International Journal of Developing and Emerging Economies
Vol.7, No.4, pp.15-29, October 2019
Published by ***ECRTD-UK***
Print ISSN: 2055-608X(Print), Online ISSN: 2055-6098(Online)

NIGERIA BEYOND OIL: THE IMPERATIVE OF DIVERSIFICATION OF THE NIGERIAN ECONOMY

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ABSTRACT: *This study appraised the nexus between economic growth and the diversification of the Nigerian economy, via the non-oil sector, with specific reference to the danger posed by over-reliance on oil export. The annual time series data that span through the period of 1980 and 2018 were applied. The Error Correction Mechanism (ECM) was adopted to help gauge the long-run and short-run dynamics of the Nigerian economic growth. Results of the empirical analysis revealed that the non-oil sector is actually the future of the Nigerian economy, as all the non-oil variables shown positive and significant relationship between them and economic growth, except ICT and Tax Revenue that were not significant and negative respectively. It is therefore recommended that policy makers should think in the direction of a non-oil economy to guarantee speedy growth of the Nigerian economy.*

KEYWORDS: diversification, oil-rich economies, Dutch disease, tax revenue.
JEL. O11, O13, P16, P28

INTRODUCTION

The diversification of the Nigerian economy assumed an episodic dimension in the last lap of the 20th Century. It has always been chorused by successive government in Nigeria, whether civil or military. Recently, the dimension it assumed was occasioned by the unstable character of the price of crude oil at the international oil market and on the ground that the Nigerian economy is predominantly and overwhelmingly dependent on crude oil export. Several petrol-dollar economies that realized how highly susceptible to fluctuations and the degree of volatility of crude oil prices, have no choice than to diversify their economies. Good examples of these countries that have successfully diversified their economies include Indonesia, Malaysia Norway, Qatar, and United Arab Emirate (UAE) (Ovenseri-Ogbomo & Abioluwajumi, 2018). For example, only 15 percent of UAE GDP is accounted for from the proceeds of crude oil for the past one and half decades due to their strong adherence to the economic philosophy of diversification. The desire to ensure the flourishing of the Nigerian economy is certainly looking beyond petroleum sector as the *"goose that lays the golden financial egg"* in Nigeria. This is because the Fourth Industrial Revolution (4IR) which began about a decade ago has brought about several technological

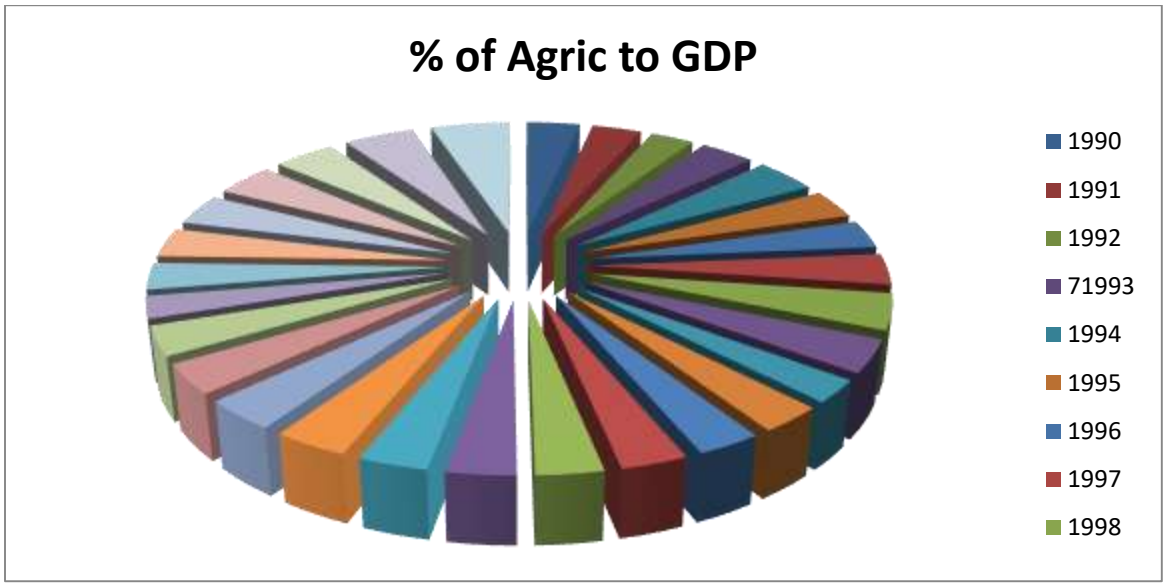
innovations. This innovation may likely relegate the use and overwhelming global dependence on oil to the background if not to the abyss in about three decades from now.

One potent factor responsible for this recent development and the clarion call for diversification is the quest by petroleum importing countries to find alternative source to petroleum and to overcome the recurring oil price volatility. According to Professor Klaus Schwab, the Founder and the Executive Chairman of the World Economic Forum and Enebeli-Uzor (2018), since the advent of the Second Industrial Revolution (2IR) around 1870, most of the industrial and emerging economies have been highly dependent on crude oil as a major source of energy. The unfolding events in the Fourth Industrial Revolution (4IR) have orchestrated a super master plan, designed to mass produce Electric Vehicles (EVs) that will take over Fuel-Engine Powered Vehicles (FEPVs) in less than four decades from now. If most industrial and emerging economies which rely on importation of crude oil to power their economies adopt this development paradigm, it will spell doom for most oil dependent economies. The worse hit will be resource curse economies like Nigeria, Ecuador, Angola, among others. Nigeria for example, only sees diversification as mere rhetoric and a campaign slogan during electioneering periods. Aremu (2018) also opined that such a paradigm shift in transport infrastructure and technology which is on the horizon will gradually replace internal combustion engines (conventional cars). The development will hamper the already hazardous fiscal structure of oil exporting countries. The state-of-the-art technology in transportation, mass adoption of electricity vehicles could halt global oil demand and prices, with ripple effects on Nigeria and other oil-dependent economies. There is therefore need for Nigeria to look beyond oil and quickly diversify the Productive base of her economy and also to use the proceeds from crude oil to scale up other sectors with a view of making these sectors revenue spinner for the nation. This is why Arturo Uslar Pietri, a Venezuelan Historian has since 1936 kept warning most oil-bearing nations to keep *"sowing the oil seed"* if they are to avert the calamities of oil glut and oil price volatility.

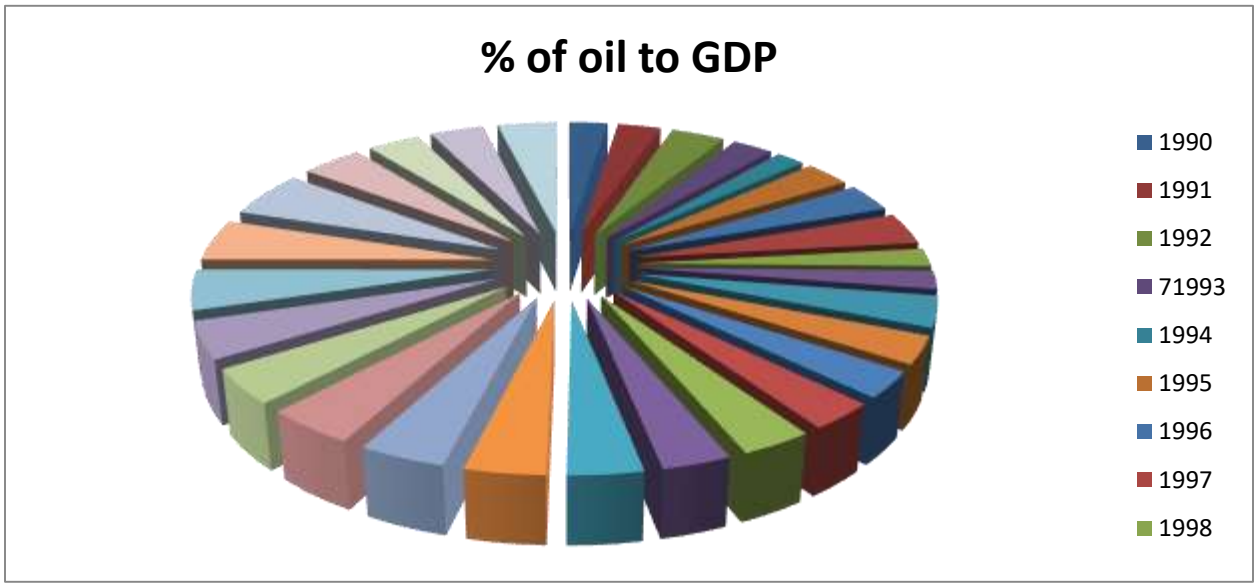
The major target of this paper is to empirically examine a link between economy growth and diversification via certain critical sectors that could drive growth outside the oil sector. Also, to further gauge the sector that will drive and spearhead the process of diversification of the Nigerian economy. The fundamental gap to be filled in this study is the introduction of ICT as one of the drivers of growth in the Fourth Industrial Revolution (4IR) in the 21 Century. This paper is structurally stratified into five sections. Following this section, section two considers the relevant literature, while section three deals with theories and methodological framework as well as model specification. Section four and five respectively deal with analysis of result and concluding remarks.

Stylized Facts

The petroleum industry in Nigeria is unarguably the largest industry and the mainstay of the Nigerian economy. It generates over 80 percent of Gross Domestic Product in the nation which happens to be the most populous nation in the African continent. Nigeria has an estimated population of over 190 million (Guobadia, 2017). Among the MINT countries (Mexico, Indonesia, Nigeria and Turkey), Nigeria has the least Gross Domestic Product and Foreign Reserves, which stood at 413 billion and 38 billion US Dollars respectively.



According to Aminu (1997), Nigeria is the sixth largest producer of crude oil in the world and by current data, the highest exporter of crude in the African continent. From a small beginning of an output of about 5100 barrels per day in 1958, production level has soared to about 2.055 million barrel per day in 1983 and rose to a its highest point of 2.3 million barrel per day in 2014 (Orubu, 2016). There was a slump in production activities and consequently a drop in output levels due to militia activities in the Oil-Rich Niger Delta between 2001 and 2009. It has again risen in 2010 due to the reduction in militant activities occasioned by the amnesty granted to the repentant militants Sala-i-Martin & Subramanian (2014).



Nigeria has a total oil field of 159 and 1481 oil wells in operation under the direct control of the Ministry of Petroleum Resources as at 2001. The most productive region of the nation in terms of crude oil is the coastal Niger Delta Basin in South-South Nigeria. Nigeria's crude oil is classified as light and sweet as the oil is largely free from sulphur. Nigeria is the largest producer of sweet oil in the Organization of Petroleum Exporting Countries (OPEC) [Orubu, 2000].

REVIEW OF LITERATURE

The Nigerian government since independence in 1960 has not taken any pragmatic and proactive steps towards the repositioning of the petroleum industry as a driver of other sectors of the Nigerian economy. Rather the oil sector is seen as one that bakes the *"cake"* to be shared by all, without recourse to the dynamics of diversification. Guobadia (2017) opined that countries that will extremely excel in this 21st century are those that will look beyond crude oil by not counting their oil wells but by investing in and counting their effective teachers and highly skilled workforce. A renowned Venezuelan Political-Historian cum writer, Arturo Uslar Pietri has severally raise the alarm on the danger that lies ahead most oil bearing countries that fail to realize that oil is an exhaustive resource. According to Pietri (1988), every oil bearing and petroleum exporting countries should begin to productively deploy the earnings from crude oil export to revamp other sectors, build infrastructure, and develop human capital. According to him, oil exporting countries should "***sow their oil seed and should not eat up their seed".***

The Zero Emission Vehicles (ZEVs) which is due to commence by 2025 according to Schwab (2017) and Kuijs & Menachem (2017) will certainly create a serious financial cliff in the nearest future for hitherto Oil-Rich Economies (OREs) and Oil Exporting Countries (OECs). Professor Paul Collier, a former economic advisor in the Strategy and Policy Department of the International Monetary Fund (IMF), noted that several Non-Resource Bearing Countries (NRBCs) like Sweden, Finland, Singapore, Japan, and Taiwan have been able to leverage on their non-physical resources like human capital to build a highly sustainable economies over the years. Collier (2000) observed that a science or a technology-driven economy that is well developed and harnessed is stronger and more potent than petrol-dollar economy that is ridden with corruption. According to him, examples have shown that most petrol-dollar economies are obviously susceptible to resource-curse and highly contagious of the Dutch Disease.

Collier, Hoeffler, and Pattillo (2001) averred that Nigeria had received over 500 billion U.S dollars from the sale of crude oil between 1960 and 2000. Corroborating the above assertion, Akpan (2019) posited that over one trillion USD have been recorded by the Nigeria government as revenue accruing from crude oil sales for close to six decades. There is nothing significantly tangible that demonstrate that such amount of resources accrue to Nigerian from crude oil sales. Nigeria is about the poorest among the members of the Organization of Petroleum Exporting Countries (OPEC). Nigeria is at its lowest ebb of all the Human Development Indices (HDI). Among the 163 countries under consideration, Nigeria occupies the 158 position. The World Bank report of 2018 labelled Nigeria as the citadel and the headquarters of the poorest people on earth.

Nigeria is a cautionary example of the resource-curse destructive impact. At independence in 1960, Nigeria had a level of development that was often compared to that of China, Malaysia, South Korea, Thailand, and Taiwan and far above Bangladesh, India, Singapore and Pakistan. It was the breadbasket of West Africa with a vibrant manufacturing industry. But an overemphasis on the oil sector, as well as widespread corruption, starved other sectors of the economy. Now Nigeria is a net importer of food and gasoline, its manufacturing sector is mostly moribund and it has fallen almost to the bottom of most development and public sector indices (Campbell, 2011).

Emerging Economic Scenarios

Aremu (2018) noted that just as motor vehicles displaced the use of horses in the early 20th century, crude oil has since replaced the use of coal and wood as leading energy sources, accelerating the global demand for, and the price of crude oil. The mass production of automobiles in the 20th and 21st centuries has made crude oil the principal source of energy in the global energy mix. According to International Energy Agency (2017), motor vehicles now consume more than 26 percent of global oil demand. This trajectory is about to change owing to the ongoing investment in Research and Development of electric cars. The IEA (2017) reports that several countries such as France and the United Kingdom plan to place a ban on new petrol/diesel cars by 2040. (Kuijs & Menachem, 2017) observed that electric vehicles manufacturers, such as Tesla, General Motors and Volvo, are looking for niche buyers for their subsidized vehicles. The US government is offering a tax rebate of $7500 each for the first 200,000 electric cars sold by automobile manufacturers. This will certainly pose a threat to oil bearing countries whose economy is obviously undiversified.

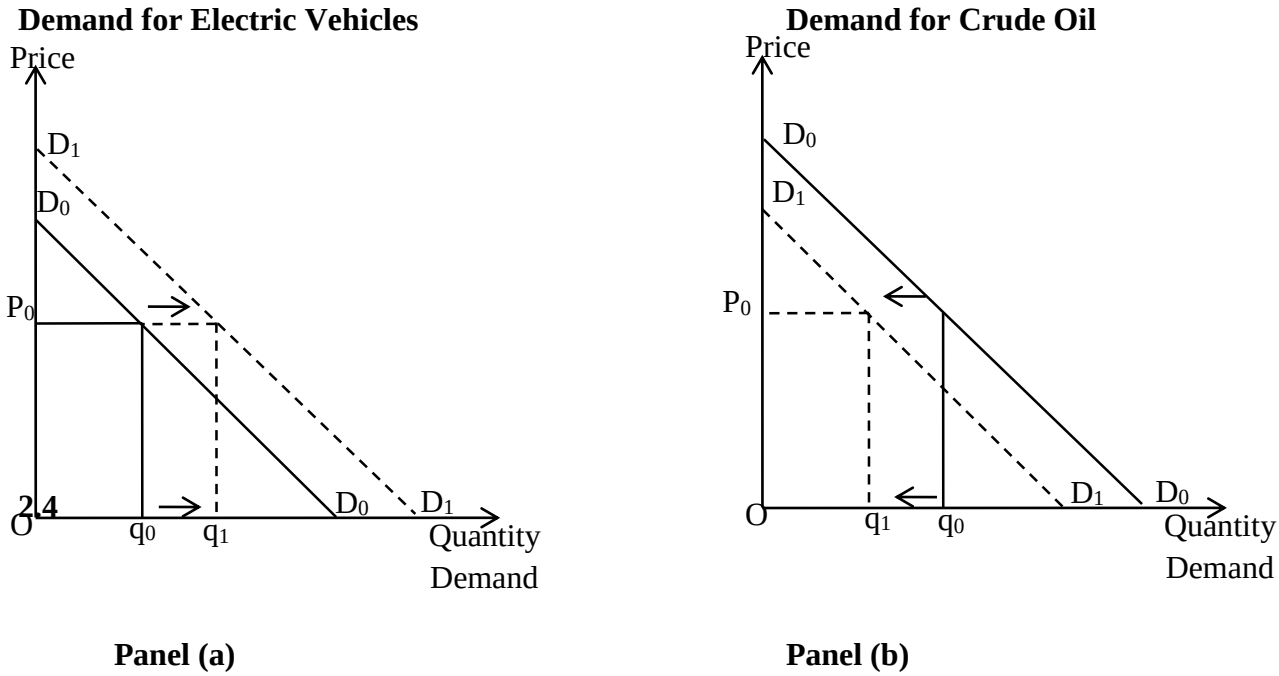
The recent economic recession in Nigeria is directly due to the slump in the price of crude oil at the international oil market. In the third quarter of 2017, the economy grew by 1.40 percent

Electric Vehicles (EVs): Its Implications for Undiversified Economies

The interest in EVs is gathering momentum and may get to a tipping point sooner than expected. Barclays Bank (2017) estimated that EVs could control one-third of the global car market by 2042. This upcoming trend could pose a deleterious economic consequence on oil exporting countries (Aremu, 2018). According to him, there will be a reduction in the demand for crude oil by over 10 million barrels per day, and oil glut will be a common feature in the international oil market. Scientific breakthroughs in renewable energy and market forces could further exacerbate the already precarious global demand for crude oil (Hubert, 2017). For example, Toyota Motor Corporations recently revealed plans to dedicate about 10 million USD to disrupt EVs markets from 2018. This will certainly have a serious economic and financial implication on oil-bearing and oil-dependent economies like Nigeria. There is no other time to diversify than now if the various tiers of government are irrevocably committed to broadening the productive base of the economy. Fitch Rating (2017) and Aremu (2018) posited that the oil and gas sector's traction and credit profile could take a hard-hit on oil-exporting countries if the electrification of transport infrastructure is intensified and driven to logical conclusion.

To further give theoretical credence to this scenario, we can consider a change in demand model for Electric Vehicles (EVs) and crude oil as well as its implication on the Nigerian economy. From

panel (a), an increase in the demand for EVs will cause a cliff in demand for crude oil in panel (b). A continuous downward trending in the demand for crude oil owing to an increasing demand for EVs will push down the revenue of oil-exporting countries. This will negatively reduce the performance ability of these economies. The already worsened poverty level of these countries will assume an alarming proportion.



Panel (a) **Panel (b)**

Figure 1 (Changes in the Demand for Electric Vehicles and Crude Oil)

Diversifying the Nigerian Economy: The Human Capital Nexus

Investment in human capital via science and technology as well as Research and Development (R and D) was the launching pad or the spring board for most of the Non-Resource Based Countries (NRBCs) like Singapore, Taiwan and Hong Kong [(Collier, 2000; Collier, Hoeffler & Pattillo, (2001); Ovenseri-Ogbomo, 2016; Ovenseri-Ogbomo & Ihensekhien 2017, & Guobadia, 2017)]. According to Collier (2000), if Nigeria has invested 40 percent of her earned 500 billion USD from crude oil export for the past four decades in science and technology, the economy would have surpassed that of Singapore at the close of the 20th Century. In his opinion, India only invested 25 percent of their GDP in science and technology, Information and Communication Technology (ICT) for the past 20 years, today they are now one of the major exporter of software packages and other computer micro-ships in world. The centre-piece of the 4IR, often known as Industry 4.0 is the inter-mingling of humans and machines. This inter-connectivity will in no small measure displaced economies that solely rely on foreign exchange earnings from exported raw materials. In words of Prof. Klaus Schwab,

"the fourth industrial revolution offers enormous opportunities from the collaboration of humans and machines in several spheres. the 4IR will potentially raise global income levels and improve wellbeing and quality of life of hundreds of millions of people in various countries around the world".

This certainly is not cheering news for oil-dependent economies that have failed to leverage on revenues from oil sales over the years. As the oil-bearing countries and the horizontal-inclined economies were drunk of their oil, the NRBCs became innovative by investing in human capital development to galvanize their economies. These innovative and vertically-inclined economies are certainly the owners of 21st century and the age of fourth industrial revolution. Schwab (2018) observed that technological innovation in the foreseeable future will also lead to a supply-side miracle, with long-term gains in efficiency and productivity. This innovation in science and technology will result in a drastic drop in the cost of transport and communication globally and drastically reduce over-dependence on crude oil as a source of energy.

Theoretical Framework

The model being considered takes its root from the neoclassical growth model. The model accentuates the fact that long term economic growth results from physical capital (K) and labour force (L). Swan (1956) and Solow (1957) were among those who first demonstrated this. The neoclassical production function exhibits constant returns to scale in labour and capital. In view of the forgoing, the Cobb-Douglas production function can be presented as follows:

$$Y_{(t)} = K_{(t)}^{\alpha} A_{(t)} L_{(t)}^{1-\alpha} \text{-------- } 0 < \alpha < 1 \quad \text{---------- (3.1)}$$

Where, Y_t = Output at time (t), K_t = Capital at time (t), A_t = The level of technology at time (t) (effectiveness of labour)

A and L are assumed to grow exogenously at rates of **n** and **g**. The growth of labour force (L) is define as **n**, while the efficiency of each unit of labour (A) grows at the rate of **g**, therefore we can defined labour force at time, t $L_{(t)}$ and the level of technology at time, t $A_{(t)}$ to be :

$$L_{(t)} = L_{(0)}e^{nt} \text{ ---------- (3.2)}$$

$$A_{(t)} = A_{(0)}e^{gt} \text{ ---------- (3.3)}$$

The Solow's model assumes that savings rates, **(s)** population growth **(n)** and technological progress (A) are all exogenously determined and that capital and labour are paid their marginal products. The number of effective units of labour $A_{(t)}$ $L_{(t)}$, grows at rate **n+g.** Many economists have asserted that the Solow model cannot account for the differentials in income among different countries of the world. This shortcoming of the Solow model stimulated an improved model which is referred to as the endogenous growth model, developed by Romer (1987, 1989). The model postulated that saving is positively related to growth and that it has a positive externality from capital accumulation. The second model of Romer (1990), takes a different approach to account for technological progress. In this model, he saw knowledge as part of the aggregate capital (k). The model assumed that technological knowledge is labour-augmented, thereby acting as a pivot to labour productivity. The production function is expressed as:

$$Y = K^{\alpha}(AL)^{1-\alpha} \text{ ---------- (3.4)}$$

Where; AL = Knowledge – adjusted workforce

If **sk** is the fraction of income invested in physical capital and **sh** is the proportion invested in human capital, the given economy is determined by

$\dot{k}_{(t)} = sky_{(t)} - (n+g+\delta)\, k_{(t)}$ ---------- (3.5)

$\dot{h}_{(t)} = shy_{(t)} - (n+g+\delta)h_{(t)}$ ---------- (3.6)

Where; y - Y/AL (ratio of per capital income to effective unit of labour), k - K/AL (ratio of physical capital to effective unit of labour), h - H/AL (ratio of human capital to effective unit of labour). Equation (3.5) and (3.6) indicate that the economy converges to a steady state defined as:

$$K^{*} = \left[\frac{S_k{}^{1-\beta} S^{\beta} h}{n+g+\delta}\right] 1/1-\alpha-\beta \text{ ---------- (3.7a)}$$

$$h^{*} = \left[\frac{S_k{}^{\alpha} S_h{}^{1-\alpha}}{n+g+\delta}\right] 1/1-\alpha-\beta \text{ ---------- (3.7b)}$$

Substituting (3.7a) and (3.7b) into the production function in equation (3.5) and (3.6) and taking logs give

$$\ln\left(\frac{Y_{(t)}}{L_{(t)}}\right) = \ln A(0) + gt - \frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta) + \frac{\alpha}{1-\alpha-\beta}\ln(sk) + \frac{\beta}{1-\alpha-\beta}\ln(sh) \text{ --- (3.8)}$$

Equation (3.8) implies that income per capita is a function of population growth and accumulation of physical and human capital. The augmented Solow model is also predicated on α, which is the physical capital's share of income and β, which is the human capital's share of income. The augmented Solow model is therefore summarized as

$$Y = AK^{\alpha}(hL)^{\beta} \text{ ---------- (3.9)}$$

Where; Y = Output level, K = Stock of physical capital, h = Level of human capital, L = Labour force, A = Efficiency of labour.

The demand for petroleum related products have been on the upward swing since the advent of the petroleum economy in the 1960s. This was due to the industrialization process embarked upon by the state and the increasing numbers of diesel or petrol-powered vehicles. This eventually made

the demand for petroleum products to be demand-sensitive and highly inelastic (Ovenseri-Ogbomo & Umoru, 2017).

METHODOLOGY AND ESTIMATION TECHNIQUES

The paper employs the Ordinary Least Square (OLS) multiple regression technique to gauge the impact of Non-Oil Variables on economic growth. It relied extensively on co-integration and Error Correction Mechanism (ECM) to establish the long and short run relationships between RGDP and the associated explanatory variables in Nigeria from 1980-2018. The presence of unit roots in the data series being considered and the inadequacies linked with linear regressions prompted the choice of a spurious methodology. The danger in applying linear regressions on non-stationary time series has the capacity to produce spurious correlation. The approach lends credence to the BLUE properties as indicated by Gauss-Markov theorem that least squares technique provides the best linear unbiased estimator through which straight line equations could be estimated.

Model Specification

Based on the above theoretical underpinning enshrined in the theoretical literature, the functional form of the model is specified as follows:

$$GRR_t = \sum_{i=0}^{n} Non - Oil + \varepsilon_t \quad \text{---------- (3.1)}$$

The specified equation above is the growth rate of the Nigerian economy with emphasis placed on the non-oil sector as economic template for diversification of the Nigerian economy well as the stochastic error term. A further decomposition of equation (3.1) gives the following:

$$GRR_t = f(AGRQt, HDI_t, ICT_t, SMS_t TXR_t, \varepsilon_t) \quad \text{---------- (3.2)}$$

Where: economic growth rate (GRR_t), agricultural output ($AGRQt$), human development index (HDI_t), information and communication technology (ICT_t) solid minerals sector, (SMS_t), tax revenue (TXR_t), stochastic error term- assumed to be Gaussian-White noise) (ε_t), all at time (t).

In a more econometric manner, equation 3.2 can be stated as:

$$GRR_t = \delta_0 + \delta_1 AGRQ_t + \delta_2 HDI_t + \delta_3 ICT_t + \delta_4 SMS_t + \delta_5 TXR_t + \varepsilon_t \quad \text{----------(3.3)}$$

All the explanatory variables are expected to have a positive relationship with the dependent variable. The error term is stated as: ε_t thus, the error correction specification takes the following form:

$$\nabla Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta_{t-2} + ... + \Gamma_{k-1} \Delta Z_{t-k-1} + \prod Z_{t-1} \text{----------(3.4)}$$

Where; $\Gamma_1 = -(1 - A1 - ... - Ai)(i = 1...K - 1)$, a matrix representing short-term adjustments and $\Pi = -(1 - A1 - ... - AK)$, being a coefficient matrix showing the long-run relationship between the vector. Z_t is px1 vector of stochastic variables integrated of order 1, K is the lag length and η_t is px1 Gaussian white noise residual factor. Therefore, from equation (3.4), we have,

$$GRR_t = \partial_0 + AGRQ_t + ... + \partial_k ECM_t \text{----------(3.5)}$$

Data Analysis and Discussion of Empirical Results

Descriptive Evidence

Table 4.1 summarises the descriptive statistics of the employed data in the study. The results indicate that the growth rate of the economy averaged 4.58 while the tax revenue was on the average of N3.42 billion. The agricultural output grew at an average rate of 4.56 percent. The descriptive evidence revealed that human development index had the lowest rate variability while solid minerals sub-sector had the highest judging from the standard deviation recorded over the period. Considering the level and direction of skewness, only GRR and AGRQ were found to be negatively skewed to the left of the normal distribution curve; while variables were positively skewed. AGRQ, HDI and SMS were found to be normally distributed at 1 percent level of significant as captured by the probability values of the Jarque-Bera statistics. The other variables were normally distributed at 5 percent levels, indicating that all the variables are stable over time and statistically significant.

Table 4.1 Descriptive Statistics

	GRR	AGRQ	HDI	ICT	SMS	TXR
Mean	4.576316	4.515789	0.504711	47.06211	16.34737	3.423684
Median	4.750000	4.250000	0.495000	39.58500	13.45000	3.150000
Maximum	9.900000	16.80000	1.700000	82.21000	112.5000	6.800000
Minimum	-1.600000	-16.50000	0.237000	22.40000	10.40000	0.900000
Std. Dev.	3.001030	5.185193	0.241085	15.12591	16.16248	1.635160
Skewness	-0.220263	-1.576497	3.283521	0.615479	5.756782	0.259698
Kurtosis	2.277565	8.975229	17.06881	2.376003	34.77222	1.877657
Jarque-Bera	1.133629	72.27083	381.6743	3.015665	1808.223	2.421591
Probability	0.567330	0.000000	0.000000	0.221389	0.000000	0.297960
Sum	173.9000	171.6000	19.17900	1788.360	621.2000	130.1000
Sum Sq. Dev.	333.2287	994.7905	2.150522	8465.342	9665.355	98.92868
Observations	38	38	38	38	38	38

Table 4.2 below shows the correlation matrix which provides evidence on the magnitude and direction of the relationship between each pair of variables. The correlation matrix was symmetric about the diagonal with values of 1.000000 indicating the perfect correlation of each variable with itself. From the results, all the variables expected to aid diversification and contribute meaningfully to economic growth are positively signed except ICT and SMS which indicate a negative relationship with the dependent variable. The results show that AGRQ, HDI, and TXR will positively impact on the economy. The SMS and ICT are highly undeveloped. The solid mineral sub-sector is unregulated, hence the negative impact on the economy.

Table 4.2 Correlation Matrix

	GRR	AGRQ	HDI	ICT	SMS	TXR
GRR	1.000000	0.374855	0.166981	-0.036146	-0.268630	0.058389
AGRQ	0.374855	1.000000	0.073232	0.413081	-0.649066	0.355093
HDI	0.166981	0.073232	1.000000	0.242932	0.042851	0.341361
ICT	-0.036146	0.413081	0.242932	1.000000	-0.154932	0.329116
SMS	-0.268630	-0.649066	0.042851	-0.154932	1.000000	-0.224138
TXR	0.058389	0.355093	0.341361	0.329116	-0.224138	1.000000

Table 4.3 Results in Unit root Tests

Variables	Augmented Dickey-Fuller		Phillips-Perron		Order of Integration
	Levels	1st Diff	Levels	1st Diff	
GRR	-3.536601**		-3.536601**		I(0)
AGRQ	-3.552973**		-3.536601**		I(0)
HDI	-3.536601**		-3.536601**		I(0)
ICT	-3.536601**	-3.540328**	-3.536601**	-3.540328**	I(1)
SMS	-3.536601**		-3.536601**		I(0)
TXR	-3.536601**	-3.540328**	-3.536601**	-3.540328**	I(1)

Note: *,**,** and ***** denotes level of significance at 1, 5, and 10 percent respectively.

Source: Authors' Computation

The unit roots tests are considered to ascertain the data generating mechanism using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron unit root tests. The results revealed that economic growth, agricultural output, human development index, solid mineral sector were stationary at levels, while ICT and tax revenue are stationary after first difference.

Table 4.4 Unit Root Test of the Residual

Null Hypothesis: ECM has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.040730	0.0012
Test critical values:	1% level	-4.226815	
	5% level	-3.536601	
	10% level	-3.200320	

*MacKinnon (1996) one-sided p-values.

The result of the stationary test of the residual from the co integrating variables is shown in table 4.4. The results revealed that the series individually exhibited random walk as it was stationary at levels, I(0) at one percent level of significance. There exists a stable long run relationship among the variables.

Error–Correction Modelling (ECM)
The result in the table below shows all the variables are in conformity with the *a priori* expectation and *a priori* restrictions except tax revenue. The variables were all statistically significant except ICT (captured by telecom density).

Table 4.5 ECM Regression Result

Dependent Variable: D(GRR)
Method: Least Squares
Date: 02/05/19 Time: 14:59
Sample (adjusted): 2 38
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012360	0.482068	0.025639	0.9797
D(AGRQ)	0.346131	0.075118	4.607838	0.0001
D(HDI)	2.661789	1.514762	1.757232	0.0891
D(ICT)	0.082316	0.165385	0.497722	0.6223
D(SMS)	0.531978	0.223547	2.358063	0.0146
D(TXR)	-0.918973	0.417268	-2.202358	0.0355
ECM(-1)	-0.738664	0.164032	-4.503162	0.0001

R-squared	0.609694	Mean dependent var	0.002703
Adjusted R-squared	0.531633	S.D. dependent var	3.537928
S.E. of regression	2.421265	Akaike info criterion	4.775115
Sum squared resid	175.8758	Schwarz criterion	5.079884
Log likelihood	-81.33964	Hannan-Quinn criter.	4.882561
F-statistic	7.810455	Durbin-Watson stat	1.945683
Prob(F-statistic)	0.000041		

The Error Correction Mechanism [ECM (-1)], which gauged the long-run effect, satisfied all its conditions as indicated in table 4.5. The estimated coefficient of ECM (-1) at 0.74 was highly germane at over 90 percent confidence level and it was rightly signed. The ECM term is indicative of the speed of adjustment to equilibrium when there was a shock and thus, implied that it would take about 0.73 years for economic growth to respond to changes in any of the explanatory variables. Alternatively, it could be infer that deviations from equilibrium were restored by about 73 percent over the next quarter. In addition, the outcome of the ECM term revealed that a long-run relationship existed between economic growth and all the applied explanatory variables.

POLICY IMPLICATION

This research helps to provide the necessary guide lines in retooling the Nigerian economy and placing it on the path of diversification and sustainability. In doing this, the direction of agricultural output, human development index, ICT, solid mineral sector and tax revenue should considered. From the result, a 10 unit increase in agricultural output, human development index, and solid minerals production translated into 0.035, 0.27 and 0.053 level of increase in economic growth rate respectively. This is consistent with the findings earlier carried out by Esu & Udongwa (2015).

They observed that non-oil exports are the key drivers of the Nigerian economy and not the oil sector.

However, an increase in tax revenue by 10 units resulted in a decrease in economic growth by 0.09 levels as revealed by the coefficient. This is quite at variant with economic theory. The possible explanation to this scenario is that tax revenue generated is not growth-induced due to the fact that tax revenue is not productively engaged. Therefore, if tax revenue is not productive-inclined, it cannot stimulate and catalyze economic growth.

Recommendation and Concluding Remarks

The government should strengthen the agricultural output programme particularly through the Central Bank of Nigeria Anchor Borrower Scheme (ABS). Human Capital Development via the education and health should be given adequate funding. Generated tax revenue should also be adequately utilized with a view of impacting positively in the growth of the Nigerian economy.

In this age of digital revolution, Nigeria must harness its ICT potentials to the fullest to enable it compete globally. Resource based economies like Nigeria should evolve plans outside the box to quickly diversify their economies if they are to remain relevant to a technologically driven World in the 21st Century. For example, France, Norway and United Kingdom have decided that between, 2025 and 2040, they will phase out petrol and diesel-powered engines or vehicles in favour of electric-powered cars (e-cars). When this e-cars policy is fully implemented, it will eventually spell doom for oil-drunk economies like Nigeria. Electric cars' policies pursued by earth-friendly and Green Economies (GEs) will make oil-dependent economies to be worse off if they refuse to diversify their economies. This clarion call should be heeded with all sense of urgency.

References

Adelman, M.A. (1990). Mineral depletion, with specific reference to petroleum, *Review of Economic and Statistics, 12 (2),* 1-10.

Akpan, U. (2019). Nigeria Natural Resource Charter (NNRC) proposes better resource management. *Vanguard, 26, 63743,* 21-22.

Aremu, K. (2018). Electric Vehicles: Does Oil have a Future? *Zenith Economic Quarterly (ZEQ), 14(1),* 17-22.

Aminu, J. A. (1997). Nigeria and the World of Oil. In: V. E. Eromosele (Ed.), *Nigeria Petroleum Business: A Handbook,* Lagos, Advance Communication, 19-38.

Campbell, G. R. (2011). Global Oil Demand and Supply as it affects Developing and Transitory Economies, *Journal of Energy Policy Institute, Chicago, USA, 56 (4),* 21-45.

Collier, P. (2001). Resource-Curse and the Nigerian Economy: A critical Assessment. *American Economic Review, 24 (2)*

Collier, P., Hoeffler, A. & Pattillo, C. (2004). Africa's Exodus. *Journal of African Economies, March, 12 (1),* 34-69.

Collier, P., Hoeffler, A. & Pattillo, C. (2001). Flight Capital as a Portfolio Choice, *World Bank Review, World Bank Publication.*

Corden, W. M. (1984). Booming Sector and the Dutch Disease Economics (DDE): Survey and Consolidation. *Oxford Economic Papers, 36 (4),* 359-380.

Enebeli-Uzor, S. (2018). The Nigerian Economy in 2018: Outlook and Expectations. *Zenith Economic Quarterly, 14(1),* 23-30

Esu,G.E. & Udongwa, U. (2015). Economic Diversification and Economic Growth: Evidence from Nigeria. *Journal of Economics and sustainable Development,6(16),* 56-68.

Guobadia, S. (2017). It's the Environment. *The 7th Inaugural Lecture Series of the Benson Idahosa University,* Benin City.

Hannesson, R. (1998). Petroleum Economics: Issues and Strategies of Oil and Natural Gas Production, *Quorum Books publishers Inc.*, London.

Hubert, G.T. (2017). The Nexus between Man and Machines in the Fourth Industrial Revolution: Growth Implications and Challenges for Resource and Non-Resource Economies, *International Energy Agency Publication, 4 (2).*

International Energy Agency (2017). Securing the Future of the Oil-Dependent Economies in the Evolution of Electric cars in the Twenty-First Century, *International Energy Agency Publications, 4 (2)*

Kuijs, L. & Menachem, K, (1998). Determinants of Inflation, Exchange Rate and Output in Nigeria. *International Monetary Fund (IMF), Working Paper.*

Orubu, C. (2000). Oil Wealth and the Derivation Principle: The need for a new Fiscal Imperative towards Oil-Producing States, *Calabar Journal of Politics and Administration, 1(4),* 189-211.

Ovenseri-Ogbomo, F. O. (2016). Human Capital Development and Economic Growth in West Africa, *Ph.D Thesis Dissertation.*

Ovenseri-Ogbomo, F. O. & Umoru, D. (2017). Economic Transformation and Human Development Index in Nigeria: An Econometric Evaluation of the Endogenous Growth Model. *International Journal of Social Sciences & Educational Studies, 4 (1),* 72-81.

Ovenseri-Ogbomo, F. O. (2017). The Relationship between subsidy and the Demand for Petroleum Products in Nigeria: An Empirical Outlook. *Unpublished* .

Ovenseri-Ogbomo, F. O. & Ihensehkien (2017). Human Capital Infrastructure: A Superstructure for Economic Growth in West Africa, *Journal of Research and Development, 3(3).*

Pietri, A.U. (1988). A New World and a New Era in World History. *A Publication of United Nation Economic, Scientific and Cultural Organization (UNESCO), the UNESCO Courier,12(2),* 12-16

Sala-i-Martin, X. & Subramanian, S. (2003). Addressing the Natural Resource Curse: An Illustration from Nigeria. *Working Paper Series WP/03/139, IMF,* Washington D. C.

Schwab, K. (2018). The Fourth Industrial Revolution (4IR): The Challenges and Prospect. *A Publication of the World Economic Forum*

World Bank (2014). Oil Exploration, Investment and its Financing: The MENA Countries Experience, *World Bank Publication,* Washington D.C.