IOSR Journal of Business and Management (IOSR-JBM)
e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 25, Issue 2. Ser. II (February. 2023), PP 01-10
www.iosrjournals.org

Empirical Investigation of Supply Response of Non-Oil Export Commodities: Evidence from Nigeria, 1986-2020.

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Abstract
In view of the growing wave of liberalization and the country's increasing degree of openness, this study empirically examined the supply response of non-oil export commodities to non-price incentives in Nigeria for the period 1986-2020. The ARDL Bounds testing method to co-integration was chosen to ascertain the influence and the long-run relationship between the dependent and independent variables. Findings from the ARDL analysis revealed that there exists no long-run relationship among the variables over the period under study. The short-run regression result revealed that credit to the private sector, index of electricity consumed, trade openness and real effective exchange rate exerted a positive and significant influence on the export supply of the non-oil commodities. However, the capacity utilization of all enterprises in the country and inflation rate had an insignificant influence on the export supply of the non-oil commodities. The outcome of this analysis has immense policy implications on the strategies being adopted by Nigeria government towards increasing the country's non-oil export supply. Therefore, short-run policies by the government to stimulate non-oil commodity production and exports should attach significance consideration to non-price incentives for the betterment of the Nigerian economy at the long-run.

Keywords: *Supply Response, Non-oil commodities, Exports, ARDL, Nigeria.*

Date of Submission: 23-01-2023 Date of Acceptance: 06-02-2023

I. Introduction

For any nation's economy to grow and develop, it is imperative that, the country improves its export sectors as export is an engine of growth. Export expansion is one of the main determinants of growth. The export-led growth hypothesis (ELGH) holds that the overall growth of countries can be generated not only by increasing the amount of labour and capital within the economy, but also by expanding exports (Medina-Smith, 2001). Therefore, export play an important role in the economy as it creates an avenue for foreign capital to flow into a country. This increases the earnings of the country thereby creating an avenue for growth by raising the national income of the country. It enhances employment generation through the development of export-orientated industries and attracts foreign direct investments from broad. Furthermore, export is capable of raising the competitive edge of firms, boosting its financial positions, increasing its resource utilization levels and raising the standards of technology utilized by firms.

Ajie, Uzomba and Chukwu (2013) described export as the bedrock of any economic growth when it is meaningfully centered on non-oil export commodities. Non-oil exports are the goods and services which are produced within the country in the agricultural, mining, quarry, industrial and services sectors that are sent outside the country in order to generate revenue for the growth of the economy excluding oil product.

In the early 1960s, the non-oil sector mainly agriculture was the mainstay of the Nigerian economy, providing employment to about 75% of the country's labour force, accounting for over 42% of export earnings and 80% of total government revenue. But the discovery of crude oil in commercial quantity in 1956 at Oloibiri in Bayelsa State shifted the attention from non-oil export to a "petroleum mono-cultural economy". However, by the end of the 1970s, the petroleum sector had taken over dominance of the economy, accounting for more than 90% of export earnings and 80% of government revenue. Apparently, after Nigeria shifted its focus from non-oil export to oil export as a major source of foreign exchange earnings, her economic performance has generally been poor. According to a report from World Bank 2019, a review of growth rate of Nigeria economy in two decades showed that between 2000 and 2014, Nigeria's gross domestic product (GDP) grew at an average rate of 7% per year. It dropped to 2.7% in 2015 and further contracted by -1.6% in 2016. The above scenario was as a result of the oil price collapse which began in mid 2014, combined with significant fall in local production, resulting from pipeline and oil export terminals vandalism in the Niger Delta region, which impacted negatively on Nigeria's foreign exchange supply and finances, hence, triggered recession. Growth

averaged 1.9% in 2018 and remained stable at 2% in the first half of 2019. In 2020, the economy again contracted by -3.0% and had remained at 1.5% in 2021 (World Bank, 2021).

This heavy reliance on crude oil is disturbing because, in the Prebish-Singer thesis, Prebisch (1950) and Singer (1950) argued that any country that concentrates on exports of primary products will experience income volatility, decreasing growth rate and deteriorating terms of trade. The above explanation is true for Nigerian economy as it manifested in the inability of the country to manage her economy as a result of fall in global price of oil in the mid 1980s as well as the COVID-19 outbreak in China hitting the global economy and pushing oil prices lower than Nigeria's budgetary benchmark of $57 per barrel. This structural distortion has in no small means contributed immensely to the shaking of the Nigerian economy as the country has been grappling with severe deterioration in her fiscal positions.

In a bid to diversify the economic base of the country away from oil, Nigerian government, under different administrations introduced new trade policies and regularly reviewed the existing ones with a view to earning higher foreign exchange from the global market and improving the performance and growth of the non-oil sectors as well as its contribution to total exports and economic growth. Immediately after independence, Nigeria adopted the Import Substitution Industrialization (ISI) strategy. During the period (1960-1985), the country adopted discriminatory tariff structure and harse exchange control measures which was informed by the import substitution trade objective of protecting those local industries that produced import substitute commodities against foreign competition. The introduction of the Structural Adjustment Programme (SAP) in 1986 by the then president Ibrahim Babangida marked the beginning of foreign trade liberalization, deregulation of the foreign exchange market, the abolition of import licensing and the introduction of foreign currency Domiciliary Account Scheme (Sanni, 2006).

In addition, Gen. Sanni Abacha during his regime (1993-1998) enabled guided deregulation of major sectors of the economy. The ex-president, Olusegun Obasanjo (1999-2007) through the National Economic and Empowerment Development Strategy (NEEDS) which transcended to the states and local governments continued the privatization, deregulation and liberalization exercise so as to enhance competitiveness among domestic industries with a view of encouraging local value added, diversifying the economy and boosting non-oil export among other things. The Goodluck Jonathan's administration (2009-2015) through his transformation agenda introduced the Vision 20:2020, a long-term strategy spanning 2009-2020 with a view for promoting the economic growth of Nigeria and lunching the country unto a path of sustained and rapid socio-economic development. Furthermore, in 2016, the Central Bank of Nigeria under the leadership of President Mohammadu Buhari launched the "Anchored Borrowers Programme" (ABP) which was aimed at fast-tracking access of rural famers to finance productivity. It facilitated a method where loans were given to farmers for improved agricultural produces, and encouraged mechanised farming to large production. Also, the government's Economic Recovery and Growth Plan (ERGP), launched aftermath of the 2016 recession, was anchored on aggressive growth from 2017-2020 in a bid to turn the economic slump around.

Indeed, diversification of the economy including its exports which is the core of Nigeria's Vision 2030 targets to raise non-oil export from 23.79% to 50% share of total export. However, achieving this will necessitate a better understanding of the response of producers of non-oil commodities to economic incentives. Put differently, the fundamental issue is how to increase export supply of non-oil commodities. Mesike, Okoh and Inoni (2010 cited in Ebi and Ape 2014) affirm that the overall success of any strategy to increase the volume of non-oil exports will depend among other things on the knowledge of what factors constraint export growth and the responsiveness of the exporters to changes in price and non-price variables. Economic theory suggests that non-price variables, such as manufacturing capacity utilization rate, credit to private sector, degree of openness to trade, index of electricity consumption, real effective exchange rate and inflation rate influences export supply of non-oil commodities (Onwuemeka, 2020). Therefore, a better understanding of these key variables affecting non-oil export performance and the direction and magnitude to elasticities is requisite in formulating a sound export policy strategy to place the nation on a path of sustainable growth and development.

Despite interest in the driving force of export however, limited research exist on the responsiveness of producers of non-oil commodities to change in non-price variables in Nigeria (Antai, 2006; Usman, 2010; Mesike *et al.*, 2010; Ebi and Ape, 2014; Samson and Abdulwahab, 2014 and Obayelu and Ebute, 2016). However, most of the studies reviewed concentrated on agricultural commodities response to price variables. Besides, an examination of the existing studies revealed that no recent study has yet been done regarding non-oil export supplies responses to non-price variables in Nigeria, hence, the need for further research in this regard, with the view to enriching the information base for policy formulation aimed at enhancing commodity production, exports as well as satisfying domestic demand.

The study is organized as follows: Section 2 concentrates on literature review and theoretical framework. Section 3 describes the methodology. Section 4 dwells on the presentation of data, analysis and discussion while section 5 will focus on conclusion and policy recommendations.

II. Literature Review

2.1. Empirical Literature

In recent times, the literature on the supply response of non-oil export commodities to change in non-price incentives has occupied a central position in development economics. In addition to providing useful insights into the effect of government policies on the supply responsiveness of producers, the analysis of supply response elasticities helps to ascertain non-oil sector's contribution to the economy. For instance, using the Granger Causality and Ordinary Least Square estimation techniques, Antai (2006) sought to ascertain the factors that influence the non-oil exports growth in Nigeria using annual time series data spanning from 1970-2004. The granger causality result revealed that bi-directional causality does not exist between non-oil exports and economic growth. The results also showed that foreign income, exchange rate, expenditure on agriculture and weather were the major determinants of non-oil exports growth in Nigeria. Also, Usman (2010) investigated the determinants of non-oil exports and economic growth in Nigeria from 1989-2008. Employing the technique of multi-linear regression for the analysis, the result confirmed that Nigeria's non-oil exports significantly contributes to economic growth in Nigeria over the period under study. The study recommends that measures to improve and increase the earnings of the country's non-oil exports are pertinent in order to achieve sustainable development.

Mesike *et al.* (2010) utilized the Vector Error Correction Model (VECM) to investigate the supply response of rubber farmers to prices and other factors in Nigeria for 39 years from 1970-2008. Using annual time series data sourced from CBN Annual Report and Statement of Account (2008) and National Bureau of Statistics (various issues), the empirical results revealed that producer prices and the structural breaks significantly affect the supply of rubber. The result also showed that the average estimated values over the period of the study are 0.373 and 0.204 respectively for short and long-run price elasticities. They recommend that in understanding farmer's responses to prices, efforts aimed at promoting sustainable marketing outlets and promoting high value and high quality products for exports is important.

Similarly, employing the Vector Error Correction Modelling technique over the period 1970 to 2010, Ebi and Ape (2014) investigated the supply response of selected agricultural exports commodities (cotton seed, cocoa, rubber, palm oil, groundnut, soybeans and benniseed) in Nigeria, using annual time series data sourced from CBN Statistical Bulletin, National Bureau of Statistics, Federal Ministry of Agriculture year book and International Financial Statistics. The study highlighted five key indicators that play vital role in Nigeria's agricultural export commodities, specifically: the empirical results showed that the response of supply to changes in relative price was positive and significant for only five commodities; output growth and credit to agriculture were also positive and significant on the export supply of the commodities; change in road network and exchange rate were positive and significant for three and four commodities respectively; rainfall significantly and positively affect perennial crops (cocoa, rubber and palm oil). More so, while the short-run price and non-price elasticities ranges between 0.01 to 0.77 that is inelastic, short and long-run export supply responses lies from (0.01 to 0.77) and (0.22 to 28.09) respectively. The study recommends that agro-climate conditions and cropping pattern of the commodities should be considered when formulating policies to stimulate commodity production and exports.

In another similar study, Samson and Abdulwahab (2014) using Autoregressive and Distributed Lag (ARDL) model technique, examined the determinants of non-oil export and economic growth in Nigeria for 43 years from 1970-2012. Using secondary data sourced from CBN statistical bulletin and World Bank Database, the study used Real Gross Domestic Product (as proxy for economic growth) as the dependent variable and non-oil export value, consumer price index, real interest rate and exchange rate as independent variables. The ARDL result reveals a positive and significant effect of non-oil exports value, consumer price index and exchange rate on economic growth both in the long and short-run. The result also showed that real interest rate has a negative and insignificant effect on economic growth in the long-run. They recommend that policies aimed at encouraging the expansion of firms in the non-oil sectors be initiated by the policymakers so as to reduce the unemployment problem of the country.

Likewise, Obayelu and Ebute (2016) employed the Vector Error Correction Model (VECM) technique to assess cassava supply response to price changes in Nigeria over the periods of 1966 to 2010 using data sourced from Food and Agricultural Organization Database (FAOSTAT), CBN Statistical bulletin and National Bureau of Statistics (NBS). Cassava output was expressed as a function of real prices of cassava and land area cultivated. The VECM results revealed that cassava prices and area of land cultivated had a positive influence on cassava supply in the short-run. The long-run results also showed that cassava response to price incentives was insignificant. Their results underscored that price policies are not efficient in the promotion of cassava production in the long-run in the country. It was recommended that government should put in place policies that will stabilize the prices of cassava in the market.

Additionally, employing Vector Error Correction Model (VECM) framework over the period of 1990 to 2014, Ghulam, Ismail and Henry (2016) investigated the supply response of rubber to changes in economic

incentives in Malaysia, using annual time series data sourced from Department of Agriculture and Statistics database. The co-integration result showed that a long-run equilibrium relationship exists between the variables (planted acreage, relative price of rubber and price of fertilizer). The study also highlighted two key indicators that play vital role in Malaysian's supply response of rubber, specifically; the empirical results showed that relative price of rubber and the price of fertilizer significantly influenced rubber supply. The study recommended that appropriate economic incentive structure be designed so as to stimulate out as well as farmer's income.

Equally, Hasanov, Javid and Joutz (2022) employed the Autoregressive and Distributed Lag (ARDL), Vector Equilibrium Correction Model (VECM) and Dynamic Ordinary Least Square (DOLS) to examine the determinants of Saudi Arabian's non-oil export during the period of 1980-2018. The model built for the study specified non-oil exports of Saudi as a function real effective exchange rate, foreign income and gross value added of non-oil sector. The study used data sourced from World Bank, World Development Indicator database and International Financial Statistics. The results of the finding showed foreign income, gross valued added of non-oil sector and real effective exchange rate exerts a positive and significant effect on Saudi non-oil exports in the long-run. However, changes in real effective exchange rate are the paramount determinant of non-oil export in Saudi Arabia. It recommends for measures to be implemented in a coordinated and balanced way so as to achieve non-oil exports.

It is evident from the review of the empirical literature that studies executed in the context of Nigeria are limited with specific reference to supply response of agricultural commodities to price factors. Apart from the price factors, there are also other non-price factors such as manufacturing capacity utilization rate, credit to private sector, degree of openness to trade, index of electricity consumption, real effective exchange rate and inflation rate that can influence non-oil export supplies which are not yet explored. Using the aforementioned variables to address a short-run gap in policy framework might yield a good result. This study concurs that examination of the export supplies responses of non-oil commodities to these non-price variables in Nigeria is necessary in order to detect optimal ones that can be useful in policy formulation. On the other hand, it was observed that no recent study has been done regarding the topic under study. Nonetheless, the study of Obayelu and Ebute, (2016) though published in 2016, was for the period of 1966 to 2010, about twelve years ago. Economic events have a way of changing economic models. Hence, it is pertinent to update a study of sensitivity of export supply response of Nigeria non-oil commodity in the face of changing economic phenomena. Therefore, in recognition of the period gap created by the earlier study, this study intends to fill this gap by looking at the variables from 1986 to 2020.

2.2. Theoretical Framework

The theoretical foundations for empirical studies of the supply response of non-oil export commodities ostensibly lie in the conventional trade theories based on the Heckscher-Ohlin theory, new trade theories and endogenous growth theories. But this study is anchored on the Heckscher-Ohlin theory as it focuses on the differences in relative factor endowments and factor prices between nations as the most determinants of export. According to Heckscher-Ohlin theory, factor endowments determine comparative advantages in production and export. This theory supplements the comparative cost theory of Ricardo by offering sufficiently satisfactory explanation of what causes differences in comparative cost.

Ricardo explained differences in comparative costs as arising from differences in skills and efficiency of labour alone whereas Ohlin pointed out more significant factors, namely differences in factor endowments of the nations and differences in factor proportions required for the production of different commodities. Simply put, only labour and capital are considered as the most important factors. Heckscher-Ohlin maintained that countries are differently endowed with productive factors required for production of goods. Some countries posses relatively more labour and some relatively more capital. Thus, the factor which is relatively abundant in a country will tend to have a lower price and the factor which is relatively scarce will tend to have a higher price. Therefore, a country should specialize in the production and export of those commodities that use intensively its relatively abundant factors. Hence, for a typical developing country like Nigeria with a relatively plenty of labour and a shortage of capital, this would imply export in labour-intensive goods such as sesame, cashew, cocoa e.t.c. On the other hand, industrialized countries would export capital-intensive goods.

However, to reach this conclusion the Heckscher-Ohlin model made very strong assumptions such as perfect competition of both factor and product markets, homogeneity of labour and capital in the two countries and costless availability of technology.

Conclusively, the basis of trade is production. You can only export what you have. Therefore, the less developed countries like Nigeria that are labour abundant should specialize in the production of primary products especially agricultural products because the labour requirement of agriculture is high. On the other hand, the less developed countries should import capital–intensive product mostly the manufactured goods from developed countries that are capital – intensive. Heckscher – Ohlin (1919) observed that trade enables countries

to secure capital and consumption of goods from other parts of the world. In this way, trade stimulates growth and serves as engine of growth.

III. Methodology

3.1. Data Sources

Annual time series data covering 1986 to 2020 were used to estimate the model. For this study, data will be collected from Central Bank of Nigeria (CBN) statistical bulletin and World Development Indicators (WDI) database. The data needs were identified on the basis of the objective of the study and the developments in the Nigerian economy necessitated the choice of the period. The variable name, definition and/or proxy, source and expected sign are shown in Table 1.

Variable Name	Definition and/or proxy	Source	Apriori Expectation
Dependent Variable			
Non-Oil Export	Non-oil share of total exports (NOX ₦′ billion) in logarithm form.	CBN Statistical Bulletin, 2014 and 2020 Editions.	Dependent Variable
Dependent Variables			
Manufacturing Capacity Ulitilization Rate	Manufacturing Capacity Ulitilization (MCU) (%) in logarithm form.	CBN Statistical Bulletin, 2015.	+
Credit to Private Sector	Credit to Private Sector (CPS) Measured by the Domestic Credit Provided by the Financial Sector (% of GDP)	WB, World Development Indicator, 2020	+
Degree of Openness to Trade	Ratio of the sum of exports and imports to GDP ($X + M/GDP$)	WB, World Development Indicator, 2020	+
Index of Electricity Consumption	Index of Electricity Consumption (IEC) (kwh per capita)	WB, World Development Indicator, 2020	+
Real Effective Exchange Rate	Real Effective Exchange Rate (REER) (2010 = 100) in logarithm form	WB, World Development Indicator, 2020	+
Inflation Rate	Annual Inflation Rate as measured by consumer price index (INFL) (%)	WB, World Development Indicator, 2020	-

Source: Author's Compilation (2022).

3.2. Model Specification

The model is built around the conventional trade theory relating to international differences in price structures between nations as the most determinants of export. Following Xiaohui and Shu (2001) with some modification, the export supply function for this study is based on Heckscher-Ohlin framework which posits that the growth of a country's export commodities is a function of: relative factor endowments of the nations (L) and factor proportions required for the production of different commodities (K). Simply, the hypothesized functional relationship of the Heckscher-Ohlin's export supply function is:

$$Q = f(L, K) \tag{1}$$

Simply, the above export supply function implies that production and export are influenced by the use of a nation's relatively abundant factor (labour or capital). Based on the reviewed literature, we modified equation 1 by incorporating six relevant policy variables (manufacturing capacity utilization, credit to private sector, degree of openness to trade, index of electricity consumption, real effective exchange rate and inflation rate) that theoretically influence non-oil exports supply in Nigeria. Furthermore, there is an increasing consensus in the literature on international trade that no single factor can neatly account for the trade performance in developing countries. We therefore develop our estimating equation for the export supply function of Nigeria as follows:

NOX =f(MCU, CPS, TOPEN, IEC, REER, INFL) (2)

Equation (2) can be put in econometric form as:

$$NOX_t = b_0 + b_1 MCU_t + b_2 CPS_t + b_3 TOPEN_t + b_4 IEC_t + b_5 REER_t + b_6 INFL_t + U_t \tag{3}$$

However, because of highly skewed values, the variables NOX, MCU and REER were logged. The logarithmic transformation was meant to transform them into a dataset that is normalized to avoid the problem of heteroscedasticity. However, the rest of the regressors (CPS, TOPEN, IEC and INFL) were unlogged since they did not depict highly skewed values. Therefore, taking the natural log of some variables in equation (3), we have:

$$Log(NOX_t) = b_0 + b_1 Log(MCU_t) + b_2 CPS_t + b_3 TOPEN_t + b_4 IEC_t + b_5 Log(REER_t) + b_6 INFL_t + U_t \tag{4}$$

Where:

NOX_t = Non-oil exports at time t
MCU_t = Manufacturing capacity utilization at time t
CPS_t = Credit to private sector at time t
$TOPEN_t$ = Trade openness at time t
IEC_t = Index of electricity consumption at time t
$REER_t$ = Real effective exchange rate at time t
$INFL_t$ = Inflation rate at time t
Log, as attached to a variable, indicates its logarithm value
b_0= Intercept or constant coefficient
$b_1, b_2, b_3, b_4, b_5, b_6$ = the parameters or coefficients to be estimated
U_t = Error term or stochastic variable accounting for other variables affecting the dependent variables.

As postulated by economic theories, the regression coefficients of the variables are expected to exhibit the signs stated in Table (1) above. The frequency of citations of these variables in previous theoretical and applied economics research informed their selection in this study. The time series properties of the data were checked for stationarity through the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests before estimating the growth equation. Further diagnostic and stability tests were employed to check the goodness of fit and model adequacy of our specification. These tests provide more information that complement the standard regression output and are essential in making judgment about the validity of the model. Thereafter, the estimation of the export supply growth equation was done through the Autoregressive Distributed Lag (ARDL) Bounds test to co-integration proposed first by Pesaran and Shin (1999), and developed by Pesaran, Shin and Smith (2001). In practice, ARDL models are least squares regressions using lags of the dependent and independent variables as regressors and they are known to have better small sample properties. The computation of the ARDL statistical procedure was done with version 9 of the E- views econometric software. Restating Equation (4) as an ARDL model in line with the framework of Pesaran *et al.* (2001), we have:

$$\begin{aligned}\Delta\log(NOX_t) &= b_0 + \sum_{i=1}^{n} b_{1,i}\Delta\log(NOX_{t-1}) + \sum_{i=1}^{n} b_{2,i}\Delta\log(MCU_{t-1}) + \sum_{i,1}^{n} b_{3,1}\Delta CPS_{t-1} \\ &+ \sum_{i=1}^{n} b_{4,i}\Delta TOPEN_{t-1} + \sum_{i=1}^{n} b_{5,i}\Delta IEC_{t-1} + \sum_{i=1}^{n} b_{6,i}\Delta\log(REER_{t-1}) + \sum_{i=1}^{n} b_{7,i}\Delta INFL_{t-1} \\ &+ b_8\log(NOX_{t-1}) + b_9\log(MCU_{t-1}) + b_{10}\log(CPS_{t-1}) + b_{11}TOPEN_{t-1} \\ &+ b_{12}IEC_{t-1} + b_{13}\log(REER_{t-1}) + b_{14}INFL_{t-1} + \mu_t\end{aligned} \quad (5)$$

Where: n denotes lag lengths for each of the variables, b_0 signifies the drift, Δ= First difference operator, t = time, t-1 =lag one (previous year), μ_t = disturbance term, $b_1, b_2, b_3, b_4, b_5, b_6, b_7$ = coefficients of the short-run parameters whereas $b_8, b_9, b_{10}, b_{11}, b_{12}, b_{13}, b_{14}$= coefficients of the long-run parameters. Consequently, equation (5) is the foundation equation for estimating the short-run and long-run export supply responses among the variables.

Furthermore, testing for the existence of a level relationship between NOX, MCU, CPS, TOPEN, IEC, REER and INFL would be investigated using the ARDL bounds testing method. We made use of critical value bounds of the F-statistic proposed by Pesaran *et al.* (2001) to ascertain the existence or absence of co-integration among the variables. In conducting the test, we compared the F-statistic with both the upper 1(1) and lower 1(0) critical values at the 5% level. In equation 5, the parameters that would be tested under the null and alternative hypotheses of absence and presence of long-run relationships between non-oil export commodities and its determinants are specified as:

H_0: $b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = 0$ (absence of co-integration among the variables)
Against:
H_A: $b_1 \neq b_2 \neq b_3 \neq b_4 \neq b_5 \neq b_6 \neq 0$ (presence of co-integration among the variables)

The series are co-integrated if the computed F-statistic exceeds the upper critical bound 1(1); and not co-integrated if the computed F-statistic lies below the lower critical bound 1(0). However, if the computed F-statistic falls between the lower and upper critical bound values, the result becomes inconclusive. Nevertheless, if the absence of co-integration was concluded among the variables in the model, only the short-run parameters, depicting the short-run impacts of each variable on non-oil export growth would be evaluated. Based on equation 5, the short-run coefficients can be estimated by constructing an error correction model as depicted in equation 6

$$\Delta \log(NOX_t) = b_0 + \sum_{i=1}^{n} b_{1,i} \Delta \log(NOX_{t-1}) \sum_{i=1}^{n} b_{2,i} \Delta \log(MCU_{t-1}) + \sum_{i=1}^{n} b_{3,i} \Delta \log(CPS_{t-1})$$

$$+ \sum_{i=1}^{n} b_{4,i} \Delta TOPEN_{t-1} + \sum_{i=1}^{n} b_{5,i} \Delta IEC_{t-1} + \sum_{i=1}^{n} b_{6,i} \Delta \log REER_{t-1} + \sum_{i=1}^{n} b_{7,i} \Delta INFL_{t-1} + \Psi ECM_{t-1} + \mu_t (6)$$

Where: $b_1, b_2, b_3, b_4, b_5, b_6, b_7$ are the coefficients of the short-run dynamics of the model's convergence to equilibrium while Ψ is the speed of adjustment to long-run equilibrium following a shock to the system which is anticipated to be negative and significant to verify the existence of co-integration among the variables and ECM_{t-1} is the error correction term which shows how disequilibrium in output can be adjusted in the short-run. Other variables are as defined earlier.

IV. Data Presentation, Analysis And Discussion Of Result

4.1. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root Tests Results on Series

We first present and analyze the results of stationarity test before analyzing our major findings. This test is carried out by relying on the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests. The null hypothesis of no stationarity against the alternative was tested at the 5% critical value. Table 2 below show the results of our findings both at level and at first difference. The results from both the ADF and the PP show that the variables (TOPEN, LREER, INFL) were integrated at the level 1(0), this is because the ADF and PP statistic (in absolute terms) are greater than the Mackinnon critical values at 5% level of significance while LNOX, LMCU, CPS and IEC were integrated at the first difference 1(1).

Table 2. ADF and PP unit root tests results.

Variable	Augmented Dickey-Fuller (ADF)				Philip-Perron (PP)			
	At level	1st Difference	5% critical Value	Order of Integration	At level	1st Difference	5% critical Value	Order of Integration
LNOX	-1.7236	-6.7842**	-2.9511	1(1)	-2.2558	-9.3005**	-2.9511	1(1)
LMCU	-1.8158	-9.2141**	-2.9511	1(1)	-1.5765	-9.2141**	-2.9511	1(1)
CPS	-2.3521	-5.4260**	-2.9540	1(1)	-1.5440	-6.3063**	-2.9511	1(1)
TOPEN	-3.5378**	-	-2.9511	1(0)	-3.5159**	-	-2.9511	1(0)
IEC	-0.8929	-7.1968**	-2.9511	1(1)	-0.7608	-7.2441**	-2.9511	1(1)
LREER	-3.4860*	-	-2.9511	1(0)	-3.6976*	-	-2.9511	1(0)
INFL	-4.5347*	-	-2.6274	1(0)	-2.8560*	-	-2.6143	1(0)

Source: Author's Compilation (2022) using E-Views 9; Note: ** and *denotes statistical significance at the 5% and 10% levels, respectively.

4.2. Co-integration Results from Bounds Test

Table 3. Bounds tests for the existence of co-integration.

Test Statistic	Value	Lag	Significance level	Bound critical values	
				Lower Bound	Upper Bound
F-statistic	1.131046	2		I(0)	I(1)
			1%	3.15	4.43
			5%	2. 45	3.61
			10%	2.12	3.23

Source: Author's Compilation (2021) using E-Views 9. Note: Lower and Upper Bounds critical values for the F-statistic at 5% significance level were taken from Narayan (2005) and Pesaran *et al.* (2001) and for this study, K which is the number of explanatory variables is 6.

The results in table 3 above shows that the computed F-statistic is 1.131046 which is lesser than the upper (3.61) critical value bound at the 5% significance level. Therefore, the null hypothesis of no co-integration between LNOX and the explanatory variables in the model cannot be rejected. The acceptance of the null hypothesis shows that a long-run relationship does not exist among the variables employed in the model. From the result, we can hence estimate only the short-run relationship between export supply response of non-oil commodities and the explanatory variables through the ARDL co-integration method.

4.3. Results of the Short-Run Dynamic Model

Since there is no evidence of co-integrating relationship among the variables employed in the model, we can proceed further to ascertain only the short-run impacts in equation (6) above.

Table 4. Estimated Short-Run relationship Results

Dependent variable: Log(NOX)

Variable	**C**	**Std. Error**	**t-Statistic**	**P-values**
D(LMCU)	0.1262	0.8542	0.1478	0.8836
D(CPS)	0.0429	0.0335	21.2814**	0.0252
D(IEC)	0.1167	0.0093	1.8043*	0.0828
D(T0PEN)	0.0170	0.0088	0.9248*	0.0653
D(LREER)	0.4641	0.2410	1.9255**	0.0652
D(INFL)	-0.0031	0.0053	-0.5751	0.5702
C	-12.0879	10.0486	-1.2029	0.2398

R-square = 0.971329
Adjusted R-square = 0.963610
F-statistic = 125.8352
Prob(F-statistic) = 0.000000

Source: Summary of result compiled by author (2021) using E-Views 9. Note ** and * denotes significance at the 5% and 10% levels, respectively.

Table 4 above shows the results of the ARDL estimate for supply response of non-oil export commodities to changes in non-price variables in the short-run. Change in the log of manufacturing capacity utilization of the current year had a positive influence on the export supply of non-oil commodities as expected. This implies that capacity utilization rate of firms were effective in the short-run promotion of non-oil commodity production in Nigeria. The result suggests that if manufacturing capacity utilization goes up by 1 unit, export supply of non-oil commodities will increase by 0.13%. However, the non-significance of MCU variable indicates the need to address the key challenges in manufacturing sector such as limited access to credit and financial services, poor infrastructure and unreliable power supply which forces businesses to rely on generators, thus, increasing their input costs and reducing their overall competitiveness and profitability. This finding is consistent with the submissions of Samson and Abdulwahab (2014) and Hasanov *et al.* (2022).

Also, change in credit to private sector had a positive and significant influence on the supply of non-oil export commodities in the short-run which is in line with theoretical expectation. This means that the export supply of non-oil commodities would increase by 0.04% should credit to the private sector be increased by 1 unit. This finding aligns with the submissions of Ebi and Ape (2014) and Samson and Abdulwahab (2014). In addition, change in electricity consumption and degree of openness of trade exerted a positive and significant influence on export supply of non-oil commodities in the current year. The result suggests that the index of electricity consumed and trade openness determine non-oil commodity production in Nigeria in the short-run. The results show that a unit increase in electricity consumed and trade openness would yield a rise of 0.12% and 0.02% respectively on export supply of non-oil commodity.

Change in the log of real effective exchange (REER) exerted a positive and significant influence on the supply of non-oil export commodities in the current year. The positive sign attached to the coefficient of REER is explained as depreciation of currency. This means that when real effective exchange rate falls by 1 unit, non-oil commodity supply tend to rise significantly by 0.46%. Theoretically, we expected that exchange rate depreciation would improve exports supply. This result is in line with apriori expectations and also conforms to the findings of Hasanov *et al.* (2022); Ebi and Ape (2014); Samson and Abdulwahab (2014) and Antai (2006)

Finally, change in inflation rate was negative but insignificant in the current year. The result shows that in the short-run, a unit increase in consumer price index (inflation) would yield about 0.003% fall in export supply of non-oil commodities in Nigeria. This finding contravenes that of Samson and Abdulwahab (2014). The coefficient of determination (R^2) value of 0.971329 simply indicates that about 97.1% of the changes in export supply of non-oil commodity are explained by the changes in manufacturing capacity utilization, credit to private sector, index of electricity consumption, trade openness, real effective exchange rate and inflation. The remaining 2.9% of the changes are explained by the error term. We go further by using the LM test to confirm the non-existent of serial correlation in our model.

4.4. Results of Diagnostic Tests for ARDL Model

The results of the diagnostic tests were shown in table 5 below. The normal distribution of the residuals was tested through the Jarque-Bera normality test. The null hypothesis that the error terms follow a normal distribution was not sustained because the probability value of 0.0241 was less than the proposed 5% level of significance. Hence, all the variables were not normally distributed. The result of the ARCH test showed that there was no heteroskadasticity in our model. This is because we accepted the null hypothesis of homoskedasticity. A probability value of 0.4608 showed that the errors were homoskedastic and independent of

the explanatory variables. The probability value of 0.8639 against the Ramsey Regression Equation Specification Error Test (RESET) was greater than the proposed 5% level of significance. Thus, the null hypothesis that the model was correctly specified was sustained. Under the Breusch-Pagan-Godfrey test for serial correlation, the p-value of 0.9130 was more than the chosen 0.05% significance level. Therefore, we accepted the null hypothesis of no serial correlation. Thus, our model does not suffer from serial correlation.

Table 5 Diagnostic Results for ARDL Model

Test	Test Statistic	P-value	Null hypothesis	Decision
Jarque-Bera normality test	7.448242	0.024234	H_o: The error terms are normally distributed.	Can reject H_o
Heteroskedasticity Test: ARCH	0.557757	0.4608	H_o: Homoskedasticity	Cannot reject H_o
Ramsey RESET test	0.029993	0.8639	H_o: Correctly specified	Cannot reject H_o
Breusch-Godfrey LM test	0.091357	0.9130	H_o: No serial correlation	Cannot reject H_o

V. Conclusion and Recommendations

This study has tried to examine the supply response of non-oil export commodities to non-price incentives in Nigeria using data obtained from World Bank, World Development Indicator and CBN statistical bulletin (2020) for the period of 1986 to 2020. Output growth as induced by manufacturing capacity utilization, credit to the private sector, index of electricity consumed, trade openness, real effective exchange rate and inflation rate in Nigeria has been estimated using the ARDL Bounds testing approach to cointegration. The empirical result reveals that there exists no long-run relationship among the variables employed in the model. The result also shows that export supply response of non-oil commodities in Nigeria largely depended on manufacturing capacity utilization, credit to the private sector, index of electricity consumed, trade openness and real effective exchange rate in the short-run. This is drawn from their positive and significant coefficients which suggest that an increase in the aforementioned variables will lead to an increase in non-oil export supply. Therefore, if government should solidify its policies on these variables, it will boost non-oil output and improve its global competitiveness, thereby boosting its export as well as contributions to economic growth.

However, further findings revealed that inflation rate do not have positive and significant influence on non-oil commodity supply of Nigeria in the short-run as reviewed in the work. Based on the obtained result of our analysis, it is recommended that short-run policies by the government to stimulate non-oil commodity production and exports should attach significance consideration to non-price incentives for the betterment of the Nigerian economy at the long-run. The government should channel efforts towards design and implementation of policies and programmes to expand and enhance the capacity of the financial system to extend credits at lower cost to export-oriented producers such as smallholder farmers and Small and Medium Scale Enterprise (SMEs) that can innovate and respond to global competitiveness. It is also imperative to create an enabling environment, notably investing in modern infrastructure and reducing the menace of insecurity so as to promote domestic investment in the non-oil sector, attract foreign investment with its attendant benefits such as technical know-how, minimize production costs and the incidence of capital flight.

LIMITATIONS OF THE STUDY

In the course of carrying out this research, we encountered some difficulties that limited the extent to which we would have handled it. Data on manufacturing capacity utilization was extracted from CBN database and was only available from 1986 up to 2015 which nearly would have resulted to small sample bias during analysis. Hence, we interpolated the data up to 2020.

References

[1]. Ajie, H. A., Uzomba, P. C. & Cukwu, S. N. (2013). Economic growth through the lens of non-oil export in Nigeria. Journal of Poverty, Investment and Development, Vol. 1.
[2]. Antai, A. S. (2006). An empirical investigation of the determinats of non-oil exports in Nigeria 1970-2004. Unpublished Ph.D thesis, Department of Economics, Unversity of Calabar, Nigeria.
[3]. Ebi, B. O. & Ape, A. S. (2014). Supple response of selected agricultural export commodities in Nigeria. Journal of Economics and Sustainable Development, 5(5), 47-57.
[4]. Ghulam, M., Ismail, A. L. & Henry, E. (2016). An empirical analysis of supply response of rubber in Malaysia. American Journal of Agriculture and Biological Sciences, 12(4), 148-156.
[5]. Hasanov, E. J., Javid, M., & Joutz, F. L. (2022). Saudi non-oil exports before and after COVID-19: Historical Impacts of Determinants and Scenario Analysis. Sustainability 2022, 14, 1-38. https://doi.org/10.3390/su14042379
[6]. Medina-Smith, E. J. (2001). Is the Export led growth hypothesis valid for the developing countries? A Case Study for Costa Rica, Policy Issues in International Trade and Commodities, Study Series Number 7, United Nations Conference on Trade and Development.
[7]. Mesike, C. S., Okoh, R. N. & Inoni, O. E (2010). Supply response of rubber farmers in Nigeria. An Application of Vector Error Correction Model (VECM). Medwell Journals of Agriculture, 4(3), 146-150.

[8]. Obayelu, O. A. & Ebute, S. (2016). Assessment of cassava supply response in Nigeria using vector error correction model (VECM). Journal of Agriculture, 13(1-2), 79-86.

[9]. Onwuemeka, I. O. (2020). The impact of non-oil exports on Nigeria's economic development. Global Scientific Journals, 8(8), 1602-1611. Retrieved 5th June, 2022 from www.globalscientificjournal.com

[10]. Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed modeling approach to co-integration analysis. Econometrics and economic theory in the 20th century: The Ragnar Frisch Centennial Symposium: Cambridge University Press.

[11]. Pesaran, M. H., Shin, Y., & Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289-326.

[12]. Presich, R. (1950). The economic development of Latin America and its principal problems. New York: United Nation.

[13]. Sanni, G. K. (2006). Nigeria's foreign trade and the new perspectives for its enhancement. Central Bank of Nigeria Bullion.

[14]. Samson, A. A. & Abdulwahab, S. (2014). Determinants of non-oil export and economic growth in Nigeria: An Application of the Bound Test Approach. Journal for the Advancement of Developing Economies, 3(1), 60-79.

[15]. Singer, H. W. (1950). The distributions of grains between investing and borrowing countries. The Amerian Economic Review, 40(2), 473-485.

[16]. Usman, O. A. (2010). Non-oil export determinants and economic growth in Nigeria (1988-2008). European Journal of Business and Management, 3(3), 236-257.

[17]. Xiaohui, L. & Shu, C. (2001). Determinants of export performance and the effect of the WTO entry on labour intensive exports: Evidence from China's manufacturing industry. UK, The Unversity of Luton, Park Square, Luton Beds. Retrieved 5th June, 2022 from www.cityu.edu.hk/ef/conference/chinaWTO/xiaohui.doc

Onwuemeka Irene Olanma, et. al. "Empirical Investigation of Supply Response of Non-Oil Export Commodities: Evidence from Nigeria, 1986-2020." *IOSR Journal of Business and Management (IOSR-JBM)*, 25(2), 2023, pp. 01-10.