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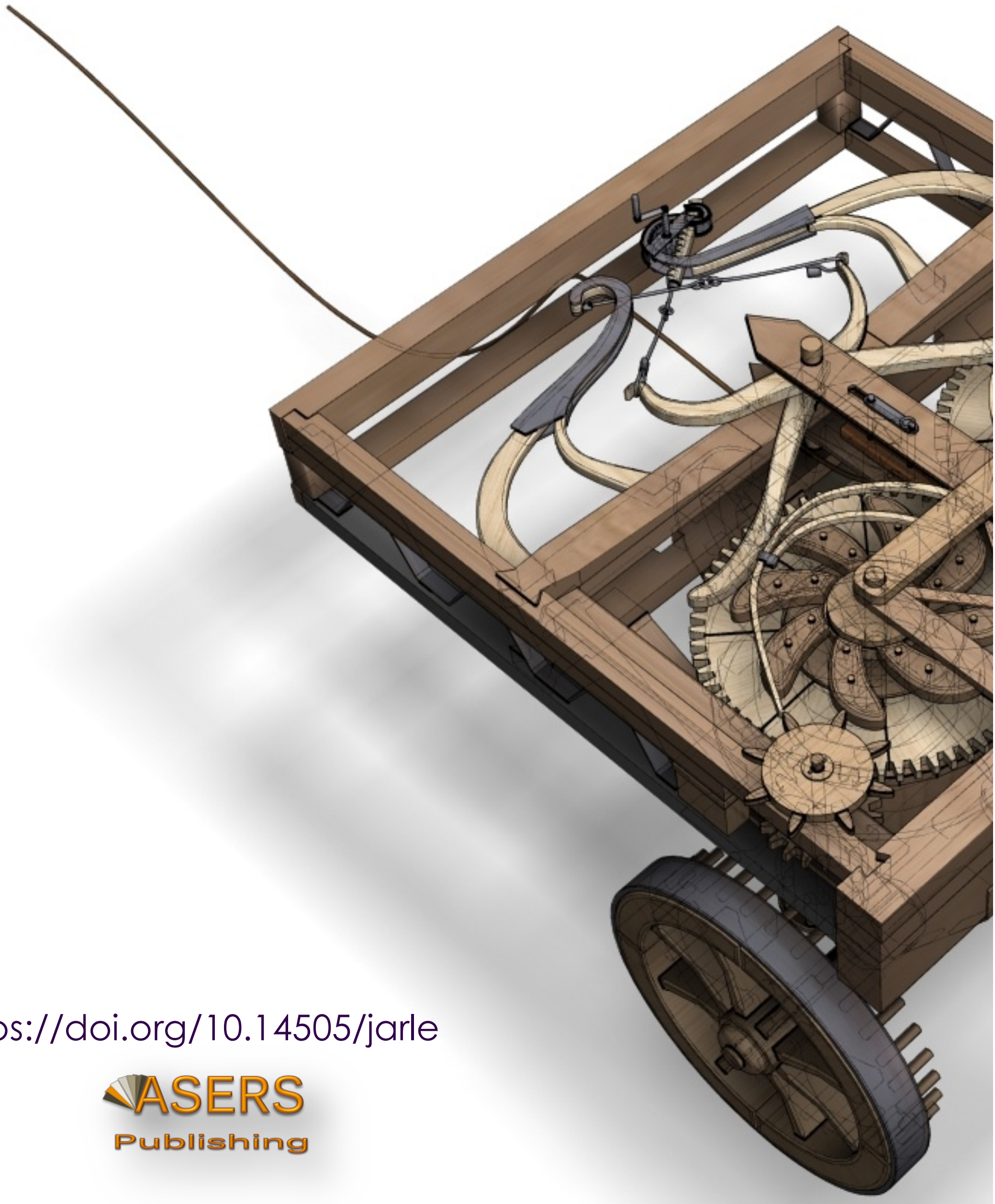

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Journal of Advanced Research in Law and Economics

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Domestic Revenue Mobilization and Agricultural Productivity: Evidence from Nigeria

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Abstract:

Foreign and domestic debts have raised questions about fiscal sustainability and implications for sustainable development. One of the major problems in the agricultural sector in developing economies is inadequate capital, despite its centrality to growth and development. This study examines the long-run relationship and the casual relationships between domestic revenue mobilization and agricultural productivity in Nigeria using Auto Regressive Distributed Lag and Granger Non-causality. Using agricultural productivity as the dependent variable, the result revealed that agricultural productivity has a negative long-run relationship with government recurrent expenditure on agriculture and tax revenue, while agricultural credit is not statistically significant. This result indicated that supplementary resource such as foreign aid could be embarked on in the long-run. Reliance on foreign aid may be volatile to the economy, and as well not suitable to achieve long-term goals. So, there is a need to maximize benefit from tax revenue and ensure that resources are allocated to prioritizes right sectors such as the agricultural sector. The causality test revealed that there is a bi-directional relationship between agricultural productivity and tax revenue. The study recommended among others, the need for public finance reforms to increase government revenue and promote growth in the agricultural sector by enhancing the quality of the tax system.

Keywords: domestic resource; mobilization; agricultural productivity; ARDL; Nigeria.

JEL Classification: F43; C32; E24

Introduction

Emphasis has been placed on capital and labor as the major determinates of growth. Empirically, studies have shown that there is a positive relationship between output and financial mobilization. The importance of resource mobilization is fundamental to economic growth and development in developing economies as identified by Wagner's law (Wagner, Weber 1977). Most developing economies depend on foreign and domestic resources through borrowing. These have raised questions about its fiscal sustainability and implications for sustainable growth and development (Baharumshah *et al.* 2017). Domestic Resources Mobilization through taxation can help to promote long-term sustainable growth in developing countries. Most studies have focused on the aggregated output and resource mobilization, while studies on the agricultural sector in developing economies are still growing. In light of the importance of the agricultural sector to development, this study examines the long-run relationship and the casual relationships between domestic revenue mobilization and agricultural productivity in Nigeria using Auto Regressive Distributed Lag and Granger Non-causality.

1. Literature Review

In the traditional growth model, an emphasis has been placed on capital and labor as the major determinates of growth. Empirically, studies have shown that there is a positive relationship between output and financial mobilization (Adama *et al.* 2018; Hassan *et al.* 2011; Tchamyou, Asongu 2017). Despite the implications of financial mobilization on growth and development, developing economies are still far behind in financial resources compared to developed economies. The importance of resource mobilization is fundamental to economic growth and development in developing economies as identified by Wagner's law (Wagner, Weber 1977). Most developing economies depend on foreign and domestic resources through borrowing. These have raised questions about its fiscal sustainability and implications for sustainable growth and development (Baharumshah *et al.* 2017).

In most developing economies, most especially in Africa within the periods of the 1980s and 1990s, major reforms were introduced to promote growth and development (Aryeetey 1994; Lawal *et al.* 2018). The programmes were encouraged and promoted by the World Bank and International Monetary Fund (IMF). Promoting financial liberalization was one of the major strategies highlighted for growth and development, via a market-based system. It was observed that the programmes succeeded in liberalizing the financial sector. However, its impact on growth and development cannot be accounted for (Reinhart, Tokatlidis 2003). In addition, Al-Suwailem (2014) documented that financial liberalization causes instability and crises in developing economies. This argument was also supported by the studies of Murinde (2010), and Demirguc-Kunt and Detragiache (2001). NEPAD (2013) also stressed that the foreign mobilization of resource in developing economies has not promoted sustainable growth and development. On the other hand, OECD (2010) pointed out that domestic resource mobilization (DRM) was identified by the 'monetary consensus on financing for development' as a means of promoting growth and development in developing economies. Tax Justice Network of Africa (2011) also emphasized on promoting DRM in developing economies since the international economic crisis in 2009. Consequently, the study by Culpeper and Aniket (2008) showed that DRM can promote higher levels of growth and reduce poverty level, especially in developing countries.

Theoretically, some studies have shown that there is a positive relationship between resource mobilization and output (Rajan, Zingale 2003; Wagner, Weber 1977). As stated in Wagner's law by Wagner and Weber (1977), as public expenditure tends to increase in most countries, there is a tendency that the increased expenditure will spur growth and development in such country. While Tchamyou and Asongu (2017) believed that the relationship between resource mobilization and output depends on some factors such as the level of the economy at the present time, the role of government and the nature of credit facilities. By this, it does not necessarily mean that government expenditure will promote growth and development if certain important factors were not considered such as the role of institutions, prioritizing the right sector, among others. Also, prioritize a particular sector to stimulate growth and development will help the developing economies to achieve various macroeconomic objectives (Campbell, Asaleye 2016; Singer 1958; Streeten 1969). Nigeria is no exception, efficient mobilization of a country's resources to the agricultural sector will help to reduce income inequality, promote employment and increase overall welfare in the long-run. Alston and Pardey (2014) noted that agricultural sector accounts for a comparatively small share of the global economy, despite its importance for creating employment in the rural areas and its centrality in the aspect of growth and development. Most of the middle and low-income countries in the world are farmers and live in rural communities where farming serves as a means of living (World Bank 2017). One of the major problems in the agricultural sector, most especially in developing economies is inadequate capital resulting from low income and savings.

DRM through taxation can help to promote long-term sustainable growth in developing countries. Nigeria has experienced notable economic growth for some decades before the recent recession in the second quarter of 2016 (World Bank 2017). However, the indicators on the economic performance showed that the growth is not pro-poor. High unemployment/underemployment rate, poverty rate and low income still remained some of the problems in the country (Nigeria National Bureau of Statistics NBS 2016; Oloni *et al.* 2017). The agriculture sector has lagged behind in GDP growth and promoting employment, growing at 3.7 per cent (WDI 2017). Nigeria population is on the increasing trend, population growth rate moved from 2.69 per cent in 2015 to 2.71 per cent in 2016 (WDI 2017). There is an increase in importation on foods and other basic commodities in the country, so there is the need to finance the agricultural sector so as to make an adequate supply that will meet the demands of the citizens and promote employment opportunities in the rural areas.

Most studies have focused on the aggregated output and resource mobilization, while studies on the agricultural sector in developing economies are still growing. Few among others include the study of Newettie (2017) that examined the impact of government spending on agricultural growth in Zambia, Malawi, South Africa and Tanzania. It was concluded by the scholars that agricultural growth responds differently to the agricultural spending types across the countries. In a similar study, Chauke *et al.* (2015) carried out a comparative study on the impact of public expenditure on agricultural growth in South Africa and Zimbabwe, result from the study showed that capital expenditure is positively related to agricultural growth in both short-run and long-run for both countries. In Greece, Anastassiou and Dritsaki (2005) examined the relationship between tax revenue and rate of economic growth using a vector autoregressive model (VAR) and Granger causality test. The result shows that there exists a causal relationship between tax revenue and economic growth.

Two main channels have been identified in literature in which finance/capital affects the output sectors. The first is the long-run impact, theoretically (Barro 1990; Rebelo 1991); and empirically (Asaleye, Adama, Ogunjobi 2018; Amador-Torres 2017; Maftaudeen, Hussainatu 2014; Shwaib *et al.* 2015; among others). In the presence of a long-run relationship between two or more series, there is a tendency for the existence of a causal relationship at least in one direction (Granger 2004). Also, studies have shown that there are causal effects between finance/capital and output sectors (Fashina *et al.* 2018; Anastassiou, Dritsaki 2005; Jangili 2011; 2009; among others).

In light of the importance of the agricultural sector to development, this study examines the long-run relationship and the casual relationships between domestic revenue mobilization and agricultural productivity in Nigeria using Auto Regressive Distributed Lag (ARDL) and Granger Non-causality proposed by Toda and Yamamoto (1995). The choices of estimations are based on the strength of techniques. For example, irrespective that the series are I (0) and I (1), the ARDL technique is most suitable to estimate long-run behavior (Pesaran, Pesaran 1997). The Toda and Yamamoto's approach to causality test overcomes the limitations of the ordinary granger causality test by putting into consideration possible non-stationary or co-integration between series when the test for causality. Though the VECM also overcome the limitation of the ordinary causality approach, however, there is a loss of long-run information due to the first difference in VECM. The Granger Non-Causality approach fits a standard vector autoregressive model in the levels of the variable (Asaleye *et al.* 2017). Three main indicators have also been identified as the measurement of domestic resource mobilization in literature, namely: domestic savings, domestic credit and taxes. Evidence from the official statistics showed that Sub-Saharan African has the lowest saving rate at developing region due to low income (World Bank 2017). This study uses agricultural value added per worker to measure agricultural productivity and, domestic credit to agriculture and taxes as metrics for domestic resource mobilization[1]. OECD (2010) stressed that expenditure on taxation is a means of shifting accountability back from the taxpayers, which helps to reduce the uneven distribution of wealth and as well create stable, more legitimate state in the process.

2. Methodology

The theoretical framework of the study is built on the unrestricted Cobb – Douglas production function. This growth is flexible to accommodate the inputs of agriculture into the growth system, such as land, labor, fertilizer among others. The implicit form of the model is given as:

$$Y = f(X_i) \tag{1}$$

Y is the output where X_i is a vector of inputs. Equation (1) can be expressed explicitly as:

$$Y_t = a_0 + \sum b_i X_i + \varepsilon_t \tag{2}$$

Equation (2) is the unrestricted Cobb-Douglas, linear in logarithms. Where Y_t is the output at time t, a_0 is the intercept, X_i is the i^{th} input used in production at time 't', ε_t is the error term. The variable Y will be proxy by Agricultural Value Added per Worker (AVAW), the inputs represented by X_i include: Tax Revenue (TXR);

[1]Saving was not included as metric for domestic resource mobilization because of the low savings rate most especially among farmers, also no disaggregate data on savings for the agricultural sector. Other variables such as government recurrent spending on agriculture and government spending on infrastructures are included.

Government Recurrent Expenditure on Agriculture (GEXP); Government Spending on Infrastructure (GSF); Agricultural Credit (ACRT); Land Cultivated (LD); and Agricultural Employment (AEMP). To achieve the objective of this study, normalization will be done on AEMP, AVAW, TXR and ACRT to establish long-run equations for agricultural employment, agricultural productivity, tax revenue, and agricultural credit which will be referred to as Model 1, 2, 3 and 4 respectively. Causality test as well was carried out to complement the results.

2.1. Modeling the Long-Run Impact

The bounds test approach by Pesaran and Pesaran (1997) was used to estimate the long-run relationship. Following the theoretical framework of the study, the Auto Regressive Distributed Lags (ARDL) unrestricted error correction models are given as follows: Model 1 using agricultural productivity (AVAW) as the dependent variable

$$\Delta AVAW_t = \alpha_0 + \alpha_1 AVAW_{t-i} + \alpha_2 TXR_{t-i} + \alpha_3 GEXP_{t-i} + \alpha_4 GSF_{t-i} + \alpha_5 ACRT_{t-i} + \alpha_6 LD_{t-i} + \alpha_7 AEMP_{t-i} + \sum_{i=0}^{q} \beta_i^1 \Delta AVAW_{t-i} + \sum_{i=0}^{q} \beta_i^2 \Delta TXR_{t-i} + \sum_{i=0}^{q} \beta_i^3 \Delta GEXP_{t-i} + \sum_{i=0}^{q} \beta_i^4 \Delta GSF_{t-i} + \sum_{i=0}^{q} \beta_i^5 \Delta CRT_{t-i} + \sum_{i=0}^{q} \beta_1^6 \Delta LD_{t-i} + \sum_{i=0}^{q} \beta_i^7 \Delta EMP_{t-i} + \varepsilon_{1t} \tag{3}$$

Model 2 using Tax Revenue (TXR) as dependent variable

$$\Delta TXR_t = \delta_0 + \delta_1 TXR_{t-i} + \delta_2 AVAW_{t-i} + \delta_3 GEXP_{t-i} + \delta_4 GSF_{t-i} + \delta_5 ACRT_{t-i} + \delta_6 LD_{t-i} + \delta_7 AEMP_{t-i} + \sum_{i=0}^{q} \lambda_i^1 \Delta TXR_{t-i} + \sum_{i=0}^{q} \lambda_i^2 \Delta AVAW_{t-i} + \sum_{i=0}^{q} \lambda_i^3 \Delta GEXP_{t-i} + \sum_{i=0}^{q} \lambda_i^4 \Delta GSF_{t-i} + \sum_{i=0}^{q} \lambda_i^5 \Delta CRT_{t-i} + \sum_{i=0}^{q} \lambda_1^6 \Delta LD_{t-i} + \sum_{i=0}^{q} \lambda_i^7 \Delta EMP_{t-i} + \varepsilon_{2t} \tag{4}$$

Model 3 using Agricultural Credit (ACRT) as the dependent variable

$$\Delta ACRT_t = \omega_0 + \omega_1 ACRT_{t-i} + \omega_2 TXR_{t-i} + \omega_3 AVAW_{t-i} + \omega_4 GSF_{t-i} + \omega_5 GEXP_{t-i} + \omega_6 LD_{t-i} + \omega_7 AEMP_{t-i} + \sum_{i=0}^{q} \phi_i^1 \Delta ACRT_{t-i} + \sum_{i=0}^{q} \phi_i^2 \Delta TXR_{t-i} + \sum_{i=0}^{q} \phi_i^3 \Delta AVAW_{t-i} + \sum_{i=0}^{q} \phi_i^4 \Delta GSF_{t-i} + \sum_{i=0}^{q} \phi_i^5 \Delta GEXP_{t-i} + \sum_{i=0}^{q} \phi_1^6 \Delta LD_{t-i} + \sum_{i=0}^{q} \phi_i^7 \Delta EMP_{t-i} + \varepsilon_{3t} \tag{5}$$

Model 4 using Agricultural Employment (AEMP) as the dependent variable

$$\Delta AEMP_t = \sigma_0 + \sigma_1 AEMP_{t-i} + \sigma_2 TXR_{t-i} + \sigma_3 AVAW_{t-i} + \sigma_4 GSF_{t-i} + \sigma_5 ACRT_{t-i} + \sigma_6 LD_{t-i} + \sigma_7 GEXP_{t-i} + \sum_{i=0}^{q} \gamma_i^1 \Delta AEMP_{t-i} + \sum_{i=0}^{q} \gamma_i^2 \Delta TXR_{t-i} + \sum_{i=0}^{q} \gamma_i^3 \Delta AVAW_{t-i} + \sum_{i=0}^{q} \gamma_i^4 \Delta GSF_{t-i} + \sum_{i=0}^{q} \gamma_i^5 \Delta CRT_{t-i} + \sum_{i=0}^{q} \gamma_1^6 \Delta LD_{t-i} + \sum_{i=0}^{q} \gamma_i^7 \Delta GEXP_{t-i} + \varepsilon_{4t} \tag{6}$$

In equation (3) to (6), the coefficients with the summation signs represent the short-run dynamics while α_i, δ_i, ω_i and σ_i for i = 1, 2, …, 7 are the long-run multiples corresponding to the long-run relationship. The intercepts are α_0, δ_0, ω_0 and σ_0 for equations (3), (4), (5) and (6) respectively (Tang 2003; Pesaran *et al*. 2001; Poon 2010). The variable 'q' is the lag length for the unrestricted error correction model.

2.2. Modeling the Causal Effects

This study follows Toda and Yamamoto (1995) to examine the causal relationship between variables of choice. This approach shows how VAR can be formulated at levels form and carried out restrictions on the parameters matrices, relevant if the series are integrated or cointegrated of an arbitrary order (Toda, Yamamoto 1995). In the causality process, K represents the lag length while $(k + d_{\max})^{th}$ order VAR represents the lag length plus the maximal of order of integration. That is, the $d_{\max}$ represents the maximal order of integration. The estimation is carried out on $(k + d_{\max})^{th}$ while the coefficient $d_{\max}$ lagged vectors are ignored. If two variables are assumed, say M and N. The model is given as:

$$M_t = a_0 + \sum_{i=1}^{K} a_{1i} M_{t-i} + \sum_{j=k+1}^{d\max} a_{2j} M_{t-j} + \sum_{i=i}^{k} \alpha_{1i} N_{t-i} + \sum_{j=k+1}^{d\max} \alpha_{2j} N_{t-j} + v_{1t} \quad (7)$$

$$N_t = b_0 + \sum_{i=1}^{k} b_{1i} N_{t-i} + \sum_{j=k+1}^{d\max} b_{2j} N_{t-j} + \sum_{i=1}^{k} \beta_{1i} M_{t-j} + \sum_{j=k+1}^{d\max} \beta_{2j} M_{t-j} + v_{2t} \quad (8)$$

By the outline of Toda and Yamamoto (1995), the standard asymptotic distribution still holds in the causality process (Asaleye *et al.* 2017).

2.3. Sources of Data

The study employs time series secondary data collected on the variables specified in the model spamming the period 1980 to 2017. Data for agricultural value added per worker, agricultural employment and land cultivated were sourced from World Development Indicators (WDI 2017) while agricultural credit, government recurrent expenditure on agriculture, government spending on infrastructure and Tax revenue were sourced from Central Bank of Nigeria statistical bulletin (2017).

3. Presentation of Results

Table 1. Summary of ADF and PP unit root test results

Variables	ADF Results		PP Results		Order of Integration
	Level	First Diff.	Level	First Diff.	
ACRT	-0.782375	-7.685885*	-0.753201	-7.812733*	I(1)
AEMP	-1.280944	-4.713551*	-1.236145	-4.732782*	I(1)
AVAW	0.370465	-5.539612*	0.370465	-5.539612	I(1)
GEXP	-2.790812**	-6.983271*	-5.411528*	-	I(0)
GSF	-1.341081	-4.882478*	-2.444566	-4.872752*	I(1)
LD	-3.410645*	-	-9.269126*	-	I(0)
TXR	-3.354247*	-	-2.379915**	-5.824097*	I(0)

Notes: * and ** Indicate Significant at 5% and 10% significance levels respectively.

Source: Computed by Authors' using EViews 9.5.

Table1 presents the summary of the unit root test results for the series in level and in first difference forms. The result of the ADF shows that apart from variables LD and TXR which were stationary at the level of 5 per cent significant in level forms, all other variables were integrated of order, since the absolute value of ADF statistics exceeded the critical value only at first difference at the level. Though, variable GEXP is stationary at 10 per cent significance level. The Philips Perron test indicated that GEXP and LD were stationary at 5 per cent significance level, while other variables were stationary at first difference. Though, TXR was stationary at the level of 10 per cent significance level. Based on this result, the ARDL was used to examine the long-run relationship.

3.1. Long-Run Behavior Results

As earlier mentioned, to achieve the objectives of this study, normalization will be done on AEMP, AVAW, TXR and ACRT to establish long-run equations for agricultural employment, agricultural productivity, tax revenue, and government recurrent expenditure respectively.

Table 2. Model 1: AVAW long-run equation: ARDL (4, 12, 12, 12, 12, 12, and 11)

Significance levels	Critical Bounds		F-Statistics Value	K_{max}	Hypothesis Testing
	I0 Bound	I1 Bound			
At 10 per cent	2.12	3.23	9.661976	6	Cointegration exist

Significance levels	Critical Bounds		F-Statistics Value	K_{max}	Hypothesis Testing
	I0 Bound	I1 Bound			
At 5 per cent	2.45	3.61	9.661976	6	Cointegration exist
At 2.5 per cent	2.75	3.99	9.661976	6	Cointegration exist
At 1 per cent	3.15	4.43	9.661976	6	Cointegration exist
Diagnostic Checks				Probability	Hypothesis Testing
Breusch-Godfrey Serial Correlation				0.0853	Rejected
Heteroskedasticity Test: ARCH				0.0556	Rejected
Histogram – Normality Test				0.2902	Rejected

Source: Authors' Computation using EViews 9.5.

Table 2 presents the ARDL bound test using agricultural productivity (AVAN) as the dependent variable. [2]The result from the model selection criteria shows that the appropriate ARDL model is, using 4 lags for AVAN and with 12, 12, 12, 12, 12 and 11 lags for ACRT, AEMP, GEXP, GSF, LD and TXR respectively. The appropriate lag length was selected by using the Hannan – Quinn criterion. As evidenced from the result there is an existence of cointegration at the levels of 10, 5, 2.5 and 1 per cent. The f-statistics is 9.661976, this is greater than the upper bounds of 3.23, 3.61, 3.99 and 4.43 for 10, 5, 2.5 and 1 per cent respectively; this means that there is a long run relationship between the variables. The diagnostic checks were carried on the model to determine its validity. The Breusch-Godfrey Serial Correlation LM with a probability value of 0.0853 shows that the study can reject the null hypothesis of serial correlation. Also, the null hypotheses of heteroskedasticity and errors not normally distributed were rejected at a 5 per cent significance level given respective probability as 0.0556and 0.2902 respectively.

Table 3. Model 2: TXR long-run equation: ARDL (6, 8, 9, 8, 3, 1 and 0)

Significance levels	Critical Bounds		F-Statistics Value	K_{max}	Hypothesis Testing
	I0 Bound	I1 Bound			
At 10 per cent	1.99	2.94	10.68930	6	Cointegration exist
At 5 per cent	2.27	3.28	10.68930	6	Cointegration exist
At 2.5 per cent	2.55	3.61	10.68930	6	Cointegration exist
At 1 per cent	2.88	3.99	10.68930	6	Cointegration exist
Diagnostic Checks				Probability	Hypothesis Testing
Breusch-Godfrey Serial Correlation				0.5379	Rejected
Heteroskedasticity Test: ARCH				0.4011	Rejected
Histogram – Normality Test				0.1282	Rejected

Source: Authors' Computation using EViews 9.5.

Table 3 shows the ARDL result using TXR as the dependent variable, with 10 lag for TXR and 12, 11, 0, 10, 2, 8 lag for AVAW, GEXP, GSF, ACRT, LD and AEMP respectively**.** The long-run relationship exists when the value of f-statistics is greater than the upper bound. From the table the f-stat is 10.68930, this is greater than the upper bounds for 10, 5, 2.5 and 1 per cent levels. This means that there is a long run relationship between the variables using TXR as a dependent variable at 10%, 5%, 2.5% and 1% level of significance. The Breusch-Godfrey Serial Correlation LM with probability Chi-square value of 0.5379 shows no serial correlation between the variables. The Heteroskedasticity test Chi-square probability value is 0.4011. Hence, the null hypothesis that

[2]The result of the model selections was not presented due to limited space but can be provided upon request.

there is no heteroskedasticity can be rejected. Likewise, the null hypothesis of errors not normally distributed is rejected at 5 per cent significance level with Chi-square probability value of 0.1282.

Table 4. Model 3: ACRT long-run equation: ARDL (10, 12, 11, 0, 10, 2, and 8)

Significance levels	Critical Bounds		F-Statistics Value	K_{max}	Hypothesis Testing
	I0 Bound	I1 Bound			
At 10 percent	2.12	3.23	3.492973	6	Cointegration exist
At 5 percent	2.45	3.61	3.492973	6	Inconclusive
At 2.5 percent	2.75	3.99	3.492973	6	Inconclusive
At 1 percent	3.15	4.43	3.492973	6	Inconclusive
Diagnostic Checks				Probability	Hypothesis Testing
Breusch-Godfrey Serial Correlation				0.0014	Cannot Reject
Heteroskedasticity Test: ARCH				0.9860	Rejected
Histogram – Normality Test				0.9857	Rejected

Source: Authors' Computation using EViews 9.5.

Table 4 shows the ARDL result using ACRT as the dependent variable, with 10 lag for ACRT and 12, 11, 0, 10, 2, 8 lag for TXR, AVAW, GSF, GEXP, LD and AEMP respectively. From the table, it can be deduced that cointegration exists at 10% level of significance with the upper value of 3.23. The value of the f-statistics is 3.492973, greater than the upper bound value. At the levels of 5%, 2.5% and 1%, the result is inconclusive since the computed F-Statistics is between the lower and the upper bound. The Breusch-Godfrey Serial Correlation LM probability is 0.0014 which is less than 0.05, therefore the null hypothesis that of no serial correlation cannot be rejected. The Heteroskedasticity test probability is 0.9860 while the histogram normality probability is 0.9857. Hence, the null hypotheses of heteroskedasticity and errors not normally distributed were rejected at a 5 per cent significance level. Although not serial correlated errors would be desired but cannot only be used to validate the model (Asaleye *et al.* 2017; Bahmani - Oskooee, Brooks 1999).

Table 5. Model 4: AEMP long-run equation: ARDL (10, 1, 0, 1, 1, 0 and 3)

Significance levels	Critical Bounds		F-Statistics Value	K_{max}	Hypothesis Testing
	I0 Bound	I1 Bound			
At 10 per cent	1.99	2.94	7.109700	6	Cointegration exist
At 5 per cent	2.27	3.28	7.109700	6	Cointegration exist
At 2.5 per cent	2.55	3.61	7.109700	6	Cointegration exist
At 1 per cent	2.88	3.99	7.109700	6	Cointegration exist
Diagnostic Checks				Probability	Hypothesis Testing
Breusch-Godfrey Serial Correlation				0.9111	Rejected
Heteroskedasticity Test: ARCH				0.8919	Rejected
Histogram – Normality Test				0.3760	Rejected

Source: Authors' Computation using EViews 9.5.

Table 5 presents the ARDL result using AEMP as the dependent variable, with 6 lag for AEMP and 8, 9, 8, 3, 1, 0 lag for TXR, AVAW, GSF, ACRT, LD and GEXP respectively. The table shows the presence of a long-run relationship between the variables at levels of 10%, 5%, 2.5% and 1% level of significance since the F-statistics is greater than the upper bounds. The study rejected the hypotheses of serial correlation, ARCH effects and errors not normally distributed at 5 per cent significance level.

3.2. Estimated Long-run Behavior (Coefficients)

Table 6. Long-run Coefficients and Error Correction Mechanism

Regressors	Dependent Variables' (Coefficient and Parameters)			
	AVAW	TXR	ACRT	AEMP
AVAW		-3.854495* [-3.785138]	-18.671884 [-0.926374]	0.8363850** [2.062349]
ACRT	0.145031 [0.934649]	1.635938* [5.309274]		0.203303** [2.314970]
AEMP	1.443564 [1.377811]	-0.985861 [-0.512511]	26.490556 [0.926373]	
GEXP	-0.038518** [-2.710691]	-0.034848* [-4.428256]	13.752614** [2.379365]	0.004507 [1.457934]
GSF	0.003676** [2.699776]	-0.002446** [-2.417415]	0.046291** [2.189407]	0.000623 [1.515683]
LD	0.007210** [2.830960]	0.023976 [1.212113]	-0.275817 [-0.920344]	-0.001681 [-0.256782]
TXR	-0.119495** [-3.065541]		-6.154688** [-2.326749]	-0.071895*** [-1.80904]
C	-8.637099 [-1.329935]	5.982300 [0.488633]	-218.221644 [-1.244747]	6.808597* [12.88091]
ECM	-0.341540* [-6.152827]	-0.338963* [-9.573282]	-0.275653* [-3.706126]	-0.01984* [-7.141627]

Note: ECM represents the error correction mechanism. *, ** and *** indicate significance at the levels of 1, 5 and 10 per cent respectively.

Source: Authors' Computation using EViews 9.5.

Table 6 presents the cointegration equations; using AVAW as the dependent variable, GEXP, GSF and LD are significant at the level of 5 per cent. AVAW has a positive long-run relationship with GSF and negative long-run relationship with GEXP and TXR. Using TXR as the dependent variable, AVAW, GEXP and ACRT are significant at the level of 1 per cent, while GSF is significant at the level of 5 per cent. TXR has a negative long-run relationship with AVAW, GEXP and GSF and positive with ACRT. Using ACRT as the dependent variable, GEXP, GSF and TXR are significant at the level of 5 per cent. A positive long-run relationship was observed between GEXP and GSF, while negative with TXR. Using AEMP as the dependent variable, AVAW and ACRT are significant at the level of 5 per cent; TXR is significant at the level of 10 per cent. AEMP has a positive long-run relationship with AVAW and ACRT, negative long-run relationship with TXR. Evidence from the result showed that the domestic revenue mobilization indicators (tax revenue and credit) have not promoted productivity in the agricultural sector. This result contradicted the Wagner's law, and this may be due to resources not efficiently mobilized to prioritize the agricultural sector in Nigeria. The speed of adjustment is given by the ECM, with the values of -0.341540, -0.338963, -0.275653, and – 0.01984 for using AVAW, TXR, ACRT, and AEMP as dependent variables means the economy with converge to initial equilibrium at the speed of 30 per cent, 30 per cent, 28 per cent, and 2 per cent annually respectively.

3.3. Causality Test Results

Table 7. Causality Test Result

Variables	Direction of Causality	D_{max}	Optimal Lag	Chi-square Value	Probability Value	Evaluation of Hypothesis
AVAW & AEMP	$AVAW \rightarrow AEMP$	1	7	10.46090	0.1065	Independent
	$AEMP \rightarrow AVAW$			1.246211	0.9745	
AVAW & ACRT	$AVAW \rightarrow ACRT$	1	7	0.666761	0.9952	Independent

Variables	Direction of Causality	D_{max}	Optimal Lag	Chi-square Value	Probability Value	Evaluation of Hypothesis
	$ACRT \rightarrow AVAW$			0.450554	0.9984	
AVAW & TXR	$AVAW \rightarrow TXR$	1	9	27.93824	0.0005	Bilateral Causality
	$TXR \rightarrow AVAW$			22.36388	0.0043	
AEMP & ACRT	$AEMP \rightarrow ACRT$	1	6	2.843628	0.7241	Independent
	$ACRT \rightarrow AEMP$			2.962713	0.7057	
AEMP & TXR	$AEMP \rightarrow TXR$	1	9	18.64093	0.0169	Bilateral Causality
	$TXR \rightarrow AEMP$			26.44966	0.0009	
GEXP & TXR	$GEXP \rightarrow TXR$	1	7	15.01401	0.0358	Bilateral Causality
	$TXR \rightarrow GEXP$			21.73600	0.0028	

D_{max} is the maximum order of integration. The lags section is done using Hannan-Quinn Information Criteria test at 5% level and the coefficient matrices of the last d_{max} lagged vectors in the model are ignored. The error term entering the causality test are uncorrelated, result are available with the authors.

Source: Author's Computation using EViews 9.5.

The result of the causality test is presented in table 7; variables of interest here are AVAW, AEMP, ACRT, TXR, and GEXP. The causality result suggests bidirectional causation: for agricultural productivity (AVAW) and tax revenue (TXR); agricultural employment (AEMP) and tax revenue (TXR); and government expenditure on the agricultural sector (GEXP) and tax revenue (TXR). No causal relationship between: agricultural productivity (AVAW) and agricultural employment (AEMP); agricultural productivity and agricultural credit (ACRT); and agricultural employment (AEMP) and agricultural credit (ACRT).

4. Discussions and Conclusions

This study examines the long-run and causal relationship between domestic resource mobilization and agricultural productivity. Based on the unit root test, the Auto-regressive distributed lags (ARDL) was used to examine the long-run. Four models were considered in the study, using agricultural productivity, tax revenue, agricultural credit and agricultural employment as dependent variables, which were referred to as Model 1, 2, 3 and 4. Evidence from the result showed the presence of cointegration in all the models. The economic implication of the result is that policy implementation to stimulate growth or development using a target variable will have a long-run relationship on other variables. In model 1, agricultural productivity has a positive long-run relationship with government spending on infrastructures, and negative long-run relationship with government recurrent expenditure on agriculture and tax revenue. The results of both the government recurrent expenditure and tax revenue are due to insufficient mobilization domestic resources towards the agricultural sector in Nigeria. In model 2, tax revenue has a negative relationship with agricultural productivity, government recurrent expenditure on agriculture and government spending on agriculture, while a positive relationship with agricultural credit was depicted. This result indicated that the domestic resource mobilization in Nigeria has not kept pace with the increasing government recurrent expenditure on agriculture. This, on the other hand, may lead to the need for a supplementary resource such as foreign aid to fund the recurrent expenditure in the long-run. Reliance on foreign aid may be volatile to the economy, and as well not suitable to achieve long-term goals since foreign aids are geared towards the solution of short-term goals. So, there is a need to maximize benefit from tax revenue by developing fiscal planning and ensure that resources are allocated to priority sectors such as the agricultural sector.

In model 3, agricultural credit has a negative relationship with agricultural productivity and tax revenue, while it has a positive relationship with government recurrent expenditure on agriculture and government spending on infrastructure. Evidence from this result revealed that growth in agricultural output per capita has not promoted revenue through credit facilities, this might due to inefficient use of resources. In model 4, agricultural employment has a positive long-run relationship with agricultural productivity and agricultural credit. Negative relationship with tax revenue was observed. The implication of the result is that rural investment in the agricultural sector has the potential to increase employment, on the other hand, can reduce the poverty rate and skewness in income distribution in Nigeria. Evidence from the causality test revealed that there is a bi-directional relationship between: agricultural productivity and tax revenue; agricultural employment and tax revenue; and government expenditure on the agricultural sector and tax revenue. The economic implication of the result is that policy implementation to promote either of the variables will result in a feedback effect on the other.

Based on the findings, the study recommended that public finance reforms need to be implemented to increase government revenue and promote growth in agricultural sector through the following policies measures: enhancing the quality of tax system in Nigeria in such a way that the increase in tax revenue will not distort the economy, and as well reduce inequality by promoting development in the agricultural sector; need to strengthen the operational capacity of tax administration and improving public accountability; investment in new development should be carefully assessed in terms of profit-oriented through a profit-investment nexus; and finally, there is a need for a frameworkto ensure tax neutrality, by ensuring a tax policy that will not have an adverse effect on other macroeconomic objectives. Finally, evidence from literature has shown that macroeconomic reforms affect agricultural productivity. This study suggested that future research should investigate the impact of macroeconomic reforms on agricultural productivity in developing economies.

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