AN ECONOMETRIC ANALYSIS OF NON-OIL EXPORTS AND ECONOMIC GROWTH IN NIGERIA

Onyinye O. Mgbemena,
Economics Department,
Michael Okpara University of Agriculture Umedike,
Umuahaia,
Nigeria

Kalu Chris U,
Economics Department,
Nnamdi Azikiwe University, Awka,
Nigeria

Abstract. *This study examines the linkage between economic growth and non-oil export dynamics in Nigeria using time series data over the period 1970-2014 and employing a simultaneous equation approach. The data sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin of various issues were analyzed using the co-integration and error-correction model techniques. The estimation of the model takes into consideration the issue of spurious correlation (arising from unit root in macro variables) as well as the problem of simultaneity bias. It was found out that an increase in the level of per capita income resulting from efficient labour force rate implies increase in productivity, leading to increase and improvement of industrial output. Among the policy recommendations is the need for the Nigerian government to formulate and implement policies that will further develop and boost investment in the industrial sector.*

Key words: *Non-oil export, economic growth, simultaneous equation.*

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1. Introduction

The role of exports in economics assumes importance against the backdrop of success achieved by the Asian Tigers (Cline, 1982, Kruger, 1990 and Rouassi et al, 2004). A common debate of recent has been on the effectiveness of the exports sector on promoting growth and sustainable development. Several cross-country as well as time series data have revealed that openness to trade promotes economic growth, making these studies to be in agreement with the export-led growth hypothesis. Export-led growth hypothesis postulates that expansion and promotion of the export sector of an economy is an important determinant of economic growth through dynamic spillover effect on the rest of the economy. Ordinarily, there are several ways in which exports can potentially cause an increase in productivity. An expansion in exports may promote specialization in the production of exports product, which may in turn boost productivity level and may cause the general level of skills to rise in the exports sector, leading to resource reallocation from the non-trade sector to the productive export sector (Raheem and Busari, 2013). Author channel through which export leads to growth is by export expansion which helps to concentrate investment in these sectors, which in turn increase the overall total productivity of the economy. Moreover, export expansion enhances employment by the government. Again, continuous inflow of foreign earnings from export could lead to economic growth and development in addition to improving the balance of payments position of the economy (Usman and Salami, 2008).

Prior to the discovery of oil in Nigeria, Agriculture had been the mainstay of the economy. The commodities exported then include: Cocoa, Rubber, and Palm oil to mention but few. Meanwhile export proceeds from agriculture accounted for over 70 percent of foreign earnings. The scenario changed completely following the discovery oil in Nigeria and since then, little or no attention has been giving to the agricultural sector. As such, Nigeria became an oil enclave, depending so much on oil export that is internationally determined. Meanwhile, the volatility of the oil price at the international market poses problem for oil dependent economies, Nigeria inclusive. For instance, the

1973-74, 1979-80 and 2003 – 2008 periods were associated with price increases while the oil market collapse of 1986 is an episode of price decrease. During the first oil price shock in Nigeria (1973-74), the value of Nigeria's export measured in US dollars rose by about 600.0 percent with the terms of trade rising from 18.9 in 1972 to 65.3 by 1974. The Nigerian government policy response to the oil price shocks has been to improve the fortune of agriculture and other non-oil sector. General policies have been employed by the government. These policies include the adoption of the structural adjustment programme (SAP), export promotion and import substitution strategies, the seven-point Agenda, Vision 20:2020 and currently, the Transformation Agenda. However, the result of these policies did not improve the prospects of the agricultural sector and non-oil sector but rather compounded the problems. The continued unimpressive performance of the non-oil sector is a serious concern to the Nigeria stakeholders. Therefore, the focus of this study is on the non-oil export. Previous studies on the non-oil export and economic growth nexus adopted the single equation approach in their analysis which may not capture the dynamics effectively. Therefore, an important contribution of this study is the use of a simultaneous equal model so as to solve the problem of endogen city that export growth nexus might pose and to extend the study period to 2012 as must studies ended in 2010, thereby bridging the knowledge gap.

The objective of the study is to investigate the relationship between the non-oil export and economic growth in Nigeria. Specifically, the study seeks to find the channels through which exports expansion can affect economic growth. The rest of the study is organized as follows: section 2 provides a background of the study, while section 3 discuses the relevant literature. The model employed in the study is contained in section 4. In section 5, an empirical estimation of the equations together with the model evaluation is presented and analyzed section 6 concludes.

2. Background of the Study

Nigeria is a major exporter of oil to the international market and also an important member of Oil Producing and Exporting Countries (OPEC). However, Nigeria's continuous reliance on oil income has made Nigeria vulnerable to the Dutch Disease syndrome i.e. a situation where the boom sector is the oil sector against the non-oil sector. As indicated from Table 1 below, agricultural and industrial sectors are the highest contributors to GDP. This is followed by service, manufacturing and building and construction respectively. Foreign direct investment in the communication sub-sector of service sector justifies the enormous increase in the service sector between 2000 and 2010.

Table 1

Contribution of non-oil Sector to GDP (N' MILLION)

	1970-1979	1980-1989	1990-1999	2000-2012	Total
Agriculture	52,983.20	303,488.16	5,508,201.85	58,585,865.09	64.450,540.30
Manufacturing	14,578.42	69,275.74	837,683.80	4,498,816.07	5,430,354.03
Service	30,020.73	124,110.19	1,503,390.04	19,416,092.00	21,073,612.96
Building and construction	17,138.08	25,042.62	134,712.18	2,124,698.01	2,301,590.89
Wholesale and Retail	39,31.42	126,208.27	2,352,630.53	24,257,203.31	26.775,433.53
Industries	48,625.47	208,705.77	5,688,04.15	58,983,059.03	64,928,431.42

Source: Computation from CBN statistical Bulletin, 2013

3. Literature Review/Theoretical Framework

A first theoretical explanation of the relationship between export and economic growth is provided by Kruguan (1987). He explained and argues that export expansion leads to an increase in the demand for a country's output, which in turn increases real output. Export expansion enables countries to harness foreign exchange that could be used to import inputs needed domestically and to finance domestic investment necessary for output GPD. Moreover, export expansion gives access to

new technologies and new management practices that are essential for economic growth in a very competitive world. The theoretical explanation is based on the export-led growth hypothesis. However, there is no general agreement on the export-led growth hypothesis. Indeed, some scholars including Lancaster (1980) and Krugman (1987) consider that GDP facilitates the expansion of export in a given country. In addition, GDP leads to enhancement of skills and technology, which facilitates export. In the same vein, Helleiner (1986) argues that a minimum level of development is required before the benefits of export expansion can be realized. If development is defined as a sustained economic growth over a long period of , then it is clear that, it is economic growth that leads to export expansion.

The main arguments of scholars who advocated the export-led hypothesis can be summarized in the diagram below.

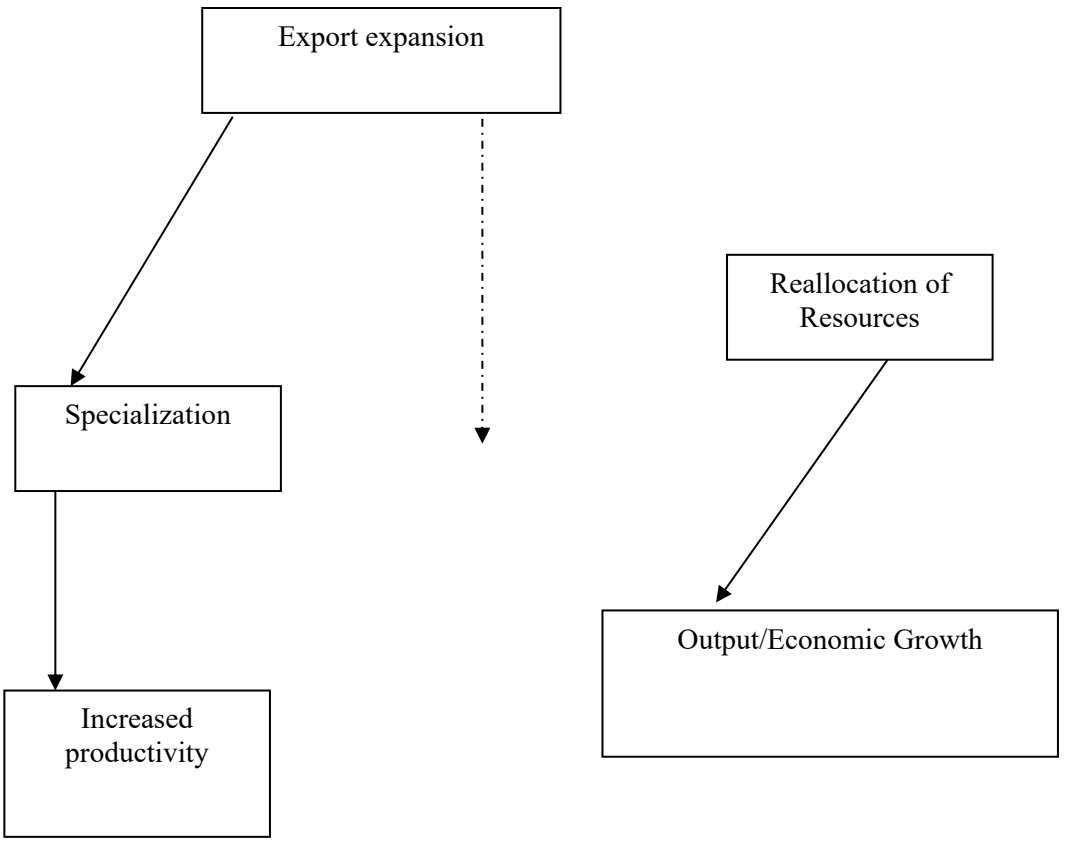

Figure 1. Export-led Growth Hypothesis

Empirical studies on the relationship between non-oil export and economic growth abounds in the literature. However, few of these empirical works will be highlighted. For instance, Aljarrah (2008) explored the relationship between economic developments and non – oil exports performance in Saudi-Arabia, using the three-stage squares test. The result supports the evidence of positive effect of non-oil exports on economic growth in Saudi Arabia. The study also reveals that the growth of non-oil exports has positive impact on investment and productivity in the country. Rahhem and Busari (2013) examined the linkage between economic growth and non-oil export in Nigeria employing both simultaneous and single equation models. They found out that the industrial sector performance and population growth are good determinant of economic growth in Nigeria.
In summary, findings from these studies in both Saudi Arabia and Nigeria validates the export-led growth hypothesis, which also confirming Verdoorn's Law which states that productivity change resulting from specialization in the production of goods due to export, via the enhancement of skills in the sector and reallocation of resources from inefficient towards more efficient sectors, may lead

to economic growth (Giles and Cara, 1999).

4. Model Specification and Analysis of Data

Although there are different methods of analyzing the relationship between non-oil export and economic growth, the model for this study is adapted though with modification from Aljarah (2008). Aljarah model is specified as follows:

$$PCG = F (FCR, NOXG, IDR, POPG) \quad (1)$$

where λ

PCG = growth of real per capital income, FCR = fixed capital formation as a percentage to GDP, NOXG = growth of the percentage of non-oil exports to GDP, IDR = industrial production as a percentage to GDP and POPG = population growth.

The model of our study adapting Aljarah(2008) though with modification and using a simultaneous approach is specified as follows:

$LnRGDP = \alpha_0 + \alpha_1 FCR + \alpha_2 LBR + \alpha_3 EER + \alpha_4 NOXR + \alpha_5 IDR + \alpha_6 AGR + \alpha_7 SER + \alpha_8 POPG + e_1.$

$\alpha_1 \ldots\ldots \alpha_8 > 0$

$LnFCR = b_0 + b_1{}^{L}GDP + b_2{}^{Ln}NORX + b_3 LnCIR + e_2$

$\beta_1 \ldots\ldots\ldots\ldots \beta_3 > 0$

$LnLBR = \gamma_0 + \gamma_1 InPoPG + \gamma_2 InNOXR + \gamma_3 InLBR_{t-1} + e_3$

$\gamma_1, \gamma_2 \ldots\ldots\ldots \gamma_3 > 0$

$Ln\ EER = \lambda 0 + \lambda_1 InNOXR + \lambda_2 InINR + \lambda_3 InLBR_{t-1} + e_4$

$\lambda_1, \lambda_3 > 0, \lambda_2 < 0$

$Ln\ NOXR = \theta_0 + \theta_1 InINR + \theta_2 InIDR + \theta_3 InAGR + \theta_4 InSER + \theta_5 InEER + e_5$

$\theta_1 < 0, \theta_2, \theta_3, \theta_4 > 0$

The variables in the above model can be defined as RGDP= Real gross domestic product, LBR = labour rate, EER = effective exchange rate, NOXR = Non-oil export growth rate, IDR = industrial production, AGR = Agricultural production, SER = Service output, POPG = population growth rates, CIR = capital inflow, RINR = real interest rate and FCR = fixed capital ration proxy for investment. The presumptive signs of the variables in the above equations are presented below each of the equations.

4.1 Sources Of Data/Analytical Techniques

This study used essentially secondary data for the analysis. The data on the various variables were obtained from the publications of the Central Bank of Nigeria (CBN): Statistical Bulletin, Annual Reports and Statement of Accounts and National Bureau of Statistics of various issues.

The variables are in logarithmic form to denote elasticity and the data scope is 1970 – 2013. The time series property of the variables used in the models were investigated before the parsimonious error correction model test. The analysis of the data will take the following order:

Stationarity /Unit Root Test

Before exploring the existence of a long-run relationship between non-oil exports and economic growth nexus in Nigeria, the Johansen (1991, 1995) co-integration test will be used after establishing non-stationarity of the series by applying the Augmented Dickey – Fuller (ADF) unit root test.

In testing for stationarity, the method suggested by Dickey and Fuller (1979) to test for unity root (or non-stationarity) is adopted. By this approach, for variable Y, for example, the following regressions are employed.

$\Delta Y_t = \gamma_0 + \gamma 1 Y_{t-1} + \sum Yi\ \Delta Y_{t-1} + e_t$

Where Δ is the first difference operator, Yi are constant parameters, e_t is a stationary stochastic process. The number of lags (m) will be determined based on the minimum Akaike information criterion. To determine the order of integration of the series, the above model is modified to include second differences on lagged first and m lags of second differences. That is

$\Delta^2 Y_t = \mu_1 \Delta Y_{t-1} + \sum \theta_i \Delta^2 Y^{t-1} + \varepsilon_{it}$ (I = 1…., m)

Where m, q_i are constant parameters while e_{it} is a stationary stochastic process. The m lagged difference terms are included so that the error terms e_t and e_{it} in both equations are serially independent.

Co-integration Tests

Following the unit root test is the co-integration test, which is carried out to avoid spurious regressions. For this purpose, we apply the ADF test to the residuals (μ) of the static co-integrating regressions as follows:

$$\Delta\mu_t = \beta_0\mu_{t-1} + \beta_1\Delta/\mu_{t-1} + C$$

Where the t-value of the β_0 (parameter of μ_{t-1}) is compared to the ADF statistics at the various levels. Co-integration implies that the long-run movements in the variables are related to one another in a long-run equilibrium relationship. The Johansen (1991, 1995) efficient maximum likelihood test is used to examine the existence of a long-term relationship between the dynamics of non-oil exports and economic growth.

From Engle and Granger (1987), it is obvious that an error correction situation will arise showing the degree of adjustment towards long-run equilibrium. In other words, the error correction model(ECM) explains the proportion of the disequilibrium in one variable in one period corrected in the next period. The error correction model (for two variables X and Y) is generally stated as;

$$\Delta Y_t = \beta_0 + \beta_1\Delta X_t + \beta_2\mu_{t-1} + \varepsilon_t$$

The value of β_2 (coefficient of μ_{t-1}) shows this degree of adjustment.

5. Discussion of Results

5.1 Unit Root Test

In determining the stationarity of the variables under consideration, the Augmented Dickey - Fuller unit root test was conducted. The tabulated results are as shown below:

Table 2

Unit Root Test Result

Variable	ADF Statistics	Remark
ΔAGR	-6.741967	1(0)
ΔCIR	-6.678926	1(0)
ΔERR	-5.339587	1(0)
ΔFCR	-3.598980	1(0)
ΔIDR	-3.598667	1(0)
ΔLBR	-7.602135	1(0)
ΔOXR	-7.116246	1(0)
ΔPOPR	-6.635367	1(0)
ΔRGDP	-5.904424	1(0)
ΔRINR	-9.356668	1(0)
ΔSER	-3.938719	1(0)

Source: Author's Computation

From the table, it is observed that at levels, all the variables are stationary with or without the presence of a trend. Also, further experiments where adjustments were made in the lag length of the variables; still confirm the stationarity of the variables, with or without a trend at the 1 per cent level. Hence, from the ADF test, we conclude that all the variables are integrated of order zero, 1(0).

5.2 Test for Co-integration

The Johansen co-integration test revealed that the trace and maximal eigenvalue statistics shows the existence of seven and four co-integrating relationship between the endogenous variables and its determinants at the 5% level of significance (Table 2 below). The conclusion drawn from this result is that there exists a unique long-run relationship between the variables. Since there is one co-integrating vector, the long-run relationship can be obtained by normalizing the estimates of the unconstrained co-integrating vector. The parameters (i.e long-elasticties and independent variables is

presented in Table 3). The identified co-integrating equation(s) can then be used as an error-correction term (ECM) in the error correction model. This series will form the error correction term similar to the residuals generated when using the Engle-Granger Two Stage Procedure.

Table 2

Johansen Maximum Likelihood Co-integrating Test Results

Panel A
Date: 01/15/15 Time: 12:18
Sample (adjusted): 1973 2014
Included observations: 42 after adjustments
Trend assumption: linear deterministic trend
Series: LNRGDP LNFCR LNLBR LNEER LNNOXR LNIDR LNAGR, LNSER LNPOPR
Lag interval (in first difference): 1 to 20
Unrestricted co integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace statistic	0.05 Critical value	Prob**
None*	0.947782	414.0026	197.3709	0.0000
At most 1*	0.857812	290.0049	159.5297	0.0000
At most 2*	0.795228	208.0796	125.6154	0.0000
At most 3*	0.773212	141.4736	95.75366	0.0000
At most 4*	0.467950	79.15657	69.81889	0.0075
At most 5*	0.381517	52.65386	47.85613	0.0166
At most 6*	0.351151	32.47349	29.79707	0.0240
At most 7	0.223955	14.30618	15.49471	0.0749
At most 8	0.083395	3.657318	3.841466	0.0558

Trace test indicates 7 co-integrating equ(s) at the 0.05 level
**Denotes rejection of the hypothesis of the 0.05 level*
***Mackinnon-Haug-Michelis (1999) P-values*

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigen value	Trace statistic	0.05 Critical value	Prob**
None*	0.947782	123.9976	58.43354	0.0000
At most 1*	0.857812	81.92527	52.36261	0.0000
At most 2*	0.795228	66.60601	46.23142	0.0001
At most 3*	0.773212	62.31706	40.07757	0.0000
At most 4*	0.467950	26.50271	33.87687	0.2909
At most 5*	0.381517	20.18037	27.58434	0.3288
At most 6*	0.351151	18.16731	21.13162	0.1237
At most 7*	0.223955	10.64886	14.26460	0.1727
At most 8*	0.083395	3.657318	3.841466	0.0558

Max – eigenvalue test indicates 4 co-integrating eqn(s) at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level ** Mackinnon – Haug-Michelis (1999) P. values.

PANEL B

Normalizing co-integrating coefficients (standard error in parentheses)

LNRGDP	LNFCR	LNLBR	LNEER	LNNOXR	LNIDR
1.00000	-0.436225	8.419902	-0.510013	-5.762449	4.080959
	(0.10489)	(0.55508)	(0.11895)	(077606)	(0.77546)

LNAGR	LNSER
-0.217473	-0.035418
(0.16218)	(0.13047)

This can be written as:
LRGDP -0.436225FCR +8.419902LBR-0.510013EER-5.762449NOXR + 4.080959IDR-0.217473AGR-0.0354185SER

5.3 Dynamic Specification of Non-Oil Export and Economic Growth

So far, the results have shown that the variables in the non-oil export and economic growth equations tend to move together in the long-run as predicted by economic theory. In the short-run, deviations from this relationship could occur due to shocks to any of the variable (Kalu and Mgbemena, 2015). In addition, the dynamics governing the short-run behavior of non-oil export and economic growth are different from those in the long-run. Due to this difference, the short-run interaction and the adjustments to long-run equilibrium are important because of the policy implications. According to Engle and Granger (1987), if co-integration exists, between non-stationary variables, then an error-correction representation specified by the equation below exists for these variables.

$\delta_{yt} = \beta_0\delta_{xt} - (1\text{-}a_1)\ [Y_{t-1} - b_0 - b_1X_{t-1}] + U_t$

The results in panel B of Table 2 shows that variables (LBR and IDR) are statistically significant and appropriately signed in line with economic theory and it suggests that an increase in the level of per capita income resulting from efficient labour rate in an economy indicates that productivity has improved which lead us to expect an improvement, in the level of industrial output as well. On the other hand, it is argued that as the country becomes more competitive, its exports share in the world market increases, which is reflected in a more industrial output. The activities of the industrial sector are quite appreciated in the growth process of the economy, while that of agricultural sector shows a negative relationship (a result that is quite contradictory, because it is ascertained that the agricultural and service sector drives the Nigerian economy). However, the influx of foreign investments in the industry must have accounted for the result. The exchange rate variable is expected to capture the effects of relative prices of traded to non-traded goods. Exchange rate affects trade flow, since other major currencies fluctuate against each other and against the Naira; this causes the effective exchange rate of Naira to fluctuate as well. An increase in the effective exchange rate represents an appreciation of the Naira. It is expected therefore, that its coefficient will take a negative sign indicating that depreciation of Naira stimulates export. This result is similar to the one obtained by Raheem and Busari (2013). Again, the connection of exchange rate and export follows theoretical argument. Hence, resulting effect of depreciation of the Naira would enhance growth through improvement and/or expansion of the export sector (non-oil).

The vector error correction model (VECM) shows how the system adjusts to the long run equilibrium implied by the co integrating equations. The ECM result is presented in Table 3 below. As expected, the error – correction term (ECM_{t-1}) is of the expected negative sign and significant in the equation model. This result substantiates the findings of the co-integration result earlier reported, but more importantly, it suggests that one cannot overlook the co-integrating relationship among the variables in the model, otherwise, this could introduce misspecification in the underlying dynamic structure. The absolute value of the coefficient of the error correction term indicates that about 60% of the disequilibrium in the model is offset by short-run adjustment within a year.

Table 3

Parsimonious Estimate of the ECM Result

Dependent Variable: D (LNRGDP)
Method: Least square
Date: 01/11/15 Time: 10; 35
Sample (adjusted): 1971 2014
Included observation: 44 after adjustments

Variable	Coefficient	Std. error	t-statistic	Prob
C	-0.037292	0.087825	-0.424618	0.6738
Δ(LNFCR)	0.529082	0.251770	2.101449	0.0431
Δ(LNLBR)	-0.4782898	0.265315	-1.820093	0.0667
Δ(LNEER)	-0.193140	0.170501	-1.132779	0.2652
Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob**
Δ(LNNOXR)	0.876026	0.351180	2.494525	0.0176
Δ(LNIDR)	-0.129960	0.318738	0.407733	0.6860

Δ(LNAGR)	-0.0080307	0.063550	-0.130715	0.8968
Δ(LNSER)	-0.004812	0.038636	0.124552	0.9016
Δ(LNPOPR)	0.040450	0.018717	2.161137	0.0298
ECM(-1)	-0.595563	0.158307	-3.762079	0.0006

R-Squared	0.6519	Mean dependent var	0.113928
Adjusted R-squared	0.580397	S.D dependent var	0.333448
S.E. of regression	0.301877	Akaike into criterion	0.639123
Sum squared resid	3.098414	Schwarz Criterion	1.044621
Log likelihood	-4.060713	Hannan-Quinn criterions	0.789501
F – statistic	2.051601	Durbin Watson stat.	1.770370
Prob (F-Statistic)	0.063324		

The estimated coefficient of the error correction term has the expected sign and is significant at 1 percent. The elasticities of fixed capital ratio (FCR), non-oil export (NOXR) and population growth (POPR) were all significant at 5%. The expected positive relationship between the growing population of Nigeria and economic growth negates the fact that population is growing faster than economic growth. As indicated in the results, FCR which serves as a proxy for investment is a major determinant of economic growth in the economy and this follows the theories of investment. The coefficient of determination (adjusted R^2) at 0.65, used to measure the goodness-of-fit of the estimated model, indicates that the model is reasonably fit in prediction ie the model explains 65 percent of behavior in non-oil export dynamic and real GDP in Nigeria. At 1.77, the Durbin Watson statistics does not suggest evidence of autocorrelation.

6. Conclusion and Lessons for Policy

6.1 Conclusion

The study investigates the relationship between the dynamic of non-oil export and economic growth in Nigeria, using annual data from 1970 to 2014. The empirical analysis involves the use of co-integration and error-correction approaches that are based on the estimation of a simultaneous equation model. The estimation of the model takes into consideration the issue of spurious correlation (arising from unit root in macro variables) as well as the problem of simultaneity bias.

A number of important results were obtained. The variables of LBR and IDR (8.42%), (4.08%) are statistically significant and appropriately signed in line with economic theory, suggesting that an increase in the level of per capita income resulting from efficient labour force rate in an economy indicates that productivity has improved, leading to an improvement of industrial output. Another important finding from the study is that the exchange affects trade flow, since other major currencies fluctuate against each other and against the Naira. Therefore an increase in the exchange rate represents an appreciation of the naira. And the negative sign (-0.51%) indicates that depreciation of the Naira.

Our empirical evidence supports the use of simultaneous equation system for estimating the relationship between exports and economic growth similar to other previous studies. The results shows that non-oil exports in Nigeria have contributed to economic growth during the period 1970-2014.

6.2 Lessons for Policy

The finding of the study reveals some lesson for policy consideration. Diversification of the economy away from oil revenue should be encouraged. Since the activities of the industrial sector contribute to growth, policies should be formulated and implemented on how to further develop and attract more investments into the industrial sector.

Moreover, the poor performance of the agriculture sector could likely be as a result of low level of investment in the sector; therefore, efforts to develop the sector should be encouraged.

6.3 Issues of Future Research

The issues for future research are:

1. A simulation study focusing on the determinants of non-oil export in Nigeria.

2. An investigation of the effects of real exchange rate volatility on non-oil export performance and the trade balance.

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Information about authors

*Onyinye O. Mgbemena***,** Economics Department, Michael Okpara University of Agriculture Umedike, Umuahaia, Nigeria; e-mail for correspondence: Onyinye02@yahoo.co.uk

Kalu Chris U, Economics Department, Nnamdi Azikiwe University, Awka, Nigeria; e-mail for correspondence: Onyinye02@yahoo.co.uk