Binus Business Review, 9(2), July 2018, 115-123
DOI: 10.21512/bbr.v9i2.4139

P-ISSN: 2087-1228
E-ISSN: 2476-9053

Does Exchange Rate Devaluation Affect Agricultural Output? Evidence from Nigeria

Olubukoye Opeyemi Oye[1]; Adedoyin Isola Lawal[2]; Ann Eneogu[3]; Joseph IseOlorunkanmi[4]

[1]Department of Sociology, Landmark University,
Omu Aran, Nigeria
[2,3]Department of Accounting and Finance, Landmark University,
Omu Aran, Nigeria
[4]Department of Political Science and International Relations, Landmark University
Omu Aran, Nigeria
[1]lawal.adedoyin@lmu.edu.ng; [2]oye.opeyemi@lmu.edu.ng;
[3]eneogu.ann@lmu.edu.ng; [4]iseolorunkanmi.joseph@lmu.edu.ng

Received: 6th November 2017/ **Revised:** 19th February 2018/ **Accepted:** 22nd March 2018

How to Cite: Oye, O. O., Lawal, A. I., Eneogu, A., & IseOlorunkanmi, J. (2018). Does Exchange Rate Devaluation Affect Agricultural Output? Evidence from Nigeria. *Binus Business Review, 9*(2), 115-123. https://doi.org/10.21512/bbr.v9i2.4139

ABSTRACT

The purpose of this research was to examine the effect of exchange rate devaluation on agricultural output in Nigeria. This investigation used the available time series data of 30 years (1986-2016) from the Central Bank of Nigeria (CBN) Statistical Bulletin and the National Bureau of Statistics. Moreover, the real effective exchange rate was used as the proxy for currency devaluation and Consumer Price Index (CPI) was used as a proxy for inflation. Other variables were Agricultural Gross Domestic Product (AGDP), Price of Export (PEXP), and Real Agricultural Exports (RAEXP). The research through the Augmented Dickey Fuller (ADF) and Philip Perron's unit root tests find that the variables used in the model are integrated in the same order. Using the Johansen's cointegration test results show that the variables are cointegrated. The results of the Vector Error Correction Model (VECM) indicates that a percent increase in the Real Effective Exchange Rate (REER), a proxy for devaluation. It will lead to a decrease in gross agricultural output. This implies that total agricultural output responds negatively to exchange rate devaluation. The result of the causality test by Toda and Yamamoto reveals that a unidirectional causality exists between real effective exchange rate and price of exports. This shows that a significant relationship exists between exchange rate devaluation and gross exports earnings. It reveals that the past values of the price of exports can be used to predict the current values of agricultural output.

Keywords: exchange rate, devaluation, agricultural output

INTRODUCTION

Through the years, the Nigerian economy has undergone various changes. Most of it can be attributed to the changes in exchange rate. This has prompted the nation, like other developing nations to implement different policies to improve its exchange rate regime and move the economy to a more stable state. Unfortunately, Nigeria has been a mono-product economy depending essentially on oil trades. According to Isola, Oluwafunke, Victor, and Asaleye (2016), there is a decline in the agricultural sector as a result of the oil glut. The researchers observed that agriculture in 1960 contributed up to 64% to the aggregate Gross Domestic Product (GDP). However, it was steadily declined in the 70's to an average of 48% and kept on declining to 20% in 1980 and to 19% in 1985. The discovery of oil in Nigeria causes attention to shift from the agricultural sector of the economy to the emerging oil sector. Then, this results in the gradual decline in the productivity of the agricultural sector. The growth of the GDP at the time of oil discovery is impressive with petroleum accounting for 32,1% on the average. Then, the manufacturing sector also contributes to the GDP, while the agricultural sector is 2% of the decline. The government focuses on the oil sector and neglects the fact that agriculture has been a viable aspect of the economy (CBN, 2015).

In the mid-1970, oil became the main source of revenue for the government accounting for more than 70% of the total revenue. This induced paradigm shifts from agriculture to the oil sector as policy makers focused on developing the oil sector virtually and leaving the non-oil sector unattended. Moreover, it was important that the sociological perspective of the people changed with the increase in consumption of foreign goods owing to the windfall experienced from the oil sector. Another factor that encouraged the importation of both consumer and capital goods was the overvaluation of the exchange rate. The overvaluation exchange rate preceding the deregulation helped to cheapen imports of competing for food items and agro-based and industrial raw materials. This led to rapid expansion in the importation of these products to the disadvantage of local production of similar goods (Imimole & Enoma, 2011).

Moreover, the fixed exchange rate regime was abolished, and the flexible exchange rate regime was introduced through the structural adjustment programme. The devaluation of the naira and the introduction of the Structural Adjustment Program (SAP) in 1986 had its effect on the Nigerian economy. An essential focus on SAP was to restore the profitable base of the economy with a positive inclination for the agricultural export. As monetary issues in Nigeria aggravated towards the end of 1985, the government permitted exchange rate to be controlled by market forces in 1986. Meanwhile, Nigeria being a developing country has experienced persistent trade deficit over the years. The import in Nigeria has increased compared to the exports. It has led to multiple economic problems such as over-dependence on imported goods, unfavorable balance of payment problems, continuous decline in the value of the nation's currency, and others. Based on this, Nigeria has implemented several policy measures to improve the trade performance. For example, the exchange rate was changed from the officially pegged exchange rate system between 1970 and 1985 to a market-determined system in 1986. Now, the foreign exchange market determines the exchange rate by demand and supply (Lawal *et al.*, 2016b).

According to Lawal *et al*. (2016b), devaluation of currency has been a measure used by several countries to the moderate trade deficit. The economic reason for that policy is as a means of improving a country's trade balance. The depreciation of a nation's currency causes the export to be cheaper in comparison to other countries. Subsequently, it is expected to bring a rise in the volume of exports. As a result, the imported goods will turn out to be more expensive. This will lead to a decrease in imports in the country and the improvement in the country's trade balance.

The devaluation of the exchange rate has adverse effects on the economy. Nigeria becomes more dependent on the importation of all products virtually because of the revenue derived from oil exports proceeds. This makes Nigeria a dependent nation with little or no production base. Almost all factories or industries have problems of sourcing for foreign exchange to purchase the raw materials. This makes those in the agricultural sector cannot purchase the necessary mechanized implements required for large-scale production. It can be due to the high cost of the implements. Most of them move to the other aspects of the economy, while others continue in small-scale agriculture which inevitably results in a decline of the export earnings in the country (Lawal *et al.*, 2016b).

According to Mueller and Mueller (2016), the immediate impact of exchange rate devaluation is to lower the prices of goods and services produced locally by promoting exports. It is believed that devaluation is a policy directed towards creating a fair balance of trade and improving the performance of the export sector of an economy. This greater improvement of the agricultural exports in Nigeria has been hindered and resulted in the several problems. For example, there are the persistent and unfavorable balance of payment, over-reliance on imported products, and over-dependence on the oil sector of the economy which leads to mono-economy.

Four theories are used as the basis for this research. There are Mundell-Fleming model; the dependency theory; theory of demonstration effect; and the J-Curve theory (Mueller & Mueller, 2016). First, the Mundell–Fleming model is commonly known as the IS-LM-BOP model. It is an economic model set forth by Robert Mundell and Marcus Fleming as an extension of the IS-LM Model. It describes an open economy, where devaluation is expansionary regarding GDP given. The exports increase more than imports.

Second, dependency theory is based on the relationship between two countries. One of the countries is dependent on the other for its economic needs. It means an economic system where one country relies upon another for its economic growth and development. Therefore, dependency theory is the concept that the resources flow from a margin of poor and underdeveloped states for selected wealthy states and enriching the wealthy states at the expense of the poor/underdeveloped states. The theory holds that the economic policies regulating the economic activities of the less developed nations are externally formulated and dictated by the developed countries.

Third, demonstration effects are effects on the behaviour of individuals caused by observation of the actions of others and their consequences. This theory was propounded by Duesenberry (1949). He said that by emphasizing relative income as a determinant of consumption, there was the relative income hypothesis. It suggested that individuals or households tried to imitate or copy the consumption levels of their neighbors or other families in a particular community.

Fourth, the J-curve phenomenon occurs when a country devalues its currency. When this happens, the total value of the country's imports exceeds the value of its exports. Thus, it causes a deficit trade balance. Eventually, the currency devaluation reduces the price of its exports. Subsequently, there is a gradual recovery in the country's exports, the balance of trade after moving back to surplus.

The impact of the devaluation of currency on the economic behaviour of nations has remained a subject of hot debate that is inconclusive. Some scholars have documented the existence of positive impact of devaluation on economic growth (Tang & Zhang, 2012; Alston & Mueller, 2016; Doan & Gente, 2014; Mueller & Mueller, 2016; Lawal *et al*., 2017). Meanwhile, the others have noted the different result (Addison & Baliamoune-Lutz, 2017; Damania, Russ, Wheeler, & Bara, 2018; Lawal, Nwanji, Asaleye, & Ahmed, 2016).

Kogid, Asid, Lily, Mulok, and Loganathan (2012) researched the effect of exchange rates on economic growth by using nominal and real exchange rate. They found out that both exchange rates, nominal and real, were considered to have similar effects on the economic growth. The results of the Autoregressive Distributed Lag (ARDL) bounds test suggested that long-run co-integration exists between both nominal and real exchange rates and economic growth with a significant positive coefficient for real exchange rate.

In China, Li, Ma, and Xu (2015) examined the impact of exchange rate fluctuations on Chinese firm (Agric. produce inclusive) export. The researchers observed that the Renminbi (RMB) price response to exchange rate changes was very small. It implied high exchange rate into foreign currency dominated prices with a moderate and significant response from volume induced export. They also noted that RMB appreciation reduced the probabilities of entry and continuation of export market with heterogeneity. It resulted in import intensity, distribution costs, the income level of destination countries, and foreign ownership playing significant roles. For more reference, see Berman, Martin, and Mayer (2012); Burstein and Gopinath (2014); Tang and Zhang (2012); Alston and Mueller (2016); Doan and Gente (2014); Bodart, Candelon, and Carpantier (2015); Bordo, Choudhri, Fazio, and MacDonald, (2017); Bouvet, Ma, and Van Assche (2017); Chen, Choi, and Devereux (2015); Chen, and Juveral, (2016); Dellas and Tavlas (2013); Katusiime, Shamsuddin, and Agbola (2015); Mueller and Mueller (2016), Lawal *et al*., (2017); Adedoyin, Babalolam, Otekunri, and Adeoti (2016).

Bahmani-Oskooee and Aftab (2017) observed that the effect of exchange rate volatility on trade flows could be asymmetric based on data sourced from 54 Malaysian industries (agricultural sector). Those had trade (export) relationship with the US as well as 63 Malaysian importing industries that import from the US. The research employed the Nonlinear Autoregressive Distributed Lag (NARDL) approach. The result showed that the support of both the short and long run asymmetric effects in almost one-third of the industries (both importing and exporting) (Skorepa & Komarek, 2015; Isola *et al*., 2016).

Faleiros, da Silva, and Nakaguma (2016) examined the impact of exchange rate fluctuation from appreciation or depreciation of the Brazilian currency in the Brazilian manufacturing sector. It was to know its impact on export of goods (manufacturing and agro-allied). The research calibrated the impact of labour productivity on exchange rate-export sector framework using the Generalized Methods of Moments (GMM) data analysis based on data from 1996 to 2011. The researchers observed that both the fluctuation in the exchange rate as well as labour productivity affected the penetration to other economies. The strongest negative impact was from labour productivity especially agro-allied related industries (see also Addison & Baliamoune-Lutz, 2017; Damania *et al*., 2018; Muller & Mueller, 2016; Sonaglio, Campos, & Braga, 2016; Lawal, Somoye, Babajide, & Nwanji, 2018; Lawal *et al*., 2016; Juselius, Reshid, & Tarp, 2017).

Tomlin (2014) agreed that fluctuation in the real exchange rate could affect aggregate productivity by altering the plant turn over. The research used a structure model that captured the effects of plant-level productivity and real exchange rate fluctuation using two-stage Nested Pseudo Likelihood (NPL) algorithm and the method of simulated moments. The research also noted that both transitory and permanent depreciation had long-term impacts on average industry productivity in a small open economy (Gabriel, Jayme, & Oreiro 2016; Menzies, Xiao, Dixon, Peng, & Rimmer, 2016).

Akpan and Atan (2011) investigated the effect of exchange rate movements on real output growth in Nigeria in 1986 – 2010. They suggested there was no evidence of a strong direct relationship between changes in exchange rate and output growth. However, Nigeria economic growth had been directly affected by monetary variables.

From the foregoing, the existing literature focuses on the impact of exchange rates on the specific contributory sector(s) of individual economies studied. For instance, Bahmani-Oskooee and Aftab (2017) focused on trade-exchange rate nexus; Tomlin (2014) investigated productivity and plant turn over as it affected exchange rate fluctuation; Li, Ma, and Xu (2015) analyzed firms' output-exchange rate nexus for China. The essence of the current research is to examine the impact of exchange rate fluctuation on sectorial contribution economic growth with a focus on agriculture in Nigeria. The research uses the Johansen's cointegration test, the Vector Error Correction Model (VECM) and the causality test by Toda and Yamamoto (1995) to examine the nature of the relationship (cointegration) and the direction of causality among these variables studied.

METHODS

To investigate the relationship between exchange rate devaluation and agricultural output in Nigeria, this research employs the Augmented Dicker Fuller (ADF) unit root test, the Philip Perron's unit root test, Johansen's cointegration test, VECM, and the Granger non-causality test by Toda and Yamamoto (1995). It analyzes the data from 1986 to 2016 from the Nigerian Bureau of Statistics (various issues) and the Central Bank of Nigeria Statistical Bulletin (various issues). All the analysis are conducted using the using the student Eviews statistical package 9.5.

Following Akpan and Atan (2011), and Babajide and Lawal (2016), the researchers develop the model. It can be seen as follows.

$$AGDP = \beta 0 + \beta 1\ REER + \beta 2\ RAEXP + \beta 3 PEXP + \beta 4\ RFP + \mu t \quad (1)$$

Where,

AGDP : Agricultural Gross Domestic Product
REER : Real Effective Exchange Rate
RAEXP : Real Agricultural Export
PEXP : Price of Exports
CPI : Consumer Price Index

RESULTS AND DISCUSSIONS

The unit root test is first conducted to ascertain the existence of stationarity or among the variables. ADF and the Philip Perron's unit root tests are used. The result of the unit root tests is in Table 1.

The result from Table 1 shows that all variables are at stationary of the first difference. It means that ADF probabilities at first difference are all less than 0,05. All variables are integrated in the same order of I(1). Therefore, it means that the variables can be tested for cointegration.

Moreover, this research employs the Johansen's cointegration test to test whether cointegration exists among the variables or not. It also tests if a long-term relationship exists among variables. The first step in carrying out the cointegration test is to determine the lag length criteria. Then, the cointegration test is conducted.

Tables 1 Result of the ADF Unit Root Test

Variables	LNAGDP	LNCPI	LNPEXP	LNRAEXP	LNREER
Stationary	1(I)	1(I)	1(I)	1(I)	1(I)

(Source: Researchers' computation using Eviews 9.5, 2017)

Table 2 The Result of the Lag Length Criteria for the Model

Lag	Logl	LR	FPE	AIC	SC	HQ
0	-6539,213	NA	9,68e+09	37,18303	37,23791	37,20487
1	-1369,591	10163,01	0,001955	7,952220	8,281507	8,083260
2	-1202,568	323,6063	0,000873	7,145274	7,748966*	7,385514
3	-1144,009	111,7939	0,000721	6,954599	7,832697	7,304040*
4	-1118,804	47,40317*	0,000721*	6,953433*	8,105936	7,412073
5	-1107,498	20,94182	0,000780	7,031239	8,458149	7,599080
6	-1102,396	9,306271	0,000874	7,144293	8,845608	7,821334
7	-1099,933	4,420899	0,000994	7,272349	9,248069	8,058590
8	-1098,385	2,736291	0,001138	7,405596	9,655722	8,301037

(Source: Researchers' computation using Eviews 9.5, 2017)

Note:
The asterisk (*) indicates the lag order selected by the criterion.
The result for the lag length criteria indicates four optimal lag length at 5% level of significance.

Table 3 The Result of the Trace Statistics

Null	Alternative	Eigenvalue	Trace statistics	0,05 critical value	Prob.	Hypothesized No. of CE(s)
r =0	r ≥ 0	0,207804	150,6570	69,81889	0,0000	None *
r ≤ 1	r ≥ 1	0,101845	67,26229	47,85613	0,0003	At most 1*
r ≤ 2	r ≥ 2	0,048226	28,80865	29,79707	0,0647	At most 2
r ≤ 3	r ≥ 3	0,026967	11,11361	15,49471	0,2046	At most 3
r ≤ 4	r ≥ 4	0,003699	1,326862	3,841466	0,2494	At most 4

(Source: Researchers' computation using Eviews 9.5, 2017)

Table 4 The Result of the Max-Eigen Value Statistics Test

Null	Alternative	Eigen value	Max-Eigen statistics	0,05 critical value	Prob.	Hypothesized No. of CE(s)
r =0	r ≥ 0	0,207804	83,39473	33,87687	0,0000	None *
r ≤ 1	r ≥ 1	0,101845	38,45364	27,58434	0,0014	At most 1*
r ≤ 2	r ≥ 2	0,048226	17,69504	21,13162	0,1417	At most 2
r ≤ 3	r ≥ 3	0,026967	9,786750	14,26460	0,2263	At most 3
r ≤ 4	r ≥ 4	0,003699	1,326862	3,841466	0,2494	At most 4

(Source: Researchers' computation using Eviews 9.5, 2017)

Table 5 VECM

Variable	Coefficient	Standard Error	T-Stat.
LNAGDP	1,000	-	-
LNCPI	-0,000661	0,00167	-0,39536
LNPEXP	-5,94E-05	1,5E-05	-3,94303
LNRAEXP	0,000782	0,00017	4,53222
LNREER	0,177405	0,09848	1,80147
Error Correction			
D(LNAGDP)	-0,35047	0,00273	-2,21320
D(LNCPI)	0,347596	0,10238	3,39520
D(LNPEXP)	-34,97100	92,2985	0,37889
D(LNRAEXP)	-15,41239	8,56286	-1,79991
D(LNREER)	-0,037824	0,01504	-2,51416

(Source: Researchers' computation using Eviews 9.5, 2017)

Table 2 presents the results of the lag length criteria with four optimal lag lengths at 5% level of significance. It shows the optimal lag length of one (i.e. m=1) out of four lag lengths as selected by the Final Prediction Error (FPE), Schwarz Information Criteria and Lag Requirement (LR). The results of both the Trace and Max-Eigenvalue tests are presented in Tables 3 and 4 respectively. The results reveal that there are two co-integration equations at 5% level of significance and existence. Thus, the maximum order of integration (*dmax*) for the variables in the system is one (*dmax* =1). The Johansen co-integration test suggests that the sustainable long run equilibrium relationship exists between the variables. This suggests causality in at least one direction. The co-integration vectors are when Trace and Max-Eigen value statistics are greater than their corresponding of 0,05 critical value. The existence of at least one co-integration vector implies that there is a long run relationship between AGDP and other endogenous variables.

Table 5 presents the adjustment parameter (error correction) with the coefficient of -0,35 and t-statistic of -2,21. The error correction term is correctly signed and significant. The importance of this coefficient is that about 35% disequilibrium in a period is corrected in the next period. The results of the error correction for PEXP, RAEXP, and REER give a negative sign. The error correction coefficient for PEXP, RAEXP, and REER indicates -34,97, -15,41 and -0,03 percent respectively in individual adjustment towards equilibrium.

The result of the Trace statistics and Max-Eigen value statistics test shows that there are 2 co-integrating equations at the 5% of level of significance. This indicates the rejection of the null hypothesis at 0,05% level of significance.

$$LNAGDP = 1{,}25LNCPI - 0{,}01LNPEXP + 0{,}06LNRAEXP + 9{,}83LNREER \quad (2)$$

The result of the normalized cointegration equation indicates that CPI, RAEXP, and REER have positive effects on AGDP. Meanwhile, PEXP has a negative effect on AGDP. REER has a positive sign and statistically significant in affecting AGDP. Therefore, an increase in REER by 1% increases the AGDP by 9,831858. However, PEXP gives a negative effect on AGDP. It means that the total price of exports negatively affects AGDP.

Then, Granger non-causality test by Toda and Yamamoto (1995) is used to determine the causal relationship between the variables. The results are presented in Table 6.

Table 6 Granger Non-Causality Test
by Toda and Yamamoto (1995)

Dependent Variable: LNAGDP			
Excluded	Chi-sq	Df	Prob.
LNCPI	2,482972	4	0,6477
LNPEXP	0,177248	4	0,9963
LNRAEXP	0,169849	4	0,9966
LNREER	0,492658	4	0,9742
All	2,901807	16	0,9999
Dependent variable: LNCPI			
Excluded	Chi-sq	Df	Prob.
LNAGDP	0,116089	4	0,9984
LNPEXP	0,429646	4	0,9800
LNRAEXP	0,097650	4	0,9988
LNREER	2,127344	4	0,7124
All	3,109834	16	0,9998
Dependent variable: LNPEXP			
Excluded	Chi-sq	Df	Prob.
LNAGDP	0,341421	4	0,9870
LNCPI	0,061889	4	0,9995
LNRAEXP	0,265844	4	0,9919
LNREER	0,386236	4	0,9836
All	0,954244	16	1,0000
Dependent variable: LNRAEXP			
Excluded	Chi-sq	Df	Prob.
LNAGDP	0,214420	4	0,9946
LNCPI	0,200442	4	0,9953
LNPEXP	0,282515	4	0,9909
LNREER	0,163284	4	0,9968
All	0,868332	16	1,0000
Dependent variable: LNREER			
Excluded	Chi-sq	Df	Prob.
LNAGDP	0,065874	4	0,9995
LNCPI	4,434244	4	0,3504
LNPEXP	0,621909	4	0,9606
LNRAEXP	0,111456	4	0,9985
All	4,495478	16	0,9977

(Source: Researchers' computation
using Eviews 9.5, 2017)

The result of Modified Wald Test MWALD test shows that the test result follows a chi-sq. distribution. It is with 4 degrees of freedom with a lag length of 4. The forecast error variance decomposition shows the contribution of each endogenous variable to the forecast of other variables. This can be seen in Table 7. The table shows that other than the LNAGDP. LNCPI contributes the most to the forecast error variance of LNAGDP right from period 3 to represent a short run period to period 10 for a long run period.

The result of the variance decomposition indicates that LNAGDP other than shocks is 100% in the period 1. The shocks to REER explains about less than 1% of changes in AGDP both in the short and long-run. In period 4, the forecast shock of LNCPI to LNAGDP is 0,40. Meanwhile, in the long run as seen in period 10 is 2,0, there is an increase in the forecast variance shock.

The results of the summary of the variance decomposition is presented in Table 8, it shows that the contribution of each endogenous variable to the forecast of other variables. The result shows that other than LNREER, LNCPI contributes the most to the forecast of error variance. LNREER is right from period 3 to represent a short run period to period 10 for a long run period.

The result is in line with the findings of Tang and Zhang (2012), and Alston and Mueller (2016). However, it contradicts with the reports of Addison and Baliamoune-Lutz (2017), and Damania *et al*. (2017). The variations in the results obtained can be traced to differences in methodology and the peculiarity of the economics research. The normalized cointegration result of the VECM shows that in the long-run, PEXP and REER are the two variables that explain variation in agricultural output. The granger-causality approach by Toda and Yamamoto (1995) shows the past values of the PEXP can help to predict the current value of the gross agricultural output. The forecast error variance decomposition also shows that inflation is a major macroeconomic variable. It possesses sufficient information about the variations in real agricultural output in short and long-run.

The current research has some implications. First, this is to the best of the researchers' knowledge to conduct empirical research linking exchange rate fluctuation with agricultural output based on data sourced from the Nigeria economy. Second, it provides insight into adjustment opportunities for macroeconomic variables like inflation, real and effective exchange rate among others. Those are key in determining agricultural output in Nigeria. Third, the research can calibrate Johansen's cointegration test, VECM, and Granger causality tests by Toda and Yamamoto (1995). It examines the nature of the relationship between exchange rate behaviour and agricultural output in Nigeria. Therefore, expanding the frontiers of knowledge is based on empirical evidence from Nigeria. The research on the factors affecting the behaviour of agricultural output such as exchange rate fluctuation can be enriched by calibrating other factors like labour, capital, foreign direct investment, and interest rate among others. The applications of different methodology in investigating the link among the constructs will further advance the frontier of knowledge.

Table 7 Summary of the Variance Decomposition

Variance Decomposition of LAGDP:						
Period	S.E.	LNAGDP	LNCPI	LNPEXP	LNRAEXP	LNREER
1	0,004491	100,0000	0,000000	0,000000	0,000000	0,000000
2	0,007325	99,95380	0,045249	3,95E-06	0,000215	0,000728
3	0,010318	99,79453	0,199910	0,001225	0,002677	0,001659
4	0,013064	99,58913	0,401214	0,003619	0,004241	0,001793
5	0,015637	99,33465	0,650521	0,007998	0,005395	0,001433
6	0,018016	99,06002	0,919183	0,013969	0,005742	0,001082
7	0,020226	98,77328	1,198508	0,021528	0,005577	0,001104
8	0,022283	98,48611	1,476774	0,030330	0,005098	0,001682
9	0,024206	98,20443	1,748076	0,040132	0,004508	0,002856
10	0,026012	97,93319	2,007676	0,050642	0,003937	0,002856

(Source: Researchers' computation using Eviews 9.5, 2017)

Table 8 Summary of Variance Decomposition of LNAGDP

Variance Decomposition of LNREER:						
Period	S.E.	LNAGDP	LNCPI	LNPEXP	LNRAEXP	LNREER
1	0,024558	0,107885	0,154170	0,355198	0,024166	99,35858
2	0,039260	0,112915	0,562042	0,197614	0,049204	99,07823
3	0,054088	0,133482	1,318126	0,104439	0,082561	98,36139
4	0,067604	0,148628	1,318126	0,080738	0,108009	97,49668
5	0,080279	0,162600	3,099388	0,100844	0,127362	96,50981
6	0,092131	0,174294	4,032345	0,145227	0,140064	95,50807
7	0,103310	0,184610	4,939767	0,202090	0,147673	94,52586
8	0,113893	0,193897	5,795240	0,262983	0,151471	93,59641
9	0,123959	0,202599	6,589578	0,323234	0,152670	92,73192
10	0,133565	0,211023	7,318183	0,380072	0,152190	91,93853

(Source: Researchers' computation using Eviews 9.5, 2017)

CONCLUSIONS

This research investigates the effect of exchange rate devaluation on agricultural output in Nigeria in 1986-2016. This research also investigated the linkages between agricultural output and macroeconomic variables. REER, PEXP, RAEXP, and inflation proxied by CPI are used as the macroeconomic variables. The researchers investigate the stationarity of the time series variables using the ADF and Philip Perron's unit root test. The results show that the variables are at stationary of I(1). Moreover, the result of Johansen's cointegration test indicates that there is a long run relationship between AGDP, REER, and PEXP. It implies that all variables move together in the long run. The limitation of the research is on the fact that it focuses mainly on the Nigerian economy. Therefore, the researchers suggest that the future research should focus on other agrarian economies.

REFERENCES

Addison, T., & Baliamoune-Lutz, M. (2017). Aid, the real exchange rate and why policy matters: The cases of Morocco and Tunisia. *The Journal of Development Studies, 53*(7), 1104-1121.

Adedoyin, L. I., Babalola, B. M., Otekunri, A. O., & Adeoti, J. O. (2016). External debt and economic growth: Evidence from Nigeria. *Acta Universitatis Danubius. Œconomica, 12*(6), 179 -194

Akpan, E. O., & Atan, J. A. (2011). Effects of exchange rate movements on economic growth in Nigeria. *CBN Journal of Applied Statistics, 2*(2), 1-14.

Alston, L., & Mueller, B. (2016). *Economic backwardness and catching up: Brazilian agriculture, 1964–2014 (No. w21988).* National Bureau of Economic Research.

Babajide, A. A., & Lawal, A. I. (2016). Macroeconomic behaviour and FDI inflows in Nigeria: An application of the ARDL model. *British Journal of Economics, Finance and Management Sciences, 11*(1), 84-107.

Bahmani-Oskooee, M., & Aftab, M. (2017). On the asymmetric effects of exchange rate volatility on trade flows: New evidence from US-Malaysia trade at the industry level. *Economic Modelling, 63*(June), 86-103.

Berman, N., Martin, P., & Mayer, T. (2012). How do different exporters react to exchange rate changes?. *The Quarterly Journal of Economics, 127*(1), 437-492.

Bodart, V., Candelon, B., & Carpantier, J. F. (2015). Real exchanges rates, commodity prices and structural factors in developing countries. *Journal of International Money and Finance, 51*(March), 264-284.

Bordo, M. D., Choudhri, E. U., Fazio, G., & MacDonald, R. (2017). The real exchange rate in the long run: Balassa-Samuelson effects reconsidered. *Journal of International Money and Finance, 75*(C), 69-92.

Bouvet, F., Ma, A. C., & Van Assche, A. (2017). Tariff and exchange rate pass-through for Chinese exports: A firm-level analysis across customs regimes. *China Economic Review, 46*(December), 87-96.

Burstein, A., & Gopinath, G. (2014). International prices and exchange rates. In *Handbook of International Economics* (Vol. 4, pp. 391-451). Elsevier.

Central Bank of Nigeria (CBN). (2015). *Statistical bulletin.* Retrieved from www.cbn.gov.ng/documents/statbulletin.asp

Chen, L. L., Choi, S., & Devereux, J. (2015). Accounting for real exchange rate changes at long time horizons. *Journal of Macroeconomics, 46*(December), 264-277.

Damania, R., Russ, J., Wheeler, D., & Barra, A. F. (2018). The road to growth: Measuring the tradeoffs between economic growth and ecological destruction. *World Development, 101*(January), 351-376.

Dellas, H., & Tavlas, G. (2013). Exchange rate regimes and asset prices. *Journal of International Money and Finance, 38,* 85-94.

Doan, T. H. T., & Gente, K. (2014). Real exchange rate and productivity in a specific-factor model with skilled and unskilled labour. *Journal of Macroeconomics, 40*(June), 1-15.

Duesenberry, J. S. (1949). *Income, saving, and the theory of consumer behavior*. Cambridge, Mass: Harvard University Press.

Faleiros, J. P. M., da Silva, J. C. D., & Nakaguma, M. Y. (2016). Evaluating the effect of exchange rate and labor productivity on import penetration of Brazilian manufacturing sectors. *EconomiA, 17*(1), 3-22.

Gabriel, L. F., Jayme Jr, F. G., & Oreiro, J. L. (2016). A North-South model of economic growth, technological gap, structural change and real exchange rate. *Structural Change and Economic Dynamics, 38*(September), 83-94.

Imimole, B., & Enoma, A. (2011). Exchange rate depreciation and inflation in Nigeria (1986–2008). *Business and Economics Journal, 28*, 1-11.

Isola, L. A., Oluwafunke, A. I., Victor, A., & Asaleye, A. (2016). Exchange rate fluctuation and the Nigeria economic growth. *EuroEconomica, 35*(2), 127-142.

Juselius, K., Reshid, A., & Tarp, F. (2017). The real exchange rate, foreign aid and macroeconomic transmission mechanisms in Tanzania and Ghana. *The Journal of Development Studies, 53*(7), 1075-1103.

Katusiime, L., Shamsuddin, A., & Agbola, F. W. (2015). Macroeconomic and market microstructure modelling of Ugandan exchange rate. *Economic Modelling, 45*(February), 175-186.

Kogid, M., Asid, R., Lily, J., Mulok, D., & Loganathan, N. (2012). The effect of exchange rates on economic growth: Empirical testing on nominal versus real. *IUP Journal of Financial Economics, 10*(1), 7-12.

Lawal, A. I., Kazi, K. P., Adeoti, J. O., Osuma, O. G., Akinmulegun, S. O., & Ilo, B. (2017). Capital flight and the economic growth: Evidence from Nigeria. *Binus Business Review, 8*(2), 125-132.

Lawal, A. I., Nwanji, T. I., Asaleye, A., & Ahmed, V. (2016). Economic growth, financial development and trade openness in Nigeria: An application of the ARDL bound testing approach. *Cogent Economics & Finance, 4*(1), 1258810.

Lawal, A. I., Somoye, R. O., Babajide, A. A., & Nwanji, T. I. (2018). The effect of fiscal and monetary policies interaction on stock market performance: Evidence from Nigeria. *Future Business Journal, 4*(1), 16-33.

Li, H., Ma, H., & Xu, Y. (2015). How do exchange rate movements affect Chinese exports?—A firm-level investigation. *Journal of International Economics, 97*(1), 148-161.

Menzies, G., Xiao, S. X., Dixon, P., Peng, X., & Rimmer, M. (2016). Rural-led exchange rate appreciation in China. *China Economic Review, 39*(July), 15-30.

Mueller, B., & Mueller, C. (2016). The political economy of the Brazilian model of agricultural development: Institutions versus sectoral policy. *The quarterly review of economics and finance, 62*(November), 12-20.

Skorepa, M., & Komarek, L. (2015). Sources of asymmetric shocks: The exchange rate or other culprits? *Economic Systems, 39*(4), 654-674.

Sonaglio, C. M., Campos, A. C., & Braga, M. J. (2016). Effects of interest and exchange rate policies on Brazilian exports. *EconomiA, 17*(1), 77-95.

Tang, H., & Zhang, Y. (2012). Exchange rates and the margins of trade: Evidence from Chinese exporters. *CESifo Economic Studies, 58*(4), 671-702.

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics, 66*(1-2), 225-250.

Tomlin, B. (2014). Exchange rate fluctuations, plant turnover and productivity. *International Journal of Industrial Organization, 35*(July), 12-28.