

Non-Oil Export and Economic Growth in Nigeria: Does Methodology Matter?

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Abstract

In an attempt to test the validity of Export-Led Hypothesis, this study examines the linkage between economic growth and non-oil export using time series data for Nigeria over a period of 1970-2010. Employing both Simultaneous Equation Model (SEM) and a single equation model, results of SEM refute the hypothesis while that of the single equation validates the hypothesis. Specifically, the growth equation in the SEM shows that non oil export and agricultural performance are negatively associated with growth, though in other equations, this was not the case. It was also found that that the industrial sector performance and population growth are good determinant of economic growth. An interesting finding is the revelation that the adoption of Structural Adjustment Program was a bad omen for the agricultural sector. Among the policy recommendations is the need for increase in government participation and patronage as well as creating investment friendly environment for investors in the sector.

Keywords: Export, Non-Oil, Growth, Simultaneous Equation

Introduction

A common debate between 1950s and 1960s was the effectiveness of the export sector in spurring growth. This argument gained prominence when developing and less developed countries (LDCs) were practicing inward-oriented strategy. Export-Led Growth Hypothesis (ELGH) postulates that expansion and promotion of the export sector of the economy is an important determinant of economic growth through dynamic spillover effect on the rest of the economy. This serves as a follow up to the neo-classical argument which elucidates the importance of an open economy. The works of Solow (1956) and Swan (1956) orate that reduction in trade barriers increases trade and productivity. Other prominent theories in this camp are absolute advantage and comparative cost advantage pioneered by Adam Smith and David Ricardo respectively (Akeem, 2012; Waithe et al, 2011 and Aljarrah, 2008).

In theory, 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 export products, which in turn may boost productivity levels and may cause the general level of skills to rise in the export sector. This then leads to a reallocation of resources from the (relatively) inefficient non-trade sector to the higher productive export sector. This productivity change leads to output growth. Another channel through which export leads to growth is via export expansion which helps to concentrate investment in these sectors, which in turn increase the overall total productivity of the economy (Akeem, 2012). In addition, export expansion enhances employment generation and subsequently, reduces social cost of unemployment by the government. Also, continuous inflow of foreign earnings from export could lead to economic growth and development aside from improving the Balance of Payment position of the economy (Usman and Salami, 2008).

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However, ELGH did not go unchallenged as Moon (1998) argued that countries that practice outward-oriented policies do not trade more than those who practice inward-oriented policies. In addition, it is not explicitly stated how export expansion will lead to sustained long run growth. Jafee (1985) also raised doubt that ELGH will operate successfully in the long run in LDCs due to unpredictability in the world market. The success stories recorded by the 'emerging countries' could be hinged under improvement in their export services. This is because the governments of these countries were able to achieve high rates of economic growth and development based not only on encouraging free market but also formulating and practicing outward-oriented policies. Their domestic production and export composition was not left to the forces of demand and supply alone to determine but a product of careful planned intervention by the respective states (Udah, 2012). This can be backed by Amsden (1989) who opined the success story of the 'Asian Tigers' to high level of governance whose policies are structured in a manner that protect domestic industries and also provide an array of incentives to encourage foreign participation.

In terms of Africa, the story is a little bit different which is based on the assertion that Africa majorly export primary products with no value added. Prior to the discovery of Oil in Nigeria, Agriculture had been the mainstay of the economy. Among commodities exported are Cocoa, Rubber, Palm Oil, Shea Butter, Cotton and Wool to list a few. Nigeria was regarded as the biggest exporter of Cocoa and Rubber in Africa. Export proceeds from agriculture accounted for over 70 percent of foreign earnings. Nigeria is blessed with a large deposit of minerals such as lime stone, iron ore, tin, lead and copper etc. However, since the inception of independence, the industry has not been given attention by the government. The plausible reason for this is difficult to put in plain words.

Nonetheless, the advent of oil and particularly the Oil boom in the 1970s brought fundamental changes to the Nigerian economy. As such, Nigeria became a monoculture Nation exporting more of oil related products which invariably rendered agricultural sector to be less competitive in the world market. Other factors that contributed to the dwelling fortune of the agric sector include low yield, inconsistent production pattern, disease incidence, pest attack and use of simple farm tools. Available data from Central Bank of Nigeria (CBN) and Federal Office of Statistics (FOS) showed that oil export earnings accounts for about 80 percent of total foreign earnings. The volatility of the oil prices at the international market poses problem for oil dependent countries like Nigeria. For instance, oil price increase from \$13 in 2000 to \$125 in 2009. Thus, the economy will swing according to the dictate of the oil price.

In order to improve the fortune of agriculture, several policies have been employed by government. Prominent among this is the adoption of Structural Adjustment Programme (SAP) in 1986 as advocated by World Bank and the International Monetary Fund (IMF). The result of this policy did not improve the prospect of the agric sector but rather compounded the problem. The continued unimpressive performance of the non-oil sector and the vulnerability of the external sector thus dictate the urgent need for a reappraisal of the trust and content of the development policies and commitments on their implementation.

The crux of this paper is to investigate how trade openness (export) would impact on growth as advocated by ELGH. Our focus will be on the non-oil export (NOE). The study defines NOE as the total export less export of oil related product and gas. This is based on the need for urgent diversification away from oil revenue as the economy cannot afford to be subjected to the vulnerability and volatility of oil prices as oil revenue can be at a disadvantage to the oil exporting country. Sachs and Warner (1997) using a sample of 95 developing countries found that countries that have a high ratio of natural resource exports to GDP appears to have shown slower economic growth than countries with low ratio of natural resource export to GDP. Similarly, Collier and Hoeffler (2002), expound that increase in natural resources

income does not result in increase in economic growth. This is so because they found that 23.0 per cent of countries that are dependent on oil exports are likely to experience civil war in any five-year period compared to 0.6 percent for countries without natural resources. During each of these periods, there was no economic growth. Yakub, (2008) also supports the argument that increase in natural resources income does not result in increases in economic growth but result in vicious development cycle (i.e. violent and adverse development). Mehrara et al (2011) while examining the non linear effect of oil revenue on growth found out that oil revenue will impact on growth negatively if oil exportation exceeds 22% of GDP. Hence, oil could also be regarded as a curse.

A traditional practice of existing studies is the adoption of causality hypothesis to determine which variable influences the other. Studies like Emery (1986), Krueger (1978), Kavoussi (1984) and Ram (1987) concluded that export expansion influences economic growth. Jung and Marshall (1985) and Chow (1987) found a bi-directional relationship. In contrast, Hsiao's (1987) result failed to confirm the ELGH in Taiwan, Singapore and Korea and concluded that the hypothesis might not hold in industrialized and semi-industrialized economies. As such, the point of divergence between this study and existing studies is based on the contention of Aljarrah (2008)³ who claimed that the benefits of export on growth can be both direct and indirect. Hence, the use of a single equation model as adopted by studies stated above and many more will not be able to capture the dynamics effectively. The main thrust of this paper is to use a simultaneous equation model (SEM) by employing three-stage least squares methods (3SLS) and single equation model to unravel the relationship that exist between NOE and economic growth in Nigeria. This technique (SEM) helps to solve the problem of endogeneity that export-growth nexus might pose and also to yield consistent and more efficient estimators. More emphasis would be laid on SEM because research in this direction is scarce while numerous studies have adequately employed a single equation approach. Following the introductory section, the rest of the paper is organized as follows; background analysis of Nigeria is provided in section two while section three elucidates the methodology and data source. Section four presents the empirical results and concluding remark was highlighted in section five.

Overview of External Sector in Nigeria

Nigeria is a major exporter of oil to the international market and also an important member of Oil Producing and Exploration Countries (OPEC). Nigeria has the best quality of oil in Africa which accounts for the reason why it is the major supplier of oil to America and Europe. Aside from the over reliance of revenue from oil export, the under-utilization of the resource poses problem for the economy since oil is exported in its crude/raw form as there is no value addition to it and later the economy import refined products in different forms⁴. This situation can be described as "in and out" i.e. what is exported is later imported in different forms. The problem arising as a result of this are in two folds: first, loss of potential revenue if oil had undergone further processing aside from exploration and second, deterioration of Balance of Payment (BOP) through importation of different refined products. Hence, this leads to a scenario where the cost-benefit analysis indicates that Nigeria is losing more than it is gaining. For long-term sustained economic growth and development, this act ("in and out") cannot be upheld.

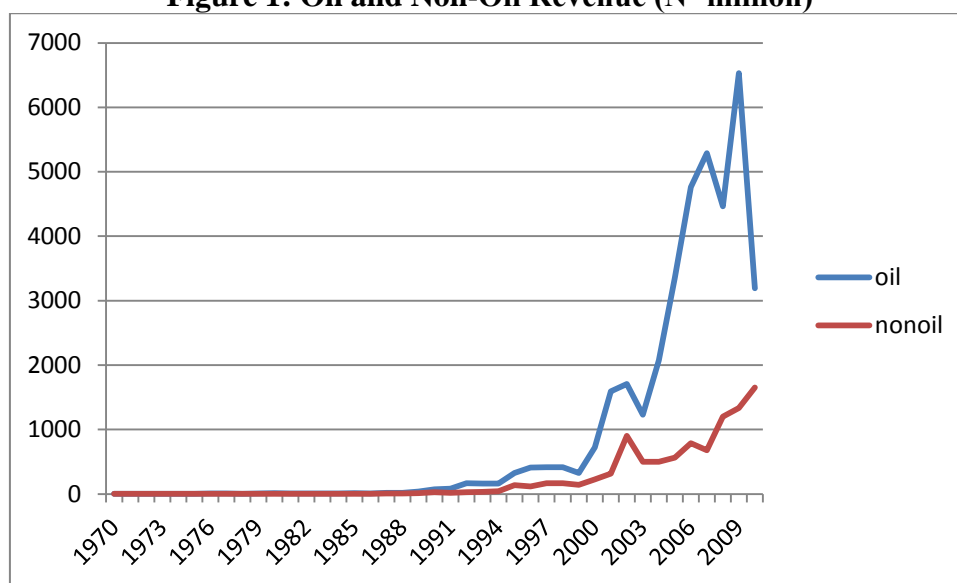
³ Interested reader should see Aljarrah (2008) pp 3

⁴ Premium Motor Spirit (PMS), Automated Gas Oil (AGO) and Dual Purpose Kerosene (DPK) among others.

With the peak oil debate⁵ and reasons stated above, successive governments have put in place policies such as youth empowerment through Small and Medium Scale Enterprises (SMEs), free/low interest rate, privatization of public enterprise to ensure efficient management and generation of employment and provision of conducive environment for foreign investment. It is anticipated that if these programmes are sustained⁶, Nigeria has looming benefits from it. Continuous reliance on oil income will lead to what is somehow called “Dutch disease” (Aljarrah, 2008).

Evidence from the figure below shows that oil and non-oil income are moving on an increasing trend. However, succeeding years after 1991, there have been a sizeable increase in oil over non-oil revenue. This shows that the benefits of diversification from oil have not started yielding benefits. This then justifies our claim that these benefits (if at all) are long-term in nature. It can be stated that Nigeria began to enjoy the income from oil around 1979. This is coincidental to the period when oil exploration began on a commercial basis.

Figure 1: Oil and Non-Oil Revenue (N' million)



Source: Computation from CBN Statistical Bulletin, 2011 Edition

As indicated in Table 1, agricultural and industrial sectors are the highest contributors to GDP. The turn of the 21st century witnessed a massive increase in the activities of these sectors compared to preceding decades. This is followed by Service, Manufacturing and Building and Construction respectively. Foreign investment in the communication sub-sector of service sector justifies the enormous increase in the of Service sector between 2000 and 2010. The unimpressive performance of Building and Construction and Manufacturing sectors is quite difficult to explain. Figure 3 shows that prior to 1986, there is no significant difference between GDP and NOE. But afterwards, GDP was growing at an increasing rate.

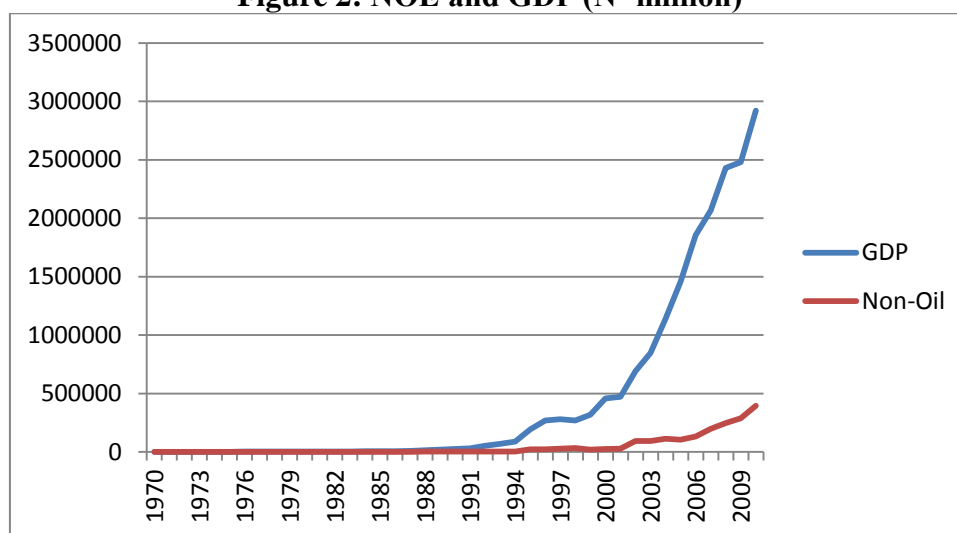
⁵ There have been arguments by the energy economists and petroleum engineers about the exhaustion of oil exploration in the world. One side of the camp argued that once oil exploration gets to the peak, there would be continuous decline in oil exploration. On the other camp, they faulted this claim on the ground that with advancement in technology and 3D seismic device, there are many undiscovered reserve. In addition, the global warming debacle and yearning for bio-fuel which seek to ensure reduction in oil products consumption without any loss in output is a source of concern.

⁶ Another important problem facing Nigeria political scene is the lack of continuity in government policies. As evident in Nigeria, an outgoing government will leave with its policies irrespective of how important and relevant they are because the usual norm is that new government means new policies.

Table 1: Contribution of Non-Oil Sectors to GDP (N' million)

	1970-1979	1980-1989	1990-1999	2000-2010	Total
Agriculture	52,985.20	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	5,420,354.03
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
Whole sales & Retails	39,391.42	126,208.27	2,352,630.53	24,257,203.31	26,775,433.53
Industries	48,625.47	208,705.77	5,688,041.15	58,983,059.03	64,928,431.42

Source: Computation from CBN Statistical Bulletin, 2011 Edition

Figure 2: NOE and GDP (N' million)

Source: Computation from CBN Statistical Bulletin, 2011 Edition

Data and Methodology

Our methodology to a large extent follows that of Salvatore (1983). We also take a cue from Aljarrah (2008) who argued for the inclusion of exchange rate into the system. However, unlike Aljarrah (2008) who treated exchange rate as an exogenous variable alone, the study is of the opinion that exchange rate should be treated as both endogenous and exogenous variables. This is based on the fact that exchange rate is a major determinant of export and as such, its determinants (i.e. exchange rate being a function of other variables) should be empirically determined.

The system consists of six equations. The first being growth equation is assumed to be a function of NOE, industrial and agricultural output⁷, population and level of domestic investment. Export and investment would stimulate growth which is measured as per capita income. Capital formation is very important to the development process through creating

⁷ We include output of agricultural sector due to its importance as indicated in section two above. This is in contrast to Aljarrah (2008) and Salvatore (1983) who only captured the performance of industrial export. This can be based on the reason that climate conditions of their scope (countries) does not supports activities of agricultural sector

more job opportunities and raising the level of output in the economy. Improvement and/or expansion in output of industrial and agricultural sectors show the level of competitiveness of the output of these sectors at the international market which would enhance growth through export. Increase in population would increase the productive capacities of the productive sectors of the economy and as such leads to economic growth. It is anticipated that these variables would impact positively on economic growth “*ceteris-paribus*”. The growth equation can be written in the following form:

$$PCG = f (FCR, NOXG, IDR, AGR, POP) \dots\dots\dots (1)$$

PCR = per capita income

FCR = fixed capita formation as a percentage of GDP

NOXG= growth of NOE

IDR = industrial production

AGR= agricultural production

POP= population growth.

The second equation in the system measures the determinants of investment in Nigeria. Thus, we specify that fixed capital formation is a function of real per capita income, capital inflow and NOE growth rate. The inclusion of capital inflow is based on the belief that many LDCs have low saving rate. Following the principle of national income accounting that equates savings and investment, LDCs source for foreign investment to spur the needed economic growth.

$$FCR = f(PCR, NOXR, CIR) \dots\dots\dots (2)$$

PCR = real per capita income

CIR = capital inflow (import of goods and services)

The third equation of the system captures the performance of the non oil sector in Nigeria and it is sub-divided into two: industrial and agriculture. It is opined that the performance would be determined by population growth, real per capita income, NOE and lagged value of the dependent variable. The inclusion of the lagged variable is to account for partial adjustment process within the economy. It is anticipated that there should be a positive association between the endogenous and exogenous variables.

$$IDR = f (PCR, POP, NOXR, IDR_{t-1} \dots\dots\dots (3a)$$

$$AGR = f (PCR, POP, NOXR, AGR_{t-1} \dots\dots\dots (3b)$$

The next equation relates to the factors that affect the external sector of the Nigerian economy. The justification for the inclusion of ratio of domestic price to world price is to show the degree of competition between the local and international producers. World income is also included to determine the affordability of the product at the international market. Hence, the equation is specified as:

$$NOXR = f (IDR, AGR, INR, WI EXR) \dots\dots\dots(4)$$

INR= ratio of domestic price to world price

WI = index of real world income

EXR = effective exchange rate

As a final equation, the study specifies exchange rate equation. Exchange rate is defined in such a way that a negative coefficient would imply depreciation of naira against basket of other currencies and hence lead to growth through increase in export (because price of export would have fallen at the international market).

$$EXR = f(WI, NOXR, INR, EXR_{t-1}) \dots\dots\dots (5)$$

The system above can be re-specified in a log linearised form as:

$$PCR_t = \alpha_0 + \alpha_1 FCR_t + \alpha_2 NOXR_t + \alpha_3 IDR_t + \alpha_4 AGR_t + \alpha_5 POP_t + \varepsilon_t \dots\dots\dots (1a)$$

$$FCR_t = \beta_0 + \beta_1 PCR_t + \beta_2 NOXR_t + \beta_3 CIR_t + \varepsilon_t \dots\dots\dots (2a)$$

$$INR_t = \gamma_0 + \gamma_1 PCR_t + \gamma_2 POP_t + \gamma_3 NOXR_t + \gamma_4 IDR_{t-1} + \varepsilon_t \dots\dots\dots (3a')$$

$$AGR_t = \delta_0 + \delta_1 PCR_t + \delta_2 POP_t + \delta_3 NOXR_t + \delta_4 AGR_{t-1} + \varepsilon_t \dots\dots\dots (3b')$$

$$NOXR_t = \theta_0 + \theta_1 IDR_t + \theta_2 AGR_t + \theta_3 INR_t + \theta_4 WI_t + \theta_5 EXR_t + \varepsilon_t \dots\dots\dots (4a)$$

$$EXR_t = \rho_0 + \rho_1 WI_t + \rho_2 NOXR_t + \rho_3 INR_t + \rho_4 EXR_{t-1} + \varepsilon_t \dots\dots\dots (5a)$$

Equations 1a - 5a are estimated simultaneously because some endogenous variables in certain equations are also expressed as an exogenous variable through the application of 3SLS. Estimating the relations between variables through system equations takes into account the simultaneity of the variables and the estimation problems, offering the advantage of simultaneously estimating the coefficients from the system using its whole information. An alternative technique to SEM is Vector Auto Regressive (VAR) model though, SEM is argued to have more important economic background. The choice of 3SLS is to exploit the correlation of the disturbances across equations. The main advantage of 3SLS over others such as 2SLS or a single equation model is a gain in asymptotic efficiency. Also, the estimators for a single equation are potentially less robust, since they will be inconsistent if the Instrumental Variable assumption.

To test for the impact of SAP on economic growth, the study introduces dummy variable which ensures that $DUM = 1$ for the years 1986 - 2010 and $D = 0$ for the years 1979 - 1985. The scope of the study is limited to Nigeria with a time frame between 1970 and 2010. Data is mainly collected from World Development Indicator (WDI) and Central Bank of Nigeria Statistical Bulletin (2011 edition).

Estimation Result

The first step in estimating SEM is to carry out identification test which stipulates that the number of equations in a system should be equal to or greater than the number of endogenous variables in the system. The result of this test when it was carried out showed that the system is exactly identified since the number of equations (i.e. 6) is equal to the number of endogenous variables (i.e. 6). Misspecification which is caused by misidentification could lead to a situation where the resulting coefficients from 3SLS can be worse than OLS.

From the table below, it can be said that most of the variables have their expected sign, though a handful of them were not statistically significant. This can be justified by the nature of data used. If quarterly data as against annual data were used, the degree of freedom will improve which will have a positive effect on the level of significance. In the 3SLS estimations, NOE was found to be negatively related to growth, though, it is not significant at all levels. However, the inverse is the case with other equations in the system. This is in contrast to the results of Aljarrah (2008) who advocated for diversification away from oil export and focus on NOE. The activities of the industrial sector are quite commendable in the growth process of the economy, while that of agriculture sector retards economic growth rate. The influx of foreign investments in the industrial sector particularly the service sub-sector and decline in government participation in the agriculture industry must have accounted for this.

There is a positive relationship between the growing population of Nigeria and economic growth. This negates the fact that population is growing faster than economic growth. As indicated in the results, per capita income which serves as proxy for economic growth is a major determinant of investment in the economy and this follows the canon of theories of

investment. Again, the connection of exchange rate and export follows theoretical argument. Hence, resulting effect of depreciation of Nigeria's currency would enhance growth through improvement and/or expansion of the export sector (non-oil). The result obtained gave an indication that Nigeria is an import dependent country for industrial services and export oriented country for agricultural products. An evaluation of the economy supports this as most investments in the industrial sector and service sub-sectors⁸ are mainly financed by foreign direct investment inflows. On the part of the agricultural sector, the absence of organized manufacturing outfits accounts for reasons why agricultural related products are exported⁹.

The negative coefficient of domestic and world price ratio showed positive relationship between the ratio and NOE. The ratio is defined in such a way that a negative coefficient would improve the performance of the export sector. This is because the low domestic price to world price ratio would lead to a situation where there would be increase in demand for local products at the expense of world (other) products at both the local and the international markets. The introduction of dummy variable improved the explanatory power of system as indicated in the values of R^2 . To some extent, the results are similar to those obtained without dummy. The introduction of SAP was at a disadvantage of economic growth. This empirically confirms the condemnation of the policy by various stakeholders, groups and organizations. It is surprising to know that the policy does not even impact positively on agricultural sector of which the motive for adopting the policy was to overturn the dwelling fortune of the sector. Hence, the adoption of the policy can be considered as a waste-drain of scarce financial resources.

Table 2: System Estimates

	3SLS		2SLS	
	Dummy	No Dummy	Dummy	No Dummy
α_0	-3.892 (-1.02)	-1.231 (-0.252)	-0.451 (-0.676)	-7.115 (-0.109)
α_1	0.899 (0.601)	2.495 (4.101)*	0.947 (0.566)	2.356 (3.568)*
α_2	-0.614 (-1.281)	-0.929 (-1.591)	-0.647 (-1.222)	-0.710 (-1.089)
α_3	1.203 (2.728)*	1.534 (3.339)*	1.206 (2.426)*	1.419 (2.739)
α_4	-0.811 (-1.627)	-0.513 (-1.042)	-0.708 (-1.157)	-0.567 (-0.956)
α_5	4.809 (0.962)	0.4003 (0.131)	4.015 (0.648)	0.105 (0.027)
α_6	0.631 (3.365)*	0.578 (4.754)*	-1.259 (-0.989)	0.555 (3.309)*
α_7	-1.365 (-1.204)		0.636 (3.086)*	
R^2	0.587	0.517	0.597	0.625

⁸ Examples include transport and communications, power, building and constructions and manufacturing among others.

⁹ Among the problem confronting Nigeria is her inability to add value to primary products. A common practice in Nigeria is to export a product in its raw form and latter import such products in manufactured form

DW	1.605	1.754	1.596	1.734
β_0	2.533 (0.544)	5.156 (0.436)	3.291 (0.617)	6.046 (0.432)*
β_1	0.395 (1.196)	1.077 (1.138)	0.441 (1.157)	1.094 (1.025)
β_2	-0.019 (-0.179)	-0.113 (-0.758)	-0.006 (-0.053)	-0.099 (-0.623)*
β_3	-0.053 (-0.199)	-0.325 (-0.432)	-0.101 (-0.339)	-0.373 (-0.423)**
β_4	0.849 (5.844)**	0.807 (4.051)*	-0.653 (-1.592)	0.793 (3.364)*
β_5	-0.619 (-1.707)*		0.833 (5.149)*	
R ²	0.668	0.347	0.642	0.375
DW	2.076	2.064	2.093	2.067
γ_0	-1.438 (-2.836)*	-3.858 (-0.976)	-1.551 (-2.501)*	-3.094 (-1.116)
γ_1	-0.979 (-2.656)*	0.019 (0.0731)	-0.944 (-2.311)**	-0.027 (-0.104)**
γ_2	0.247 (2.84528)*	2.188 (1.035)	0.011 (2.509)*	2.615 (1.175)*
γ_3	0.801 (2.831)*	0.613 (3.846)*	0.781 (2.492)*	0.606 (3.441)*
γ_4	-0.401 (-0.845)	0.184 (0.826)	-0.372 (-0.703)	0.159 (0.647)
γ_5	-2.24 (-2.50293)**	0.761 (5.433162)*	-2.166 (-2.190193)*	0.691 (4.422905)*
γ_6	-0.012 (-0.074)		-0.027 (-0.147)	
R ²	0.987	0.993	0.879	0.993
DW	1.784	1.923	1.985	1.879
δ_0	3.442 (0.948)	10.149 (1.116)	3.349 (0.951)	8.193 (0.933)
δ_1	1.272 (2.101)*	0.483 (0.705)	1.007 (1.017)*	0.523 (0.518)
δ_2	-5.387 (-0.971)	-5.667 (-1.101)	-5.973 (-0.967)	-5.583 (-0.937)
δ_3	1.174 (2.576)*	1.506 (3.478)*	1.248 (2.192)**	1.372 (2.365)*
δ_4	0.043 (0.191)**	0.056 (0.224)*	0.134 (0.462)**	0.165 (0.565)
δ_5	0.856 (5.787)**	0.788 (6.479)*	0.809 (0.661)	0.801 (4.268)*
δ_6	1.181 (1.212)		0.834 (4.601)*	

R^2	0.971	0.961	0.970	0.968
DW	1.577	1.971	1.686	1.972
θ_0	6.494 (0.448)*	27.068 (1.964)**	7.287 (0.408)	19.020 (0.944)
θ_1	-2.175 (-1.335)	-0.673 (-0.289)	-2.151 (-1.152)	0.467 (0.141)
θ_2	3.176 (1.835)**	1.696 (0.680)	3.151 (1.589)	0.406 (0.112)
θ_3	-1.033 (-0.837)	-2.354 (-0.574)	-1.049 (-0.718)	1.873 (0.333)
θ_4	-7.568 (-0.31048)	-0.542 (-1.930045)**	-8.739 (-0.312928)	-1.599 (-1.008455)
θ_5	-0.009 (-1.446)	-0.007 (-2.337)**	-0.010 (-1.273)	-0.006 (-1.579)
θ_6	0.395 (1.946)**	0.795 (7.088)*	-2.584 (-0.758)	0.719 (6.856)*
θ_7	-2.607 (-0.883)		0.411 (1.792)**	
R^2	0.918	0.382	0.918	0.908
DW	1.923	1.238	1.945	1.398
ρ_0	1.583 (0.434)	-1.596 (-1.219)	-4.456 (-0.047)	-1.048 (-1.141)
ρ_1	-0.976 (-0.465)	0.864 (1.256)	0.724 (0.036)	0.827 (1.177)
ρ_2	0.759 (0.764)	-1.564 (-1.391)	0.887 (0.511)	-1.536 (-1.263)
ρ_3	1.572 (0.738)	-3.813 (-1.067)	0.954 (0.377)	-0.187 (-1.046)
ρ_4	0.139 (0.466)	0.004 (0.006)	0.152 (0.453)	-0.022 (-0.028)
ρ_5	0.781 (7.423)*	0.555 (3.536)*	-0.013 (-1.261)	0.545 (3.231)
ρ_6	-0.691 (-1.687)		0.689 (1.233)	
R^2	0.990	0.880	0.978	0.951
DW	2.134	0.188	2.163	1.9

Note: * and ** shows the level of statistical significance at 1 per cent and 5 per cent respectively. The values in parenthesis represent the t-statistics.

Despite the advantages of 3SLS stated above, it can be noted that 3SLS is sensitive to specification and measurement error and hence, could produce results that are more bias and spurious to what could have been obtained with OLS. In order to take this into accounts, the study went further to provide the 2SLS result, a technique that adequately takes care of the aforementioned problems of 3SLS. However, there is no noticeable difference in the results of the two techniques.

Table 3: Modified System Estimates

	3SLS		2SLS	
	DUMMY	NO DUMMY	DUMMY	NO DUMMY
α_0	-5.528 (-0.659)**	-1.795 (-0.201)	-7.458 (-0.676)	-7.115 (-0.109)
α_1	1.148 (0.773)	2.329 (3.913)*	0.947 (0.566)	2.356 (3.568)*
α_2	-0.657 (-1.347)	-0.657 (-1.084)	-0.647 (-1.222)	-0.719 (-1.089)*
α_3	1.352 (3.128)*	1.447 (3.035)*	1.206 (2.426)*	1.411 (2.739)**
α_4	-0.789 (-1.484)	-0.685 (-1.277)**	-0.708 (-1.157)	-0.567 (-0.956)
α_5	3.345 (0.623)	0.395 (0.113)	4.015 (0.648)	0.105 (0.027)
α_6	0.616 (3.304)*	0.553 (3.557)*	0.636 (3.089)*	0.555 (3.309)*
α_7	-1.119 (-0.956)		-1.259 (-0.981)	
R^2	0.566	0.627	0.587	0.627
DW	1.662	1.752	1.595	1.737
θ_0	-1.493 (-0.354)	0.557 (0.110)	-1.152 (-0.234)	0.723 (0.124)*
θ_1	-0.971 (-2.825)*	-1.115 (-2.789)*	-0.977 (-2.466)	-1.125 (-2.458)**
θ_2	1.533 (4.397)*	1.825 (4.677)*	1.532 (3.806)*	1.825 (4.089)*
θ_3	-1.311 (-5.757)*	-0.936 (-4.752)*	-1.298 (-4.915)*	-0.927 (-4.108)*
θ_4	-5.202 (-0.671)	-4.696 (-0.504)*	-5.732 (-0.637)**	-4.781 (-0.447)
θ_5	-0.001 (-0.939)	-0.005 (-4.879)*	-0.001 (-0.887)*	-0.005 (-4.378)*
PCR	1.157 (4.008)*	0.781 (3.167)*	1.178 (3.543)*	0.791 (2.802)*
θ_6	-0.162 (-0.941)*	0.049 (0.301)	-0.156 (-0.777)	0.071 (0.385)**
θ_7	2.160 (2.348)**		2.156 (2.033)	
R^2	0.972	0.973	0.971	0.973
DW	2.025	1.955	2.018	1.974

Note: * and ** shows the level of statistical significance at 1 per cent and 5 per cent respectively. The values in parenthesis represent the t-statistics.

It is viewed that the negative effect of NOE on growth could be related to the manner in which the system is structured and the underlining assumption, hence, the system is reduced to two equations¹⁰. The result obtained is similar to the one obtained earlier. The study further

¹⁰ Equations 1a and 4a are simultaneously solved.

conducted a single equation analysis which has been the practice of most studies¹¹. It is interesting to note that bidirectional causality between NOE and growth was reached. This affirms the studies of Akeem (2012), Olurankise and Bayo (2012), Ojo (1993) and Ukoha (2002) who all call for increase in the production capacities of agricultural and manufacturing sectors, provision of infrastructures as well as the completion of export processing zones. When interpreting the results of SEM, caution must be taken because of the way the system is structured and some simplified assumptions involved which could deter the advantage of the results (Aljarrah, 2008). The embedded assumptions could account for difference in the results of the methodology adopted.

Table 4: Single Equation Estimates

Variables	Equation 1a		Equation 4a	
	DUMMY	NO DUMMY	DUMMY	NO DUMMY
α_1				
α_2	-1.941 (-0.431)	-3.635 (-0.075)**	2.746 (0.787)	2.620 (0.740)
α_3	0.993 (2.079]8)**	1.124 (3.067)]*	0.204 (1.0170)**	0.289 (1.494)
α_4	0.010 (0.119)	0.873 (0.001)**	0.743 (3.485)*	0.628 (3.127)*
α_5	0.346 (3.288)**	0.368 (3.507)*	-0.312 (-1.237)	-0.382 (-1.514)
α_6	-0.248 (-1.144)	-0.207 (-0.724)	-6.379 (-1.094)**	-6.583 (-1.103)
α_7	0.968 (0.454)	0.228 (0.082)	-0.002 (-2.293)*	-0.001 (-1.979)**
α_8	-0.243 (-1.193)		-0.648 (-1.366)	
R^2	0.924	0.920	0.985	0.976
DW	1.6	1.161	1.933	2.079

Note: * and ** shows the level of statistical significance at 1 per cent and 5 per cent respectively. The values in parenthesis represent the t-statistics.

Conclusion and Policy Recommendations

In an attempt to unravel the relationship of NOE and growth, two methodologies were adopted (simultaneous and single equation models) and varying results were obtained. Thus, the answer to the topic is **YES**. Due to data availability, the scope of the study is limited to Nigeria and a time frame of between 1970 and 2010. The SEM result showed that there exist a negative effect of non oil on growth and inverse was the case for a single equation. Proffering recommendations on the conflicting results obtained is rather a tedious task. However, the following are the author's recommendations to concerned stakeholders:

Diversification of the economy away from oil revenue should be encouraged. Since the activities of the industrial sector constitute to growth, policies should be formulated on how to further develop and to attract more investments into the sector.

The poor performance of the agriculture sector could be caused by low patronage from the government and low level of investment in the sector. It can also be said that agriculture accounts for a larger part of total NOE and since a positive relationship is confirmed between exchange rate and export on one hand and export and agriculture on the hand, efforts to

¹¹ Equations 1a and 4a are individually solved. Equation 4a was modified with the introduction of per capita income as an additional exogenous variable.

develop the sector should arise as this might spur the needed growth. Also, there is need to complete the export processing zones to promote the establishment of export oriented firms that will produce solely for export market.

On a general note, investment into the various sectors of the economy should be encouraged. The low savings rate which translates to investment cannot sustain economic growth needed. Hence, foreign investments which are the aim of most African countries should be given serious attention through the provision of an enabling environment which is conducive for both local and international investors.

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