Information Communication Technology, Tax Revenue Mobilization and Economic Performance in Nigeria

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ABSTRACT

This study examined the nexus between information communication technology, tax revenue mobilization and economic performance between 1981 and 2017 in Nigeria. VECM showed bi-directional relationship between information communication technology, tax revenue mobilization and economic performance in Nigeria. The speed of adjustment of government expenditure was slow while that of tax revenue was high. FEVD revealed shock variations among variables with more of the variations accounted for by 'own shocks'. The study also found negative relationships between information communication technology and tax revenue mobilization as well as a negative relationship between tax revenue and economic performance in Nigeria. However, a positive relationship between information communication technology and the Nigeria economy was established with VECM stability test pointing to the fact the model is relatively stable. As such, recommendations were proffered.

Keywords: Technology, Tax, Economy Performance, Nigeria
JEL Classification: O30, H21, O11, O55

1. INTRODUCTION

Taxes are employed as a veritable instrument of economic policy in virtually all countries of the world. They are compulsory levy imposed by government or its agent on individuals and firms (Anyanwuocha, 1993). They also act as a means of transferring resources from private to the public sector and as an instrument for redistributing wealth (Iyoha, Oyefusi and Oriakhi, 2003). Today, Nigeria is indeed in need of an effective and efficient tax system in other to generate enough revenue that will stimulate and sustain economic growth and development. Oriakhi (2002) observed that taxation has thus become an instrument of government policy for sourcing fund. Oriakhi (2002) also gave three major roles played by taxation in the development of an economy, they include; financial functions, social functions and economic functions. Financial function here means that taxes are used for the payment of services provided for in the society. The social functions of taxes are directed at discouraging socially undesirable activities. The economic function ensures that taxes are designed to influence specific sectors of the economy.

Also, the utilisation of information communication technology (ICT) in tax administration has led to huge growth and expansion in tax revenue and by extension, economic performance in most advanced countries. This is because ICT brings along some niceties that ease and facilitates revenue mobilization and tax administration alongside the positive multiplier effects on the economy in the long-run. Iyoha, Oyefusi and Oriakhi (2003) and Oriakhi (2002) also revealed that Nigeria loss huge revenue from taxes as a result of the non-usage of ICT in tax administration. Thus, this research work is, therefore, design to econometrically ascertain the effect the use of ICT has on tax revenue mobilization and economy performance in Nigeria for the period 1981 to 2017. Specifically, this study seeks to answer research questions such as; what is the effect of information communication technology on tax revenue mobilization in Nigeria, what is the effect of tax revenue mobilization on economic performance in Nigeria, and lastly, what is the effect of information communication technology on economic performance in Nigeria.

In furtherance to the stated objectives, this paper will be structured into four sections. Following this introduction is background to the study, empirical literature, theoretical framework and model specification, analysis of result, policy implication, conclusion and recommendation

2. BACKGROUND TO THE STUDY

2.1. Regional Comparisons of Tax Revenue Mobilization and Economic Performance

Table 2.1 Tax-GDP ratios across regions between 2005 and 2015

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
European Union	19.9	20	20.2	19.9	18.9	19.4	19.5	19.9	20.1	19.75	19.73
SSA	16.9	17	16.9	17.5	15.4	14.8	15.1	15.6	15.7	16.1	16.01
North America	10.8	11.4	11.4	10.5	8.3	8.8	9.7	9.9	10.6	10.15	10.08
East Asia	11.3	11.7	11.9	11.7	11.2	11.2	11.5	11.7	11.8	11.55	11.58
World	14.3	14.8	14.9	14.4	13.2	13.5	13.9	14	14.3	14.14	14.12

Source: World Bank, World Development Indicator, 2017

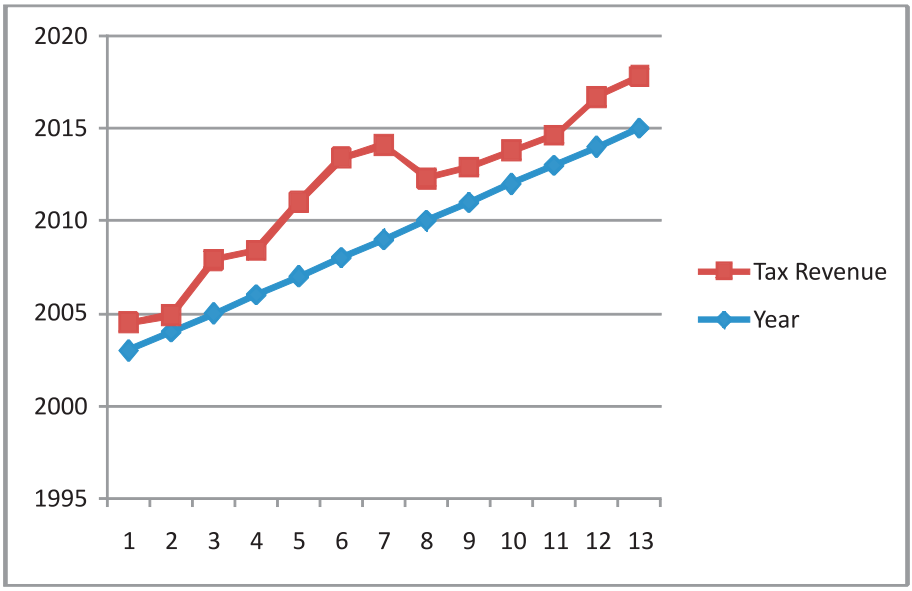
Table 2.1 shows the Tax-GDP ratio between 2005 and 2015 across regions of the world. A cursory look at the table reveals that Tax-GDP ratio was relatively stable in all the regions. Specifically, there were marginal increases from about 19 percent in 2005 to about 20 percent in 2015 for the European Union. In sub-Saharan Africa (SSA), Tax-GDP ratio stood at about 16 percent in 2005, got to its peak in 2008 with about 17.5 percent before it fell marginally to about 16 percent in 2015. This implies that there was a decline in tax contribution to economic performance in sub-Saharan Africa in 2015 compared to 2005. Also, the Tax-GDP ratio in North America and East Asia followed a similar trend of marginal growth with an approximate average value of about 10 percent and 11 percent for each of the regions respectively. Also, the contribution of tax to world economic performance followed a similar pattern of marginal gain and loss between 2005 and 2015. For example, Tax-GDP ratio was about 14.3 percent in 2005 got to its peak in 2007 with about 14.9 percent and thereafter fell to about 14.1 percent in 2015.

Table 2.2 Tax revenue as a percentage of GDP from 2003-2015 in Nigeria

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tax Revenue	1.5	0.9	2.9	2.4	4	5.4	5.1	2.3	1.9	1.8	1.6	2.7	2.8

Source: World Bank, World Development Indicator 2017

Figure 2.1 Tax Revenue as a percentage of GDP from 2003-2015 in Nigeria



Source: World Bank, World Development Indicator 2017

Figure 2.1 shows the trend of tax contribution to Gross Domestic Product (a proxy for economic performance) from 2003 to 2015 in Nigeria. Tax contribution to GDP as at 2003 was about 1.5 percent, got to its peak of about 5.4 percent in 2008 and thereafter fell to about 2.8 percent in 2015, showing a fluctuating and downward trend. This means that tax revenue to GDP ratio has been very minimal despite the growing potential capacity of the taxable net in Nigeria. A similar view was also held by Taiwo (2016) that Nigeria's tax contribution to the GDP is the lowest in the world compared to the United States with about 19 percent; China with about 21 percent; and Japan with about 35 percent.

3. BRIEF THEORETICAL AND EMPIRICAL LITERATURE REVIEW

3.1. Theoretical Literature: *Ability to Pay Theory of Taxation*

This theory is linked to Slade in 1939. According to this theory, the dominant theory of taxation is usually interpreted in terms of sacrifice. It is held to justify progressive taxation under any one of the three possible interpretations of sacrifice: the equal, equal proportional, and least sacrifice theories. These theories are based on assumptions of a declining marginal utility of money with an increase in supply, the

existence of sacrifice arising from the payment of taxes, and the quantitative expression of that sacrifice. Slade (1939) opined that the usual and indeed, theonly serious justification of ability to pay is on the ground of sacrifice. The idea of sacrifice when linked to the concept of the declining marginal utility of money gave rise to three theories of progressive taxation: the equal, equal-proportional, and least sacrifice theories.

3.2. Empirical Literature Review

Tax revenue mobilization and administration in Nigeria has meant with various impediments such as large scale tax evasion, tax avoidance and other forms of corrupt practices due to the partial or non-utilization of the information communication technology amongst others. These have been considered among the reasons responsible for the present poor state of development in Nigeria (World Bank, 2004). United Nations (2000) in Worlu and Emeka (2012) employed macro econometric approach in their analysis of tax revenue and economic development in Nigeria. Their result revealed that there is need to streamline Nigeria tax system to ensure a realization of optimal tax revenue and substantial contribution to the national revenue profile. Okafor (2012) analyzed tax revenue generation and Nigerian economic development. He employed ordinary least square estimation (OLS) multiple regression to determine the relationship between Nigeria's economic growth (proxied by GDP) and tax revenue in Nigeria. The study found that there is a positive and significant relationship between GDP and tax revenue variables.

Efunboade (2014) analysed the impact of ICT on tax administration in Nigeria based on the dwindling global fortune occasioned by the fall in the price of crude oil which is the major source of foreign exchange to Nigeria. The study examined the overall effectiveness of ICT on tax administration in Nigeria was examine descriptively and observed that ICT is yet to be maximally utilized in various tax functions in Nigeria. It was then recommended that ICT should form the core part of tax administration in Nigeria Another study by Ahmed and Mohammed (2010) analyzed 25 countries cross-section data for the year 1998 to 2008 and used pooled least square method for result analysis. The result shows that import, manufacturing sector, services sector, monetization and budget deficit influence positively the tax buoyancy while growth in grants impact negatively on tax buoyancy. The growth of agriculture sector has an insignificant impact on tax buoyancy in case of developing countries because they are either not taxed or under taxed. Also, Adeneti, Sanni and Adesina (2011) in Cornelius, Ogar and Oka (2016) examined value added tax and economic growth in Nigeria spanning the period 1994 to 2008. They employed Time series data were employed in a simple descriptive statistics and regression analysis. Their findings showed that there exists a positive and significant correlation between value-added tax (VAT) revenue and GDP in Nigeria.

4. Theoretical Framework and Model Specification

This is based on the endogenous growth model, which emerged in the 1980s. It holds that economic growth is primarily the result of endogenous and not exogenous factors as held by neoclassical and Harrod-Domar growth models. The main contributors are Romer (1986) and Lucas (1988).

The function is given as;

$Y_t = AK_t$ ..... (4.1)

Where; Y_t is growth, K_t is capital, and A is the total factor productivity growth.

To ensure a sustained growth, increase in capital is equated to growths alongside labour. That is, human capital with technical progress embodied in the quality of labour was introduced. Thus, the production function is given as;

$Y_t = f(K_t, H_t)$ ..... (4.2)

Where; H_t is the level of human capital and other variables are as previously explained.

If the production function has constant returns to scale in human capital and physical capital, then investment in both can raise output without limit even if the quantity of labour time is fixed and considered as a distinct variable. Hence, we argument equation (4.2) as;

$Y_t = f[(K_t, H(ICT)_t, L]_t$ ..... (4.3)

The introduction of information communication technology (ICT) is to show its importance in human capital development and in this case tax revenue enhancement. A public input (government expenditure mainly on public goods) can also be introduced by assuming that the production function in equation (4.2) at time t takes the form;

$Y_t = ALt^{1-\alpha} Kt^{\alpha} H(ICT)_t^{1-\alpha} Gt^{1-\alpha}$ ..... (4.4)

Where; A is a positive constant and Gt is the public input. It is assumed here that the public input is financed by a tax base on output.

Assuming that capital does not depreciate, then the profit level with the production function is given as;

$\pi_t = 1(1-\tau) ALt^{1-\alpha} Kt^{\alpha} H(ICT)_t^{1-\alpha} Gt^{1-\alpha} - Kt^{\alpha} r_t k_t - w_t L_t$ ..... (4.5)

Where; r_t is the interest rate, the wage rate.

The government budget constraint requires that tax revenue equals the cost of the public good provided, so that;

$$G_t = \tau Y_t \quad (4.6)$$

Now assume that labour supply is constant at L for all t. Without the public input, it would not be possible to sustain growth because the marginal product of capital would decrease as capital stock increase. With the public input, growth can now be driven by the joint increase in private and public capital though labour supply is fixed. From equation (4.4) and (4.6), the level of public input can be written as;

$$G_t = (\tau A)^{1/\alpha} L^{(1-\alpha)} K_t \quad (4.7)$$

Substituting this into equation (4.5) result in an expression showing interest rate as a function of the tax rate;

$$r_t = (1 - \tau)\alpha A^{\frac{1}{\alpha}} (L\tau)^{\frac{1-\alpha}{\alpha}} \quad (4.8)$$

Also, the consumer representative in the economy is assumed to have preferences described by the utility function;

$$U = \Sigma_{t=i}^{\infty} \beta^t \frac{Ct^{1-\sigma} - 1}{1-\sigma} \quad (4.9)$$

If the consumer chooses the path (Ct) over time to maximize utility, then the standard condition for intertemporal choice must hold optimization. Thus, the ratio of the marginal utilities of consuming at t and at t +1 must equal the gross interest rate. Hence;

$$\frac{\partial U/C_t}{\partial U/\partial C_{t+1}} / \frac{C_t^{-\sigma}}{\beta C_t^{-\sigma}} = 1 + r_{t+1} \quad (4.10)$$

By working out Ct+1 /Ct and subsequently subtracting Ct /Ct from both sides of the resulting equation, the optimality condition can be re-written in terms of growth rate of consumption as;

$$\frac{C_{t+1} - C_t}{C_t} = (\beta(1 + r_{t+1}))\frac{1}{\sigma} - 1 \quad (4.11)$$

Lastly, using the equation (4.8) as a substitute for interest rate, the growth rate of consumption will be related to the tax rate

$$\frac{C_{t+1} - C_t}{C_t} = (\beta \frac{1}{\sigma} (1 + \tau)\alpha A^{\frac{1}{\alpha}} (L\tau)^{\frac{1-\alpha}{\alpha}})\frac{1}{\sigma} - 1 \quad (4.12)$$

The result in (4.12) demonstrates the two channels through which the tax rate affects consumption growth. The first is that tax reduces the growth rate of consumption through the term (1–τ). The second is that tax rate increases growth by the term $\tau^{(1-\alpha)/\alpha}$ which represents the gains through provision of public inputs.

4.1. Model Specification

Base on the theoretical foundation, the model for this study is as specify below;

$$\Delta V_t = \delta_{it} + \Sigma_{i=1}^{k} \beta_{ij} \Delta V_{t-j} + \varnothing_{ij} ECM_{t-j} + \varepsilon_{it} \quad \text{..... (4.13)}$$

Where;

V_t = Vector of variables [Tax Revenue (TAXR), Information Communication Technology (ICT), Real Gross Domestic Product Per Capital Growth Rate (RGDPC), Government Expenditure (GEXP), Agriculture as a share of GDP (AGRIC), Trade Openness (OPN)]

V_{t-j} = Vector of lagged variables

δ_{it} = Vector of intercept term

ECM_{t-j} = Error correction term

ε_{it} = Error term

5. Data Analysis

Table 5.1: Stationarity Test (ADF)

	Levels			First Difference		
Variables	Statistics	Prob	Remarks	Statistics	Prob	Remarks
AGRIC	-1.83	0.4	non-stationary	-6.41	0.00*	stationary
GEXP	0.17	1.00	non-stationary	-4.61	0.00*	stationary
ICT	-2.61	0.28	non-stationary	-3.19	0.00*	stationary
OPN	1.62	1.00	non-stationary	-5.20	0.00*	stationary
RGDPC	-2.71	0.25	non-stationary	-6.21	0.00*	stationary
TAXR	-2.51	0.34	non-stationary	-7.15	0.00*	stationary

Source: Author's computation using EVIEWS 9.
** 5% significance level*

The result from the unit root test using the Augmented Dickey-Fuller (ADF) in Table 5.1 shows that all the variables are non-stationary in their levels. But after the first difference, they became stationary at 5% significance level and integrated of order one I(1). Hence, we reject the null hypothesis of non-stationarity among the variables.

5.2 Johansen Co-Integration Test

Table 5.2(a): Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace		
No. of CE(s)	Eigenvalue	Statistic	5% Critical Value	Prob.**
None *	0.82	133.86	95.95	0.00
At most 1 *	0.64	80.89	69.82	0.01
At most 2	0.51	46.52	47.86	0.07
At most 3	0.28	25.81	29.85	0.14
At most 4	0.27	15.49	15.79	0.09
At most 5 *	0.15	5.47	3.84	0.07

Source: Author's computation using Eviews 9.

Table 5.2(a) presents the results of Johansen co-integration test using the Rank Test (Trace). The result from the trace statistics indicate that there are three co-integrating equations in the model because their corresponding probability is less than 5%. Therefore, we reject the null hypothesis of no co-integrating relations among the variables.

Table 5.2(b): Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen		
No. of CE(s)	Eigenvalue	Statistic	5% CriticalValue	Prob.**
None *	0.87	53.07	40.08	0.00
At most 1 *	0.64	34.26	33.88	0.05
At most 2	0.62	20.72	27.60	0.29
At most 3	0.28	10.88	21.13	0.67
At most 4	0.29	9.68	14.26	0.25
At most 5 *	0.21	5.78	3.88	0.02

Source: Author's computation using Eviews 9.

Table 5.2(b) shows the result of Johansen co-integration test using the Maximum Eigenvalue. The result from the maximum eigenvalue statistics indicates that there are three co-integrating equations because their corresponding probability is less than 5%. Therefore, we reject the null hypothesis of no co-integrating relations among the variables.

5.3. Vector Error Correction Estimates

Though vector error correction (VECM) is a constrain vector auto-regressive estimation with an inbuilt restricted co-integration employed when dealing with non-stationary series that have long-run convergence, it also shows the bi-directional relationship between and among variables. It was employed here to show the systematic disequilibrium adjustment process and the short-run transmission mechanism among the variables as reported in Table 5.3 in the appendix.

From Table 5.3., the result shows that there exists a negative relationship between RGDPC and AGRIC, GEXP, TAXR in both lags. The relationship between RGDPC and AGRIC, and between RGDPC and GEXP is significant at 10 percent while between RGDPC and TAXR it was significant at 5 percent. Also, the result shows that there is a negative relationship between RGDPC and ICT in lag one and a positive relationship in the second lag. However, for RGDPC and OPN a positive relationship was established in both lags.

Table 5.3 also shows that there is a negative relationship between AGRIC and GEXP, and between RGDPC and TAXR in lag one and two at 10 percent and 1 percent significant level respectively. There is a negative relationship between AGRIC and ICT in lag one at 10 percent significant level. For lag two, the result shows a positive relationship between AGRIC and ICT. The result further shows that a positive relationship exists between AGRIC and RGDPC in both lags though they were not significant. Also, the impact of AGRIC on itself is significant at 10 percent level in lag two.

Table 5.3 shows further that there exists a negative relationship between GEXP and ICT in lag one and a positive relationship in lag two. This impact is significant at 5 percent and 10 percent levels. The impact of GEXP in relation to OPN is significant at 10 percent and 5 percent levels with a stronger impact in lag one. The impact of GEXP in relation to TAXR is significant at 5 percent levels with a negative relationship in lag one and a positive relationship in lag two. The impact of GEXP on itself is significant at 1 percent and 10 percent levels in lag one and two though with a negative relationship.

The relationship between ICT and GEXP was negative and significant at 10 percent levels in lag one. In lag two, the relationship was positive though insignificant. The impact of ICT in relation to TAXR is significant at 5 percent level in lag one but shows a negative relationship in both lags. Again, Table 5.3 shows that ICT has a positive relationship with RGDPC in lag one but a negative relationship in the lag two. However, these relationships were not significant in both lags. The impact of ICT on itself is significant at 5 percent levels in lag one with a positive relationship in both lags. The impact of OPN in relation to RGDPC, AGRIC and GEXP is significant at 10 percent, 5 percent and 10 percent level in lag 1 respectively. Also, the impact of TAXR in relation to RGDPC is positive in both lags though was not significant. The impact of TAXR in relation to ICT shows a positive relationship in lag one and a negative relationship in lag two. However, these relationships were not significant in both lags.

Though, the R^2 in the two lags of the vectors of the variables account for a reasonable amount of the systematic variation in economic performance indicator, the major

concern in this estimation is the adjustment of the economy to changes in the variables shown by the coefficient of ECM_{t-j}. The adjustment coefficient of RGDPC which is correctly sign and significant at 5 percent level, indicates that the economy adjusts to changes to the tune of about 46 percent in a given period. The adjustment coefficient of the GEXP which is correctly sign and significant at 10 percent indicates that the economy adjusts to changes in GEXP to the tune of about 30 percent. Also, the adjustment coefficient of TAXR, which is correctly sign and significant at 1 percent indicates that the economy adjusts to changes in TAXR to the tune of about 76 percent. However, the adjustment coefficient of AGRIC, ICT and OPN were about 12 percent, 1 percent and 39 percent respectively. These were wrongly signed and not significant required by theory. Hence their speed of adjustment and restoration to equilibrium has zero effect on the economy.

5.4. Vector Error Correction Granger Causality/Block Exogeneity Wald Test

This test examines each equation in the vector error correction (VEC) as well as the joint significance of each of the lagged endogenous variables in the equation. This is reported in Table 5.4 in the appendix.

Table 5.4 shows that the six variables are not all endogenous because the p-values of the joint test for each of the equations of the variables are not all less than 0.05 except for panel 3, 4 and 6. The test also provides evidence that we can reject the null hypothesis of excluding the lags of all the variables in the various equations except in some cases like OPN in the GEXP equation, GEXP in the ICT equation, AGRIC, GEXP and ICT in the TAXR equation. The VEC Granger causality tests in panel 1, 2 and 5 reveal that there is no unidirectional causality between each of the dependent variable and the explanatory variables. Though there was a joint significance of 5 percent in each of the panels, panel 3, 4 and 6 shows a unidirectional relationship between each of the dependent variable and their explanatory variables.

The implication of the above is that there exist a bi-directional causality between information communication technology, tax revenue and economic performance indicator (RGDPC) in Nigeria.

5.5. Forecast Error Variance Decomposition (FEVD)

This measures the proportion of the variability as a result of shocks in each of the variable in relation to shocks in other variables. This is also reported in Table 5.5 in the appendix.

From Table 5.5, the FEVD of RGDPC indicates that the variation in its 'own shocks' falls within the range of about 25 percent to 100 percent reflecting a decline from the

first period over the forecast horizons. Shocks to AGRIC indicates a rising proportion from about 1.58 percent in period two to about 5.21 percent in period four and declined continuously to about 1.54 percent in the last period. The variability in the shocks of GEXP, ICT and OPN accounts for an increasing variation in RGDPC with that of ICT taking the lead to the tune of about 43.69 percent followed by GEXP 16.06 percent and OPN 13.22 percent in the tenth year. It is worthy to emphasize here that ICT began to explain a reasonable proportion of RGDPC by the fifth year with a value of about 12.96 percent. This implies that the impacts of ICT on RGDPC can best be felt in the long-run, that is, over a period of time.

Furthermore, AGRIC and TAXR accounted for a marginal proportion of fluctuations in RGDPC with the maximum of each at 5.21 percent and 0.80 percent in the fourth period respectively.

The shocks to AGRIC explains about 38.45 percent of 'own shock' in the first period and subsequently decline to about 31.49 percent and 32.06 percent in the ninth and tenth year of the forecast horizon. RGDPC explains a declining variance in AGRIC that ranges between 61.55 percent in the first period to about 50.70 percent in the tenth period. GEXP shows a rising variation in AGRIC which ranges between 1.06 percent in the third year to about 1.98 percent at the end of the forecast horizon. Shocks to ICT explain a fluctuating variation in AGRIC with a value of about 1.25 percent in the second year to a substantial increase of about 7.74 percent in the fourth year and thereafter decline to about 4.74 percent at the end of the forecast horizon. OPN shows substantial increase in the variation in AGRIC at the third year with a value of about 7.71 percent. However, its value at the end of the forecast horizon was about 6.12 percent. Also, TAXR explains a rising variance in AGRIC from about 2.64 percent in the third year to about 4.47 percent and 4.39 percent in the ninth and at the end of the forecast horizon.

The forecast error variance of GEXP explained by 'own shock' ranges between 86.43 percent and 68.94 percent while shocks accounted for by RGDPC, AGRIC, ICT, OPN and TAXR ranges between 5.89 percent and 0.71 percent, 7.68 percent and 7.50 percent, 0.00 percent and 5.31 percent, 0.00 percent and 17.42 percent, and 0.00 percent and 0.12 percent respectively in the forecast horizon. Here, the variance of the shocks resulting from OPN, ICT and 'own shocks' contributed significantly to the variance of GEXP.

The FEVD of ICT explain by 'own shock' ranges between 86.64 percent and 78.05 percent while shocks in RGDP, AGRIC, GEXP, OPN and TAXR ranges between 5.19 percent and 3.25 percent, 0.35 percent and 1.02 percent, 2.13 percent and 8.73 percent, 1.77 percent and 8.32 percent, and 0.85 percent and 0.62 respectively. Also, GEXP,

OPN and 'own shocks' accounted for a reasonable proportion in the variance of ICT in the forecast horizon.

The FEVD of OPN explained by 'own shock' was about 67.10 percent in the first period and fell to about 46.77 percent at the end of the forecast horizon. The shocks in RGDPC, AGRIC, GEXP, ICT, and TAXR ranges between 7.54 percent and 12.00 percent, 0.22 percent and 1.81 percent, 24.74 percent and 34.44 percent, 2.48 percent and 4.00 percent, 1.66 percent and 1.30 percent respectively. Again, the variance of shocks resulting from GEXP and 'own shock' contributed significantly to the variance of OPN.

The FEVD of TAXR explains by 'own shock' was about 44.80 percent in the first period but subsequently decline to about 9.44 percent at the end of the forecast horizon. The shocks in RDGPC, AGRIC, GEXP, ICT, and OPN ranges between 8.18 percent and 3.06 percent, 0.11 percent and 7.94 percent, 18.36 percent and 27.08 percent, 3.86 percent and 8.28 percent, and 39.54 percent and 44.20 percent respectively. Lastly, the variance of shock resulting from GEXP, ICT and AGRIC contributed significantly to the variance of TAXR in the entire forecasting period.

5.6. VECM Stability Test

Figure 5.8

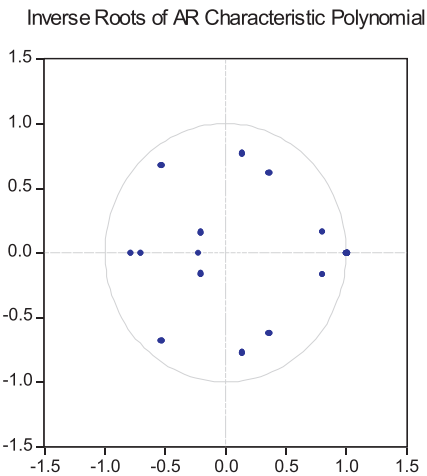


Figure 5.8 shows the stability of the VECM test. From the figure, it can be observed that the values of the roots are less than unity and the inverse roots of the AR Characteristic Polynomial lie within the Unit Circle. These affirm that the model is stable.

6. Policy Implications

There is a negative relationship between tax revenue mobilization and information communication technology as well as an insignificant impact of tax revenue on the Nigeria economy. In other words, information communication technology is yet to be fully adopted in tax administration in Nigeria and this had resulted in insignificant impact of tax revenue on the economy. Another implication from this study is that, there is a positive relationship between information communication technology and economic performance in Nigeria. This point to the fact that information communication technology has the potency of boosting economic performance in Nigeria through information technology driven tax system and administration.

7. Conclusion and Recommendation

This study examined the interrelationships between information and communication technology, tax revenue mobilization and economic performance in Nigeria. VEC causality tests showed that there exist a bi-directional relationship between information communication technology, tax revenue mobilization and economic performance in Nigeria. The result showed that the speed of adjustment of government expenditure is slow while that of tax revenue is very high. FEVD revealed shock variations among variables with more of the variations accounted for by 'own shocks'. It was also held that there exist a negative relationship between tax revenue mobilization and information communication technology and tax revenue and economic performance. However, there was a positive relationship between information communication technology and the Nigeria economy with VECM stability test pointing to the fact the model is relatively stable.

In the light of the above, the following recommendations are suggested;

i. There should be urgent reform of the current tax administration in Nigeria by leveraging on the numerous attractions pose by information communication technology.

ii. There should be routine training of various categories of tax officers in other to sharpen their efficiency and effectiveness.

iii. Relevant policy makers should embark on a regular enlightenment campaign on the need to pay actual and correct taxes with evidences of tax revenue efficiently put into uses.

References

Ahmed, Q., M., & Mohammed, S., D., (2010). *Determinants of Tax Buoyancy: Empirical Evidence from Developing Countries. European Journal of Social science 13(3).*

Anyawuaocha, R. A. (1993). Fundamentals of Economics for Senior Secondary Schools (8th Ed) Onitsha: Africana Feb Publishers.

Cornelius, M., O., Ogar A. & Oka, F. A. (2016). The Impact of Tax Revenue on Economic Growth: Evidence from Nigeria. *IOSR Journal of Economics and Finance, 7*(1), (Jan-Feb. 2016), 32-38.

Efunboade, A. O.(2014). Impact of ICT on Tax Administration in Nigeria. *Computer Engineering and Intelligent Systems*, *5*,(8). www.iiste.orgISSN 2222-1719 (Paper) ISSN 2222-2863 (Online) [Accessed, June 19th, 2019].

Iyoha, M. A., Oyefusi, S. A. & Oriakhi, D. E. (2003). An Introduction to Modern Macroeconomics (Revised Edition). *Published by Mindex publishing Co. Ltd, Benin City, Nigeria.*

Lucas, R. (1988). Mechanics of Economic Development. *Journal of Economic Development, 22*(3), 3-42

Okafor, R. G. (2012). Tax Revenue Generation and Nigerian Economic Development. *European Journal of Business and Management, 4*(9), 2012.

Oriakhi, D. E. (2002). *Introduction to Public Finance (Revised Edition). Benin: Mindex Publishing.*

Romer, P.M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy* 94, 1002-37.

Slade, M., K., (1939). *The Ability-To-Pay Theory of Taxation. The American Economic Review, Vol. 29, No.1 (Mar., 1939), 92-101.*

Taiwo, O. (2016). Guess How Many Nigerians Pay Tax and How Our Government Spends the Money. *Tax watch*, June, 2016.

World Bank, (2016). Government Finance Statistics Yearbook and Data Files, World Bank, International Monetary Fund and OECD Group Estimates.

World Bank (2017), World Development Indicator Statistical year book.

World Bank, (2004). Statistical Data and Bulletins.

Worlu, C. N. & Emeka, N. (2012). Tax Revenue and Economic Development in Nigeria: A Macroeconometric Approach. *Academic Journal of Interdisciplinary Studies. 2*(2). November, 2012.

Appendix

Table 5.3: Vector Error Correction Estimates

Error Correction:	D(LRGDPC)	D(LAGRIC)	D(LGEXP)	D(LICT)	D(LOPN)	D(LTAXR)
ECM	-0.46	0.12	-0.30	0.01	0.39	-0.76
	-0.24	-0.17	-0.20	-0.09	-0.25	-0.25
	[-1.91351]**	[0.71508]	[-1.51767]*	[0.11288]	[1.58922]*	[-3.00792]***
D(LRGDPC(-1))	0.01	-0.20	-0.12	-0.10	0.20	-0.26
	-0.35	-0.25	-0.28	-0.13	-0.36	-0.36
	[0.03031]	[-0.80792]	[-0.41977]	[-0.74306]	[0.54958]	[-0.72477]
D(LRGDPC(-2))	0.20	-0.30	-0.31	0.12	0.00	-0.51
	-0.27	-0.19	-0.22	-0.10	-0.27	-0.28
	[0.76258]	[-1.57393]*	[-1.42193]*	[1.18480]	[0.00424]	[-1.81168]**
D(LAGRIC(-1))	0.08	-0.20	-0.54	-0.25	0.16	-1.18
	-0.45	-0.32	-0.37	-0.17	-0.46	-0.47
	[0.18095]	[-0.62874]	[-1.46896]*	[-1.49703]*	[0.33617]	[-2.50210]***
D(LAGRIC(-2))	0.30	-0.52	-0.05	0.15	0.22	-0.29
	-0.43	-0.31	-0.35	-0.16	-0.44	-0.45
	[0.68396]	[-1.68634]*	[-0.13686]	[0.92590]	[0.48888]	[-0.65107]
D(LGEXP(-1))	-0.31	-0.11	-0.58	-0.21	0.40	-0.63
	-0.26	-0.18	-0.21	-0.10	-0.26	-0.27
	[-1.22221]	[-0.57479]	[-2.79101]***	[-2.15504]**	[1.50480]*	[-2.33731]**
D(LGEXP(-2))	-0.08	-0.18	-0.43	0.23	0.77	0.06
	-0.39	-0.28	-0.32	-0.15	-0.40	-0.41
	[-0.21113]	[-0.62528]	[-1.34952]*	[1.57794]*	[1.91534]**	[0.14432]
D(LICT(-1))	0.06	0.26	-0.84	0.59	0.46	-1.65
	-0.75	-0.53	-0.61	-0.28	-0.77	-0.78
	[0.07902]	[0.48725]	[-1.38593]*	[2.13496]**	[0.59672]	[-2.12002]**
D(LICT(-2))	-0.72	0.43	0.07	0.19	0.12	-0.39
	-0.74	-0.53	-0.61	-0.28	-0.76	-0.78
	[-0.96910]	[0.79783]	[0.11040]	[0.67764]	[0.15079]	[-0.50214]
D(LOPN(-1))	-0.32	0.29	0.37	0.04	-0.35	0.02
	-0.21	-0.15	-0.17	-0.08	-0.22	-0.22
	[-1.50270]*	[1.90341]**	[2.18021]**	[0.50492]	[-1.61686]*	[0.07034]

D(LOPN(-2))	-0.27	0.08	0.61	0.06	-0.01	0.15
	-0.22	-0.15	-0.18	-0.08	-0.22	-0.23
	[-1.23734]	[0.48734]	[3.46731]***	[0.73830]	[-0.06554]	[0.67817]
D(LTAXR(-1))	0.23	0.03	-0.02	0.09	0.10	-0.09
	-0.19	-0.14	-0.16	-0.07	-0.20	-0.20
	[1.20735]	[0.23209]	[-0.14604]	[1.26230]	[0.52574]	[-0.45233]
D(LTAXR(-2))	0.19	0.07	0.08	-0.02	0.07	0.22
	-0.18	-0.13	-0.14	-0.07	-0.18	-0.18
	[1.05331]	[0.52012]	[0.52117]	[-0.37557]	[0.37950]	[1.20163]
C	0.16	-0.09	0.54	0.03	-0.38	0.69
	-0.23	-0.17	-0.19	-0.09	-0.24	-0.24
	[0.67401]	[-0.56294]	[2.87495]	[0.29983]	[-1.59273]	[2.84343]
R-squared	0.50	0.43	0.56	0.73	0.51	0.74
Adj. R-squared	0.14	0.01	0.25	0.53	0.16	0.56

Source: Author's computation using Eviews 9.
*Note: */**/*** = significance at 10 percent, 5 percent and 1 percent levels with critical values of 1.31, 1.70 and 2.50 respectively.*

Table 5.4: Vector Error Correction Granger Causality/Block Exogeneity Wald Test

Panel 1: Dependent variable: D(LRGDPC)

Excluded	Chi-sq	Df	Prob.
D(LAGRIC)	0.49	2	0.78
D(LGEXP)	1.69	2	0.42
D(LICT)	0.97	2	0.61
D(LOPN)	2.77	2	0.24
D(LTAXR)	1.92	2	0.38
All	6.825030	10	0.74

Panel 2: Dependent variable: D(LAGRIC)

Excluded	Chi-sq	Df	Prob.
D(LRGDPC)	2.88	2	0.23
D(LGEXP)	0.48	2	0.78
D(LICT)	1.16	2	0.55
D(LOPN)	3.68	2	0.15
D(LTAXR)	0.27	2	0.87
All	7.08	10	0.71

Panel 3: Dependent variable: D(LGEXP)

Excluded	Chi-sq	Df	Prob.
D(LRGDPC)	2.09	2	0.35
D(LAGRIC)	2.16	2	0.33
D(LICT)	1.99	2	0.36
D(LOPN)	12.8*	2	0.00
D(LTAXR)	0.38	2	0.82
All	18.49*	10	0.04

Panel 4: Dependent variable: D(LICT)

Excluded	Chi-sq	Df	Prob.
D(LRGDPC)	2.17	2	0.33
D(LAGRIC)	3.21	2	0.20
D(LGEXP)	13.8*	2	0.00
D(LOPN)	0.60	2	0.73
D(LTAXR)	2.32	2	0.31
All	21.6*	10	0.01

Panel 5: Dependent variable: D(LOPN)

Excluded	Chi-sq	Df	Prob.
D(LRGDPC)	0.30	2	0.85
D(LAGRIC)	0.33	2	0.84
D(LGEXP)	4.08	2	0.12
D(LICT)	0.46	2	0.79
D(LTAXR)	0.32	2	0.85
All	11.3	10	0.33

Panel 6: Dependent variable: D(LTAXR)

Excluded	Chi-sq	Df	Prob.
D(LRGDPC)	3.56	2	0.16
D(LAGRIC)	6.56*	2	0.03
D(LGEXP)	7.67*	2	0.02
D(LICT)	5.74*	2	0.05
D(LOPN)	0.50	2	0.77
All	44.3*	10	0.00

Source: Author's computation using Eviews 9.
** indicates rejection of the null hypothesis of no Granger causality at the 5% level of significance.*

Table 5.5 : Forecast Error Variance Decomposition

Variance Decomposition of LRGDPC

*Period	**S.E.	LRGDPC	LAGRIC	LGEXP	LICT	LOPN	LTAXR
1	0.24	100	0.00	0.00	0.00	0.00	0.00
2	0.26	93.81	1.58	2.90	1.64	0.00	0.07
3	0.27	88.97	4.94	3.75	1.99	0.04	0.32
4	0.28	84.48	5.23	4.21	4.67	0.64	0.80
5	0.31	74.46	4.69	5.05	12.96	2.07	0.77
6	0.33	59.87	3.75	7.85	23.68	4.15	0.79
7	0.38	47.33	2.95	9.68	33.08	6.35	0.61
8	0.44	37.64	2.31	11.37	38.93	9.26	0.48
9	0.48	30.56	1.85	13.58	42.32	11.28	0.43
10	0.53	25.16	1.54	16.06	43.69	13.22	0.34

Variance Decomposition of LAGRIC

*Period	**S.E.	LRGDPC	LAGRIC	LGEXP	LICT	LOPN	LTAXR
1	0.16	61.55	38.45	0.00	0.00	0.00	0.00
2	0.22	55.90	36.36	0.08	1.25	6.06	0.36
3	0.24	50.63	31.46	1.06	6.50	7.71	2.64
4	0.25	50.65	29.56	1.12	7.74	7.12	3.81
5	0.27	51.72	29.97	1.01	6.95	6.72	3.64
6	0.29	51.01	31.50	0.92	6.06	7.02	3.50
7	0.30	50.36	31.77	1.16	5.74	7.03	3.94
8	0.31	50.37	31.32	1.62	5.46	6.85	4.39
9	0.32	50.58	31.49	1.87	5.10	6.49	4.47
10	0.33	50.70	32.06	1.98	4.74	6.12	4.39

Variance Decomposition of LGEXP

*Period	**S.E.	LRGDPC	LAGRIC	LGEXP	LICT	LOPN	LTAXR
1	0.18	5.89	7.68	86.43	0.01	0.00	0.00
2	0.26	3.12	12.76	70.78	2.21	10.46	0.77
3	0.35	2.27	7.74	74.96	1.29	13.31	0.42
4	0.43	1.57	7.95	75.92	1.34	12.90	0.34
5	0.52	1.15	7.97	71.55	1.25	17.82	0.27
6	0.57	1.06	7.78	71.74	1.93	17.28	0.22
7	0.63	0.87	7.71	71.61	2.67	16.96	0.18
8	0.69	0.81	7.56	69.75	3.69	18.03	0.17
9	0.74	0.72	7.34	69.86	4.35	17.59	0.13
10	0.78	0.73	7.54	68.95	5.33	17.42	0.12

Variance Decomposition of LICT

*Period	**S.E.	LRGDPC	LAGRIC	LGEXP	LICT	LOPN	LTAXR
1	0.08	12.86	0.33	0.17	86.64	0.00	0.00
2	0.16	5.19	0.35	2.13	89.70	1.77	0.85
3	0.23	3.38	0.46	1.25	92.97	1.02	0.91
4	0.30	3.36	0.65	1.40	92.52	1.36	0.70
5	0.37	3.64	0.50	2.13	89.84	3.25	0.64
6	0.44	3.60	0.52	3.58	87.65	4.03	0.62
7	0.52	3.59	0.74	4.83	84.91	5.30	0.62
8	0.59	3.41	0.85	6.06	82.58	6.47	0.63
9	0.66	3.36	0.93	7.66	80.18	7.26	0.61
10	0.73	3.25	1.02	8.73	78.05	8.32	0.62

Variance Decomposition of LOPN

*Period	**S.E.	LRGDPC	LAGRIC	LGEXP	LICT	LOPN	LTAXR
1	0.23	7.54	0.09	23.44	1.84	67.10	0.00
2	0.32	22.28	0.24	24.74	2.48	48.62	1.66
3	0.42	15.77	1.45	29.02	1.65	50.36	1.74
4	0.51	15.08	1.42	28.33	1.55	51.82	1.84
5	0.59	12.02	1.43	35.17	1.51	48.43	1.47
6	0.66	11.62	1.74	34.70	1.83	48.73	1.38
7	0.73	11.32	1.74	35.03	1.97	48.63	1.33
8	0.79	11.75	1.83	35.47	2.51	47.12	1.34
9	0.85	11.64	1.87	34.89	3.19	47.11	1.33
10	0.91	12.20	1.84	34.44	4.11	46.44	1.32

Variance Decomposition of LTAXR

*Period	**S.E.	LRGDPC	LAGRIC	LGEXP	LICT	LOPN	LTAXR
1	0.24	1.95	0.11	2.07	5.16	45.91	44.80
2	0.35	1.02	7.31	1.35	3.86	55.62	30.84
3	0.44	8.18	6.84	18.36	4.20	39.54	22.87
4	0.55	7.21	8.56	21.87	7.69	39.55	15.12
5	0.65	6.12	6.87	24.83	5.92	43.81	12.44
6	0.72	5.04	7.68	26.93	5.54	43.26	11.59
7	0.84	4.21	8.19	26.51	5.21	44.79	11.08
8	0.86	3.63	8.11	26.51	6.41	44.76	10.58
9	0.94	3.44	7.91	27.83	7.28	43.75	9.84
10	0.99	3.06	7.94	27.08	8.28	44.23	9.44

Source: Author's computation using Eviews 9.
*Time Period, **Standard Errors