate production function has three arguments: private capital stock and two types of government spending (that is, productive expenditure and unproductive expenditure). The postulated model was empirically tested using data from forty-three developing countries over twenty years. Their findings reveal that an increase in the share of current expenditure has a positive and statistically significant growth effect, and in a related development, the relationship between capital government spending and per capita growth is negative. However, following the understanding derived from Barro's (1990) discussion of government spending in a simple model of endogenous growth, it is assumed that the government finances the various forms of government expenditure by levying a flat-rate income tax. Hence, in the study the growth implications of fiscal variables are closely related, therefore, it can be discussed jointly in the present study. Establishing the nexus between each of these fiscal policy instruments and the growth of the Nigerian economy does not imply that they are independent of each other.

Methodology

The model specifications for this study are rooted in the modified endogenous growth model that addresses both the growth-enhancing effect of public expenditure and the growth-inhibiting effect of the levying of distortionary taxes. Following Barro (1990), Easterly (1989 and 1990), Barro and Sal-i-Martin (1992and 1995), Cashin (1995), and Devarajan, Swaroop and Zou (1996), as well as other relevant empirical literature on the interrelationships among fiscal variables and output growth, various empirical models are selected for this study. The choice of the various empirical models adopted for this present study is strongly rooted in econometric frameworks that take into account the estimation of the medium-and long-term impacts of public policy, with the sets of assumptions that justify the nature of the contemporaneous relationships (if any) among the various operational variables. The methodological issues for this study are provided in the different subsections below.

Vector Autoregressive (VAR) / Vector Error Correction (VEC) Models

This study adopted the VAR models as the most appropriate and adequate model for this study because: they are efficacious in accommodating the dynamic feedback between fiscal variables and growth as well as their respective effects on other variables; they can resolve the endogeneity bias and reverse causation challenges resulting from the interrelationships among output, public expenditure, budget balance and tax revenue; and they are not too demanding on data, most especially when considering the macroeconomic effects of fiscal policy like in the case at hand (Capet, 2004; Kamps, 2005; Marcellino, 2006; Perotti, 2004 & 2005). The use of this methodology in the present study stands out from its applications by previous authors because of its expansive evaluations of the time path of the various shocks on the variables, and the critical analysis of the proportion of movement in a sequence that occurs due to the own shocks versus those of the public finance instruments – apportioning forecasting errors for output growth and those of the other fiscal variables and control variables alike. The various estimates of the influence of fiscal instruments/variables are based principally on the impulse response functions supported by forecast error variance decomposition, both of which are derived from VAR/VEC estimates. In the present study, we consider the effect of the growth rate of output of a one-off and one percentage point shock in fiscal variables over a 10-year horizon. It is noteworthy that in the present study, we determine the order of integration of the variables, and the test was undertaken with the augmented Dickey-Fuller (ADF) test. The optimal number of lags was selected according to the Akaike Information Criterion (AIC) test, and by extension, the Johansen Cointegration test was conducted to ascertain the long-run relationship among the variables of interest. As a preliminary diagnostics, we also conduct some specification tests to ascertain if the model residuals suffer from the practical and theoretical consequences of first-order autocorrelation, heteroscedasticity or non-normality.

The baseline Vector Autoregressive (VAR) and Vector Error Correction (VEC) model specifications in its reduced form is:

$$V_t = \eta_0 + \sum_{j=1}^{k} \eta_j V_{t-1} + \ell_t \quad (1a)$$

$$\Delta V_t = \pi_0 + \sum_{j=1}^{k} \pi_j \Delta V_{t-1} + \phi EC_{t-1} + \mu_t \quad (1b)$$

Alternatively, the compact form of the VEC model can be re-specified as:

$$V_t = \beta(L) V_{t-1} + \varphi EC_{t-1} + \mu_t \quad (1c)$$

β the above equation represents the matrix of coefficients for the ith lag and μ_t represents the vector that incorporates the reduced form residuals. The latter takes into account the non-zero correlations. The error term of the above equation stands other compared to those of previous models because it expresses some degrees of economic relevance of the entirety of the model b defining the linear combinations of the structural shocks in the model under consideration, hence, the innovation model is given as:

$$Z\mu_t = X_t \quad (1d)$$

Where X_t represents the vector of the shocks or impulse responses in the model, hence, $E(X_t X_t^{'}) = N$, and N being diagonal. In this study, we adopt the Cholesky decomposition method as against other decomposition methods (like generalised impulse, structural decomposition, and residual (one unit, one standard deviation) ordering to identify our systems of equations, and the ordering adopted *TEXP*, *CEXP*, *REXP*, *GDPgr*, *TFCR*, *BALG*, *OTAX*, *NOTAX*, *DEBTD* AND *DEBTE*, and these are shown in the following equations (2-10). These equations do not suggest the use of the structural vector autoregressive (SVAR) in this study because there are no imposed restrictions on our model framework by the economic theories adopted and/or adapted for this study, it is provided to emphatically showcase the time paths of the various shocks and the forecasting errors in our VAR/VEC models :

$$\mu_t^{REXP} = V_t^{REXP} \quad (2)$$

$$\mu_t^{CEXP} = a_{2,1}\mu_t^{REXP} + V_t^{CEXP} \quad (3)$$

$$\mu_t^{GDPgr} = a_{3,1}\mu_t^{REXP} + a_{3,2}\mu_t^{CEXP} + V_t^{GDPgr} \quad (4)$$

$$\mu_t^{TFCR} = a_{4,1}\mu_t^{REXP} + a_{4,2}\mu_t^{CEXP} + a_{4,3}\mu_t^{GDPgr} + V_t^{TFCR}. \quad (5)$$

$$\mu_t^{BALG} = a_{5,1}\mu_t^{REXP} + a_{5,2}\mu_t^{CEXP} + a_{5,3}\mu_t^{GDPgr} + a_{5,4}\mu_t^{TFCR} + V_t^{BALG} \quad (6)$$

$$\mu_t^{OTAX} = a_{6,1}\mu_t^{REXP} + a_{6,2}\mu_t^{CEXP} + a_{6,3}\mu_t^{GDPgr} + a_{6,4}\mu_t^{TFCR} + a_{6,5}\mu_t^{BALG} + V_t^{OTAX} \quad (7)$$

$$\mu_t^{NOTAX} = a_{7,1}\mu_t^{REXP} + a_{7,2}\mu_t^{CEXP} + a_{7,3}\mu_t^{GDPgr} + a_{7.4}\mu_t^{TFCR} + a_{7,5}\mu_t^{BALG} + a_{7,6}\mu_t^{OTAX} + V_t^{NOTAX} \quad (8)$$

$$\mu_t^{DEBTD} = a_{8,1}\mu_t^{REXP} + a_{8,2}\mu_t^{CEXP} + a_{8,3}\mu_t^{GDPgr} + a_{8,4}\mu_t^{TFCR} + a_{8,5}\mu_t^{BALG} + a_{8,6}\mu_t^{OTAX} + a_{8,7}\mu_t^{NOTAX} + V_t^{DEBTD} \quad (9)$$

$$\mu_t^{DEBTE} = a_{9,1}\mu_t^{REXP} + a_{9,2}\mu_t^{CEXP} + a_{9,3}\mu_t^{GDPgr} + a_{9,4}\mu_t^{TFCR} + a_{9,5}\mu_t^{BALG} + a_{9,6}\mu_t^{OTAX} + a_{9,7}\mu_t^{NOTAX} + a_{9,8}\mu_t^{DEBTD} + V_t^{DEBTE} \quad (10)$$

Where:

V_t denotes the vector of the endogenous variables employed for this study. In this case, they include the growth rate of gross domestic product (*GDPgr*); federal government total expenditure (*TEXP*); federal government capital expenditure (*CEXP*); federal government recurrent expenditure (*REXP*); federally collected revenue (*TFCR*); overall budget balance of the federal government (*BALG*); federal government domestic debt (*DEBTD*); federal government external debt (*DEBTE*), federal government oil tax revenue (*OTAX*) and federal government non-oil tax revenue (*NOTAX*). while V_{t-1} represents the vector of the lagged variables, η denotes the parameter coefficients in the VAR model, ℓ represents error term, π represents parameter coefficients in the VEC model, EC_{t-1} is the error correction factor in the VEC model while ϕ captures the speed of adjustment and μ_t indicating the error term in the VEC model. The inclusion of the fiscal variables into the VAR model is based on the following assumptions: public spending does not react contemporaneously to shocks to the other variables in the system; output is affected contemporaneously by shocks to public spending but does not react contemporaneously to shocks to tax revenue; and tax revenue is affected contemporaneously by shocks to all other variables in the system (Ramos & Roca-Sagales, 2008).

As a way to avoid the challenges of "omitted variable bias" we choose to use different models for the study, and the first model (Model 1) is the benchmark model, and it is the most parsimonious. It includes GDP growth rate (GDPgr), aggregate federal government expenditure (TEXP = REXP + CEXP), total federally collected revenue (TFCR), aggregate budgetary balance (BALG), overall domestic debt (DEBTD) and overall external debt (DEBTE). The second model includes GDPgr, overall government spending, disaggregated tax revenue (Oil Tax Revenue (OTAX) and non-oil tax revenue (NOTAX)), overall budgetary balance (BALG), and debt components (DEBTD + DEBTE). Model 3 includes

disaggregated expenditure (REXP and CEXP), GDPgr, TFCR, BALG, DEBTD and DEBTE, and Model 4 includes all disaggregated fiscal variables, GDPgr, and BALG.

Fully Modified Ordinary Least Squares (FMOS)

The baseline framework for the fully modified ordinary least squares (FMOLS) model is estimated based on the following co-integrated system time series model, and this econometric methodology further complements the VAR/VEC models and helps mitigate the likely challenges of endogeneity, heterogeneity, simultaneity bias, and reverse causation that may occur from the joint analysis of fiscal variables and output growth. It provides extensive empirical outcomes for the analysis of the long-run relationship among the variables in the annual time series data employed for this study (Phillips, 1993; Dritsakis et al 2017 & Pedroni, 2001). This complementary methodology is performed to check the robustness of the parameter estimates of our benchmark model. The study specified the following FMOLS model:

$$GDPgr_t = \alpha_t + \beta_i \sum_{i=1}^{n} V_t + \varepsilon_t \quad (11)$$

V_t represents the vector of explanatory variables and ε_{it} represents the error term

Data description, measurement and sources

The present study uses annual time series data for the periods that ranged from 1981 to 2021. The output growth variable (i.e., GDP growth rate) series was obtained from the Central Bank of Nigeria (CBN) statistical bulletin and expressed in real terms (at 2010 market prices in billion Naira). On the expenditure side, the total public spending was disaggregated into two major components (current and capital expenditure) and the data were obtained from the CBN statistical bulletin and measured in real terms (excluding transfers).On the revenue side, the total federally collected revenue series were obtained from the CBN statistical bulletin and expressed in billion Naira, However, the present study distinguishes oil-tax revenue from the non-oil tax revenue, and both series were obtained from Nigeria's Federal Inland Revenue Service Department for Planning, Research, and Statistics. On the debt side, the total debt stocks were divided into two broad components: domestic debt stock and external debt stock. Both series are expressed in real terms and billion Naira, and they were obtained from the CBN statistical bulletin. Lastly, the dataset for the aggregate budgetary balance (expressed as a per cent of GDP) was obtained from the CBN statistical bulletin,

Results

This subsection provides detailed empirical outputs and discussions of our estimation techniques which include the Unit root tests, unrestricted co-integration rank tests, specification tests, the VECM estimates of the various models tested, the Cholesky variance decomposition and accumulated impulse response, as well as the fully modified ordinary least squares.

Table2: Augmented Dickey-Fuller (ADF) Unit Root Test

Variables	*Levels*			*First Difference*		
	Coef.	*Critical values*		*Coef.*	*Critical values*	
	test stat.	*1%*	*5%*	*test stat.*	*1%*	*5%*
GDPgr	-2.733 (0.230)	-4.212	-3.529	-10.564* (0.000)	-4.212*	-3.530**
TEXP	-4.403 (0.9840)	-4.212	-3.529	-7.970* (0.000)	-4.211*	-3.530**
REXP	-0.672 (0.968)	-4.212	-3.530	-8.769* (0.000)	-4.212*	-3.530**
CEXP	-1.455 (0.828)	-4.205	-3.527	-6.767* (0.000)	-4.212*	-3.530**
TFCR	-0.657 (0.969)	-4.205	-3.527	-5.432* (0.000)	-4.219*	-3.533**
BALG	-3.165 (0.106)	-4.205	-3.527	-7.196* (0.000)	-4.212*	-3.530**
DEBTD	-1.645 (0.601)	-4.212	-3.530	-4.901* (0.002)	-4.212*	-3.530**
DEBTE	-1.967 (0.674)	-4.212	-3.530	-4.772* (0.002)	-4.212*	-3.530**
OTAX	-1.818 (0.674)	-4.244	-3.544	-4.363* (0.000)	-4.263*	-3.553**
NOTAX	0.656 (0.999)	-4.244	-3.544	-5.588* (0.000)	-4.253*	-3.548**

*The probability values of the t-values are in the parenthesis, and * = 1per cent significance level, and ** = 5 per cent significance level.*

The present study adopts the Augmented Dickey-Fuller (ADF) Unit root test, and the test results suggest that total federal government expenditure is stationary at level (that is, it is integrated of order zero) at both 1 per cent and 5 per cent significance levels respectively, while the other series are non-stationary at levels. However, the test results reveal that all the series (GDPgr, TEXP, REXP, CEXP, TFCR, BALG, DEBTD, DEBTE, OTAX, and NOTAX) stationary in first differences at 1 per cent and 5 per cent significance levels. Hence, we can therefore proceed to estimate a VEC model in the first differences, and these variables appeal to fundamental econometric considerations that make them qualify to be used to test for the long-run relationships among the variables, and for further time series data estimations.

Table 3: Unrestricted Cointegration Rank Test (Trace & Maximum Eigen Value)

Models	*Hypothesised number of Cointegrating Equations*	*Trace statistics*	*0.05 Critical Value*	*Prob.*	*Max. Eigen*	*0.05 Critical Value*	*Prob.*
Model 1	*None*	105.491*	95.754	0.009	42.790**	40.078	0.024
Model 2	*None*	167.207*	125.615	0.000	63.759*	46.231	0.000
	Almost 1	103.447*	95.734	0.013	41.660**	40.077	0.033
Model 3	*None*	154.364*	125.615	0.000	57.846*	46.231	0.002
	Almost 1	96.524**	95.754	0.044	-	-	-
Model 4	*None*	245.278*	159.530	0.000	93.702*	52.363	0.000
	Almost 1	151.576*	125.615	0.000	-	-	-
	Almost 2	107.260*	95.754	0.006	41.585**	40.078	0.034

** co-integrating equation(s) in each model (Probability values of the t-values are in the parenthesis, and * = 1 per cent significance level, and ** = 5 per cent significance level)*

Our emphasis on the unrestricted Johansen co-integration approach (for both trace and maximum Eigenvalues) is not unconnected with our adoption of the systems of equations. The co-integration tests were conducted across the four models and the test results reveal that long-run relationships exist among the variables in the four models but such relationships seem stronger in model 4 with the highest number

of co-integrating equations. Hence, the establishment of the convergence of the variables in the long-run further substantiates the further application of the VEC to analyse the responses of output growth to fiscal variables in Nigeria. This further showcases the reliability of our model for policymaking.

Table 4: Specification Tests (p-values)[a]

	Model 1	*Model 2*	*Model 3*	*Model 4*
*Autocorrelation***	0.291	0.844	0.861	0.325
*Heteroscedasticity****	0.649	0.292	0.414	0.526
*Normality*****[*]*	0.504	0.365	0.409	0.282

*** VEC residual serial correlation LM test (Ho: no serial correlation), **** VEC residual heteroscedasticity tests and ***** VEC residual normality tests. **Note**: the specification tests across the different models are based on the residuals from the estimation of unrestricted VAR (1)/VEC(1).*

The empirical results of the specification tests conducted for our models show that Models 1 to 4 do not seem to suffer from specification challenges. At the 5 per cent significance level, there are no observable signs of autocorrelation, heteroscedasticity or non-normality.

Table 5: VECM Estimation Results (Benchmark Model - Model 1)

Variables	*Endogenous Variables*							Diagnostics		
	Δ *TEXP*$_{-1}$	Δ *GDPgr*$_{-1}$	Δ *TFCR*$_{-1}$	Δ *BALG*$_{-1}$	Δ *DEBTD*$_{-1}$	Δ *DEBTE*$_{-1}$	*EC*$_{-1}$	*R.sq*	*Adj. R sq*	*F-Stat.*
Δ *TEXP*	-0.446** (-1.921)	-4.159 (-0.325)	0.026 (0.509)	3.404 (0.094)	-0.300 (-1.576)	0.067 (0.879)	0.406* (3.882)	0.608	0.519	6.876**
Δ *GDPgr*	4.007 (0.289)	-0.581* (-3.812)	0.120 (0.407)	0.759 (1.767)	-0.110 (-0.437)	0.121 (1.320)	-0.461* (-3.448)	0.345	0.197	12.335*
Δ *TFCR*	1.391 (1.699)	17.063 (0.378)	-1.001 (-0.548)	13.114 (1.103)	1.482** (2.205)	0.422 (1.562)	-0.819** (-2.202)	0.219	0.043	1.245
Δ *BALG*	0.006 (0.594)	-0.115** (-1.847)	0.681 (0.066)	-0.076 (-0.433)	0.004 (0.496)	0.004 (1.201)	-0.001 (-1.301)	0.182	0.016	0.986
Δ *DEBTD*	-0.311 (-1.517)	-14.963 (-1.322)	-0.088** (-1.921)	-8.272 (-0.259)	-1.105 (-0.622)	-0.069 (-1.016)	0.544* (5.886)	0.849	0.815	24.917*
Δ *DEBTE*	0.260 (0.564)	0.043 (0.002)	-0.159 (-1.553)	-44.691 (-0.624)	0.251 (0.663)	0.404* (2.654)	0.209 (1.006)	0.658	0.581	8.523**

*Figures in ( ) absolute t-values are in the parenthesis, and * = 1 percent significance level, and ** = 5 per cent significance level.*

The results of the VECM estimations for Models 1 to 4 are reported in this study. For Model 1 – the most parsimonious among the four models, the test results show the inter-relationships among aggregate fiscal variables (like aggregate federal government expenditure, total federally collected revenue, aggregate or overall budget balance, aggregate domestic debt and aggregate external debt) and the growth rate of GDP, the benchmark model empirically examine the output effects of fiscal policy, and the VECM test results reveal that aggregate federal government expenditure (TEXP), aggregate budgetary balance (BALG) and overall external debt (DEBTE) exert impacts of 4.01, 0.76, and 0.12 on the GDP growth rate, which are positive but not significant at 1 per cent and 5 per cent respectively, and total federally collected revenue (TFCR) and domestic debt (DEBTD) exert impacts of 0.12 and -0.11, where total federally collected revenue exerted positive impact, and the latter reflects negative but not significant impact. These results suggest that expansionary fiscal policy exerts a non-significant long-term effect on output growth in Nigeria. However, the impact of output growth is observed to be -0.58, it is negative and significant at 1 per cent. The other test results show the various interrelationships among GDP growth rate and fiscal variables (like, federal government expenditure, federally collected revenue, budgetary balance, domestic debt and external debt), for instance, GDP growth rate exerts impacts of -4.16 on federal government expenditure, which is negative and not significant, and output growth also exert positive effect on federally collected revenue while GDP growth rate exerts an impact of -0.12 on BALG, which is negative at 5 per cent. The coefficient of the error correction term for the output growth equation is -0.41, and it is negative - less than one and significant at 1 per cent, which is an indication that the adjustment of output growth from short-run to long-run position is moderately

rapid. The diagnostic results show that R^2 of the output growth equation is 0.345, which suggests that 34.5 per cent of the systematic change in output is accounted for by fiscal variables, and this is further validated by the F-statistics (12.34), indicating that fiscal variables have strong explanatory power in the overall models, and it is significant at 1 per cent.

Table 6: VECM Estimation Results (Model 2)

Variables	*Endogenous Variables*								*Diagnostics*		
	Δ *TEXP*$_{-1}$	Δ *GDPgr*$_{-1}$	Δ *OTAX*$_{-1}$	Δ *NOTAX*$_{-1}$	Δ *BALG*$_{-1}$	Δ *DEBTD*$_{-1}$	Δ *DEBTE*$_{-1}$	*EC*$_{-1}$	*R. sq*	*Adj. R sq*	*F-Stat.*
Δ *TEXP*	0.098	0.812	0.072	1.439	17.703	0.166	0.119	0.014	0.349	0.141	1.676
	(0.362)	(0.0430	(0.427)	(0.836)	(0.393)	(0.592)	(1.241)	(0.104)			
Δ *GDPgr*	0.003	-0.693*	-0.001	0.011	0.659	0.001	0.001	-0.002	0.453	0.278	2.589**
	(1.063)	(-4.274)	(-0.437)	(0.7630	(1.687)	(0.475)	(0.827)	(-1.343)			
Δ *OTAX*	0.559**	-3.966	-0.146	3.287**	-10.356	0.968**	0.008	-0.458*	0.368	0.165	1.817
	(1.862)	(-0.192)	(-0.789)	(1.738)	(-0.209)	(3.139)	(0.077)	(-2.993)			
Δ *NOTAX*	-0.088	4.032	0.123*	-0.054	-4.882	0.030	0.001	0.021	0.374	0.174	1.867
	('-1.560)	(1.045)	(3.564)	(-0.153)	(-0.527)	(0.527)	(0.058)	(0.735)			
Δ *BALG*	0.001	-0.168**	-0.002	0.007	-0.041	0.001	0.003	-0.001	0.201	0.015	0.786
	(0.504)	(-2.097)	(-0.286)	(0.953)	(-0.214)	(0.608)	(0.782)	(-1.127)			
Δ *DEBTD*	-0.211**	6.406	-0.047	-3.997*	-0.154	-0.369*	-0.019	0.543*	0.935	0.914	44.769*
	(-1.871)	(0.826)	(-0.677)	(-5.624)	(-0.008)	(-3.192)	(-0.497)	(9.454)			
Δ *DEBTE*	0.643	-5.121	-0.563**	0.427*	-31.285	0.597	0.469	-0.056	0.584	0.451	4.382*
	(1.280)	(-0.148)	(-1.822)	(9.135)	(-0.378)	(1.158)	(0.497)	(-0.219)			

/ 1 per cent and 5 per cent significance levels and absolute t- values in parenthesis*

The estimation test results reported in Model 2 reveal that all fiscal variables (except Oil Tax Revenue, and the impact of GDP growth rate) exert positive influence on output growth, though, the impacts are relatively low and not significant. However, output growth exerts an impact of -0.17 on budgetary balance, which is negative and significant at 5 per cent. The other test results in the model express the interrelationships among the variables as shown by fiscal variable equations.

Table 7 : VECM Estimation Results (Model 3)

Variables	*Endogenous Variables*								*Diagnostics*		
	Δ *REXP*$_{-1}$	Δ *CEXP*$_{-1}$	Δ *GDPgr*$_{-1}$	Δ *TFCR*$_{-1}$	Δ *BALG*$_{-1}$	Δ *DEBTD*$_{-1}$	Δ *DEBTE*$_{-1}$	*EC*	*R. sq*	*Adj. R sq*	*F-Stat.*
Δ *REXP*	-0.417**	-0.102	1.731	0.009	6.155	-0.061	-0.009	0.029*	0.783	0.725	13.526*
	(-2.067)	(-0.545)	(0.246)	(0.315)	(0.316)	(-0.649)	(-0.192)	(5.049)			
Δ *CEXP*	-0.171	-0.518**	-4.634	0.058	11.749	-0.003	0.081	0.005	0.341	0.165	1.937
	(-0.685)	(-2.225)	(-0.529)	(1.546)	(0.486)	(-0.023)	(1.455)	(0.641)			
Δ *GDPgr*	-0.301	0.402	-5.595*	-0.002	0.771**	-0.006	0.001	-0.681	0.356	0.185	2.076**
	(-0.054)	(0.737)	(-3.821)	(-0.391)	(1.794)	(-0.336)	(1.453)	(-0.416)			
Δ *TFCR*	2.922**	1.410	22.831	-0.213	-28.443	1.186**	0.384	-0.095*	0.261	0.064	1.324
	(2.261)	(1.172)	(0.505)	(-1.099)	(-0.228)	(1.971)	(1.333)	(-2.516)			
Δ *BALG*	0.003	0.001	-0.119**	0.382	-0.093	0.001	0.004	-0.482	0.167	0.051	0.749
	(0.208)	(0.806)	(-1.833)	(0.014)	(-0.519)	(0.179)	(1.126)	(-0.888)			
Δ *DEBTD*	0.319	-1.427*	-9.350	-0.091**	-2.379	0.029	-0.155**	0.041*	0.881	0.848	27.562*
	(1.075)	(-5.164)	(-0.902)	(-2.049)	(-0.083)	(0.212)	(-2.341)	(4.703)			
Δ *DEBTE*	0.004	-0.226	-1.962	-0.133	-38.837*	0.211	0.321**	0.032	0.678	0.592	7.889*
	(0.006)	(-0.335)	(-0.077)	(-1.223)	(-6.554)	(0.624)	(1.987)	(1.502)			

/ 1 per cent and 5 per cent significance levels and absolute t- t-values in parenthesis*

In Model 3, the VECM estimation results show that capital expenditure exerts an impact of 0.40 on output growth. This is positive but not significant. Recurrent expenditure exerts an impact of -0.30 on output growth, which is negative, and not significant, and this implies that capital expenditure or public investment exhibits a higher level of influence on output growth in Nigeria than current expenditure. However, output growth exerts a negative effect of about -0.12 on the overall budget balance, and it is significant at 5 per cent. The other test results in the model simply demonstrate the interrelationships among the variables.

Table 8: VECM Estimation Results (Model 4)

Variables	Endogenous Variables									Diagnostics		
	Δ *REXP*$_{-1}$	Δ *CEXP*$_{-1}$	Δ *GDPgr*$_{-1}$	Δ *OTAX*$_{-1}$	Δ *NOTAX*$_{-1}$	Δ *BALG*$_{-1}$	Δ *DEBTD*$_{-1}$	Δ *DEBTE*$_{-1}$	*EC*	*R. sq*	*Adj. R sq*	*F-Stat.*
Δ *REXP*	-0.439 (-1.565)	-0.269 (-1.028)	-0.002 (-0.585)	1.592* (3.027)	-0.257* (-2.749)	0.009 (0.448)	-0.421 (-1.448)	0.172 (0.192)	0.131* (2.764)	0.676	0.555	5.5688*
Δ *CEXP*	0.326 (1.143)	0.015 (0.058)	0.009** (2.088)	0.140 (0.262)	0.053 (0.562)	0.001 (0.443)	-0.954* (-3.228)	0.105 (0.115)	0.015 (0.332)	0.340	0.093	1.375
Δ *GDPgr*	-0.839 (-0.078)	2.557 (0.250)	-0.663* (-4.210)	22.469 (1.121)	2.200 (0.618)	-0.135 (-1.648)	-19.963** (-1.801)	-10.91 (-0.319)	-0.002 (-0.382)	0.504	0.318	2.712**
Δ *OTAX*	0.025 (0.254)	0.221** (2.389)	0.037 (0.009)	-0.259 (-1.395)	0.142* (4.306)	-0.002 (-0.299)	-0.021 (-0.208)	-0.474 (-1.499)	-0.285* (-3.220)	0.421	0.204	1.940
Δ *NOTAX*	-1.384 (-1.439)	-0.796 (-0.889)	-0.005 (-0.329)	2.823 (1.566)	-0.149 (-0.467)	0.005 (0.741)	-2.744* (-2.753)	-3.429 -(1.117)	0.023 (1.439)	0.483	0.289	2.488**
Δ *BALG*	24.656 (0.911)	18.685 (0.742)	0.722** (1.813)	-59.896 (-1.181)	0.679 (0.075)	-0.091 (-0.436)	31.569 (1.126)	-10.79 (-0.124)	-0.003 -0.964	0.193	0.110	0.637
Δ *DEBTD*	-0.108 (-0.671)	0.049 (0.330)	0.003 (0.133)	0.878* (2.904)	0.024 (0.438)	0.001 (0.490)	-0.269 (-1.613)	0.085 (0.164)	0.283* (5.776)	0.871	0.822	17.935*
Δ *DEBTE*	0.058 (1.025)	0.038 (0.727)	0.006 (0.772)	0.052 (0.483)	-0.009 (-0.051)	0.003 (0.895)	-0.068 (-1.143)	0.422** (2.319)	0.155 (1.029)	0.604	0.456	4.074*

/ 1 per cent and 5 per cent significance levels and absolute t- t-values in parenthesis*

The disaggregated analysis by components as shown in Model 4 reveals that the components of overall government expenditure exert a negative, though, not significant influence on output growth, while the tax components exert positive effects on output growth, and debt components also exert a negative influence on the GDP growth rate. Overall, budget balance exerts a negative impact on output growth, but output growth exerts a positive and significant influence on budget balance. The other test results simply show the interrelationships among the disaggregated components of fiscal variables and output growth.

Table 9: Cholesky Variance Decompositions and Accumulated Impulse Response Functions of GDP Growth to Shocks in other Fiscal Variables (Averages of a 10-year horizon)

Methods			*Variables*								
	Models	*VEC Variants*	*GDPgr*	*TEXP*	*TFCR*	*BALG*	*REXP*	*CEXP*	*DEBTD*	*DEBTE*	*OTAX*	*NOTAX*
VEC Model Specifications	*Model 1*	*FEVDs*	88.904	1.709	0.400	2.615	-	-	0.598	5.774	-	-
		IRFs	2.806	-0.545	-0.172	0.294	-	-	-0.125	0.859	-	-
	Model 2	*FEVDs*	78.442	0.525	-	7.020	-	-	0.477	2.766	2.814	7.956
		IRFs	1.933	-0.166	-	0.673	-	-	-0.158	0.484	0.517	0.905
	Model 3	*FEVDs*	85.815	-	0.248	3.553	1.073	1.966	2.313	5.032	-	-
		IRFs	2.818	-	-0.121	0.518	-0.402	0.049	-0.515	0.767	-	-
	Model 4	*FEVDs*	74.100	-	-	9.165	0.852	5.925	0.468	3.025	2.750	3.896
		IRFs	1.794	-	-	0.759	-0.258	0.472	-0.188	0.485	0.378	0.536

This present study utilises both the forecast error variance decompositions (FEVDs) and the impulse response functions (IRFs) as variants of the VEC model to account for the possibilities of the dynamic feedback between fiscal variables and the growth in the economy as well as their likely effect on other variables in both the short and long terms. The response forecast period for the study was for ten years, and the averages of the shocks were taken. The longer forecast horizon was employed to allow us to

compare both the long-term and short-term responses. The FEVDs and IRFs were conducted for the benchmark model, and the other three models because of their peculiarities.

The test results of the FEVDs reported for model 1 show that the GDP growth rate explains the predominance of their shocks to the tune of the average of 88.9 per cent for ten years, and the contemporary variances in the innovations in other fiscal variables were relatively low. For instance, total government expenditure (TEXP) accounts for about 1.7 per cent for ten years, and the variations in the shocks (or innovations) of other fiscal variables like total federally collected revenue (TFCR), overall budget balance (BALG), domestic debt (DEBTD) and external debt (DEBTE) are 0.4 per cent, 2.6 per cent, 0.6 per cent, and 5.8 per cent respectively. It is evident from our benchmark model that the GDP growth rate explains the predominance of its shock, but shocks of external debt (5.8%) and budget balance (2.6%) have the strongest and most lasting effect on the GDP growth and the averages of IRFs for Model 1 was also considered able to ascertain the interaction among the variables. It is observed that GDP growth rate exhibit positive and predominant interaction of its shock, while government expenditure, federally collected revenue and domestic debt exert relatively small and negative shocks on output growth while budget balance and external debt exert positive impact shocks on output growth on the average of ten years. These positive impacts of the latter further confirm their relevance as showcased by the FEVDs analysis.

In the case of Model 2, output growth explains the predominance of its innovations by an average of about 78 per cent followed by those of non-oil tax revenue (NOTAX) and budget balance (BALG) to the tune of 8 per cent and 7 per cent respectively, and the other fiscal variables like oil tax revenue (OTAX), external debt (DEBTE), government expenditure (TEXP), and domestic debt (DEBTD) has a relatively low variations in their shocks or innovations of about 2.8 per cent, 2.7 per cent, 0.5 per cent and 0.4 per cent respectively on the average for the ten years forecast horizons. However, non-oil tax (NOTAX) and budget balance (BALG) account for the substantial variations in the shocks of output growth than the other fiscal variables, and the IRFs reveal that budget balance (BALG) and external debt (DEBTE) exert positive response forecast on output growth, and government expenditure (TEXP) and domestic debt (DEBTD) exert negative impact, while oil tax revenue (OTAX) and non-oil tax revenue (NOTAX) exert positive influences, but, GDP growth rate overreacts to its shock to the tune of the average of 1.93 per cent compared to those of government expenditure (TEXP) (-0.16%), budget balance BALG (0.67%) and domestic debt (DEBTD) (0.16%).

In the case of model 3, it is apparent that GDP growth rate explains the largest proportion of its shock of about 85.8 per cent followed by those of external debt (DEBTE) and budget balance (BALG) at an average of 5.03 per cent and 3.55 per cent for the 10-year forecast horizons. However, the accumulated impulse response of federally collected revenue (TFCR), recurrent expenditure (REXP) and domestic debt (DEBTD) to GDP growth rate are negative while those of budget balance (BALG), capital expenditure (CEXP) and external debt (DEBTE) are positive, but the GDP growth rate expresses the strongest and most impactful effects on its shock.

The FEVD estimates from model 4 reveal that GDP growth rate provides the predominance of its shocks by explaining about 74 per cent of the innovations that may be attributable to shock in the own variable followed by budget balance (BALG) and capital expenditure (CEXP) to the tune of 9 per cent and 5 per cent respectively, and the accumulated forecast response of the fiscal variables are relatively low, but GDP growth rate has the strongest impulse response of about 1.8 per cent compared to those of the other variables. However, current expenditure exerts negative impacts on output growth while capital expenditure reveals a positive impact, and oil tax revenue and the non-oil tax revenue exert positive influences on the shocks of GDP growth rate while budget balance (BALG) and external debt (DEBTE) exert positive impacts.

Robustness checks: consistency of estimation results

This section reports the results from a different econometric methodology that was performed to check the robustness of our main results on the long-term macroeconomic effect of fiscal policy variables on output growth in Nigeria.

Table 10: Fully Modified Ordinary Least Square Estimates

Variables	Model 1	Model 2	Model 3	Model 4
TEXP	-5.120*	-2.913*		
	(-2.690)	(-11.658)		
TFCR	6.192*		2.487*	
	(5.445)		(3.335)	
BALG	0.434**	0.089*	0.888*	0.378*
	(1.914)	(3.168)	(6.279)	(15.251)
DEBTD	-2.341	-12.649**	-6.447*	-11.082*
	(-1.199)	(-45.162)	(-9.503)	(-5.264)
DEBTE	3.459*	2.081*	3.179*	1.642*
	(9.743)	(26.549)	(15.472)	(24.041)
OTAX		1.183*		1.314*
		(15.556)		(17.932)
NOTAX		10.409*		7.901*
		(32.036)		(28.204)
REXP			-4.561*	-1.008*
			(-2.569)	(-4.221)
CEXP			2.652*	0.387*
			(5.445)	(4.975)
Constant	-12.817*	45.486*	-2.856**	37.459*
	(-8.299)	(39.417)	(-1.766)	(44.266)

/ 1 per cent and 5 per cent significance levels and absolute t- t-values in parenthesis*

From the FMOLs estimation results reported in Table 10, in the benchmark model, it is evident that overall government expenditure exerts a negative and significant impact on output growth at a 1 per cent significant level, and this negative influence is in sync with that of the VECM estimate in Model 1. Federally collected revenue (TFCR) exerts a positive and significant impact on output growth in Nigeria at a 1 per cent significant level, and the impact of 6.192 is far stronger than that of aggregate government expenditure of -5.120, and the positive impact of the Federally collected revenue (TFCR) as indicated in the FMOLs corroborates the VECM estimates in the benchmark model. The overall budget balance exerts a positive and significant impact of about 0.434 on output growth, and this also aligns with the positive impact of about 0.759 in VEC model 1.

In terms of the debt components, domestic debt exerts a negative impact of about -2.34 on output growth which is not significant at either 1 per cent or 5 per cent significant levels, whereas external debt exerts a positive and significant impact on output growth at 1 per cent level. These mixed effects of the impacts of debt components on output growth also support the findings of the VECM estimates as in the benchmark model.

In the overall disaggregated analysis, it is evident in Models 3 and 4 that capital expenditure exerts positive and significant impacts on output growth in Nigeria at a 1 per cent level, whereas recurrent expenditure exerts a negative influence on output growth at a 1 per cent significance level, and these variabilities of the impacts of expenditure components on output growth are also corroborated with the VECM estimates in Models 3 and 4 in our main estimation.

In terms of the tax revenue components, it is evident that both oil tax revenue and non-oil tax revenue exert positive and significant levels as indicated in Models 2 and 4 respectively. However, the non-oil tax revenue exerts a much stronger influence on output growth than that of the oil tax revenue, and the FMOLs estimates further validate our VECM estimates in Models 2 and 4 respectively.

The finding of the long-run macroeconomic effect of fiscal policy variables on output growth in Nigeria has different impact factors depending on the fiscal instrument, and then associated model(s). The impact of capital expenditure which exerts a significant positive impact on output growth and recurrent expenditure exerts a significant negative impact on output in Nigeria conforms with the finding by Aluthge, Jibir and Abdu (2021), Oyinlola and Akinnibosun (2013), Awode and Akpa (2018) and Onifade et al (2020), while the study by Devarajan and Swaroop (1996) on expenditure-growth nexus for 43 developing countries contradicts these findings.

In a similar vein, Aregbeyen (2006) and Aregbeyen and Akpa (2013) also contradict the finding of a significant negative impact of overall public spending on output growth in Nigeria, but the current study's finding on the negative impact of overall public spending on output growth is supported by the study of Ramos and Sagales (2008) on the long term impact of GDP of increasing public spending in the UK, and that the increase in public spending likely harms output. Also, our findings of the positive impacts of revenue shocks on output growth in Nigeria conform to the study by Abubakar (2016) in his study of the dynamic effects of fiscal policy on economic growth in Nigeria employing the SVAR approach, and that of Benanaya et al (2014) on the analysis of fiscal policy on economic growth adopting a panel data model.

Broadly, our findings conform to the consensus that fiscal policy plays a critical role in affecting the long-run growth performance of a country (Nigeria inclusive). (see, Buffie, 1992; Barro & Sala-i-Martin, 1992; Easterly & Rebelo, 1993; Tanzi & Zee, 1997; Capet, 2004; Ramos & Roca-Sagales, 2008; Onifade et al, 2020; Aluthge et al, 2021, etc.). This present study extends the frontiers of knowledge by providing empirical evidence on the macroeconomic impact of the disaggregated components of fiscal variables on output growth unlike the case of aggregated analysis, and provides evidence that the components of the fiscal variables show a much stronger influence on output growth compared to those of the aggregated fiscal variables. In addition, the introduction of some fiscal policy variables not employed in previous studies into the fiscal policy–growth model (like oil tax revenue, non-oil tax revenue, aggregate balance budget and debt components) makes this study stand out.

Conclusion and Recommendations

In this study, fiscal variables have been empirically examined as critical instruments influencing output growth in Nigeria. There is a consensus in both theoretical and empirical literature that fiscal instruments exert significant influence on the growth of output in both developing and developed economies. However, unsettled controversies exist regarding the nature of the impact of fiscal variables on output growth as identified in the standard neoclassical models. Most macroeconomic studies of fiscal policy do not offer a disaggregated analysis of expenditure, debt and revenue. The study covers 1981 to 2021 and empirically evaluates the impact of the aggregated (or disaggregated) components of fiscal policy instruments on output growth in Nigeria employing the techniques of the variants of the VECM. This allows the present study to assess the long-term effect of fiscal variables on output growth taking into account the feedback effects among the variables. Our findings suggest from the benchmark model that changes in fiscal variables like total government expenditure, total government revenue, budget balance, and domestic – and external debts exert significant influences on output growth and this conforms to consensus views. The GDP growth rate explains the predominance of its shock and is closely followed by those of external debt and overall budget balance. In specific terms, government expenditure, overall budget balance, total government revenue, tax revenue components and debt components exert considerable impacts on output growth as shown by the empirical outcomes of the VECM and FMOLS estimations. The test results from the disaggregated analyses reveal that capital expenditure exerts a positive and significant impact on output growth, unlike the case of recurrent expenditure which shows a negative influence. For instance, in Models 3 and 4 capital expenditure exerts a positive effect on output growth, while in the same models' recurrent expenditure exerts a negative impact on output growth, while in Models 2 and 4, tax revenue components exert a positive influence on output growth,

whereas the debt components exerts mixed influences on output growth – domestic debt revealing negative impacts and the external debt component exerting positive impact on output growth. The clear implications of our empirical findings are that there are significant trade-offs in considering the relative contributions of fiscal variables to the output growth of Nigeria.

Arising from the findings and policy implications of the study, we recommend the following policy measures:

- the government should adopt growth-enhancing fiscal policy measures that will promote macroeconomic stability;
- there should be an increase in its budgetary allocations to capital expenditure as against that of the recurrent expenditure to further enhance the growth of the economy;
- the fiscal authorities should as a matter of urgency refocus the recurrent expenditure framework through appropriate and adequate expenditure-switching policies that encourage human capital development; and
- a robust tax administration should be encouraged to minimise the distortionary effects of taxes on output growth and cure the fiscal anxiety of the country to allow it to curtail the excessive fiscal deficit that is shrinking the fiscal space and capacity of the economy.

References

Abubakar, A,B, (2016). Dynamic effects of fiscal policy on output and unemployment in Nigeria: An econometric investigation. *CBN Journal of Applied Statistics*, 7(2), 101-122.

Adegboyo, O., Ajoje, O., & Agu, O(2023). The impact of non-oil revenue on economic growth: Empirical evidence from Nigeria. *Euro Economica*, 2(42), 158-168

Aluthge, C., Jibir, A., & Abdu, M. (2021). Impact of government expenditure on economic growth in Nigeria, 1970 – 2019. *CBN Journal of Applied Statistics*, 12(1), 139 – 174.

Awode, S. S & Akpa, E.O. (2018). Testing Wagner's law in Nigeria in the short and long run, *AUDOE*, 14(7), 7 -23.

Aregbeyen, O. (2006). Cointegration, causality and Wagner's law: A test for Nigeria, 1970-2003. *Central Bank of Nigeria Economic and Financial Review*, 44(2), 1-17.

Aregbeyen, O. & Akpan, U.F. (2013). Long-term determinants of government expenditure: A disaggregated analysis for Nigeria. *Journal of Studies in Social Sciences*, 5(1), 31-87.

Benanaya, D., Khaled, R., Rachid, T., and Badreddine, T. (2014). The impact of fiscal policy on economic growth: Empirical evidence from panel estimation. *The 2014 WEI International Academic Conference Proceedings*, New Orleans, USA.

Barro, R.J. (1990). Government spending in a simple model of endogenous growth. *Journal of Political Economy*, 98, S102-S125

Barro, R.J. & Sal-i-Martin, X (1992). Public finance in models of economic growth. *Review of Economic Studies*, 59, 645-661

Barro, R.J. & Sal-i-Martin, X (1995). *Economic growth.* New York: McGraw Hill.

Buffie, E.F. (1992), The short- and long-run effects of fiscal policy. *The World Bank Economic Review*, 6(2), 331-351.

Capet, S. (2004). The efficiency of fiscal policies: a survey of the literature', *Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), Working Paper* (11).

Cashin, P(1995). Government spending, taxes and economic growth. *IMF Staff Paper*, 42(2).

Devarajan, S., Swaroop, V., & Zou, H. (1996). The composition of public expenditure and economic growth. *Journal of Monetary Economics*, 37, 313 – 344.

Dauda, M., Alege, P.O., Ewetan, O, O., & Asemota, F.F(2023). Oil revenue and sustainable economic growth in Nigeria: Empirical analysis. *International Journal of Energy Economics and Policy*, 13(4), 150 -155

Dritsakis, N., & Stamatiou, P.(2017). Foreign direct investment, exports, unemployment and Economic growth in the new EU members: A panel data approach. *International Economics*, 70(4), 443-468

Easterly, W. (1989). Policy distortions, size of government and growth. *Cambridge, Massachusetts NBER Working Paper* (3214).

Easterly, W. (1990). *Endogenous growth in developing countries with government-induced distortions.* Unpublished: Washington: Macroeconomic Adjustment and Growth Division, World Bank.

Kamps, C. (2005). The dynamic effects of public capital: VAR evidence for 22 OECD countries, *International Tax and Public Finance*, 12, 533-58.

Marcellino, M. (2006), Some stylised facts on non-systematic fiscal policy in the Euro Area, *Journal of Macroeconomics*, 28, 461-479.

Okpabi, A.S., Ijuo, A.O., & Akiri, S.E. (2021). Government expenditure and economic growth in Nigeria. *IOSR-Journal of Economics and Finance*, 12(1), 28 -35.

Onifade, S,T., Cevik, S., Erdogan, S., Asongu, S & Bekun, F.V. (2021). An empirical retrospect of the impacts of government expenditures on economic growth: New evidence from the Nigerian economy. *Economic Structures*, 9(6)

Onoja, E.E & Ibrahim, A.S (2021). Tax revenue and Nigeria's economic growth. *European Journal of Economics and Business Studies.* 7(2), 60 – 80.

Oyinlola, M.A & Akinnibosun, O.(2013). Public expenditure and economic growth nexus: Further evidence from Nigeria. *Journal of Economics and International Finance, 5(4), 146- 154*.

Pedroni, P.(2001). Fully modified OLS for heterogeneous co-integration panels. *Advances in Econometrics*, 15.

Perotti, R. (2004). Public investment: another (different) look', *Innocenzo Gasparini Institute Economic Research (IGIER), Working Paper*, (277).

Perotti, R. (2005), Estimating the effects of fiscal policy in OECD countries, *Centre for Policy Research (CEPR), Discussion Paper* (4842).

Phillips, P.C.B. (1993). Fully modified least squares and vector autoregression, *Cowles Foundation for Research in Economics Discussion Paper* (1047).https://cowles.yale.edu/publications/cfdp/cfdp-1047

Ramos, X. & Roca-Sageles, O. (2008). Long-term effects of fiscal policy on the size and distribution of the pie in the UK. *Fiscal Studies*, 29(3), 387-411.

Tanzi, V. & Zee, H.H (1997). Fiscal policy and long-run growth. *International Monetary Fund Staff Paper*, 44(2), 179-209.

Ukwueze, E.R.(2015).Determinants of the size of public expenditure in Nigeria, *SAGE Open*, 1-8.

Umeh, A.C., Ezudike, R.P & Anyaegbunam, N.S. (2022).Impact of government expenditure on Economic growth in Nigeria: Econometric approach of error correction model. *International Journal of Multidisciplinary Research and Growth Evaluation*, 3(4), 82-92.