The Impact of Export Promotion Schemes on Agricultural Growth in Nigeria.

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Abstract
This paper examines the impact of government export promotion schemes on the growth of agriculture in Nigeria. Employing an ARDL cointegration technique, impulse-response functions and variance decompositions, the results indicate a significant positive impact of the government export promotion schemes on agricultural output growth in the short- and long-run. The findings highlight the need to be selective in the choice of export promotion strategies in Nigeria. Most notably, government must not only provide more credit facilities to the sector but also ensure increased recurrent and capital expenditure in the agricultural sub-sector.

Keywords: Export promotion programmes; agricultural growth; ARDL; Nigeria
JEL classification code: Q13, Q18

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1. Introduction

The role of agriculture in the economic development process is well noted in the economic development literature (Johnston and Mellor, 1961; Johnston, 1970). Agricultural productivity is fundamental for sustainable development (Lewis, 1954; Rostow, 1960). The sub-sector does not only supply high-quality labour to the manufacturing and the service sub-sectors but also provides food for consumption. Besides, it provides raw materials for industries, and help to generate foreign exchange earnings to finance domestic production.

At independence in 1960, agriculture was the mainstay of the Nigerian economy. The sub-sector contributed over 80 per cent of the earnings and employment; about 58 per cent of the GDP (gross domestic product), and about 50 per cent of the government revenue, despite the subsistence nature of production in the sector (Federal Republic of Nigeria, 2016). However, the discovery and production of oil in large quantities in the 1970s led to the total neglect of agriculture. Consequently, the contribution of agriculture along with allied sectors of fisheries and forestry dropped remarkably from 58.2 per cent in 1960 to 31.5 per cent in 1972 and further down to 19.2 per cent in 1979.

As part of the efforts to boost agricultural production and exports, several export promotion policies and projects have been instituted by the government since 1979. These policies and plans include the establishment of National Accelerated Food Production Projects (NAFPP), Agricultural Development Projects (ADP), River Basin Development Projects (RBDA), National Fadama Development Projects (NFDP), Root and Tuber Expansion Programme (RTEP), and National Special Programme in Food Security (NSPFS) (Iwuchukwu and Igbokwe, 2012). Other quantifiable measures included increased credit to agriculture through Agricultural Credit Guarantee Scheme Fund, exchange rate liberalisation, higher capital and recurrent expenditure on agriculture, and increased foreign investment into the agricultural sector (Efobi and Osabuohien, 2011; Zakaree, 2014).

In spite of all these policies put in place by the Nigerian government to boost agricultural output, there is no commensurate growth in the sector. Instead, the performance in the sector has manifested in environmental degradation, mounting food deficits, and decline in both gross domestic product and export earnings, while retail food prices and import bills have been increasing (Osemeobo, 1992). It will however be instructive to examine the role of agricultural export promotion schemes on agricultural output growth in Nigeria.

Empirically, few studies have examined the impact of export promotion policies on agricultural output and exports (Efobi and Osabuohien, 2011; Oyakhilomen, Omodachi, and Zibah, 2012; and Oyakhilomen, Falola and Rekwot 2014). However, existing evidence is far from being uniform. While some studies reported a significant positive effect of export promotion schemes on agricultural output (Gao, 2007; Baltensperger and Herger, 2009; Efobi and Osabuohien, 2011; Opara, 2010); few others found a limited effect of export promotion schemes on agricultural output (Yutaka, 2005). Yet, studies by (Ozturk and Kalyonzu, 2009, and Chit, 2008) found that exchange rate volatility arising from exchange rate deregulation policy had a significant adverse effect on agricultural output growth.

However, there are few observations from existing studies on the impact of export promotion policies on agricultural output growth. Firstly, not many empirical studies have examined the effect of agricultural export promotion schemes on agricultural growth. Most existing studies have focused on aggregate export and economic growth. Secondly, in a few cases where agricultural export promotion schemes have been targeted, only one or the other component has been examined. No known study has developed a comprehensive measure of the export promotion schemes. To fill these gaps, we construct a more comprehensive measure of export promotion schemes using the Principal Component Analysis (PCA) and examine its role in agricultural growth in Nigeria.

The paper is organised as follows: Section 2 discusses the data and methodology. Section 3 presents the empirical results. The last section provides the conclusion.

2. Literature Review

This study finds its theoretical support for the effect of export promotion strategy on agricultural growth in the Hechsher-Ohlin (henceforth, H-O). The H-O factor endowment model assumes away the inherent difference in relative labour productivity by postulating that all countries have access to the same technology where trade arises because of fixed but differing labour productivities for different commodities in different countries. Here, the basis for trade comes up not because of inherent technological differences in labour productivity but consequent to fact that countries are endowed with different factor supplies. . The H-O theorem of trade states that: "countries will export those goods whose production is relatively intensive in the factor with which they are well endowed" (Winters, 1991). The H-O trade theory provides the rationale to justify the export promotion strategy on agricultural growth in Nigeria because it is logical that industrial countries, which had plenty of capital, should specialize in capital-intensive sectors of the economy while less developed countries (LDCs), with their cheap labour, should invest in labour-intensive industries (Biel, 2000).

Export promotion has also been considered as an incentive program designed to attract firms into exporting by offering help in product and market identification and development (Valuckaite and Snieska, 2007; Zhou, Lin, and Li, 2010; Ortiz, R. F., Ortiz, J. A., and Ramirez, 2012) prescription and post-shipment, financing, training, payment guaranty schemes, trade fairs, trade visits, foreign representation, (Shamsuddoha, Ali and Ndubisi, 2009; Tang and Liu, 2011) used electronic information retrieval methods (Zavadskas, 2010; Azimi, Yazdani-Chamzini, Fouladgar, Zavadskas, & Basiri, 2011) and systems (Zavadskas, Kaklauskas, and Trinkunas, 2005). It plays a major role in the accumulation of physical capital through forced national saving and the policies to attract foreign capital. Much of the government's physical capital accumulation was conducted to attract foreign capital, while most of the foreign capital concentrated in the manufacturing sector and increase in services.

Many studies have empirically examined the impact of export promotion policies on agricultural output, exports and economic growth (Efobi and Osabuohien, 2011; Oyakhilomen, Omodachi, and Zibah, 2012; Shane, Roe and Sowaru 2008 and Oyakhilomen, Falola and Rekwot 2014; Ongeri and Ongeri 2017; Koester, 1993; Donoso, 2016; Reimer, Williams, Dudensing, and Kaiser, 2017; Williams, Reimer, Dudensing, McCarl, Kaiser, and Somers, 2016; Ikpesu and Okpe, 2019; Chhuor, 2017; Osemeobo, 1992; Apanisile & Okunlola, 2017; Yakovenko and Ivanenko, 2020; Comi and Resmini 2019; Grabowski, 2015; Delgado, 1995; Marcelin and Nanivazo, 2019). Some studies reported a significant positive effect of export promotion schemes on agricultural output (Wang, 2005; Lan, 2001; Caballero and Corbo, 1990; Haque and Kermel, 2007; Gao, 2007; Baltensperger and Herger, 2009; Efobi and Osabuohien, 2011; Opara, 2010). For instance, using an augmented gravity model, Ongeri and Ongeri (2017) established a positive impact of export promotion schemes like the duty drawback scheme. They concluded that the export promotion schemes used have different impacts on the East African Community (EAC) countries considered in their work. Their study, however, focused on only the fiscal incentives forms of export promotion such as the duty drawback schemes, duty and value-added tax remission, manufacturing under bond schemes, export processing zones, VAT exemptions on exports and excise duty relief. Similarly, Ikpesu and Okpe (2019) used capital inflows and exchange rate as measures of export promotion and found a positive result.

On the other hand, few others found a limited effect of export promotion schemes on agricultural output (Yutaka, 2005; Osemeobo, 1992). Osemeobo (1992) claimed that the major efforts by the Nigerian government to develop the agricultural sector failed to improve agricultural growth. Rather, these strides have resulted in environmental degradation, mounting food deficits, and decline in both gross domestic product and export earnings, while retail food prices and import bills have been increasing. Furthermore, studies by (Honroyiannis et al. 2008; Ozturk and Kalyonzu, 2009, and Chit, 2008) found that exchange rate volatility arising from exchange rate deregulation policy had a significant adverse effect on agricultural output growth. In addition, Cameron, Kihangire & Potts, (2005) in their study examined the effects of exchange rate variability on Uganda's tropical freshwater fish exports under the floating exchange rate regime 1994-2001. They tested the central hypothesis that Uganda's fish exports are negatively and significantly correlated with exchange rate variability.

While the majority of the existing studies in the literature focus on the impact of aggregate export on economic growth, a few have considered the impact of export promotion strategies on agricultural output growth. The few studies that measured the impact of agricultural export promotion schemes only used a single or few measure(s) of export promotion (Ikpesu & Okpe, 2019; Reimer et al, 2017; Chhuor, 2017). There is no study known to this work computed a comprehensive measure of export promotion strategies. This study, however, contributed to this discussion by using a construct of export promotion strategies which is being computed from different measures of export promotion policies to measure the role of export promotion on agricultural growth in Nigeria.

3. Data and Methodology

3.1. Data Description

This paper uses annual time series data from 1980 to 2014. The dependent variable is the agricultural output share of gross domestic product (AGDP). AGDP comprises output from crop production, forestry, livestock, and fishery. The independent variables are the amount of arable land for farming measured by agricultural land (sq. km) (ALN), the agricultural labour force (ALAB), capital investment proxied by gross fixed capital formation (CAP), and the rate of inflation (INF) measured as the consumer price index. Other independent variables are openness (OPN), measured as the ratio of export and import to the gross domestic product, export promotion schemes (EXPP).

Many export promotion schemes have been implemented in Nigeria. In this study, five different types of export promotion schemes are used. The five schemes are agricultural Credit Guarantee Scheme Fund (ACGSF), the exchange rate (EXC), government capital expenditure in the agricultural sector (AMACH), government recurrent expenditure in the agricultural sector (AEXP), and foreign direct investment in the agricultural sector (FDI). However, for robustness check, we further construct a comprehensive measure of the export promotion scheme (XP) using Principal Component Analysis (PCA). Before undertaking the PCA, we check the factorability of variables with the Barlett's test for sphericity and Kaiser-Meyer-Oklin (KMO) coefficient. The Barlett's test converts the calculated determinants of the matrix to a χ^2 statistic that is tested for significance. The null hypothesis of the test is that variables are collinear. The Kaiser-Meyer-Oklin (KMO) test, on the other hand, entails comparing the size of the variables' correlation coefficients with the size of the partial correlation coefficients. In the KMO test, a minimum value of 0.60 is necessary for an acceptable PCA. The results in Table 1 show the results from Barlett's and KMO tests and the PCA. The results show that the five variables can be merged into another set of factors using the PCA. Thus, the values of the first PCA are utilized in determining the weights for the export promotion index (XP).

Data were sourced from the World Bank, World Development Indicators, 2015 Edition, United Nations Conference on Trade and Development (UNCTAD) Statistics database, Central Bank of Nigeria Statistical Bulletin, 2015 edition. Specifically, data on Agricultural Credit Guarantee Scheme Fund, exchange rate direct investment in agriculture and government current

Table 1. Construction of Export Promotion Index

Table 1a. **Test for factorability**

Determinant of the matrix of correlation	0.002
Barlett's test for sphericity	127.591
	(0.000)***
Kaiser-Meyer-Oklin measure	0.807

Table 1b. **Principal Component Analysis**

Principal Components/Correlation — Number of Obs = 35

Number of comp. = 5
Trace = 5
Rotation: (unrotated = principal) Rho = 1.0000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.56086	2.76563	0.7122	0.7122
Comp2	0.795231	0.447877	0.1590	0.8712
Comp3	0.347354	0.13364	0.0695	0.9407
Comp4	0.213713	0.130874	0.0427	0.9834
Comp5	0.0828382	---	0.0166	1.0000

Principal Components(eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
ACGSF	0.4552	0.3658	0.3360	-0.7387	0.0224	0
EXC	-0.3166	0.8820	0.1063	0.2947	0.1537	0
FDI	0.4964	0.0981	0.3026	0.4723	-0.6553	0
AEXP	0.4400	0.2614	-0.8589	0.0093	0.0174	0
AMACH	0.5026	-0.1014	0.2158	0.3800	0.7390	0

Source: Authors' computation

expenditure was sourced from the Central Bank of Nigeria Statistical Bulletin 2015 edition. Data on gross capital formation, trade openness and consumer price index were sourced from the World Bank, World Development Indicators 2015 edition. Data on agricultural labour force and agricultural land area were sourced from World Development Indicators of the World Bank.

3.2. Methodology

This section presents a co-integration method to demonstrate any long term relationship between agricultural growth and export promotion strategy in Nigeria over the period 1980-2014. The study applies the ARDL–bounds testing approach developed by Pesaran, *et al.* (2001) to investigate the primary objective of the paper. The following model is estimated:

$$AGDP_t = \propto_0 + \beta_1 EXPP_t + \beta_2 ALN_t + \beta_3 ALAB_t + \beta_4 CAP_t + \beta_5 INF_t + \beta_6 OPN_t + \mu_t \qquad (1)$$

All variables are as earlier defined. It is expected that the coefficient of export promotion index (β_1) be positive. The main reason for this is that agricultural production and export promotion schemes are incentives for farmers to produce and export more output. Mainly, they are introduced to reduce the cost of production and enhance efficiency and productivity in the agricultural sector. However, where agriculture operates majorly at subsistence level as obtained in the Nigerian economy, response to incentives by the operators in the sector might be prolonged and weak. Consequently, export promotion schemes may not produce the expected outcomes, particularly in the short run. An estimate of β_2 is expected to be positive since the more arable land available for agricultural use, the more the level of agricultural output. Farmers enjoy the economies of large production with an increase in the available arable land. The labour force in the agricultural sector is expected to impact positively on output growth. The coefficient of gross capital formation β_3 is expected to be positive. Inflation and agricultural growth are expected to be inversely related. Hence, β_4 should be negative. Inflation is a measure of macroeconomic instability, and when the economic environment is perceived unstable, the level of investment (domestic and foreign) in the sector will reduce. Besides, a high rate of inflation working through input costs could lead to increase costs of production. Trade openness is expected to be positively related to agricultural growth. Openness is a measure of how friendly a country is to foreign investors. A more open economy is likely to attract more foreign investment into the agricultural sector with a possible positive effect on output.

Based on the bounds-testing approach proposed by Pesaran and Smith (1998) and Pesaran, *et al.* (2001), the long-run relationship is given by the equation:

$$\begin{aligned}\Delta AGDP_t = \beta_0 &+ \sum_{i=1}^{q_1} \gamma_i \Delta AGDP_{t-i} + \sum_{i=0}^{q_1} \partial_i \Delta EXPP_{t-i} \\ &+ \sum_{i=0}^{q_2} \delta_i \Delta ALN_{t-i} + \sum_{i=0}^{q_3} \rho_i \Delta ALAB_{t-i} + \sum_{i=0}^{q_4} \vartheta_i CAP_{t-i} + \sum_{i=0}^{q_5} \theta_i \Delta INF_{t-i} \\ &+ \sum_{i=0}^{q_6} \psi_i \Delta OPN_{t-i} + \varphi_0 AGDP_{t-1} + \varphi_1 EXPP_{t-1} + \varphi_2 ALN_{t-1} + \varphi_3 ALAB_{t-1} \\ &+ \varphi_4 CAP_{t-1} + \varphi_5 INF_{t-1} + \varphi_6 OPN_{t-1} + \varepsilon_t \qquad (2)\end{aligned}$$

where q is the optimal lag length, and Δ refers to the first difference of variables.
The hypothesis for testing the existence of any long-run co-integration among the variables is given thus:

H_0: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 = \varphi_7 = 0$ (3)

H_1: $\varphi_1 \neq 0, \ \varphi_2 \neq 0, \ \varphi_3 \neq 0, \ \varphi_4 \neq 0, \ \varphi_5 \neq 0, \ \varphi_6 \neq 0, \ \varphi_7 \neq 0$

This states the joint null hypothesis of no co-integration against the existence of co-integration between agricultural output growth and the set of explanatory variables. Given that there is co-integration, the short-run model is stated as:

$$\begin{aligned}\Delta AGDP_t = \beta_0 &+ \sum_{i=1}^{q_1} \gamma_i \Delta AGDP_{t-i} + \sum_{i=0}^{q_1} \partial_i \Delta EXPP_{t-i} \\ &+ \sum_{i=0}^{q_2} \delta_i \Delta ALN_{t-i} + \sum_{i=0}^{q_3} \rho_i \Delta ALAB_{t-i} + \sum_{i=0}^{q_4} \vartheta_i CAP_{t-i} + \sum_{i=0}^{q_5} \theta_i \Delta INF_{t-i} \\ &+ \sum_{i=0}^{q_6} \psi_i \Delta OPN_{t-i} + ʎ ECM_{t-1} + \mu_t \qquad (4)\end{aligned}$$

The coefficients $\gamma_i, \partial_i, \delta_i, \rho_i, \vartheta_i, \theta_i$, and ψ_i denote the short-run dynamics of the variables, while the coefficient φ_1(i=1, 2, 3, 4, 5, 6) denote the long-term dynamics. The term ʎ is the coefficient of correction in disequilibrium.

As a final point, our investigation of the impact of export promotion schemes on agricultural output growth concludes by examining the dynamic interactions of the variables. To achieve this, we generate the Variance decompositions (VDCs) and Impulse response functions (IRFs). The variance decompositions help us to ascertain the proportion of the forecast error in a given variable that is accounted for by innovation in each endogenous variable. In contrast, the impulse response functions help to validate the degree of response and how long it would take to normalize.

Before examining the ARDL results, we present the descriptive statistics and correlation matrix of all the variables used in the empirical model in Tables 2 and 3, respectively. Table 2 shows that the mean and median values of ACGSF, FDI, ALAB, ALN, AMACH, INF, and OPN are close, which indicates symmetry. However, the mean and median values of AEXP, AGDP, CAP, EXC, and XP are wide indicating asymmetry. From the kurtosis statistic, the distribution of AEXP, AGDP, EXC, and INF is peaked relative to the normal with kurtosis exceeding 3. The distribution for the remaining variables, namely ACGSF, FDI, ALAB, ALN, AMACH, CAP, OPN, and XP is flat relative to normal with kurtosis less than 3. The descriptive statistics show high variability in all the variables except for ACGSF and XP.

Table 3 shows the correlation between the variables under consideration. The results show a positive correlation between measures of export promotion and agricultural output growth except for the exchange rate. Inflation is negatively correlated with all the variables except labour. However, caution must be exercised in interpreting the correlation results. Such results cannot provide a reliable indicator of association in a manner that controls for additional explanatory variables. This is why the multivariate model is estimated.

Table 2: Descriptive Statistics

	ACGSF	AEXP	AFDI	AGDP	ALAB	ALN	AMACH	CAP	EXC	INF	OPN	XP
Mean	12.98	12.78	6.47	24.20	9.43	13.40	9.73	28.91	159.19	19.74	51.88	0.00
Median	12.33	2.06	7.10	24.22	9.43	13.44	9.78	28.64	99.12	12.22	53.03	0.46
Maximum	16.34	65.40	7.88	24.61	9.44	13.57	10.12	29.87	546.40	72.84	81.81	1.14
Minimum	10.11	0.01	4.76	23.73	9.42	13.07	9.04	28.22	49.78	5.38	23.61	-1.98
Std. Dev.	2.11	18.09	1.14	0.21	0.01	0.15	0.34	0.52	128.82	17.92	15.80	1.00
Skewness	0.37	1.45	-0.55	-0.66	0.27	-0.92	-0.49	0.51	1.56	1.63	-0.22	-0.57
Kurtosis	1.63	4.15	1.62	3.05	2.33	2.75	2.00	1.74	4.50	4.38	2.18	1.85
Jarque-Bera	3.56	14.22	4.55	2.53	1.07	4.98	2.87	3.85	17.39	18.21	1.26	3.85
Probability	0.17	0.00	0.10	0.28	0.59	0.08	0.24	0.15	0.00	0.00	0.53	0.15
Sum	454.45	447.27	226.48	847.07	329.96	468.98	340.50	1011.84	5571.63	690.97	1815.81	0.00
Sum Sq. Dev.	151.07	11125.96	44.57	1.45	0.00	0.75	3.89	9.30	564256.30	10918.06	8487.90	34.00
Observations	35	35	35	35	35	35	35	35	35	35	35	35

Table 3. Correlation Matrix

	ACGSF	AEXP	AFDI	AGDP	ALAB	ALN	AMACH	CAP	EXC	INF	OPN	XP
ACGSF	1.000											
AEXP	0.734	1.000										
AFDI	0.879	0.716	1.000									
AGDP	0.401	0.329	0.386	1.000								
ALAB	-0.499	-0.271	-0.375	0.265	1.000							
ALN	0.872	0.625	0.824	0.265	-0.728	1.000						
AMACH	0.955	0.705	0.901	0.332	-0.616	0.959	1.000					
CAP	0.849	0.693	0.817	0.435	-0.207	0.623	0.760	1.000				
EXC	-0.529	-0.343	-0.459	-0.110	0.564	-0.692	-0.597	-0.304	1.000			
INF	-0.309	-0.358	-0.171	-0.148	0.117	-0.146	-0.249	-0.309	-0.164	1.000		
OPN	0.208	0.056	0.264	-0.208	-0.638	0.468	0.372	-0.006	-0.538	0.028	1.000	
XP	0.858	0.608	0.857	0.268	-0.676	0.966	0.961	0.609	-0.629	-0.191	0.510	1.000

4. Results and Discussion

The starting point for the examination of the time-series properties of any data is to check for the presence of unit root or non-stationarity in the data. To achieve this, we employ the Augmented Dickey-Fuller (ADF) (1979) and the Phillip-Peron (1988) tests. Table 4 reports the unit root tests for all the variables employed in the study.

The results in Table 4 show a mix of both I(1) and I(0) variables, which allows for the use of the ARDL approach. As shown in Table 4, the variables AEXP, AMACH, INF and ALAB are stationary at level. In contrast, the remaining variables, namely ACGSF, FDI, AGDP, CAP EXC, OPN, ALN, and XP are stationary at first difference. The results obtained with the Philip-Peron unit root test are similar to the ADF unit root test except that agricultural labour input (ALAB) is stationary only at first difference.

Table 4: Unit root test results

Variables	Augmented Dickey-Fuller			Philip-Peron		
	Levels	**1st Diff**	**Remarks**	**Levels**	**1st Diff**	**Remarks**
ACGSF	-0.4939	-5.7028***	I(1)	-0.4939	-5.6952***	I(1)
AEXP	-2.7942*		I(0)	-2.6689*		I(0)
FDI	-1.166836	-2.2452*	I(1)	-1.1811	-5.8639***	I(1)
AGDP	-0.466726	-2.772213***	I(1)	1.447186	-2.66248***	I(1)
AMACH	-7.2130***		I(0)	-5.2650***		I(0)
CAP	0.220285	-1.8611099***	I(0)	-0.0328874	-5.271599*	I(0)
EXC	-1.8218	-4.0905***	I(1)	-1.9391	-4.0656***	I(1)
INF	-2.9060*		I(0)	-2.8205*		I(0)
ALAB	-7.723366*		I(0)	-1.163893	-2.138526***	I(1)
OPN	-2.187878	-7.96822*	I(1)	-2.124124	-7.950048*	I(1)
ALN	-1.621509	-6.421342***	I(1)	1.67853	-6.367981*	I(1)
XP	-0.4939	-5.7028***	I(1)	-1.259856	-5.6952***	I(1)

***Notes*:** ***,**, * indicates level of significance at 1%, 5% and 10% respectively. The unit root conducted with intercept and no trend.

Next, we test for the presence of long-run relationships among the variables used. Table 5 reports the results of the ADRL bounds co-integration tests for models 1-VI. The Wald tests (*F* tests) for the joint null hypothesis that the coefficients of the lagged variables in the level form are zero (no co-integration between the variables) and the results of the calculated *F*-statistics and the values for both upper and lower bound are shown in Table 5. The computed *F*-statistics for models 1-6 is higher than the upper critical bound at 5% and 10% critical values in all cases, as indicated in Table 5. The study, therefore, concludes from the ARDL bounds test that there is a long-run relationship among the variables. Given that the variables are co-integrated, we obtain the long-run and short-run dynamic parameters for the variables.

Table 5. Testing for long run cointegration; F statistic

Model 1: (Dependent variable: AGDP)		F-Statistic
F(AGDP, ACGSF, ALN, CAP, LAB, INFL, OPN)		6.23
Critical Values	Upper Bound I(1)	Lower Bound I(0)
K=6; n=34		
10%	2.87	1.75
5%	3.24	2.04
Model 2: (Dependent variable: AGDP)		F-Statistic
F(AGDP, AFDI, ALN, CAP, LAB, INFL, OPN)		4.43
Critical Values	Upper Bound I(1)	Lower Bound I(0)
K=6; n=34		
10%	2.87	1.75
5%	3.24	2.04
Model 3: (Dependent variable: AGDP)		F-Statistic
F(AGDP, AEXP, ALN, CAP, LAB, INFL, OPN)		4.01
Critical Values	Upper Bound I(1)	Lower Bound I(0)
K=6; n=34		
10%	3.23	2.12
5%	3.61	2.45
Model 4: (Dependent variable: AGDP)		F-Statistic
F(AGDP, EXC, ALN, CAP, LAB, INFL, OPN)		3.84
Critical Values	Upper Bound I(1)	Lower Bound I(0)
K=6; n=34		
10%	2.87	1.75
5%	3.24	2.04
Model 5: (Dependent variable: POV)		F-Statistic
F(AGDP, AMACH, NAGDP, POP, INFL, DE)		4.167
Critical Values	Upper Bound I(1)	Lower Bound I(0)
K=6; n=34		
10%	2.87	1.75
5%	3.24	2.04
Model 6: (Dependent variable: AGDP)		F-Statistic
F(AGDP,ALN, CAP,LAB,XP,OPN,INF)		9.34
Critical Values	Upper Bound I(1)	Lower Bound I(0)
K=6; n=34		
10%	3.80	2.37
5%	3.23	1.96

For the long-run dynamics, we estimate equation (4) using the following various ARDL specification, as shown in Table 6. The results of the estimation presented in Table 6, show that the coefficient on arable land is positive and significant in the models that adopt FDI and

XP as measures of export promotion (models II & VI). The results show that a 1 per cent increase in arable land will increase agricultural output by 2.793 per cent in the long run for the model, with FDI as a measure of export promotion (model II). Arable land is any land fertile enough to grow crops. An identifiable challenge to agriculture in Nigeria is the land tenure system. The post-colonial land tenure system has made land ownership too centralized. For instance, the Nigerian land-use decree of 1978 stipulates that all land belong to the government holding the same in trust for the public. This has led to consequent abuses especially by public office holder and has denied access by farmers who genuinely need it. For model VI that uses the composite export promotion index (XP), a 1 per cent increase in arable land will increase agricultural output by approximately 0.00041 per cent in the long-run. The result is consistent with that of Huang and Ma (2010).

The coefficient on arable land is negative in the remaining models but significant only in the model that uses the exchange rate as a measure of export promotion (model IV). The coefficient of inflation is positive in all the models except in model IV that incorporates the exchange rate as a measure of export promotion. The coefficient is only significant in models III & VI. These are models that use AEXP and composite export promotion index (XP) as measures of export promotion. This result possibly suggests that price increase possibly serves as an incentive for increased agricultural output. Labour input has a positive effect on agricultural output in the long-run except in model VI that uses the composite export promotion scheme (XP) as a measure of export promotion. In the long-run, an increase in agricultural labour-input by 1 per cent increases agricultural output growth by 0.395 and 0.619 per cent for models IV and V that use exchange rate (EXC) and AMACH respectively as a measure of export promotion scheme. The result is in line with the argument that the discovery and production of oil in Nigeria led to high urban migration, which created a huge rural-labour deficit with an adverse impact on agricultural output. Hence, an increase in labour in the agricultural sector will likely translate into increased production in long-run.

The coefficient of openness is positive and significant for models that adopt ACGSF, AMACH, and XP as measures of export promotion scheme (models I, V &VI). This finding simply suggests that openness positively affects agricultural output growth. This result is consistent with a priori expectation that the friendlier a nation is to trade, the more the increase in agricultural output. However, the coefficient of openness is negative and significant for models III and IV with AEXP and EXC as measures of export promotion. The fact that openness is negative and significant in these two cases should not come as a surprise because, during the period of study, there was massive depreciation of exchange rate, which possibly adversely affected the prices of agricultural inputs and output.

In the long run, the coefficient of capital formation is positive and significant in all the models except in model with ACGSF as a measure of export promotion (model II). This finding shows that capital investment plays a vital role in agricultural production in Nigeria. This result is similar to the findings of Huang and Ma (2010), Huang and Rozelle (1996) and Jin, Ma, Huang, Hu, and Rozelle (2010). The coefficient of export promotion is positive and significant for models with ACGSF, AEXP, and AMACH (models I, III & V). This result simply shows that export promotion schemes improve agricultural output growth. The result is consistent with a priori expectation that export promotion schemes work through various channels to enhance agricultural output growth. In models II, IV, and VI with FDI, EXC, and XP as a measure of export promotion scheme respectively, the coefficient is negative but not significant. Hence, a conclusive inference cannot be drawn from the result.

Table 6. Estimated long-run coefficients from the ARDL models

Variable	(AGDP) ARDL(1,0,0,0,0,0,0) I	AGDP ARDL(1,0,0,0,0,0,1) II	(AGDP) ARDL(1,0,1,0,0,0,0) III	(AGDP) ARDL(1,1,0,0,0,1,0) IV	(AGDP) ARDL(1,1,0,1,0,1,1) V	(AGDP) ARDL(1,0,1,0,1,0,1) VI
ACGSF	0.231*** (0.007)					
FDI		-0.237 (0.205)				
AEXP			1.259** (0.044)			
EXC				-0.0001 (0.962)		
AMACH					0.476** (0.038)	
XP						-2.0758 (0.096)
ALN	-0.867 (0.365)	2.793** (0.021)	-0.853 (0.107)	-6.641** (0.036)	-1.863 (0.232)	0.0004083*** (0.000)
CAP	-0.065 (0.595)	0.804** (0.036)	0.331** (0.044)	1.786 (0.060)	0.868 (0.073)	0.0279340*** (0.000)
ALAB	0.523 (0.212)	0.974 (0.206)	0.395** (0.045)	0.619** (0.022)	0.549 (0.211)	-0.013517** (0.019)
INF	0.002 (0.205)	0.003 (0.378)	1.052*** (0.045)	-0.019 (0.139)	0.003 (0.781)	0.0010644*** (0.000)
OPN	0.453 (0.066)	0.859 (0.187)	-0.986** (0.034)	-2.590** (0.041)	1.869*** (0.007)	0.52554** (0.050)

Notes: ***, ** indicate statistical significance at the 1 per cent, and 5 per cent level respectively. The test for serial correlation is the LM test for autocorrelation, the test for a functional form is Ramsey's RESET test, the test for normality is the test proposed by Bera and Jarque (1981), the test for heteroskedasticity is the LM test. Lag length is based on SBC. All variable are in log form except EXC, INF and XP.

Source: Author's Computation

The short-run results shown in Table 7 confirm positive effect export promotion schemes on agricultural output growth except for models IV & VI with EXC and XP as a measure of export promotion scheme, respectively. As obtained in the long-run situation, the coefficient of the composite export promotion scheme (XP) is not significant, while the coefficient of the exchange rate (EXC) is negative and significant. The massive depreciation of the local currency possibly led to increasing costs of imported farm inputs with an adverse effect on agricultural output growth in the short-run.

The coefficient of land is not significant in almost all the models except in model VI with the composite export promotion scheme (XP). The preponderance of evidence from Table 7 shows that capital formation (CAP) is positively related to agricultural output growth in the short-run. The coefficient is positive and significant in models with ACGSF and AEXP as a measure of export promotion scheme (models I & III). Labour input is positive and significant in models with ACGSF, AEXP, and EXC as a measure of export promotion (models I, III & IV). This result shows that labour input has a significant positive effect on agricultural output growth in the short-run. The coefficient of inflation is not significant in all the models (models I-VI). The coefficient of openness is negative and significant in models II, III, and IV with FDI, AEXP, and EXC as a measure of export promotion scheme, respectively. This result shows that trade intensity tends to depress agricultural output growth in the short-run. Indeed, several studies have shown that trade openness is inversely related to environmental quality in low-income countries such as Nigeria (Shahbaz et al. 2017, Solarin et al. 2017 and Feridun et al. 2006). Finally, the coefficient of the error correction term is negative for all the models. The negative sign of the error-correction term means that if the system deviates from its equilibrium position, it will eventually converge back to equilibrium. The speed of adjustment ranges from 93 per cent to 13 per cent.

To check for the stability of the model, we applied the CUSUM and CUSUMSQ tests for all the models. The plots of the two tests are as shown in Figures 1-6. As shown in Figures 1-6, for all the models, the statistics lie within the critical bounds. The only exception is CUSUM of Squares for model (IV) with the exchange rate (EXC) as measure of export promotion scheme. In general, the coefficients in the estimated model are stable. The figures also indicate that there is no evidence of any structural instability and parameter stable over time. Moreover, the models pass all the diagnostic tests.

Table 7. Estimated short-run coefficients from the ARDL

Variable	(AGDP) ARDL(1,0,0,0,0,0,0) I	AGDP ARDL(1,0,0,0,0,0,1) II	(AGDP) ARDL(1,0,1,0,0,0,0) III	(AGDP) ARDL(1,1,0,0,0,1,0) IV	(AGDP) ARDL(1,1,0,1,0,1,1) V	(AGDP) ARDL(1,1,0,1,0,1,1) VI
d(ACGSF)	0.307 (0.355)					
d(AFDI)		0.562** (0.022)				
d(AEXP)			0.018** (0.017)			
d(EXC)				-0.003** (0.027)		
d(AMACH)					0.850** (0.037)	
XP						-9.0663 (0.103)
d(ALN)	0.962 (0.190)	-5.924 (0.086)	-0.519** (0.017)	1.600 (0.498)	-0.021 (0.995)	0.0001844*** (0.000)
d(CAP)	2.569** (0.014)	0.832* (0.082)	2.064** (0.016)	0.867** (0.029)	0.199 (0.580)	-0.0007579 (0.688)
d(LAB)	4.017** (0.021)	-0.699 (0.434)	2.499*** (0.055)	0.969*** (0.000)	-0.463 (0.684)	-0.0061044** (0.16)
d(INFL)	0.002 (0.639)	0.003 (0.462)	-0.002 (0.083)	-0.001 (0.977)	-0.002 (0.680)	-0.0001264 (0.763)
d(OPN)	-0.055 (0.836)	-1.618*** (0.001)	-2.517*** (0.006)	-1.257*** (0.009)	1.020** (0.024)	0.62757 (0.547)
CointEq(-1)	-0.552*** (0.000)	-0.617*** (0.000)	-0.127** (0.047)	-0.485*** (0.001)	-0.929*** (0.000)	-0.4516*** (0.001)
Adj R-squared	0.805	0.904	0.999	0.929	0.955	0.77576
DW-statistics	1.989	2.749	2.19	2.504	2.043	2.1468
LM (χ^2) Version						
Serial Correlation	$\chi^2(2)$= 26.26[.000]	$\chi^2(2)$= 12.97[.002]	$\chi^2(2)$= 15.57[.000]	$\chi^2(2)$= 5.83[.054]	$\chi^2(2)$= 8.072[.018]	χ^2=0.47278[.049]
Functional Form	$\chi^2(5)$= 10.3[.246]	$\chi^2(14)$= 12.86[.435]	$\chi^2(4)$= 8.862[.953]	$\chi^2(18)$= 6.48[.222]	$\chi^2(20)$= 10.911[.724]	$\chi^2(1)$=3.935[.047]
Normality	$\chi^2(1)$= 0.53[.000]	$\chi^2(1)$= 3.61[.164]	$\chi^2(1)$= 3.13[.208]	$\chi^2(1)$=19.05 [.000]	$\chi^2(1)$= 5.634[.063]	$\chi^2(2)$=3.208[.201]
Heteroskedasticity	$\chi^2(26)$=26.91[.271]	$\chi^2(17)$=26.74[.062]	$\chi^2(27)$=28.797[.371]	$\chi^2(14)$= 29.36[.001]	$\chi^2(16)$= 25.585[.060]	$\chi^2(1)$=1.1072[.293]
F-Statistics						
Serial Correlation	F(2,4)=7.79[.042]	F(2,13) = 4.21[.040]	F(2,3)=1.34[.384]	F(2,17)= 1.75[.202]	F(2,15) =2.423[.122]	F(1, 23) = 0.324[.058]
Functional Form	F(1,5)=105.9[.246]	F(1,14) = 165.29[.435]	F(1,4)=78.535[.953]	F(1,18)=42.04[.212]	F(1,16) = 119.05[.724]	F(1, 23) = 3.01[.096]
Normality	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Heteroskedasticity	F(26,6)=2.23[.160]	F(17,15)=3.76[.007]	F(27,5)=1.268[.432]	F(14,19)= 8.59[0.002]	F(16,16)=3.45[.009]	F(1, 23) = 1.077[.307]

Notes: ***, ** indicate statistical significance at the 1 per cent, and 5 per cent level respectively. The test for serial correlation is the LM test for autocorrelation, the test for a functional form is Ramsey's RESET test, the test for normality is the test proposed by Bera and Jarque (1981), the test for heteroskedasticity is the LM test. Lag length is based on SBC. All variable are in log form except EXC, INF and XP.

Source: Author's Computation

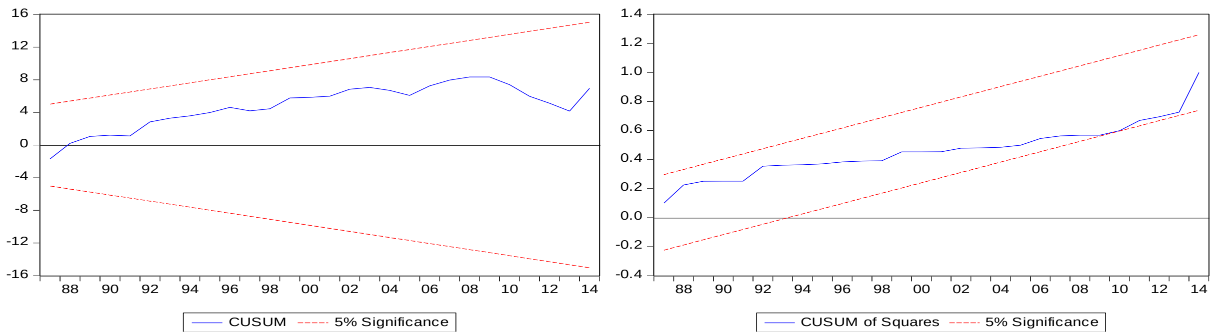

Figure 1. CUSUM and CUSUM of Squares Graphs for model I

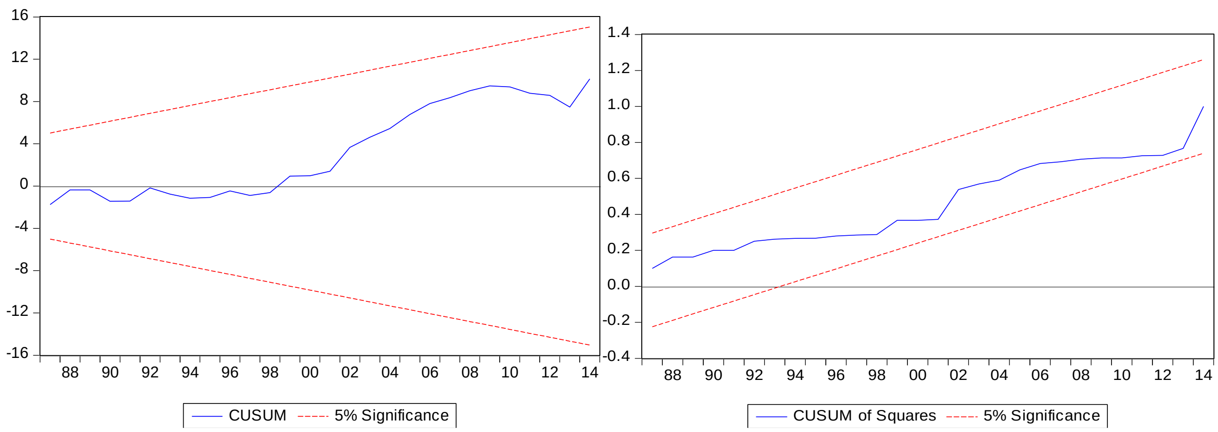

Figure 2. CUSUM and CUSUM of Squares Graphs for model II

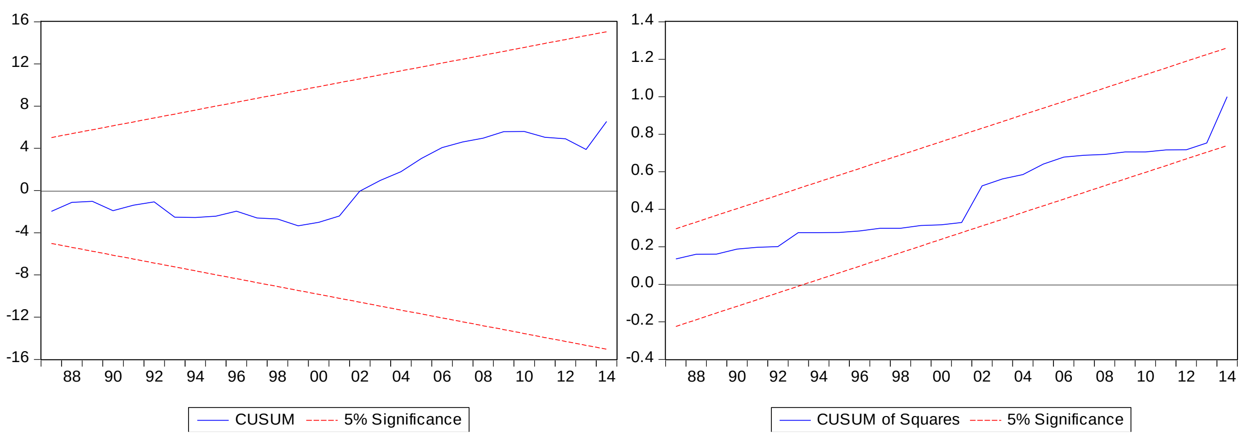

Figure 3. CUSUM and CUSUM of Squares Graphs for model III

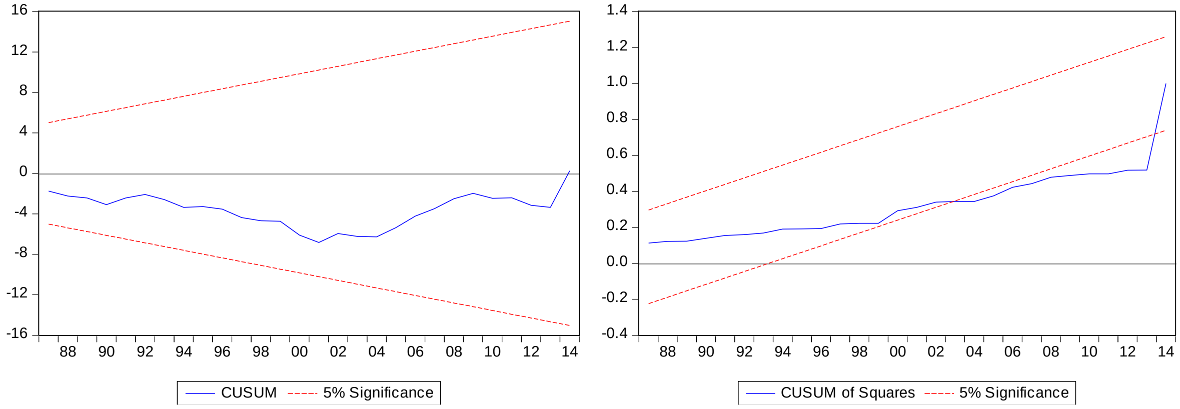

Figure 4. CUSUM and CUSUM of Squares Graphs for model IV

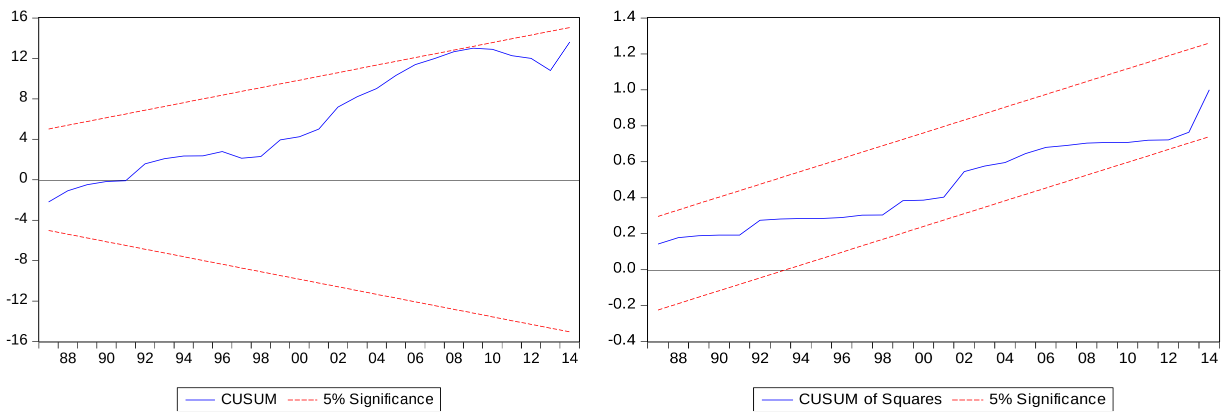

Figure 5. CUSUM and CUSUM of Squares Graphs for model V

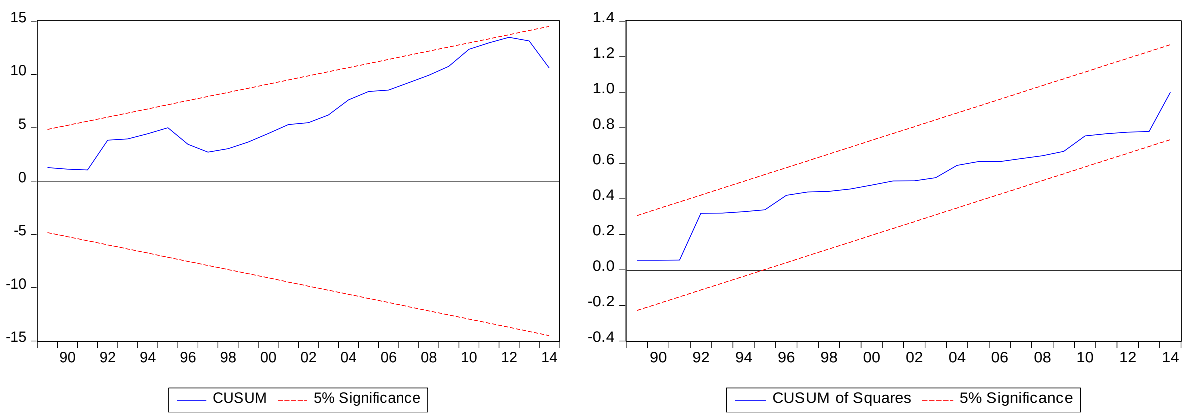

Figure 6. CUSUM and CUSUM of Squares Graphs for model VI

4.1 Assessing the Dynamic Interactions of the Variables

To further assess the relationship between the variables, we estimated a multivariate error-correction model for three models in which export promotion has a positive effect on agricultural output growth. These are models I, III, and V with ACGSF, AEXP, and AMACH as a measure of export promotion scheme, respectively. Figures 7-9 show the Cholesky impulse-response functions. As revealed in Figures 7-9, a one standard deviation shock applied to export promotion schemes, namely ACGSF, AEXP, and AMACH produce a positive but relatively small impact on agricultural output growth both in the short- and medium-term periods. However, in the long run, the positive effect becomes noticeable except in the case of ACGSF. This finding corroborates the result obtained using the ARDL approach. Also, a one standard deviation shock to labour input shows a positive but relatively constant impact on agricultural output growth in the short run and medium-term periods. The positive impact becomes more noticeable in the long-run period for the three measures of export promotion scheme. Capital input has no discernible impact on agricultural output growth in the short-run period but produces a negative impact in the medium- and long-run periods. A one standard deviation shock to arable land assumes a constant level in all the periods except in the ninth period when it produces a slightly positive impact. In the case of trade openness, the impact of a one standard deviation shock is not discernible on agricultural output growth in the short- and medium-term periods. However, it produces a slight negative effect in the long-run period. In the same way, a one standard deviation shock to inflation shows no impact on agricultural output growth in the short – and medium-term but a slightly negative impact in the long-run.

Impulse-response functions are very useful in determining the direction of the effects but not their magnitude. Hence to ascertain the extent of the impact, we analyze the variance decompositions. The variance decompositions show the proportion of the forecast error in a given variable that is accounted for by innovation in each endogenous variable. The results of the variance decompositions are as shown in Table 8 & 9. It shows that the three export promotion schemes (ACGSF, AEXP, and AMACH) have no impact on agricultural output growth in the first period, but the magnitude of the effect increases from the second period to the tenth period in the case of ACGSF and AEXP. In the case of AMACH, the magnitude of the impact increases in the second and third periods but declines steadily afterwards. The results show that labour had one period delay but a meagre effect on agricultural output growth.

In all the cases, the proportion of the variance in agricultural output by labour is less than 1 per cent. The proportion of the variance explained by capital stock is relatively high. In the three cases, capital input accounts for over 20 per cent of the variation in agricultural output growth. The proportion of variance explained by land, openness, and inflation individually is less than 4 per cent in all the periods except in the case of AEXP. These results are, to a reasonable extent, consistent with the Autoregressive Distributed Lag (ARDL) and Impulse-Response Functions analyses. The estimated results can indeed be sensitive to the ordering of the variables; however, we check for the robustness of the results by re-estimating the model by reversing the order of the first and the last variables. The results obtained were not significantly different from the one presented here.

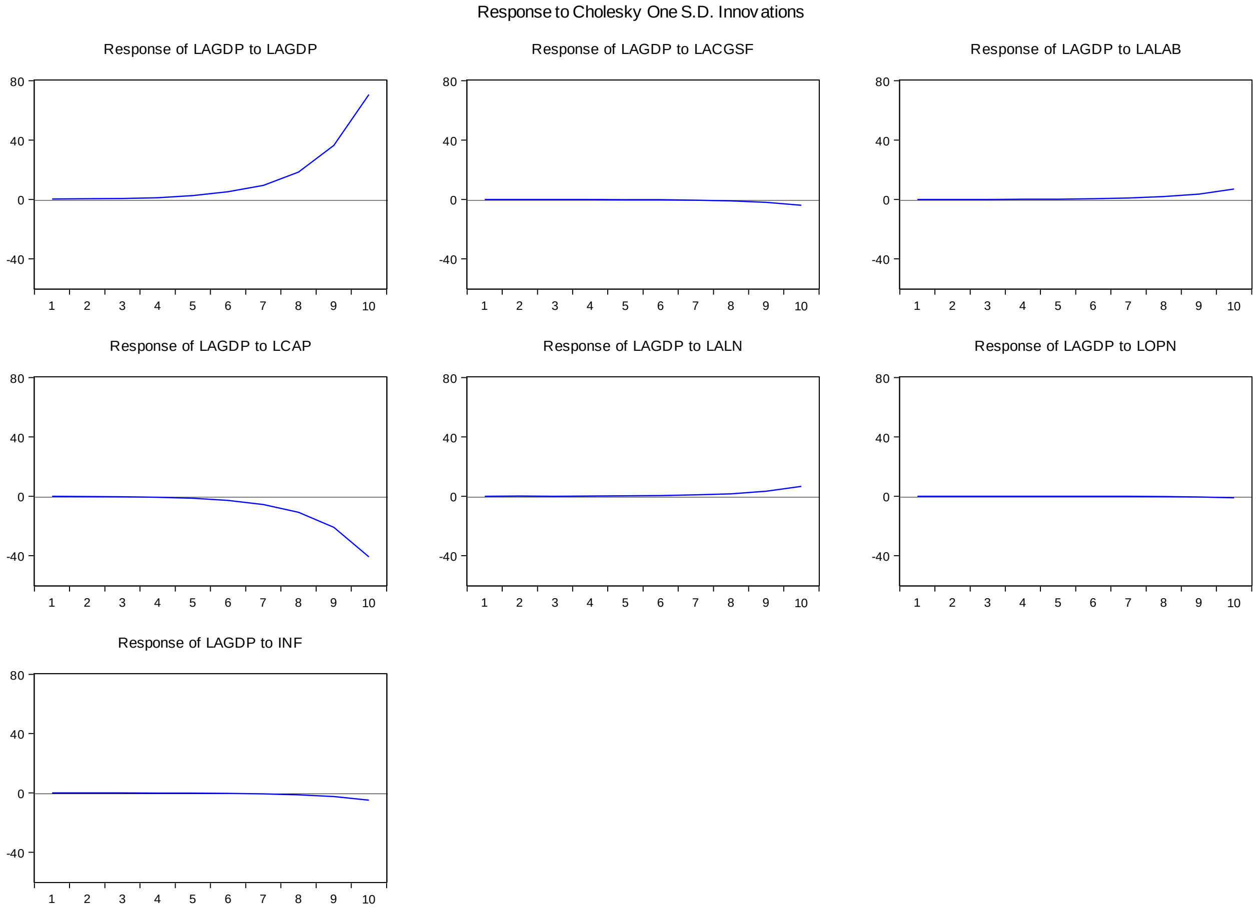

Figure 7: Impulse Response Functions with ACGSF as a measure of export promotion scheme

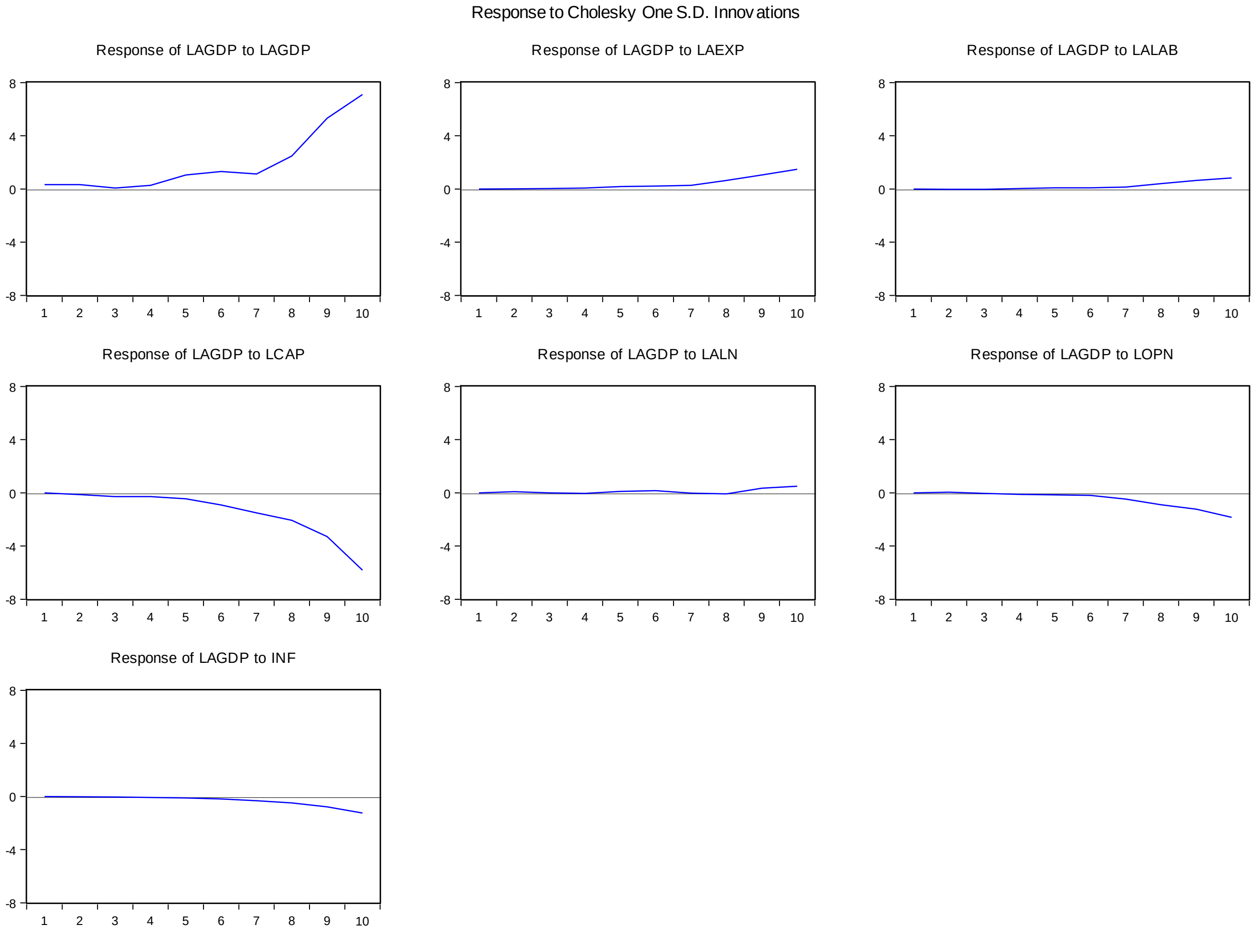

Figure 8: Impulse Response Functions with AEXP as a measure of export promotion scheme

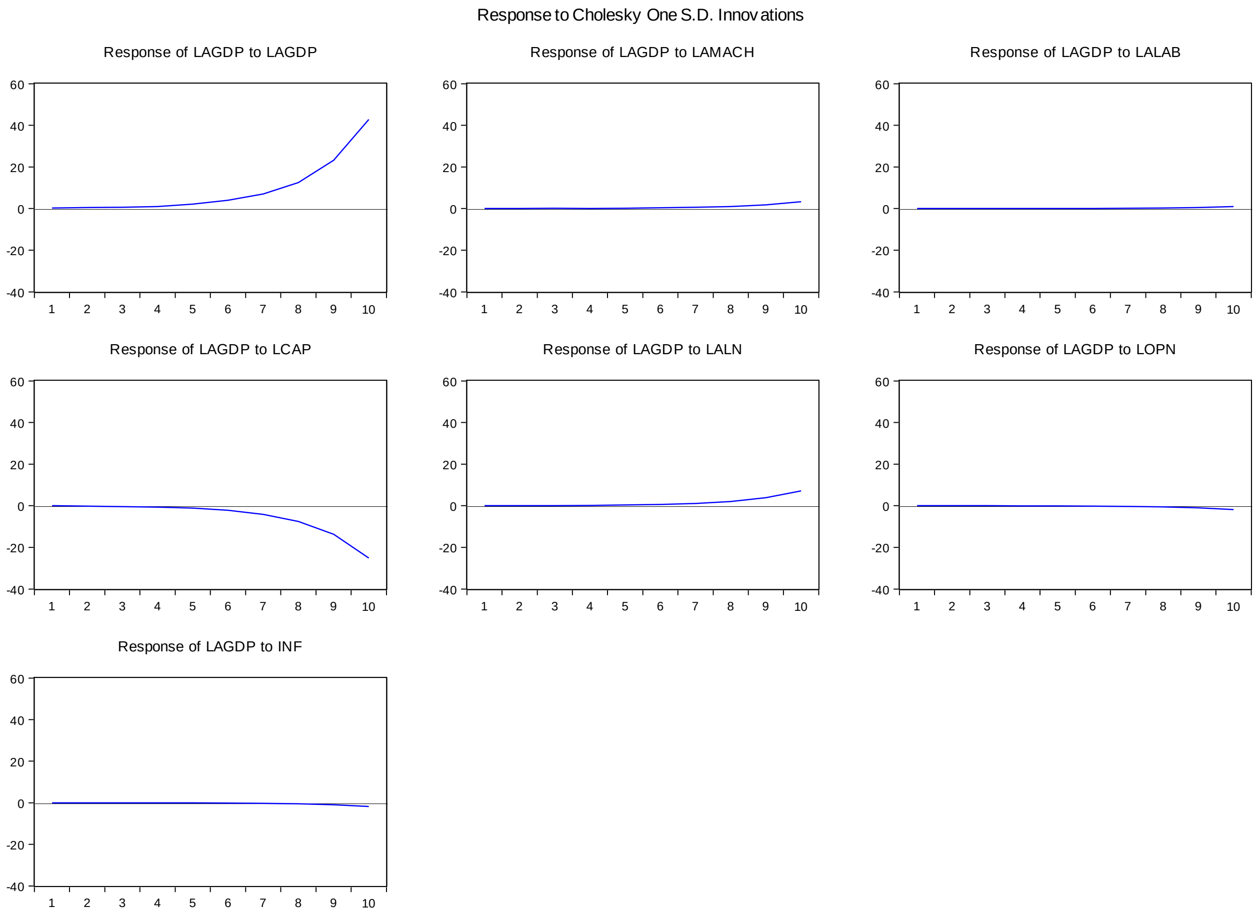

Figure 9. Impulse Response Functions with AMACH as a measure of export promotion scheme

Table 8. Variance Decomposition of LAGDP

PERIOD	LAGDP	LACGSF	LALAB	LCAP	LALN	LOPN INF	
1	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	89.5676	0.2082	0.3117	8.2562	1.1415	0.4163	0.0981
3	75.5711	0.0848	0.2715	23.2245	0.4743	0.1733	0.2002
4	72.8099	0.7310	0.5623	25.8105	0.3548	0.0554	0.3335
5	75.0538	0.2081	0.4961	23.0271	0.8559	0.0170	0.3417
6	75.2873	0.2104	0.5514	22.9302	0.6914	0.0074	0.3215
7	73.3614	0.2106	0.6340	24.8213	0.6290	0.0091	0.3343
8	73.1028	0.2186	0.7237	24.9864	0.6098	0.0145	0.3438
9	73.4941	0.2340	0.7166	24.5483	0.6489	0.0140	0.3437
10	73.4469	0.2364	0.7132	24.5940	0.6528	0.0141	0.3422

Cholesky Ordering: LAGDP LACGSF LALAB LACAP LALN LOPN INF

Table 9. Variance Decomposition of LAGDP

PERIOD	LAGDP	LAEXP	LALAB	LCAP	LALN	LOPN	INF
1	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	87.4102	0.0472	0.4780	7.5022	3.4342	0.9264	0.2014
3	65.4457	0.3344	0.6984	29.0969	2.5704	1.1141	0.7398
4	56.2495	0.9306	0.6380	34.9835	2.2306	3.6434	1.3240
5	72.8538	1.9564	0.5563	19.9682	1.2435	2.3945	1.0270
6	67.1673	1.7408	0.3721	26.5930	1.0663	1.8723	1.1878
7	50.8373	1.8414	0.4571	40.9272	0.5853	3.6143	1.7371
8	50.8366	2.7006	0.9968	37.8860	0.2829	5.4261	1.8707
9	61.0053	2.6286	0.9628	29.4403	0.2714	4.1445	1.5467
10	57.2317	2.4576	0.8263	33.7080	0.2642	3.8715	2.6402

Cholesky Ordering: LAGDP LAEXP LALAB LCAP LALN LOPN INF

5. Conclusion

The paper examines the impact of export promotion policies on agricultural output growth in Nigeria using time series data from 1986-2014 employing the ARDL co-integration, impulse response functions, and variance decomposition techniques. The paper generates a composite index of export promotion scheme index for Nigeria, taking into consideration the essential dimensions of the export promotion policies. The empirical findings show that export promotion schemes, particularly ACGSF, AEXP, and AMACH have a significant positive impact on agricultural output growth in Nigeria. Labour and capital inputs have a significant positive impact on agricultural output growth both in the long and short run. Openness has a positive impact on agricultural output growth in the long-run but negative in the short-run. The results show that inflation is not a significant determinant of agricultural output growth.

Our results have several policy implications. First, the government needs to implement more export promotion schemes to enhance agricultural output growth. In particular, emphasis should be on increased government expenditure (recurrent and capital expenditure) and more credit facilities to the sector. The results show that the use of the exchange rate depreciation to enhance output growth in the agricultural sector should be de-emphasized. Moreover, increased foreign investment in the agricultural sector should be encouraged as it could lead to increased agricultural output growth in the short-run. Also, human capital development and increased government investment in farm equipment are imperative to boost output in the sub-sector. The development of the rural areas through the provision of necessary infrastructural facilities such as rural roads, schools, health centres, and water would be required to attract young school leavers to the farm. Also, the land tenure system in Nigerian should be repealed to enable easy access to land by farmers who will make productive use of it. The government needs to address the high exchange rate depreciation and volatility that often accompany the deregulation of the local currency. In sum, government export promotion schemes that lead to increased labour and capital in the agricultural sector will improve agricultural output growth in Nigeria.

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