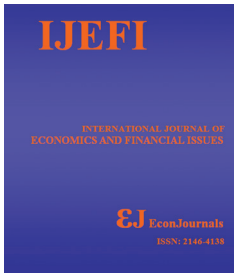

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Tax Reforms and Tax Yield in Nigeria

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ABSTRACT

This study estimates elasticity and buoyancy of various tax components as well as the impact of tax reforms on tax components in Nigeria between 1981 and 2014. Error correction mechanism (ECM) technique was employed in analyzing the data. The results revealed that: All the tax components were inelastic, there was a general improvement in post-reformed tax elasticities ranging from 0.199 to 1.28 with petroleum profit tax and the total tax revenue having coefficients >1, values of tax buoyancies were all positive and <1, with post reform samples buoyancies being greater than that of common samples ranging from 0.13 to 0.93, tax reform was further confirms to improve tax revenues by positive and significant coefficients of the dummies. Based on the findings, the study recommended that: Government should diversify the economy for more development as well as strengthening tax reforms in order to increase overall tax revenue.

Keywords: Tax Reforms, Tax Elasticity, Tax Buoyancy
JEL Classification: H250

1. INTRODUCTION

Governments require revenue to augment the spending needs of maintaining adequate level of public investments and social services, and taxes constitute the main source of raising revenue in both developed and developing countries. Tax reform is a process of changing the way taxes are collected or managed by the government in order to enhance tax yields-cum-revenue.

Accordingly, the governments of Nigeria have carried out a number of tax reforms over the years. Such notable reforms in Nigeria include: Establishment of Federal Inland Revenue Service (FIRS) in 1992 through the Finance (miscellaneous taxation provisions) Act No. 3 and Decree No.104. With the passage of the FIRS (establishment) Act, the FIRS was granted financial and administrative autonomy from civil service bureaucracy in terms of funding, personnel and material resource management (FIRS, 2014). Other prominent tax reforms include the introduction of value added tax (VAT) in 1992 which was prompted by the recommendation of the Dr. Sylvester Ugoh led study group on indirect taxation, imposition of 10% and 2.5% levy on banks' excess profits and on building and construction companies respectively (Olajide and Associates, 2013).

The primary motivation for tax reforms-cum-revenue mobilization in Nigeria has been the need for diversified tax base and increased revenues. The need to raise more revenue against the backdrop of high expenditure has taken added importance when compared to other sources of resource mobilization such as deficit financing and money creation; and the fact that Nigeria federally collected revenue has been basically from oil. Specifically, oil revenue constitute on average over 70% of the revenue between 1990 and 2014 (Central Bank of Nigeria [CBN], 2014). The over dependence on oil revenue couple with its incessant fluctuations due to exogenous oil price shocks formed one of the reasons for the establishment of FIRS and the subsequent tax policies aimed at diversifying the revenue based away from oil.

Despite the major tax reform and restructuring in Nigeria, Nigeria's fiscal deficit is still ever increasing and the revenue base highly skewed in favor of oil-revenue. In this regard, we augured strongly here that the knowledge of tax buoyancy and elasticity is indispensible for efficient tax reforms. Tax revenue/yield may change due to a variety of factors, such as changes in income, changes in tax rate and tax base, changes in efficiency of tax assessment and collection, among others. The responsiveness of tax revenue or yield to such changes can be explained with the

help of tax elasticity and buoyancy (Timsina, 2008; Muibi and Sinbo, 2013; Mawia and Nzomol, 2013; Ebi and Aladejare, 2016).

Tax elasticity may be defined as the ratio of a percentage change in adjusted tax revenue to a percentage change in income (nominal gross domestic product [GDP]). On the other hand, tax buoyancy refers to changes in actual tax revenues due to the changes in income as well as due to the changes in discretionary measures such as tax rates and tax bases (Timsina, 2008). This distinction between the tax elasticity and buoyancy is very useful in analyzing and evaluating whether future revenues will be sufficient to meet the resource needs without changing the rates or bases of the existing tax. To measure the tax elasticity, historical tax series must be adjusted so as to eliminate the effects of tax revenues from discretionary changes. If there is no change in the tax rates and the tax base during the reference period, the buoyancy will be the same as elasticity. If the changes in the tax system are revenue enhancing, then buoyancy will exceed elasticity (Timsina, 2008; and Ebi and Aladejare, 2016).

Alternatively, the buoyancy and the elasticity of tax revenues are also estimated by applying the partitioning approach. Under this approach, tax elasticity and buoyancy coefficients are partitioned into tax to income and tax to base. In other words, tax elasticity and buoyancy are estimated with respect to the GDP as well as their respective proxy bases. The advantage of using such a partitioning approach is the ability to identify factors responsible for rapid or lagged revenue growth. Factors that affect the tax to base elasticity such as tax rates exemptions and improvements in tax administration are within the control of the fiscal authorities, thereby making this measure important for related purposes. The tax to income elasticity, on the other hand, determined largely the way in which taxes responds to economic structure/growth (Timsina, 2008).

Against this background, this study attempts to utilize the time series approach to empirically estimate the tax elasticity and buoyancy in Nigeria for the period 1981-2014. The choice of this period is based on availability of data for most tax components as well as the desire to capture the impact of the establishment of FIRS in 1992 which marked the beginning of major tax reforms and tax policy administrations on tax yields. The major components of tax revenue such as personal income tax (PIT), petroleum profit tax (PPT), VAT, and excise duties (ED), etc., are employed and their buoyancy and elasticity estimated.

2. LITERATURE REVIEW

A good tax system is expected to generate tax revenue that is responsive to changes in national income. There is substantial literature on the responsiveness of tax revenue to economic growth (GDP) and development. These literature provides support for the argument that economies with better/efficient tax system generates sufficient revenue for public expenditure without resulting to deficit financing, develop faster than their counterparts with insufficient tax revenue for public expenditure. The responsiveness of a tax system to changes in national income can result from two effects namely either elasticity (in-built flexibility) or the buoyancy of the tax. Hence studies conducted by eminent scholars on this subject outside and within Nigeria are reviewed in this section.

Mukariam (2001) carried out a study on the elasticity and buoyancy of major taxes in Pakistan over the period 1981-2001. The study adopted chain indexing technique which was used for the adjustment of the tax yield series to subtract the revenue effect of the discretionary changes from the actual tax yield so as to represent the tax revenues that would have been obtained in each year if the rates applicable in the reference year had prevailed throughout the period. The study also employed the ordinary least squares econometric method for regression of the equations in the study. He found that, customs and ED appear to be relatively rigid. Accordingly, the study projected that direct taxes and sales tax will be the pillar of Pakistan's future resource mobilization strategy. The results further showed that the buoyancy of all the taxes were higher than their corresponding elasticities and well above unity for direct taxes and sales taxes.

Muriithi and Moyi (2003) analyzed the productivity of Kenya's tax structure in the context of the tax reforms. The findings suggest that tax reforms had a positive impact on the overall tax structure and on the individual tax handles, even though the impact of the reforms was not always uniform. The study confirms that the reforms had a bigger impact on direct taxes than on indirect taxes, suggesting that revenue leakage is still a major problem for indirect taxes. The study also submitted that the better responsiveness of direct taxes is attributed to the relative effectiveness of the reforms in direct taxes, which not only made the tax system simpler but also reduced avenues for evasion and corruption.

In a related study conducted by Samuel and Isaac (2012) on the elasticity and buoyancy of tax components and tax systems in Kenya using time series data, spanning from 1987 to 2011, the tax revenue model for estimating tax buoyancy and tax elasticity used by Muriithi and Moyi (2003) was adopted in the study; ordinary least square method was employed to estimate the parameters of the model. The findings of their study revealed that Kenya tax system was neither income elastic nor buoyant. All major tax components in Kenya are inelastic. Income tax and ED had unity buoyancies over the study period. This was not in agreement with what Muriithi and Moyi (2003) found out that the two taxes were buoyant. According to the findings of the study import duties are the most buoyant tax component while the sales tax was least buoyant.

The study was further examined in Kenya by Mawia and Nzomol (2013); and Omondi et al. (2014). Mawia and Nzomol (2013), utilized a time series approach to estimate tax buoyancy for Kenya for the period 1999/2000-2010/2011. Tax buoyancies were computed for income, import, excise, VAT and total taxes. Specifically, their paper examined the buoyancies of tax revenues to changes in economic growth (GDP) and proxy bases using quarterly data instead of annual data of GDP and tax revenues and their bases. They also analyzed the tax buoyancy of pay as you earn (PAYE), other income tax, as components of income tax and local and import VAT as components of total VAT, in order to ascertain the response of these specific taxes to their bases. Their

results showed that the total tax was buoyant with a buoyancy value of 2.58 while the individual taxes were not buoyant except the excise duty which was buoyant with respect to the base. Tax bases were found to respond well to economic changes with buoyancy values greater than unity, with an exception of excise duty base to income buoyancy coefficient being less than unity. Based on their findings, they recommended a constant review of the tax system as the economic structure changes.

Omondi et al. (2014), conducted a study on the effects of tax reforms on buoyancy and elasticity of the tax system in Kenya. Annual time series data was used spanning from 1963 to 2010 to examine the effects of tax reforms on tax buoyancy and elasticity estimates and to determine the effect of tax modernization programme and revenue administration reforms on tax buoyancy and tax elasticity. The study employed regression analysis to regress tax revenue on income. The results showed that the elasticity for Kenya's overall tax system was 0.690 which means that the increase in national income brought about a less than proportionate increase in tax revenue. The results conformed to the findings of Muriithi and Moyi (2003); and Wawire (2006) who found the overall tax system to be inelastic.

Timsina (2008) conducted a study on tax elasticity and buoyancy in Nepal. Annual time series data was applied from 1975 to 2005 to empirically measure the elasticity as well as buoyancy for the different taxes so as to ensure whether or not the tax system in Nepal is elastic. Partitioning approach was also applied to estimate the elasticity and buoyancy coefficients. In other words, tax elasticity and buoyancy were estimated through two ways: Tax to base and base to income. The tax to base elasticity measured the progressiveness of the tax structure and/or a given trend in administrative efficiency while the base to income elasticity measured the responsiveness of tax base to income. The study revealed that the tax system in Nepal is inelastic (less than unity) in the period 1975-2005 with a more than unitary buoyancy coefficient, thus reflecting that the bulk of revenue collection emanated from discretionary changes in the tax policy, rather than from automatic responses. It is also worthy of note that the product of the two coefficients of tax to base and tax base to income gave the same result of traditional income elasticity approach.

Choifor (2008) conducted a study on the indirect tax reforms and revenue mobilization in Cameroon. Annual time series data was used in the study spanning from 1980 to 2003 in order to investigate if the tax reforms did improve the initial tax revenue situation or rather helped to engineer the response of the tax system to changes in the tax bases for the purpose of raising sufficient revenue requirement for the economy; and to identify which indirect tax hurdles become more responsive (flexible) or remain rigid after the tax reform, as well as which of the indirect taxes responded to revenue increases depend on discretionary power influence than by natural response (elasticity). From the findings of the study, it was summarized that, Cameroon tax system was inelastic.

Acharaya (2011) conducted a study on the measurement of tax elasticity in India. The study adopted the annual time series data approach for the period 1991-2010 in order to empirically estimate tax elasticities for India. Findings of his regression analysis revealed that, the elasticity of direct tax was higher (1.62) compared to indirect tax with elasticity of <1. He explained that the result implies that government has been lenient or conservative with the tax collection in indirect tax area. In terms of tax buoyancy, he found that both direct tax and indirect tax shows nearly 1 as elasticity as expected and that the overall outlook was good for India as the elasticity calculated were high and more than 1 and thus shows that the tax revenue collections responds better to the changes in tax base and income.

Cotton (2012) conducted a study on the buoyancy and elasticity of non-oil tax revenues in Trinidad and Tobago. Annual time series data was sourced for from the Ministry of Finance in the country and sub-divided into two main categories i.e., direct and indirect tax revenue and their components. The study revealed that the non-oil taxation system relatively response to changes in non-oil GDP and as such when growth recurs, revenue would increase and help to improve the fiscal position.

Ndedzu et al. (2013), conducted a study on the revenue, productivity of Zimbabwe's tax system. Yearly time series data was used in the study spanning from 1975 to 2008 to evaluate the revenue productivity of Zimbabwe's overall tax system and of individual taxes on the basis of estimates of tax buoyancy. The study employed the multiplicative functional form of a tax revenue model by Singer (1968). Tax buoyancy measures percentage changes in tax revenue, including discretionary tax changes, due to a one percent increase in the base (GDP, in aggregate level). The findings of the study show that the tax system as a whole and the individual taxes with the exception of customs duty are both income inelastic and non-productive. Buoyancy and elasticity coefficient, except for customs duty, were all less than unity. This implies that the tax system has failed to generate the necessary revenue.

Belinga et al. (2014), conducted a study on tax buoyancy in OECD countries to estimate short-run and long-run tax buoyancy in these countries between 1965 and 2012. The study used single error correction model. Tax buoyancy was generally measured by regressing the log of tax revenue on the log of GDP, sometimes with controls for other factors influencing revenue performance. Their findings showed that, long-run buoyancy was not significantly different from one in about half of the OECD countries. For 14 countries, long-run tax buoyancy exceeds one, implying that GDP growth has helped improve fiscal performance through the revenue side of the budget.

In Nigeria, a number of studies have been conducted on this subject over time. Ariyo (1997) examined the productivity of the Nigerian tax system for the period 1970-1990. The study adopted the double log form and the proportional adjustment methods. The findings of the study support a general acceptable tax productivity level, but with significant variations in the level of tax revenue by various tax sources which is related to the permissiveness in the administration of non-oil tax sources during the oil "glory day" period.

Temitayo and Edu (1999), in a similar study for Nigeria for the period 1970-1995 obtained a buoyancy of 1.6 with the base year as the denominator; while obtaining a buoyancy of 1.3, when the current year was adopted as the denominator, and a 1.4 buoyancy value when the mean of the base and current periods was adopted has the denominator. Hence, their study deduced that, total government revenue was generally buoyant for the study period.

Meshak and Jeff (2014) conducted a study on the productivity of the Nigeria Tax system using a time series data covering 30 years, from 1983 to 2012. The study adopted the tax elasticity and buoyancy approach and employed the regression in Mintab statistical software. From the findings of the study, individual tax sources were all significant at 5% level of significance. The buoyancy result showed that PPT, custom ED (CED) and total tax revenue (TTR) were negative and less than unity. This result was synonymous to the one obtained by Ariyo (1997). VAT and company income tax (CIT) exhibited a buoyancy excess of unity (1.85 and 1.13 respectively). The negative result of TTR indicates that the tax revenue collection was negatively responsive to changes in GDP. They concluded that the negative result of some of the tax bases to GDP can be attributable to poor tax effort, corruption, weak administrative structure, tax evasion, reoccurring tax exemption or incentives. The result of the analysis also revealed that two out of the four tax base have buoyancy above unity with VAT as the most buoyant among all. This supports the thinking that VAT will constitute a major source of revenue generation in both short and long run to meet government spending requirement.

Oriakhi and Ahuru (2014) examined the impact of tax reforms on federal revenue generation in Nigeria. The study employed annual time series data spanning the years (1981-2011). The study also employed the regression analysis. The total federally collected revenue was regressed on several tax revenues such as PPT, VAT, and CED being used as proxy for tax reform. The study showed that by improving the tax system, reducing tax avoidance and evasion, reducing tax burden by scaling down the PIT from 25% to 17.5% and CIT from 30% to 20% improve the ability of the government to generate more revenue through taxation. This has the potential to improve both the quantity and quality of public expenditure, and de-link Nigeria's public expenditure from the happenings in the international oil market, thereby hedging the economy away from oil price volatility. The study recommended that in order to consolidate on the benefits from tax reforms, efforts should be made to achieve full autonomy for the FIRS, tackle the hydra-headed monster of multiple taxations and promote accountability and transparency in government business so as to restore the confidence of the tax payer in the tax system.

Ebi and Aladejare (2016) examined how much economic growth has boosted government tax revenue in Nigeria between 1980 and 2013. The study adopted the auto-regressive distributive lag approach to examine the short and long run buoyancy of government revenue sources which were decomposed into: TTR, oil revenue and non-oil revenue. Results revealed very weak buoyancy of government revenue in both the short and long run periods. Based on the findings, it was recommended that pervasive corruption at both the collection and remittance point of revenue should be tackled in the system, and that the development of the non-oil sector should not be taken lightly.

These previous studies in Nigeria as reviewed above followed a traditional approach to calculate elasticity and buoyancy of several taxes. Again their period of studies did not take cognizance of any specific tax reforms in Nigeria. Hence this study differs from other works done Nigeria on this subject in that, it focuses on elasticity and buoyancy of various taxes in Nigeria from the period of establishment of FIRS in 1992-2014 using partitioning approach. An advantage of using such a partitioning approach is the ability to identify factors responsible for rapid or lagged revenue growth. In the partitioning approach, as discussed earlier, tax elasticity and buoyancy coefficients are partitioned into tax to base and base to income components (Timsina, 2008).

3. DATA SOURCES, MEASUREMENT AND METHOD

3.1. Data Sources and Measurement

The data for this study was obtained from secondary sources such as the CBN Statistical Bulletin (CBN, various issues), National Bureau of Statistics, FIRS (Appendix Table A).

The study followed the IMF's Government Finance Statistics method to classify the tax revenue. "In this classification, tax revenues are classified with respect to their bases on which they are levied" (IMF, 2006). The tax revenue can be classified on the basis of income, profit, consumption of goods and services, international trade, property etc. For example, income tax is levied on income of individuals and profits of business. In this study, for simplicity purpose, the non-agricultural income (NAI) was taken as the proxy base for the income tax (as the agricultural income is not taxed in Nigeria). The VAT and ED are levied on private consumption and imports of goods and services respectively. The total tax is based on the GDP at current market price. The taxes and their proxy bases are presented in Table 1.

3.2. Model Specification

IMF (2006) tax to base classification as well as works of Timsina (2008) provides conceptual framework upon which this study is anchored. In the partitioning approach, as discussed earlier, tax elasticity and buoyancy coefficients are partitioned into tax to income, tax to base and base to GDP components respectively (Timsina, 2008). Accordingly, we specify that:

$$PIT = f(GDP, NAI, DM, U_1) \quad (1)$$

Table 1: Proxy tax bases

Tax revenue	Proxy bases
PIT	NAI
VAT	PC
PPT	OREV
ED	IMPS
TTR	Nominal GDP

Source: IMF's Government Finance Statistics (GFS) 2006, PIT: Personal income tax, NAI: Non-agricultural income, PC: Private consumption, PPT: Petroleum profit tax, OREV: Oil revenue, ED: Excise duty, IMPS: Imports and export of goods and services, TTR: Total tax revenue

Where,
PIT: Personal income tax (a component of TTR).
NAI: Non-agricultural income (a base for PIT).

DM: Dummy variable used to proxy establishment of FIRS as a major tax reforms in 1992 (D = 0 for periods before the establishment of FIRS in 1992 and 1for periods starting from 1992).

U: Error term.

The econometric model for PIT is specified as:

$$PIT = \alpha_0+\alpha_1GDP+\alpha_2NAI+\alpha_3DM+\alpha_4GDP*DM+\alpha_5NAI*DM+U_1 \quad (2)$$

Where all the variables remained as previously defined.
GDP*DM and NAI*DM are differential of GDP and NAI due to reforms.
α_1 and α_2 are common elasticity and buoyancy of PIT.
α_3: Coefficient of tax reforms policy.
α_4 and α_5: Differentials elasticity and buoyancy of PIT respectively.

The common elasticity and buoyancy measure the impact of income and the base on the tax component (PIT). On the other hand, the differentials elasticity and buoyancy measure the amount by which the impact of the corresponding income and base has change with tax reforms.

We also specified that:

$$PPT = f(GDP, OREV, DM, U_2) \quad (3)$$

Where,
PTT: Petroleum profit tax (also a component of TTR).
OREV: Oil revenue (a base for PPT).
DM: Dummy variable used to proxy establishment of FIRS as a major tax reforms in 1992.

The econometric model for PIT is specified as:

$$PPT = b_0+b_1GDP+b_2OREV+b_3DM+b_4GDP*DM+b_5OREV*DM+U_2 \quad (4)$$

Where all the variables remained as previously defined.
b_1 and b_2 are common elasticity and buoyancy of PPT.
b_3: Coefficient of tax reforms policy in respect to PPT.
b_4 and b_5: Differentials elasticity and buoyancy of PPT respectively.

We also specified that:

$$ED = f(GDP, IMPGS, DM, U_3) \quad (5)$$

Where:
ED: Exercise duty tax (also a component of total tax).
IMPGS: Imports and export of goods and services (a base for ED).
DM = Dummy variable used to proxy establishment of FIRS as a major tax reforms in 1992.

The econometric model for ED is specified as:

$$ED = c_0+c_1GDP+c_2IMPGS+c_3DM+c_4GDP*DM+c_5IMPGS*DM+U_3 \quad (6)$$

Where all the variables remained as previously defined.
c_1 and c_2 are common elasticity and buoyancy of ED.
c_3: Coefficient of tax reforms policy in respect to ED.
c_4 and c_5: Differentials elasticity and buoyancy of ED respectively.

We also specified that:

$$VATT = f(GDP, PC, DM, U) \quad (7)$$

Where,
VATT: Value added tax (also a component of total tax introduced in 1992).
PC: Private consumption (a base for VATT).
Other variables remained as previously defined.

The econometric model for VATT is specified as:

$$VATT = d_0+d_1GDP+c_2PC+U_4 \quad (8)$$

Where all the variables remained as previously defined.
d_1 and d_2 are elasticity and buoyancy of VATT.

Note, no differentials elasticity and buoyancy for VATT since it was introduced in 1992.

We also specified that:

$$TTR = f(GDP, DM, GDP*DM, U) \quad (9)$$

Where,
TTR: Total tax revenue.
GDP: GDP at current market price as base for TTR.
Other variables remained as previously defined.

The econometric model for TTR is specified as:

$$TTR = e_0+e_1GDP+e_2DM+e_3GDP*DM+U_5 \quad (10)$$

Where all the variables remained as previously defined.
e_1: Common elasticity TTR.
e_2: Coefficient of tax reforms policy in respect to TTR.
e_3: Differentials elasticity of TTR.

3.3. Estimation Procedures

Several techniques are employed in this study to test and estimate the relevant equations. These include the unit root test, the cointegration test, and the error correction mechanism.

4. RESULTS

4.1. Unit Root Result

The test for unit root is invariably, the test for stationarity. The test was carried out on each variable in the model in order to

avoid the estimation of a spurious relationship arising from using two or more non-stationary time series data to estimate long-run relationship. The Augmented Dickey Fuller (ADF) method was used to test for the unit root. The initial set of analysis involves the test on the data series in their level and if the variables are stationary at level, we difference it to make it stationary.

The results of the unit root are presented in Table 2.

The result of the unit root using ADF test reported in Table 2 shows that all the variables are non-stationary at level. However, after first difference (CIT, Imports and export of goods and services [IMPS], OREV, PPT, TTR and VAT) were stationary at 1% level of significance and variables PC, PIT, DM and ED) were also stationary at 5%, while variables GDP and NAI attained stationarity at 10% level of significance. Implying that all the variables are integrated of order one" I(1)." This result also made error correction mechanism (ECM) suitable for estimation.

Using the MacKinnon critical values for rejection of hypothesis of a unit root, we therefore reject the null hypothesis that there is no unit root for all the variables in the model whose ADF test statistic values are greater than the critical values at 10%, and accept that there is unit root for all in the variables.

4.2. Cointegration Test Results

Given the unit-root properties of the variables, we proceeded to establish whether or not there is a long-run cointegrating relationship among the variables in the various equations using the Johansen full information maximum likelihood method.

The Johansen cointegration tests revealed that the maximal Eigen value statistics show existence of 3 cointegration equations for PIT equation, 1 cointegration equation for PPT equation, 2 cointegration equations for ED equation, 2 cointegration equations for VATT equation, and 1 cointegration equation for TTR equation, all at 5% level of significance (Table 3).

The conclusion drawn from this result is that there exists a unique long-run relationship among the explanatory variables in our various models. Hence, economic interpretation of the long-run relationship in the various models can be obtained by normalizing the estimates of the unconstrained cointegration equations.

4.3. Result of Taxes Response to Changes in GDP and GDP*DM (Common and Post Reform Tax Elasticities)

Table 4a and b shows summary of coefficients of various taxes in respect to changes in GDP and GDP*DM from their various short-run estimates respectively (Appendix Table B). While the common-sampled coefficients of all the tax components were less than one (inelastic) as shown in Table 4a, there was a general improvement in their post-tax elasticities with PPT and the total tax (TTR) having coefficients greater than on (elastic) as shown in Table 4b

The summary of the estimated values of tax elasticities over the post reform period shows that the estimated coefficients of elasticity are positive for all the tax variables. The coefficients of

Table 2: Unit root result

Variables	ADF test statistic	1st different	Remark
	Level		
GDP	0.320853	−2.723637***	I (1)
IMPS	1.252945	−4.131008*	I (1)
NAI	4.206605	−2.900793***	I (1)
OREV	−0.3162293	−5.948482*	I (1)
PC	0.114715	−2.997906**	I (1)
PIT	1.326001	−3.283867**	I (1)
PPT	−1.835385	−2.690734*	I (1)
TTR	−1.848325	−3.690974*	I (1)
VAT	1.6060956	−4.697178*	I (1)
ED	3.620211	−3.003260**	I (1)
DM	−0.970780	−3.013274**	1 (1)

Source: Author's interpolation with E-views 8.0, critical values at level: 1% = −3.6496, 5% = −2.9558, 10% = −2.6164, *,**, and *** indicate statistical significance at 1%, 5% and 10% levels, ADF: Augmented Dickey Fuller, GDP: Gross domestic product, IMPS: Imports and export of goods and services, NAI: Non-agricultural income, PIT: Personal income tax, PPT: Petroleum profit tax, TTR: Total tax revenue, VAT: Valued added tax, ED: Excise duties, OREV: Oil revenue

Table 3: Cointegration test results

Equations	Eigen value	0.05 critical value	Hypothesized number of CE (S)
PIT	30.513	21.1316	At most 3*
PPT	4.8044	3.8414	At most 1*
ED	34.933	33.876	At most 2*
VAT	17.579	14.264	At most 2*
TTR	28.266	27.584	At most 1*

Source: Extracted from cointegration results on the appendix, *denotes rejection of the hypothesis at 5% level, PIT: Personal income tax, PPT: Petroleum profit tax, TTR: Total tax revenue, VAT: Valued added tax, ED: Excise duties

Table 4a: Response of taxes to D (GDP) (tax elasticities %)

Taxes	Coefficient	Standard error	T-statistic	P
PIT	0.171140	0.195290	0.876367	0.3889
PPT	0.922000	0.866000	0.106511	0.9160
ED	0.768300	0.011425	67.24850	0.0000
VAT	0.722000	0.859000	0.840619	0.4116
TTR	0.986900	0.365100	2.702917	0.0115

Source: Author's computation from the main result in the appendix, PIT: Personal income tax, PPT: Petroleum profit tax, TTR: Total tax revenue, VAT: Valued added tax, ED: Excise duties, GDP: Gross domestic product

Table 4b: Response of taxes to D (GDP*DM) (post reform tax elasticities %)

Taxes	Coefficient	Standard error	T-statistic	P
PIT	0.199930	0.195550	1.022380	0.3160
PPT	1.009140	1.008660	0.105535	0.9168
ED	0.977509	0.411424	2.375910	0.0230
TTR	1.287500	0.365500	3.520930	0.0011

Source: Author's computation from the main result in the appendix, PPT: Petroleum profit tax, TTR: Total tax revenue, ED: Excise duties, GDP: Gross domestic product, PIT: Personal income tax

PIT and ED were less than one (inelastic). That is, in every 1% change in post-tax reform GDP (that is GDP*DM), there is <1% increase in PIT and ED. While a 1% increase in post-tax reform GDP) led to a more than 1% increase in PPT and TTR. Again, only ED and TTR were statistically significant, while others were not statistically significant given their t-statistic values. The result also indicates that the TTR responded most to changes in GDP while the PIT had the least response to changes in GDP. This

is clearly shown by their coefficients of 0.98 and 0.17 for TTR and PIT respectively. The findings of post-tax reform elasticities disagreed with Ariyo (1997) and Meshak and Jeff [2014]) results, that all major tax components in Nigeria are inelastic. Our post reform PPT and TTR are elastic. The implication of these results is in tandem with Oriakhi and Ahuru (2014) that a tax reform improves tax elasticities.

4.4. Result of Taxes Response to Changes in Their Bases (Tax Bouyancy)

Table 5a and b shows the results of the responsiveness of various tax components to changes in their various common sampled bases and changes in their post-reform bases (post -reform tax buoyancies) respectively.

From the result, the NAI, oil revenue (OREV), import of goods and services, and private consumption (PC) were used as bases for PIT, PPT, ED and VAT respectively, as it provides a more accurate estimation for these tax types. Their respective post-reformed were captured by the various base interaction with DM (dummy representing reforms as stipulated earlier in Table 1).

The summary of the estimated values of tax buoyancies show that the coefficients are all positive and less than one for common sample base and post reform samples buoyancies were greater than that of common samples, except for PPT (0.018 against 0.017). Also, PIT and PPT were not statistically significant while ED and VAT are statistically significant given their t-statistic values. The none buoyancy of all the taxes (less than unity) indicates the fact tax revenue grows less than proportionate to growth in their respective bases. In other words, an increase in the bases spurred a less than proportionate increase in tax revenue. This result agrees with Ebi and Aladejare (2016) that government tax revenues in Nigeria exhibit weak buoyancy both the short and long run periods.

The weak buoyancy of the ED can be attributed to the fact that policies are being put in place to discourage importation and encourage domestic production. This will inevitably lead to decline in the growth of excise commodities and reduction in collection. Commodities such as beer, cigarette, and other alcoholic beverages which can generate over 80% of the excise revenue are price inelastic, hence the cause of the slow growth of the tax base. In addition, non-productivity of the VAT may be attributed to numerous exemptions and tax evasions necessitated by multiple and complex rates assigned to VAT, and the fact that VAT which does not have a broader base and therefore captures less tax payers. This can be justified by the policy of the government to increase the VAT to 10% from the current 5%.

4.5. Response of Taxes to Reforms (Dummies)

Dummies were assigned to PIT, PPT, TTR and the ED in other to capture their response to tax reforms within the period of the study.

The results as summarized in Table 6 showed that the dummy coefficients are positively signed and statistically significant at 5% level. This further confirms the fact that tax reforms improve tax revenues. The positive impact of the reform could be associated with the organizational re-alignment achieved by the implementation of the PIT act (PITA). During the period of the reform, the buoyancy estimate was found to be 2.46. It therefore implies that the reforms improved tax buoyancy by about 2.46% over the reform period, thereby a boost in revenue collection through the PIT. This positive impact can be attributed to objectives set by (PITA) through a number of initiatives which included; a more equitable income tax structure as well as consolidated allowances percent of total evolvement introduced.

PPT had a dummy coefficient of 2.44, also implies that the revenue administration reforms had a positive impact on the PPT. The positive impact of the reforms could be associated with the implementation of the PPT act (PPTA). This positive impact can be attributed to objectives set by (PPTA) through a number of initiatives which included; the NNPC to provide FIRS with comprehensive information on joint venture, sole risk and contract service in the upstream sub-sector of the oil industry for more effective taxation of the industry, as well as encouraging donations to tertiary and research institutions by making such donations tax deductible.

The TTR response was very large 12.22. This conforms to the excess revenue in federated account over this period. Although the t-statistic value of ED reflects its insignificance since it is <2, its coefficient of 4.122989 shows that the tax reforms improved revenue generated from ED by about 4.122%.

Table 5a: Taxes response to common period bases (tax buoyancy %)

Taxes	Coefficient	Standard error	T-statistic	P
PIT/NAI	0.253301	0.255601	0.991004	0.3308
PPT/OREV	0.018153	0.042292	0.429240	0.6713
ED/IMPGS	0.032069	0.066878	0.479517	0.6356

Source: Author's computation from the main result in the appendix, PPT: Petroleum profit tax, ED: Excise duties, PIT: Personal income tax, NAI: Non-agricultural income, IMPGS: Imports and export of goods and services, OREV: Oil revenue

Table 5b: Taxes response to post-reform period bases (post-reform tax buoyancies %)

Taxes	Coefficient	Standard error	T-statistic	P
PIT/NAI*DM	0.283106	0.255805	1.106753	0.2785
PPT/OREV*DM	0.017905	0.042292	0.423364	0.6755
ED/IMPGS*DM	0.931421	0.466874	1.995011	0.0584
VAT/PC*DM	0.013950	0.001880	7.422152	0.0000

Source: Author's computation from the main result in the appendix, IMPGS: Imports and export of goods and services, PPT: Petroleum profit tax, ED: Excise duties, PIT: Personal income tax, NAI: Non-agricultural income, ED: Excise duties, OREV: Oil revenue

Table 6: Taxes response to reforms

Taxes	Coefficient	Standard error	T-statistic	P
PIT	2.466548	0.488827	5.045854	0.0000
PPT	2.447765	1.184605	2.066313	0.0489
ED	4.122989	4.997327	0.825039	0.4169
TTR	12.22739	3.607978	3.388987	0.0021

Source: Author's computation, PPT: Petroleum profit tax, PIT: Personal income tax, ED: Excise duties, TTR: Total tax revenue

4.6. Comparing the Tax Bouyancy and Tax Elasticity of Various Tax Categories

Tax is revenue enhancing if its buoyancy exceed its elasticity. From the result presented in Table 7, it can be observed that all the tax components except PIT are not revenue enhancing.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The analysis of tax reforms and tax yield in Nigeria shows that the coefficients of all the tax variables in both pre-reforms and post-reforms are positive during the period under study. While tax variables are inelastic in pre-reform period because they are less than unity (one) each, there was a general improvement in their post-reforms tax elasticities with PPT and TTR having coefficients >1 (elastic). A progressive tax system needs to have at least greater than unity value of the coefficient of elasticity, (Timsina, 2008). And a higher degree of progressivity in the tax structure would result in elasticity >2, (Timsina, 2008).

From the findings using the partitioning approach, tax elasticities in the tax components to GDP in both the pre-reform and post-reform shows that TTR responded most to changes in GDP while the PIT had the least response to changes in GDP. The low responses of both PIT and ED respectively can be attributed to the fact that not all self-employed people if any at all are incorporated into the tax net for proper deductions/payment of tax in the case of PIT as it is obtainable in the advanced countries like the United State of America, great Britain, etc., while that of ED can be attributed to the fact that policies are being implemented to discourage importation and encourage domestic production. This will inevitably lead to decline in the growth of excise commodities and reduction in collection. The revenue from tax is income elastic after the reforms in that the PPT and the TTR are >1 each which implies that GDP growth has helped in improving the fiscal performance through the revenue side of the budget. The tax buoyancy in the taxes to bases category are all positive but less than unity in both pre-reforms and post-reforms respectively but there was general improvement in the interaction of the bases with dummy (representing reforms) after reforms except for PPT that slightly fell from 0.018 to 0.017. However, the taxes are not buoyant in that even after the reform, the coefficients are still less than unity indicating that an increase in the bases spurred a less than proportionate increase in tax revenue. The dummy results further confirm the fact that tax reforms improve tax revenues in Nigeria with the least coefficient >2 indicating a higher degree of progressivity in Nigerian tax structure.

Table 7: Comparison between tax bouyancy and tax elasticity

Taxes	Bouyancy	Elasticity	Difference
PIT	0.283106	0.199930	0.08317
PPT	0.017905	1.009140	−0.9912
ED	0.931421	0.977509	−0.0460
VAT	0.013950	1.287500	−1.27355

Source: Author's computation, PPT: Petroleum profit tax, PIT: Personal income tax, ED: Excise duties, VAT: Valued added tax

6. RECOMMENDATIONS

Based on the findings and conclusion, the study recommends as follows;

a. TTR being elastic and responsive to economic growth, implies that economic growth and development increases overall tax revenue. Hence, this study recommends that government should diversify the economy for more development in order to continue to increase overall tax revenue. Diversification of the economy would also broaden and expand the base (tax base). By developing new and existing sectors in the economy, government will attract and generate income from the activities of these sectors.
b. For the PIT policy to have a more significant impact on the revenue base of Nigeria, the government should ensure that self-employed individuals in Nigeria register with the revenue authority and pay their taxes which can impact positively on increased revenue generation. Public (civil) servants that constitute the chunk of labour force in Nigeria with meager income pay PIT (PAYEE) more regularly than elective political office holders and appointees who receive huge allowances off the book without being taxed even as taxes are deducted from source. The introduction of progressive tax rates at source for elective political office holders and appointees with jumbo salaries/allowances may make NAI base of the PIT significant and buoyant.
c. With respect to ED, introducing new goods in the tax net with low duties on locally manufactured goods will encourage more local potential manufacturers to produce even for exports, and thus broadening the tax net of ED. Also, adoption of advalorem tax rates rather than specific tax rates are measures to be taken.
d. For the PPT policy to have a more significant impact on the revenue base of Nigeria, the government should minimize or find ways of eliminating totally the widespread corruption and leakages in the PPT administration.
e. With regards to VAT, there should be an upward review of the VAT, from the current 5% to about 10% on luxury goods while the current rate of 5% may be maintained on necessities. Also, developing a sound billing habit, increasing consumers' consciousness on demanding bills, easing the tax reduction and VAT refund process, discouraging the sellers' trend of demanding huge amount of tax credit, developing cooperate and positive thinking of VAT personnel to correct mistakes of the sellers on maintaining the account and relevant training for the VAT personnel are some measures to be taken into consideration.

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APPENDIX A

Data 1						
Year	**GDP**	**IMPGS**	**NAI**	**VAT**	**PC**	**CIT**
1981	94.32502	12.8396	74.82502	5.026	28.57486	4.03E+08
1982	101.0112	10.7705	78.45491	5.026	30.41138	5.5E+08
1983	110.064	8.9037	83.62717	5.026	35.21514	5.62E+08
1984	116.2722	7.1783	82.49495	5.026	42.85869	7.87E+08
1985	134.5856	7.0626	96.34105	5.026	49.30292	1E+09
1986	134.6033	5.9836	94.67025	5.026	51.53747	1.1E+09
1987	193.1262	17.8617	135.5467	5.026	75.98113	1.1E+09
1988	263.2945	21.4457	176.7099	5.026	106.6786	1.55E+09
1989	382.2615	30.8602	262.2013	5.026	126.1862	1.91E+09
1990	328.6061	45.7179	206.3755	5.026	177.2346	2.99E+09
1991	545.6724	89.4882	400.9689	5.026	206.8135	3.83E+09
1992	875.3425	143.1512	657.9229	5.026	373.5267	5.42E+09
1993	1089.68	165.6294	739.6326	5.026	502.7752	9.55E+09
1994	1399.703	162.7888	870.7515	5.026	610.3402	1.23E+10
1995	2907.358	755.1277	1967.053	6.2569	1387.446	2.19E+10
1996	4032.3	562.6266	2756.548	11.286	2124.271	2.31E+11
1997	4189.25	845.7166	2744.102	13.9053	2091.069	2.78E+11
1998	3989.45	837.4187	2388.874	16.2068	2371.328	3.33E+11
1999	4679.212	862.5157	2974.389	23.7505	2454.795	4.62E+11
2000	6713.575	985.0224	4912.092	30.6438	2478.777	5.33E+11
2001	6895.198	1358.18	4485.148	44.9129	3687.656	6.94E+11
2002	7795.758	1512.695	4948.644	52.632	5540.186	8.91E+11
2003	9913.518	2080.235	6682.075	65.8876	7044.545	1.15E+12
2004	11411.07	1987.045	7507.308	96.1956	8637.732	1.31E+12
2005	14610.88	2800.856	9857.903	87.4498	11075.06	1.7E+11
2006	18564.59	3108.519	12624.36	110.5668	11834.58	2.47E+11
2007	20657.32	3911.953	13899.45	144.3728	16243.72	3.32E+11
2008	24296.33	5593.18	16314.93	198.0653	16090.5	4.21E+11
2009	24794.24	5480.656	15607.93	229.3232	18980.96	6.01E+11
2010	33984.75	8163.975	23674.1	275.5746	22845.13	6.66E+11
2011	37409.86	10995.86	25816.43	318	22840.83	7.15E+11
2012	40544.1	9766.557	27130.26	347.6882	19536.05	8.47E+11
2013	42396.77	9439.425	27687.66	389.5263	19536.05	9.98E+11
2014	89043.62	10538.78	71025	388.85	19536.05	8.53E+11

FIRS: Federal Inland Revenue Service, CBN: Central Bank of Nigeria, Statistical Bulletin, VAT: Valued added tax, IMPGS: Imports and export of goods and services, NAI: Non-agricultural income, GDP: Gross domestic product, CIT: Company income tax

Data 2					
Year	PPT	PIT	TTR	OREV	DM
1981	6325.8	1997.3	6728.8	8.5644	0
1982	4840.4	732.5	5390.4	7.81	0
1983	3746.9	710.1	4308.4	7.25	0
1984	4761.4	580.9	5548.6	8.27	0
1985	6711	938.9	7715.3	10.92	0
1986	4811	433.7	5913.2	8.11	0
1987	12504	407.6	13606.5	19.03	0
1988	6814.4	540.5	8365.2	19.83	0
1989	10598.2	938	12512.4	39.13	0
1990	26909	1724	29901.3	71.89	0
1991	38615.9	3040.4	42443.8	82.67	0
1992	51476.7	4903.1	56893.9	164.08	0
1993	59207.6	5626.5	68761.7	162.1024	1
1994	42802.7	3888.2	62338.3	160.19	1
1995	42857.9	20436.4	85497.2	324.55	1
1996	47.6	3407	106.4	408.78	1
1997	64.3	8339.9	130.8	416.81	1
1998	24.6	11400	99.4	324.31	1
1999	71.1	20100	171.9	724.42	1
2000	334.5	38100	455.3	1591.676	1
2001	407.1	44400	586.6	1707.563	1
2002	224.4	68100	433.9	1230.851	1
2003	438	54200	703.1	2074.281	1
2004	878.6	58900	1194.8	3354.8	1
2005	1352.2	212100	1741.8	4762.4	1
2006	1352.5	33300	1866.2	5287.567	1
2007	1132	268700	1846.9	4462.91	1
2008	2060.9	178500	2972.2	6530.6	1
2009	939.4	227900	2197.6	3191.938	1
2010	1480.36	712000	2839.3	5396.091	1
2011	3070.59	806000	4628.46	8878.97	1
2012	3210.32	963200	5003.57	8025.971	1
2013	2666.36	963200	4805.65	6809.231	1
2014	2453.94	973200	4714.6	6793.724	1

FIRS: Federal Inland Revenue Service, CBN: Central Bank of Nigeria, Statistical Bulletin, PPT: Petroleum profit tax, PIT: Personal income tax, TTR: Total tax revenue

APPENDIX B

For PPT				
Dependent variable: LOG (PIT)				
Method: Least squares				
Date: 07/23/16 time: 06:43				
Sample (adjusted): 1982 2014				
Included observations: 33 after adjustments				
Variable	Coefficient	Standard error	t-statistic	P
D (GDP)	0.171140	0.195290	0.876367	0.3889
D (NAI)	0.253301	0.255601	0.991004	0.3308
D (GDP*DM)	0.199930	0.195550	1.022380	0.3160
D (NAI*DM)	0.283106	0.255805	1.106753	0.2785
DM	2.466548	0.488827	5.045854	0.0000
ECM1(−1)	−0.388106	0.132706	−2.924555	0.0168
C	6.743572	0.299842	22.49043	0.0000
R^2	0.688850	Mean dependent variable		9.729949
Adjusted R^2	0.663200	SD dependent variable		2.590782
SE of regression	0.958239	Akaike info criterion		2.938393
Sum squared residuals	23.87377	Schwarz criterion		3.255833
Log likelihood	−41.48348	Hannan-Quinn criterion		3.045202
F-statistic	34.65303	Durbin-Watson stat		1.798235
P (F-statistic)	0.000000			

PIT: Personal income tax, NAI: Non-agricultural income, GDP: Gross domestic product, PPT: Petroleum profit tax

For PPT				
Dependent variable: LOG (PPT)				
Method: Least squares				
Date: 07/23/16 time: 07:29				
Sample (adjusted): 1982 2014				
Included observations: 33 after adjustments				
Variable	Coefficient	Standard error	t-statistic	P
GDP	0.922000	0.866000	0.106511	0.9160
OREV	0.018153	0.042292	0.429240	0.6713
DM	2.447765	1.184605	2.066313	0.0489
GDP*DM	1.009140	1.008660	0.105535	0.9168
OREV*DM	0.017905	0.042292	0.423364	0.6755
ECM2(−1)	−0.071805	0.021905	−3.284657	0.0029
C	8.753993	1.065408	8.216568	0.0000
R^2	0.547660	Mean dependent variable		7.713453
Adjusted R^2	0.443273	SD dependent variable		2.086458
SE of regression	1.556792	Akaike info criterion		3.908964
Sum squared residuals	63.01366	Schwarz criterion		4.226405
Log likelihood	−57.49790	Hannan-Quinn criterion		4.015773
F-statistic	5.246473	Durbin-Watson stat		1.856532
P (F-statistic)	0.001175			

PPT: Petroleum profit tax, GDP: Gross domestic product, SD: Standard deviation

Result for ED				
Dependent variable: LOG (ED)				
Method: Least squares				
Date: 07/23/16 time: 08:17				
Sample (adjusted): 1982 2014				
Included observations: 33 after adjustments				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
D (GDP)	0.768300	0.011425	67.24850	0.0000
D (IMPGS)	0.032069	0.066878	0.479517	0.6356
D (DM)	4.122989	4.997327	0.825039	0.4169
D (GDP*DM)	0.977509	0.411424	2.375910	0.0230
D (IMPS*DM)	0.931421	0.466874	1.995011	0.0584
ECM3(−1)	−0.499119	0.246208	−2.027228	0.0530
C	24.50357	0.401617	61.01220	0.0000
R^2	0.766167	Mean dependent variable		24.80229
Adjusted R^2	0.719897	SD dependent variable		2.162483
SE of regression	1.909979	Akaike info criterion		4.317893
Sum squared residuals	94.84854	Schwarz criterion		4.635334
Log likelihood	−64.24524	Hannan-Quinn criterion		4.424702
F-statistic	2.503374	Durbin-Watson stat		1.904695
P (F-statistic)	0.047864			

GDP: Gross domestic product, SD: Standard deviation, IMPGS: Imports and export of goods and services, ED: Excise duties

Result for VAT				
Dependent variable: VAT				
Method: Least squares				
Date: 07/23/16 time: 08:40				
Sample (adjusted): 1993 2014				
Included observations: 22 after adjustments				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
D (GDP)	0.722000	0.859000	0.840619	0.4116
D (PC)	0.013950	0.001880	7.422152	0.0000
ECM5(−1)	−0.105622	0.036313	−3.140601	0.0057
C	−23.21895	9.743858	−2.382932	0.0284
R^2	0.962276	Mean dependent variable		130.0521
Adjusted R^2	0.955989	SD dependent variable		134.8514
SE of regression	28.29022	Akaike info criterion		9.685875
Sum squared residual	14406.06	Schwarz criterion		9.884246
Log likelihood	−102.5446	Hannan-Quinn criterion		9.732605
F-statistic	153.0509	Durbin-Watson stat		1.846373
P (F-statistic)	0.000000			

VAT: Valued added tax, GDP: Gross domestic product, SD: Standard deviation

For TTR				
Dependent variable: LOG (TTR)				
Method: Least squares				
Date: 07/23/16 time: 08:26				
Sample (adjusted): 1982 2014				
Included observations: 33 after adjustments				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
D (GDP)	0.986900	0.365100	2.702917	0.0115
D (DM)	12.22739	3.607978	3.388987	0.0021
D (GDP*DM)	1.287500	0.365500	3.520930	0.0011
ECM4(−1)	−0.572705	0.165911	−3.451883	0.0018
C	7.761601	0.289821	26.78069	0.0000
R^2	0.776496	Mean dependent variable		8.127190
Adjusted R^2	0.701709	SD dependent variable		1.884921
SE of regression	1.457972	Akaike info criterion		3.730698
Sum squared residuals	59.51915	Schwarz criterion		3.957441
Log likelihood	−56.55651	Hannan-Quinn criterion		3.806990
F-statistic	6.371426	Durbin-Watson stat		1.919457
P (F-statistic)	0.000891			