



Research Paper

# Empirical Analysis of the Impact of Tax on Economic Growth: Evidence from Vector Error Correction Model

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## Abstract

This study examines the impact of tax on economic growth in Nigeria from 1986-2021, with a special focus on Companies' Income Tax (CIT), Value Added Tax (VAT) and Petroleum Profit Tax (PPT). Annual time series data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and the National Bureau of Statistics (NBS). The study uses a Vector Error Correction Model (VECM) to establish the nature and strength of the relationship between tax and economic growth in Nigeria. The Granger causality test found a causal relationship between GDP and the different tax components. The Johansen test of co-integration reveals that there is at least one co-integrating equation in the long run and there are stable and long-term equilibrium relationships among the variables. The impulse response functions and the variance decomposition analysis through the Vector Error Correction Model (VECM) uphold the findings as follows: A one standard deviation shock applied to Gross Domestic Product (GDP) produces a positive impact on GDP throughout the period. What this seems to suggest is that there is evidence in support of the positive impact of GDP on its shocks in Nigeria. A one standard deviation shock to CIT initially has a positive perceptible impact on GDP in the short run, however, for a long period it has a negative perceptible impact on GDP and causes output to decrease. A one-standard-deviation shock to VAT has a huge and positive impact on GDP in the short run. The impact becomes noticeable in the long run. Lastly, a one standard deviation shock to PPT has a positive but low impact on GDP. Between periods 5 and 6.5, PPT has no impact on GDP. However, the impact becomes noticeable again as the subsequent period shows that PPT's shock responds positively to GDP. It is therefore recommended that to increase the level of CIT and tax compliance in Nigeria, the government should make an effort to promote businesses by providing basic public services to every nook and cranny of the nation. The government should stop all leakages in the petroleum industry so that the PPT collected from Nigerian crude oil can support and advance Nigeria's economic growth. To increase the VAT base Government should provide a favourable environment for businesses and innovations to thrive.

**Keywords:** Tax, Company Income Tax (CIT), Value Added Tax (VAT), Petroleum Profit Tax (PPT) and Economic Growth and Gross Domestic Product

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## I. Introduction

There is little consensus among academics regarding the role that taxes play in a nation's economic development; some claim that taxes have positive effects (Eze & Onyedikachi, 2020; Ibadin & Oluwatuyi, 2021) others claim that taxes have negative effects (Aliyu & Mustapha 2020). The literature on economic growth up until the early 1990s was primarily concerned with modelling an economy with a long-run

equilibrium where output is exogenously determined by technological advancement, assumed to be determined outside the system, and where the instruments of government policy have no long-term impact on the growth rate. The fundamental tenet of the argument, according to Solow (1956), is that where the rule of diminishing returns to scale is in effect, the Neo-classical economist view attributes economic growth to increases in physical and human capital (Chiumia & Simwaka, 2012).

Romer (1986) has opposing viewpoints, which are represented in their theories of endogenous growth. They suggested that government policies, such as tax levels and tax structure, can have an impact on economic growth. This suggests that immediate government action might stimulate economic growth. Taxation, however, is a cost incurred by the government while formulating various frameworks and policies for economic progress. Five potential processes are listed by Tosun & Abizabeh (2005) for how taxes as a tool of fiscal policy impact economic growth. First, taxes like corporate and personal income taxes and capital gains taxes can lower investment rates. Second, taxes have the potential to stifle the expansion of the labor force by favoring leisure over work. Third, by discouraging investment in Research Development (R&D), tax policy can harm productivity growth. Fourthly, according to the Harbinger Framework, taxes may cause resources to move to industries with lower productivity. Finally, because large tax burdens will demotivate societal productivity, high taxes on the labor supply can distort the effective utilization of human resources. Endogenous growth models have been used in several recent theoretical studies to enhance the effects of a fundamental tax change on economic growth. Gale & Samwick (2014) investigate how taxes affect the potential Gross Domestic Product (GDP) and the growth of the supply side of the economy. A rise in the yearly growth rate, a one-time boost in the size of the economy that doesn't affect future growth rates but puts the economy on a higher growth path, or a combination of both could be the result of the expansion. They concentrate on the supply side of the economy, which contrasts with the short-term phenomena known as "economic growth," wherein an increase in aggregate demand, in a sluggish economy, can improve GDP and help bring actual GDP into line with potential GDP Engen & Skinner (1996).

Taxation has become a hot topic of discussion and debate in Nigeria due to the need to find a long-term alternative to oil revenue (Adeyemi & Adedapo, 2021). Tax revenue and non-tax revenue are the only two sources of income for the government (Oladipupo & Oladipo, 2022). Tax revenue mobilization in Nigeria must be accelerated (El-Yaqub 2021). Both academic and socio-political circles have vigorously disputed the impact of taxes on economic growth and development (Etim, Nweze, Umoffon & Asogwa, 2020). At one extreme are those who support tax cuts and claim that doing so will increase economic growth by citing the benefits that lower taxes have on incentives to work, save, and invest. (Ergete & Dahlby, 2012).

In Nigeria, tax revenue has historically represented a minor part of overall revenue generation compared to the Federal Government's primary source of income (Otu & Adejumo, 2013). According to records, the current downturn in oil prices has reduced the amount of money that Nigeria's Federal, State, and Local Governments have available for distribution (Afuiberon & Okoye, 2014). Therefore, Nigeria's excessive reliance on oil as a significant source of income has seriously hampered the country's ability to experience sustainable economic growth. The fluctuation in oil prices on the global market has caused Nigerians and the government to seriously consider the necessity to diversify the economy. It is noteworthy that there is a paradigm shift toward tax income as a better alternative form of revenue creation globally, and the Nigerian government now has a pressing need to produce sufficient tax revenue (Afuiberon & Okoye, 2014).

How to ensure taxpayers' voluntary compliance is one of the many issues that tax administration in the Nigerian economy faces. No one wants to pay taxes, thus taxpayers don't much like the tax collector, who they see as the government's toll collector. The poor performance of the majority of state governments in terms of providing amenities for the tax-paying population through government expenditure and otherwise (Musa & Ismail, 2023) exacerbates the taxman's difficulty. Voluntary compliance issues were a result of mutual mistrust and a lack of confidence in the government, represented in this case by the taxman. Nigerian tax rules are complicated and challenging for the average taxpayer to understand, and in some circumstances, even literate officials face challenges. Along with a lack of comprehension, many taxpayers are not even aware that certain taxes are charged. This, coupled with the lack of information, the tax official's sloth, the unwillingness of the taxpayers, and the propensity for "quick fixes," supports the employment of the best judgment approach. This could be a result of inadequate tax education and a lacklustre effort on the part of tax authorities to perform their duties related to public awareness. If customers had the option, they wouldn't want to purchase tax because it is an imposition, according to Ocheoha (2000). He says that taxes are levied by the government primarily to generate the necessary funds to pay for general administration and defense expenses. He argues that paying people emoluments, salaries, and wages for leaders or those in authority, their aides, as well as the salaries of city officials, police, and military personnel, constitutes the cost of general administration. Since taxes now serve a larger range of purposes, the government uses them as a true administrative tool. It is impossible to overstate the importance of taxation as a subject that merits study. According to Abudulrazaq (2002), many different aspects of Nigerian taxation should be researched and applied. He suggested that technical proficiency

with a strong collection of primary sources is required and that the proficiency might be tested in a variety of methods, from simple computation to transaction planning. People in positions of authority levy tax for several reasons and fees. According to Musgrave (2004), taxes and fees are taken out of the private sector without leaving the government liable to the payee.

The total amount of taxes collected by the nation in 2019 was 5.26 trillion naira (\$13.5 billion), according to the Federal Inland Revenue Service. However, the estimated 19 million tax-paying individuals show that around 50.5 million employed Nigerians do not pay taxes FIRS (2021). Tax revenues are the main revenue channels for the government. The government uses tax revenue to carry out its duties, including providing public goods, maintaining law and order, defending against internal and external aggression, regulating trade and business to ensure social and economic upkeep, and using fiscal tools to promote economic stability (El-Yaqub & Obi, 2021). The taxes are levied on individuals, groups, corporate entities, and other institutions chargeable to tax, and play a vital role in the economic planning and development of nations.

However, although charges and borrowing entail voluntary transactions, tax is a mandatory imposition. In other words, one of the key characteristics that set tax apart from other fees is that it is not a quid pro quo expenditure, which implies that a taxpayer shouldn't demand or anticipate receiving a similar exchange of products or services in return for the tax they have paid. Increased tax evasion, avoidance, and ineffective and inefficient personal income tax administration in the Nigerian economy were caused by a high-level incidence of corruption in the administration of personal income taxation. Corruption and other vices in the administration of personal income tax in the Nigerian economy are to blame for the system's obvious inefficiency, which is demonstrated by the rise in tax defaulters, evasion, and avoidance. Therefore, additional research in Nigeria is warranted in light of the contradictory findings of earlier studies evaluating the impact of tax income on economic growth. In light of the foregoing, this study makes an effort to examine the empirical analysis of the impact of tax on Nigerian economic growth from 1986 -2021.

## **II. Literature Review and Theoretical Framework**

### **2.1 Conceptual Review**

The concepts employed in this study are explicitly discussed below;

#### **2.1.1 Concept of Tax**

According to Onakoya, Afintinni & Ogundajo (2017), the word "tax" is derived from the Latin word "tax," which means to estimate the value or compute the value. A recurring and required payment made by citizens to the government for it to deliver services that they use is known as a tax. As old as the "State" itself are these kinds of payments made to the government. The primary source of public funding for ages has been the public domain. Azubike (2009), a tax is a mandatory charge that the government imposes on a person or their property to fund social services and foster societal economic growth. Similarly, Chigbu & Njoku (2015) underline that taxes are a significant source of income for any country and that they are frequently utilized as a tool to close the wealth gap. Afuberoh & Okoye (2014) view taxation as a mandatory levy imposed by the government through its agencies on the capital, income, and consumption of its subjects. These taxes are levied on individual income, including wages, business profits, interests, dividends, discounts, and royalties, in addition to business earnings, petroleum profits, and capital gains. An additional definition of tax is a compulsory charge imposed by tax authorities on wealth, money, or individuals for which the taxpayers do not specifically or directly receive anything in return (Shang, 2016). Tax revenue is acknowledged as the most significant financial source for governmental public spending among the many ways that governments might earn income (Frecknall-Hughes, 2014).

#### **2.1.2 Concept of Economic Growth**

Because it has long been acknowledged as a crucial goal of economic policy, a sizable body of research has been devoted to explaining how economic growth might be accomplished (Fadare, 2010). Economic growth is the expansion of a nation's potential GDP or output. If the societal rate of return on investment is higher than the private return, for instance, tax measures may encourage growth rates and utility levels. According to Olopade & Olopade (2010), the ideal tax policy concentrates on the characteristics of services in development models that include public services. The causes of states' different rates of growth over time have also been clarified by economic growth, and this affects the government's monetary policy as well as the tax and expenditure levels that will decide growth rates. Economic growth is the gradual increase in the market value of the goods that a country's economy produces. 2016 Economic Outlook for Africa Typically, it is expressed as the real gross domestic product, or real GDP, growth rate in percentage terms. The per capita income growth rate, commonly referred to as the GDP per capita growth rate, is more important. An increase in per capita income is referred to as intensive growth. According to Gordon (1999), extensive growth is defined as GDP

growth that is exclusively attributed to gains in territory or population.

## **2.2 Theoretical Review**

To help the government choose how to accomplish justice or equity in taxation, economists have proposed a variety of taxation theories or guiding principles across time. In a nutshell, the basic theory or principles used to underpin this study is the Ability to Pay Theory.

### **2.2.1 Ability to Pay Theory**

Pigou (1920) first proposed this theory, which contends that each person should pay taxes based on his or her financial capacity to cover the cost of governmental expenses. The principle of equity or justice in taxation is the same as the ability to pay theory of taxation. There should be "no quid pro quo" since those with greater earnings should pay more taxes than those with lower incomes. Taxes should be collected based on a person's ability to pay, as this seems more fair and logical. The definition of someone's ability to pay is the theory's main flaw. The most well-known and widely accepted tenet of fairness or justice in taxation is that a nation's residents should contribute to the government following their financial capacity. Taxes should be assessed based on a person's ability to pay them, which seems quite fair and logical. For instance, if Mr. A has a higher taxable capacity than Mr B, the former should be required to pay more taxes than the latter. Therefore, this approach gives the payer's capability priority when estimating tax revenue. Accordingly, it is assumed that those with greater incomes will pay more than those with lower incomes (Jacob, Josiah, & Solomon, 2021). In light of this theory, everyone should only be subject to taxes that they can afford. The government can maximize the distributive impact of taxation in this way.

## **2.3 Empirical Review**

Given that the relationship between taxes and economic growth is at the core of macroeconomic policy, many studies have looked at both the impact of taxes on economic growth as well as the relationship between taxes and economic growth. The essential characteristics of the chosen empirical studies that looked at the connection between economic growth and tax revenue are the main emphasis of this section of the study.

Tax income, economic growth, and the human development index are all examined by Ibadin & Oluwatuyi (2021). The study examines the impacts of many significant taxes on the real gross domestic product (RGDP) and human development index (HDI), including company income tax (CIT), petroleum profit tax (PPT), value-added tax (VAT), and customs and excise duty (CED). Both RGDP and HDI have been widely employed as indicators of economic progress and growth, respectively. Annual time series data for the years 1994 to 2017 were used in the study. The Augmented Dickey-Fuller (ADF) unit root test, the Johansen multivariate co-integration approach, and the Error Correction Model (ECM) method, which is mostly used for time series analysis, were all applied in the study's methodology. The results indicated a favorable and significant correlation between tax revenue and HDI. The outcome shows that, as the dependent variable, RGDP has a greater impact on HDI than tax revenue does. Because HDI is more comprehensive than RGDP, which, according to their findings, presents a weaker picture of linkages between tax income and economic growth in Nigeria, they advise placing more trust in it as a result. Based on this, and given that HDI criteria are known for their measurability, both in quantitative and qualitative terms, and proposes tax policies that are development-driven. Even though CIT, VAT, and PPT were amongst the variables involved in this study, the period covered was not up to 2021 as it is in the study.

Furthermore, the relationship between tax revenue components and economic growth in Nigeria from 1989 to 2018 is examined by Etim, Nweze, Umoffon, & Asogwa (2020). The increased global emphasis on increasing tax collections relative to Gross Domestic Product (GDP) and diversifying national economies' revenue sources served as the study's driving force. Data on the GDP and tax receipts were taken from the Federal Inland Revenue Service's (FIRS) annual reports and the Central Bank of Nigeria's (CBN) statistical bulletin. Data were analyzed using descriptive and inferential statistics, including the Granger Causality tests, the Error Correction Mechanism (ECM), the Augmented-Dickey Fuller (ADF) stationary unit root test, and correlational statistics. The ECM was used to correct the differences between the long-run and short-run effects of explanatory factors. The ECM coefficient showed that the explanatory variables adjusted between the short-run and long-run effects extremely slowly. Economic growth (GDP) and personal income taxes (PIT; 3.7045), petroleum profit taxes (PPT), and corporate income taxes (CIT) have a positive and statistically significant relationship, whereas EDT and CED have no such relationship at the 0.05 level of significance. Economic growth and EDT, CED, and PPT are all positively correlated with one another, according to the Causality Test results. The findings demonstrate that tax revenue components are crucial to Nigeria's economic growth and advise that government policies on taxation matters be managed delicately to stimulate interventionist actions that will accelerate economic growth. In this study, company income tax and value-added tax were not captured.

Using annual secondary time series data from 1981 to 2020, Oluwasegun & Joseph (2020) explore the



dynamic relationship between tax income, infrastructure improvement, and economic growth in Nigeria. The Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) tests were used to investigate the series' unit root properties, and the Johansen Co integration test was used to determine whether or not the series is cointegrated. The outcomes show that all of the series are nonintegrated and of order 1 integration. A vector autoregression (VAR) causality test and a VAR at-first difference model were conducted to investigate the direction of causality and the correlation among the variables. The findings show a unidirectional correlation between tax revenue and infrastructure development, as well as a bidirectional causality between infrastructure development and economic growth. Based on the results of the impulse response tests, it can be concluded that while infrastructure has a considerable impact on tax revenue received, infrastructure has no discernible impact on economic growth. The study suggests that the government should more fully embrace fiscal responsibility by holding taxpayers more accountable for the provision of higher-quality infrastructures that can foster economic growth.

Aliyu & Mustapha (2020) look at the effect of tax income on economic growth in Nigeria from 1981 to 2017. It makes use of time series data from the National Bureau of Statistics (NBS) webpage, FIRS yearly publications, and CBN statistical bulletins. The dynamics and long-term effects of independent variables on the dependent variable were estimated using the OLS and ARDL approaches. The variables are co-integrated, as shown by the ARDL bound test, and the ARDL long-run estimation showed that the GDP is significantly and positively correlated with petroleum profit, value-added tax, and government domestic debt. Additionally, corporation income tax and excise and customs taxes were large but had a detrimental effect on economic growth. As a result of the low contribution of tax revenue to GDP identified during the study's duration, they advise the government to step up efforts to increase tax collection. This can be accomplished by closing all tax law loopholes and bringing in additional potential taxpayers, particularly from the unorganized sector. This study used ARDL as the methodology, as such there is a need to use different methods to ascertain the impact of tax on economic growth in Nigeria up to 2021.

Ukeme & Olayinka (2020) investigated the impact of tax revenue on public debt and capital spending in Nigeria between the years 1999 and 2018. The Statistical Bulletin of the Central Bank of Nigeria (CBN) was used as a source of secondary data. To investigate the impact of the independent variables (represented by value-added tax, company income tax, petroleum profit tax, customs, and excise duty) on the dependent variable (external debt, internal debt, and capital expenditure), it used the ordinary least square regression method by the E-views program. Descriptive Statistics, Unit Roots using Augmented Dickey-Fuller, Cointegration tests using the Bounds Test, and Vector Error Correction Model are the data treatments utilized for the times series secondary data. The results show that tax income had a statistically significant positive and negative impact on capital expenditure and state debt. The impact of tax collection on Nigeria's external debt and capital spending was mixed. This study examined the impact of tax on public debt (both internal and external) and capital expenditure but the study did not capture the impact of tax on economic growth.

Oluwole (2022) investigates whether tax income (Company Income Tax, Custom Excise Duty, and Value-Added Tax) will have an impact on Nigeria's economic development either alone or collectively. This study uses an ex post facto research design. The study's findings ranged over 40 years from 1980 to 2020. The National Bureau of Statistics (NBS), Federal Inland Revenue Services (FIRS), and Central Bank of Nigeria (CBN) were the sources of the study's data. The acquired data were examined using the ARDL (autoregressive distributive lag model). The results of this study showed a long-term association between tax collections and Nigeria's economic growth. The implication is that long-term economic growth and real gross domestic product in Nigeria will be considerably impacted by successful tax revenue mobilization in the economy. Additionally, it was shown that over time, customs and excise duties had a negative and considerable impact on Nigeria's economic growth. In Nigeria, it was discovered that over time, Company Income Tax (CIT) had a marginally beneficial impact on real GDP. Additionally, it was discovered that value-added tax in Nigeria had a long-term, beneficial, and large impact on the real gross domestic product. This study finds that tax income, as measured by CIT, CED, and VAT, significantly contributes to Nigeria's economic growth. It advises that the government strengthen the tax system because it has an impact on both economic growth and development.

The relationship between taxation and Nigeria's economic growth is investigated by Dibia & Onwuchekwa (2019). Utilizing time series data for the years 1981 to 2016, it explicitly examined the relationships between firm income tax, petroleum profit tax, and the economic growth of Nigeria as measured by Real Gross Domestic Product. A research design known as ex post facto was used. The results reveal that the Real Gross Domestic Product (RGDP) in Nigeria is positively and significantly impacted by the Petroleum Profit Tax (PPT) and the Company Income Tax (CIT). The study recommended that the Nigerian government implement fiscal policies to promote investments in the real estate sector and generate employment opportunities; work toward bringing social amenities to every corner of the nation as this will increase tax compliance in Nigeria; and foster an environment that will encourage entrepreneurship and innovation to increase income derived from tax proceeds.

Abomaye-Nimenibo, Michael & Friday (2018) looked at how taxes affect the economy. With GDP as the dependent variable and Petroleum Profit Tax (PPT), Company Income Tax (CIT), and Customs and Excise Duties (CED) as the independent variables, the study was prepared to empirically examine the relationship between tax revenue and economic growth in Nigeria from 1980 to 2015. The Multiple Regression Analysis approach was used to conduct the study's analysis. The primary analytical method used with Econometric software (EViews 9.0) was the Ordinary Least Square (OLS) method of econometrics. Their findings indicate that there is no substantial correlation between the taxation of petroleum profits, corporate income taxes, and customs and excise fees and Nigeria's economic expansion. However, if integrated properly and methodically, taxes have the potential to have a positive impact on the economy.

The empirical evidence varies across economics, data, and methodology; some findings indicate a negative impact while others demonstrate that tax revenue has little to no impact on economic growth. Furthermore, studies have tended to use aggregated data of tax revenue or total government revenue rather than the disaggregated tax revenue components that this study seeks to examine, making the pattern of flow and the intervening relationship between tax revenue and economic growth still an open question, particularly for developing and emerging markets like Nigeria.

It is indeed obvious that from the above empirical reviews that examined the impact of tax on government expenditure, the majority of the studies have some scope gaps because some have time limits while others have gaps with regards to methodologies and others have gaps on variables captured and so on. Therefore, this study intends to fill these identified gaps by examining the impact of tax on economic growth in Nigeria from 1986-2021.

### III. Methodology

#### 3.1 Research Design

This study aims to examine the impact of tax on economic growth in Nigeria (1986-2021). The Gross Domestic Product (GDP), Companies' Income Tax (CIT), Petroleum Profit Tax (PPT), and Value Added Tax (VAT) are the secondary data used. These time series data were obtained from the Statistical Bulletin of the Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS). To ascertain the genuine nature of the stationary qualities of all the variables under investigation, the present study first used the unit root test based on this concern. Since unit root issues are a regular occurrence in the majority of time series research, doing this is essential to avoid the issue of spurious regression. To determine whether all the variables are integrated in the same order, such as at the first difference [I(1)], the Johansen Cointegration test was used. Following the co-integration test, the study's estimating technique was the Vector Error Correction (VEC) model, depending on whether the variables were co-integrated or not. Additionally, it's crucial to remember that (I (2)) if any of the variables are integrated at order two. There would have been the usage of the Toda Yamamoto.

#### 3.2 Model Specification

This study aims to investigate the empirical analysis of the performance of tax revenue in the Nigerian economy. The study adopts a model from Abomaye-Nimenibo, Friday, and Chika (2018) to achieve this. In its functional form, their original model is specified as:

$$GDP = f(PPT, CIT, CED) \tag{3.1}$$

From the above function, we derived the statistical model as follows:

$$GDP = \alpha + \beta_1 PPT_t + \beta_2 CIT_t + \beta_3 CED_t + \epsilon \tag{3.2}$$

By transforming the linear function into their log form, we have;

$$GDP = \alpha + \beta_1 LPPT + \beta_2 LCIT + \beta_3 LCED + \epsilon \tag{3.3}$$

Where;

GDP: Gross Domestic Product;

PPT: Petroleum Profit Tax;

CIT: Company Income Tax;

CED: Customs and Excise Duties;

$\alpha$  is a constant

Our fundamental long-run model for identifying the effects of tax revenue performance on various industries in the Nigerian economy is Equation 1. The need to incorporate a model that accommodates the short-run dynamic adjustment process, which is the speed of adjustment from short-run disequilibrium to long-run equilibrium, has been amply supported in recent financial econometrics literature. However, the value-added tax is missing in equation (1), hence, our new model will be:

$$GDP = f(CIT, PPT, VAT) \tag{3.4}$$

Where;

GDP = Gross Domestic Product

CIT = Company Income Tax

PPT = Petroleum Profit Tax

VAT = Value Added Tax

Specifying the model in econometric form, we have;

$$GDP_t = \alpha_0 + \alpha_1 CIT_t + \alpha_2 PPT_t + \alpha_3 VAT_t + U_t \tag{3.5}$$

GDP is the Dependent while CIT, PPT, AND VAT are the independent variables.

Equation (3.5) is meant to explain the impact of tax on economic growth in Nigeria.

$\alpha_0, \alpha_1, \alpha_2, \alpha_3$ , are the parameters to be estimated in the equation.

### 3.3 Estimation and Evaluation Techniques

This study uses the following techniques Unit Root Test, Co-integration Test, Causality Test, Stability Test, and Impulse Response Function

## IV. Presentation and Analysis of Data

### 4.1 Descriptive Statistics of Data

The summary of descriptive statistics includes the mean, minimum, and maximum values, standard deviation, skewness, kurtosis, and the Jarque-Bera test for the data, among other fundamental statistical characteristics of the data under examination. These descriptive statistics provide our data's behavior with a historical context.

**Table1: Descriptive Statistics**

	GDP	CIT	PPT	VAT
<b>Mean</b>	42703.33	997.9078	461.4125	483.8189
<b>Median</b>	34889	658.3	122.8	357.15
<b>Maximum</b>	94463.55	3201.32	1793.33	1398.08
<b>Minimum</b>	17180.55	4.81	1.1	7.7
<b>Std. Dev.</b>	23571.31	1046.759	576.6033	446.961
<b>Skewness</b>	0.728041	0.657074	1.032465	0.627382
<b>Kurtosis</b>	2.272674	2.051404	2.708341	2.155638
<b>Jarque-Bera</b>	3.973766	3.940224	6.523506	2.66861
<b>Probability</b>	0.137122	0.139441	0.038321	0.263341
<b>Sum</b>	1537320	35924.68	16610.85	13546.93
<b>Sum Sq. Dev.</b>	1.94E+10	38349665	11636499	5393901
<b>Observations</b>	<b>36</b>	<b>36</b>	<b>36</b>	<b>28</b>

Source: AutAuthormputation using E-views 9, 2024

The Jarque-Bera test, which is a test of the normality distribution of the variables, appears to be crucial among the statistics presented in Table 1 among the other statistics. According to our findings and the Jarque-Bera statistics' P-values, all the variables were normally distributed because they had P-values greater than (0.05).

### 4.2 Correlation Matrix

A table displaying the correlation coefficients between the variables utilized in this study is called a correlation matrix. The correlation between the two variables is displayed in each cell of the table. This correlation matrix functions as a data summary, an input for more sophisticated analysis, and a diagnostic for sophisticated studies.

**Table2: Correlation Coefficients between the Variables**

	GDP	CIT	PPT	VAT
<b>GDP</b>	1			
<b>CIT</b>	0.815468	1		

<b>PPT</b>	0.984604	0.757339	1
<b>VAT</b>	0.992036	0.800245	0.989491

**Source: AutAuthormputation using E-views 9, 2024**

According to Table 2, there is a significant and favorable correlation between the GDP and CIT, PPT, VAT, CIT and PPT, and PPT and VAT.

### 4.3 UnitRootTest

To prevent the issue of erroneous regression, we utilize the Augmented Dickey-Fuller (ADF) test to check the stationarity of the variables. The unit root outcome is shown in the table below.

**Table3:StationarityTestResult**

Variables	AugmentedDickey-Fuller(ADF) UnitRootTest				
	CriticalValues	Atlevel	CriticalValue	At 1st Difference	Decision
<b>LGDP</b>	-2.567984	-3.20032	4.458605***	-4.226815	I(1)
<b>LCIT</b>	-0.097227	-4.219126	6.024527***	-4.226815	I(1)
<b>LVAT</b>	-3.238054	-3.279051	-7.35812***	-7.246813	I(1)
<b>LPPT</b>	-2.337794	-4.219126	5.842179***	-4.234972	I(1)

*Note: \*\*\* 1% level of statistical significance; \*\* at 5%, statistical significance; \* at 10% Statisticalsignificance*

**Source: Author ComputationusingE-views9**

All of the variables were not stationary at level, according to the results of the unit root tests performed using the Augmented Dickey-Fuller (ADF) test, which is shown in Table 3. In other words, the GDP, LCI, V, and LPPT were stationary at the first difference I(1), and were either significant at 1%, 5%, or 10%, depending on the situation. Thus, the Vector Error Correction Model (VECM) was used to estimate the model.

### 4.4 Granger Causality Test

The co-integration test shows a long-term equilibrium relationship between the two variables, but additional testing is required to determine whether there is a causal relationship. The explanatory power of the regression can be significantly improved if variable A is useful in predicting B, i.e., the regression of B is based on previous values of B, and past values of A are added. Then A can be referred to as B's Granger cause; otherwise, it can be referred to as B's non-Granger cause. The null hypothesis—that Granger causality exists—must be accepted because the p-value is less than the significant level of 5% ( $P < 0.05$ ).

**Table4:GrangerCausalityTestResult**

Null Hypothesis:	Obs	F-Statistic	Prob.	
CIT does not Granger Cause GDP	34	0.51886	0.6006	
GDP does not Granger Cause CIT		3.22204	0.0545	Unidirectional
PPT does not Granger Cause GDP	34	9.5558	0.0006	
GDP does not Granger Cause PPT		4.37427	0.0219	Bidirectional
VAT does not Granger Cause GDP	26	3.04506	0.069	
GDP does not Granger Cause VAT		4.07342	0.032	Bidirectional
PPT does not Granger Cause CIT	34	1.32216	0.2822	
CIT does not Granger Cause PPT		7.18924	0.0029	Unidirectional
VAT does not Granger Cause CIT	26	3.95087	0.035	
CIT does not Granger Cause VAT		0.13861	0.8714	Unidirectional
VAT does not Granger Cause PPT	26	22.6801	6.00E-06	
PPT does not Granger Cause VAT		0.48172	0.6244	no causality

**Source: Author Computation from E-views 9, 2024**



According to Table 4's findings, GDP and CIT; VAT and GDP are both granger causes of one another, meaning that there is a bidirectional relationship between the variables. While there is no Granger causality between PPT and VAT, there is unidirectional causality between GDP and CIT, CIT and PPT, and CIT and VAT.

#### 4.5 Lag Length Selection Criteria

The number of lags to be included in the model before the Johansson co-integration test was determined using the optimum lag length selection criterion before the VECM technique was looked at. To avoid misspecification and autocorrelation issues, the best lag choice must be taken into account (Gonzalez, 2016). The outcome is displayed in Table 5 below:

**Table5:OptimalLagLengthSelectionCriteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-759.6795	NA	4.01e+21	61.09436	61.28938	61.14845
1	-670.1202	143.2950	1.14e+19	55.20961	56.18471	55.48006
2	-639.9368	38.63467*	4.10e+18	54.07495*	55.83013*	54.56176

\* indicates lag order selected by the criterion, LR: sequential modified LRtest statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, and HQ: Hannan-Quinn information criterion

**Source: Author Computation using E-views 9, 2024**

Table 5 shows that two maximum lags should be included in the model according to the Akaike information criterion (AIC), Hannan-Quinn information criterion (HQ), and all other criteria except the Schwarz information criterion (SC). As a result, the Akaike information criterion (AIC) will serve as our model.

#### 4.6 Johansen Co-integration Test

The long-term relationships between integrated variables are made more understandable by co-integration analysis. It was employed in this study since Johansen's (1991) method provides the greatest likelihood for finite-order Vector Auto-regressions (VARs) and is simple to compute for such systems. The outcome is displayed below:

**Table6:Johansen Co-integrationTest**

Unrestricted Co-integration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.768531	70.10929	47.85613	0.0001
At most 1 *	0.651588	33.52651	29.79707	0.0178
At most 2	0.219698	7.167251	15.49471	0.5583
At most 3	0.037880	0.965390	3.841466	0.3258

Trace test indicates 2 co-integrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

**Source: Author Computation using E-views 9, 2024**  
Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.768531	36.58278	27.58434	0.0027
At most 1 *	0.651588	26.35926	21.13162	0.0084
At most 2	0.219698	6.201861	14.26460	0.5874
At most 3	0.037880	0.965390	3.841466	0.3258

*Max-eigenvalue test indicates 2 co-integrating eqn(s) at the 0.05 level*

*\* denotes rejection of the hypothesis at the 0.05 level*

*\*\*MacKinnon-Haug-Michelis (1999) p-values*

**Source: Author Computation using E-views 9, 2024**

The Johansen (1988) and Juselius (1990) approach is typically used to examine the co-integration connection between variables in the VAR model. The Gross Domestic Product (GDP), Companies Income Tax (CIT), Petroleum Profit Tax (PPT), and Value Added Tax (VAT) all passed the Johansen co-integration test. Table 5 above demonstrates that under the 5% level, test results in both the maximum eigenvalue test and the trace test accept the null hypothesis and at least one co-integrating equation exists. This indicates that the variables have enduring and stable equilibrium relationships. VEC modelling can proceed under the assumption that co-integration linkages exist.

#### **4.7 Vector Error Correction Model (VECM)**

It should be noted that the Error Correction Mechanism (ECM) aims to connect the co-integrating equations' short-run dynamics to their long-run static dispositions. The Vector Error Correction Method (VECM) was used to capture the short-run variation, and the outcome is shown in Appendix II.

#### **4.8 VEC Residual Serial Correlation**

**Table 7: Serial Correlation LM Test**

Lags	LM-Stat	Prob
1	13.57461	0.6304
2	18.94134	0.2717

Probs from chi-square with 16 df.

**Source: Author Computation using E-views 9, 2024**

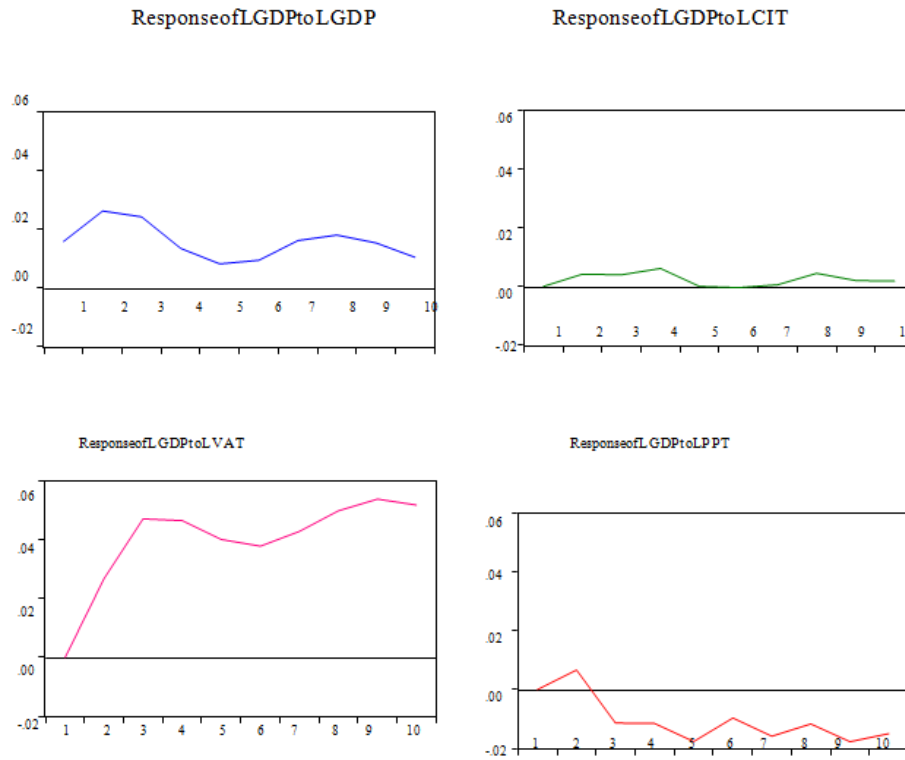
According to Table 7, the alternative hypothesis of serial dependency among error terms is the null hypothesis, which states that there is no serial connection in the error terms. It implied that this results analysis is trustworthy and free of serial correlation because the probability of the LM test in the result has values for the two-lag period of 0.6304 and 0.2717 which is greater than the 5% level of significance.

#### **4.9 Impulse Response**

Further analysis is performed using the impulse response function and variance decomposition based on the Vector Error Correction Model, and the results for 10 periods are acquired. This analysis is done to study the dynamic impacts of the model responding to certain shocks as well as how the effects are among the four variables.

Individual coefficients from the Vector Error Correction Model for the vector-auto-regressive model are difficult to interpret, as has been noted in the literature. It is challenging to comprehend VAR models. Making an impulse response function (IRF) is one approach. The IRF tracks how endogenous variables react to a shock of one standard deviation to one of the system's disturbance factors. The dynamic design of the VEC models allows for the transmission of this shock to all endogenous variables (Lutkepohl, 2001). As a result, the analysis of the model's dynamic features involves looking at the variance decompositions and impulse response functions. The impulse response functions show the expected course over time of the variable to shocks in the innovations, tracing the dynamic reactions to the effect of shock in one variable affecting itself and on all other variables. Figure 1 plots these impulse response functions.

**Figure1: Plot of the Impulse Response Function**



Source: Author’s computation using Eviews9,2024

According to Figure 1, the Gross Domestic Product experiences a one standard deviation shock that is positive for the duration of the period. This seems to imply that there is evidence supporting the favorable impact of GDP on shocks of its own in Nigeria. In the near term, a one standard deviation shock to CIT has a positive discernible effect on GDP; but, over the long term, it has a negative perceptible effect on GDP and reduces output. The short-term impact of a shock to VAT of one standard deviation is enormously favorable.

Over time, the effect becomes apparent. Last but not least, a shock to PPT of one standard deviation has a positive but minor impact on GDP. PPT has little impact on GDP between periods 5 and 6.5. However, the impact returns as later periods demonstrate that PPT's shock responds favorably to GDP.

#### 4.10 VarianceDecompositionofGDP

**Table8: VarianceDecompositionofGDPResult**

Period	S.E.	LGDP	LCIT	LVAT	LPPT
1	0.160422	100.0000	0.000000	0.000000	0.000000
2	0.214064	95.30948	2.110210	2.569134	0.011172
3	0.359003	76.59182	12.66408	4.623789	6.120308
4	0.455133	79.67191	11.08167	5.429145	3.817274
5	1.110311	68.24019	7.347223	4.142537	20.27006

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6	1.428246	79.03976	4.501934	3.925491	12.53281
7	5.478374	64.74615	3.568167	2.891410	28.79427
8	7.668482	78.58366	2.649787	2.630152	16.13640
9	32.37484	65.23620	2.535494	2.575864	29.65244
10	48.64399	79.53668	1.807503	2.382440	16.27337

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**Cholesky Ordering: LGDPLCITLVATLPP**  
**Source: Author Computation using E-views 9, 2024**

The results for 10 sessions are shown in Table 8. For the first period, we can see that a shock to GDP during that period accounts for 100% of the variation in GDP (own shock), but no contribution was made by shocks to CIT, VAT, or PPT. CIT has a little greater short-term impact on GDP growth than PPT. However, over a longer period, VAT has a much greater impact on GDP growth than CIT and PPT. The change in GDP growth with the lengthening of the period can be better explained by the shock to the VAT. In other words, beginning with period 3 and continuing through consecutive periods, VAT accounts for approximately 60% of the fluctuation in GDP.

#### **4.11 Discussion of Findings**

With a particular emphasis on the Companies Income Tax, Value Added Tax, and Petroleum Profit Tax, this research investigated the relationship between tax and economic growth in Nigeria. There is at least one co-integrating equation between the variables in the long run, according to the Johansen test of co-integration. The nature and degree of the association between tax and economic growth were determined by the study using a Vector Error Correction Model (VECM). A causal relationship between Real GDP and the various tax components was discovered using the Granger causality test. The following conclusions are supported by impulse response functions and variance decomposition analysis using Vector Error Correction Model (VECM):

- I. In the short run, a one standard deviation shock to CIT has a positive discernible impact on GDP; however, over the long run, it has a negative perceptible effect on GDP and reduces output.
- II. A one-standard-deviation shock to VAT has a significant and favorable impact on GDP in the short run. While in the Long-run the effect became noticeable.
- III. A shock to PPT of one standard deviation has a positive but minimal impact on GDP. PPT has little impact on GDP between periods 5 and 6.5. However, the impact returns as later periods demonstrate that PPT's shock responds favorably to GDP.

As a result, the shock to the indirect tax (VAT) tends to have an increasingly large impact on GDP growth over time. The CIT and PPT, as well as the low level of tax compliance, can be ascribed to a variety of things, such as the complex and ineffective tax administration system, ambiguities in the tax rules, and a lack of transparency regarding the use of tax income for social services and obvious development.

### **V. Conclusion and Recommendations**

The informal sector, which makes up the majority of the economy, is only partially covered by Nigeria's overly complex, distorting, and generally unfair tax regulations. As a result, the impact of the indirect value-added tax (VAT) shock on GDP growth tends to expand dramatically over time. The CIT and PPT, as well as the low level of tax compliance, can be ascribed to a variety of things, such as the complex and ineffective tax administration system, ambiguities in the tax rules, and a lack of transparency regarding the use of tax income for social services and obvious development. For the tax system to be efficient and effective, it must produce officials who are well-paid, well-motivated, properly organized, and adequately equipped. Other major challenges facing tax authorities include the need to not only build but also utilize institutional and human capacity, funding, and logistics as well as finding solutions for tax evasion, fraud, and mismanagement of collected revenue, improving voluntary compliance, and speedy adjudication on legal matters. The system must comply with straightforward, explicit, and simple tax regulations, and assessment and collection procedures must be easy to understand, open to the public, and client-friendly. Nigeria must create special tax tribunals and train specific tax judges. Based on the study's findings, therefore, this study makes the following recommendations;

Based on the study's findings, it is recommended that since in the short run CIT, VAT and PPT have significant and favourable impacts on GDP, it is highly recommended that there is a need to increase their level. To increase the level of CIT and tax compliance in Nigeria, the government should make an effort to promote businesses by providing basic public services to every nook and cranny of the nation. The government should stop all leakages in the petroleum industry so that the PPT collected from Nigerian crude oil can support and advance Nigeria's economic growth. Additionally, the government should seek to reduce or completely eradicate

the pervasive corruption in the administration of the petroleum profit tax. To increase the government's VAT base and provide a favorable environment for oil companies and innovation utilizing tax money

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