Do Natural Resource Abundance Spur Economic Growth in Nigeria?[1]

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Abstract

The present paper investigates the relationship between natural resource abundance and economic growth for Nigeria covering the period 1970 to 2016. Our methodology encompasses autoregressive distributed lag (ARDL) bound test to cointegrating approach augmented by Bayer and Hanck combined cointegration test. Empirical results confirm a long run relationship among the variables under examination. More importantly, findings indicate that natural resource exerts a negative and significant impact on economic growth in both long run and short run dynamic analysis. This validates the Sachs and Warner's hypothesis that natural resource is a curse than a blessing in Nigeria. Hence, the study stresses the needs for diversifying the non-resource based sectors to support the economy.

Keywords: Natural resource abundance; Public investment; Economic growth; ARDL

JEL Classification: Q13; F43

1. Introduction

Since Sachs and Warner's seminal paper on natural resource abundance and economic growth (see, Sachs and Warner, 1995), a great number of academic literature have shifted their debate on whether natural resource abundance is a curse or a blessing to the resource rich economies. Ever since, a substantial set of empirical evidences supporting the negative effect of natural resource abundance on economic growth have been published. These adverse effects are largely emanating from a number of macroeconomic difficulties, which are more or less connected to resource booming, and in this respect, the abundance of natural resource turn to be a curse than a blessing, which is termed as a *"resource curse"* (Sachs and Warner, 1995). For example, among the resource rich countries of Africa, Nigerian economy had been strongly dependent on revenue from natural resource, in particular oil exports. With all the revenues

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from oil exports, the country has been underperforming as GNP per capita today is no much higher in value than at independence in 1960 (Sala-i-Matin & Subramanian, 2003; Adamu, 2019). This indicates that Nigeria has not fully utilized the resource windfalls (Ayamena et al., 2016). Whereas countries with fewer or none exportable resources for instance Malaysia, Singapore, Japan and Hong Kong are able to attain appreciable levels of economic growth (Frankel, 2012).

This paper seeks to investigate the natural resource abundance and economic growth nexus for Nigeria covering the period 1970 to 2016. At this juncture, it is necessary to briefly justify why this study is important. By way of example, after the independence in 1960, Nigeria has exhibited a degree of economic prosperity in the global context due to appropriate economic policies adapted then. Unfortunately, the development experience that follows has been a gloomy. According to World Bank, (2016) income from natural resource constitutes a substantial share of GDP growth in Nigeria. Available data shows that natural resource increase to 31.1 percent during 1973/1974 oil boom, it further recorded an increase of 48.5 percent during the second oil boom of 1979 and later dropped to 34.4 percent in 1980. It also picks up in 1993 to 63.5 percent, this could be due to oil boom during the gulf war of 1991 to 1993. This trend continues except for some period between 2008 and 2016 following the sudden shocks in the oil price. Ideally, these changes could be associated to the dwindling in the Nigeria's oil revenues during the same period. This illustrates the scenarios of natural resource abundance and how Nigerian economy has witnessed those consequences in the last decades (Robinson and Torvik, 2006). It is clearly shown that Nigeria is heavily depending on resource exports, which provides the bulk of the foreign exchange earnings. By virtue of this, conclusively growth in Nigeria is tied to commodity price cycle as most of the indicators of economic activities move with changes in commodity prices. A marginal change in the oil price will doubtlessly affect Nigerian economy to a large extent, thereby making a clear understanding between resource dependence and resource abundance (Sachs and Warner, 2001). For this reason, this study will serve as counterpart to the existing studies that explore the nexus between natural resource abundance and economic growth in multiple countries.

In essence, this study contributes to the current debate on resource curse literature in three dimensions. First, the natural resource-economic growth nexus has been studied to a great extent at the panel and cross sectional level, which indicates that the studies have been centered on multi-country case, leaving single country questions unattended. We argue that conclusion from multi-country case is not satisfactory to provide sufficient information on resource paradox because of the country's specific characteristics which differs from one country to another. Therefore, this study is among the few that consider a single country case in an attempt to provide unbiased conclusion. Second, we also distinguish our econometric methodology from the existing studies. They used maximum likelihood (ML) fixed-effects panel techniques, cross section, VECM, VAR and instrumental variable strategy for single and multi-country case (see, Sachs and Warner, 1995; Butkiewicz and Yanikkaya, 2010; Mideksa, 2013; Gyfaso, 2001; Ogunleye, 2008). For this study, the famous Autoregressive Distributed Lag (ARDL) approach is employed to overcome the constraints of small sample bias (Pesaran et al., 2001). Third, unlike other studies that used a single component of natural resource (see for example, Ogunleye, 2008; Henry, 2004; Auty and Pontara, 2008; Apergis and Payne, 2010; Behmiri and Mansu, 2012; Weber, 2012; Bildirici and Kayikci, 2013), this study takes into account the total natural resource to enable us to understand the overall contributions of natural resources that might have affected economic growth over the study period. Similarly, the results will document further evidence on whether natural resource abundance is a *"curse or a blessing"* in Nigeria.

The remaining parts of this paper are organised as follows: Section 2 provides a review of the related literature on natural resource-growth relation. Section 3 presents the empirical model, data and econometric techniques. Section 4 discusses the main results and finally Section 5 concludes the study and offer policy implications.

2. Literature Review

The curse of natural resource, also called paradox of plenty or resource bonanza (Karl, 1997; Van der Ploeg, 2011), describes countries with abundance natural resources but experience slower aggregate income, unstable democracy, poor governance and development (Coulibaly, 2018) when compared to countries with fewer or without natural resources. So far, resource curse theory is used to justify for, and question to, these negative effects. Although, majority of scholars are in the view that resource curse is not a common phrase but affects specific countries or regions that are blessed with natural resources. However, the notion natural resource might be a curse than a blessing came into being in academic debates around 1950s following economic crisis faced by the resource abundant countries. Sachs and Warner (1995) suggest a robust negative association between natural resource abundance and economic growth in a cross country study. In line with this, another foremost explanation in connection to resource curse is that of the Dutch Disease hypothesis, which presupposes the economic condition where by resource discovery lowers the competitiveness of non-traded sectors for instance, agriculture and manufacturing sectors in the world market, and therefore leading to absolute dependence on revenues from natural resource for economic growth (Ndikumana and Abderrahim, 2010). Explicitly, however, it illustrates the combined influence of two effects that widely follow resource booms, first, the real exchange rate appreciation of a country occasioned by sudden increase in exports. Second, the likelihood of a tradable sector (booming sector) to pull out labour and capital from non-tradable by increasing production cost. However, collectively these effects can result to a fall in the export of non-tradable goods and can increase the cost of non-tradable goods.

On the other hand, there is clear evidence to the effect of natural resource on economic growth in a number of countries. The majority found poor performance in the resource abundance countries. For example, Sachs and Warner (1995, 2001) reveal a slower economic growth in countries with abundance natural resource than resource poor countries. Using oil reserves as proxy for resource abundance, Stijns (2005) disclose negative link between natural resource abundance and economic growth, albeit, the capacity of an economy to harness its resource rely largely on the learning and doing process. Ding and Field (2005) empirically explores the relationship between natural resource abundance and economic performance and found negative effect on output growth, validating the findings of the resource curse hypothesis. Using Chinese provincial data, Kangning and Jian (2006) carries out an empirical study on the interrelationship between natural resource and growth. Results confirm that natural resource is not a promising factor to depend for the growth process. Gylfason (2007) investigate the association between abundance of natural resources and economic growth. Except Norway, the symptoms of Dutch Disease have appeared in the majority of the natural resource abundant countries.

Using oil revenue, Ogunleye (2008) investigate the effect of natural resources on economic growth in Nigeria and found a negative relationship between natural resource and economic growth in the long run. Asekunowo and Olaiya (2012) investigate why some resource abundant countries, namely Botswana, Norway and Chile attain a considerable rate of output growth while Nigeria records slower economic performance. They conclude that Nigeria is lagging behind these countries due to poor governance, management of oil windfalls and excessive spending at the expense of oil revenues. In contrast, Sala-i-Martin and Subramanian (2003) analyse the role of natural resource abundance on the Nigerian economy and found that growth is affected negatively through institutional quality. It is concluded that poor resource management stemming from institutional quality have been the cause for the poor economic performance. Hamdi and Sbia (2013) use Algerian data to investigate the dynamic relationship between natural resource rents, trade openness and economic growth covering the period 1971 to 2009. The results established a negative long run relationship among the variables. Furthermore, the study observes bidirectional causality between natural resource rents and economic growth. Satti et al. (2014) examine the relationship between total natural resources and economic growth with other control variables such as financial development, capital stock, and trade openness in Venezuela from 1971 to 2011. They ascertained the adverse effect of natural resource on growth confirming the presence of resource curse hypothesis. Also, a bidirectional causal relationship was found between total resource abundance and economic growth.

Of course, there are also a plethora of related resource curse studies that challenge the existence of resource curse as claimed by Sachs and Warner and others. For example, Esanove et al. (2001) argue that oil revenues encourage foreign investments which in turn generate positive multiplier effect in the transition economies (Rasiah et al., 2017). Lederman and Maloney (2007) expose the positive effect of natural resource abundance on growth, but export concentration in resources hurts growth because of lower human and physical capital and the collapse in the commodity prices. Brunnschweiler (2009) conclude that oil reserve exerts a strong positive effect on economic growth in transition economies. Similarly, Philippot (2010) found natural resource promote economic growth in transition countries. Alexeev and Conrad (2011) reveal that including omitted variables in a model may change the outright version of the resource curse to positive. In study of 53 oil exporting and importing countries, Cavalcanti et al. (2011) found resource abundance is a blessing to income levels of those countries. Using a panel data dimension, Mavrotas et al. (2011) investigate the effect of natural resource dependence and economic growth in developing countries. Results indicate dependence on natural resource afflicts the progress of institutions, which negatively affect growth. Mideksa (2013) investigate the impact of natural resource endowment on Norwegian economy and found a strong positive link between natural resource and growth. Furthermore, the result confirms that on average, about 20 percent increase in GDP per capita due to natural resource endowment. In a related study involving OPEC member countries, Esfahni et al. (2014) established that oil revenues positively affect growth.

3. Model, Data and Methodology

To provide an explanatory analysis to the main objective of the study, we adapt a base line linear multivariate growth model suggested by Barro (1991) and Sachs and Warner (2001).

$$\ln Y_t = \alpha_0 + \alpha_1 \ln N_t + \alpha_{2t} Z + \mu_t \tag{1}$$

where ln$Y$ and ln$N$ are the log of real GDP per capita and natural resource abundance, z denotes for the vector of other auxiliary variables that includes log of public investment, log of terms of trade, log of trade openness and log of labour, t and μ are period and the stochastic term to take care of unobserved factors, which are presumed to be independently, identically normally distributed. The extended baseline regression for equation (1) can be specified as:

$$\ln Y_t = \alpha_0 + \alpha_1 \ln N_t + \alpha_2 \ln I_t + \alpha_3 \ln T_t + \alpha_4 \ln O_t + \alpha_5 \ln L + \mu_t \tag{2}$$

All variables included in equation (2) are expected to have their behavioural role according to economic theory. For instance, if natural resource abundance is a blessing for Nigeria, the *a priori* expectation is that the estimated coefficient of natural resource (ln$N$) will exert a positive effect on the Nigeria's economic growth, thus, contradicting the resource curse hypothesis. Neoclassical growth theory suggests that an improvement in public investment may also stimulate output growth in the economy (Arscheur, 1989; Fedderke and Garlick, 2008; Adamu and Rajah, 2016; Adamu and Rasiah, 2017). Likewise, Harrod (1939) and Domar (1946) emphasize the importance of public capital investment (ln$I$) as the foremost key input of growth since the growth rate of output depend on investment to output ratio (Adamu, 2016). Trade openness (ln$O$) measures the gain to a country, most importantly on technological innovations from trade with other countries of the world. However, in developing countries, trade openness allows importation of manufactured goods rather than importing the technology for development of domestic production, with adverse effects on output growth (Butkiewicz and Yanikkaya, 2010). Sapsford et al. (1992) stress that any change in the terms of trade (ln$T$) occasion by volatility in commodity prices may result to changes in output. Labour force (ln$L$) proxy by population has been widely recognized in the growth framework as it serves not only as a productive input alongside capital but also as an engine of output growth (Romer, 1986; Lucas, 1988).

Our empirical estimation is based on annual data, spanning from 1970 to 2016. Data on real GDP per capita, natural resource, terms of trade, trade openness and labour force proxy by population growth are taken from *World Development Indicators, World Bank* while data on public investment is obtained from the *World Macroeconomic Research*. All variables in logarithmic form to reduce inconsistency in data and ease interpretation.

Prior to estimating equation (2), the variables under study must be examine carefully to ascertain their order of integration. To achieve this objective, we employ the Ng-Perron unit root test (Ng and Perron, 2001). This test provides a robust result, particularly in dealing with small sample. The Ng-Perron is superior to the ADF and PP unit root tests because these tests lack explanatory power especially when the root of the autoregressive polynomial is around to but lower than one (Ng and Perron, 2001). In addition, ADF and PP tests suffer from serious size distortions, especially when the moving average polynomial of the first differenced variable has a sizeable negative root (Ng and Perron, 2001). After the stationarity test, the next step is to examine whether or not the long run relation exists among the variables. For this purpose, Wald test (*F*-test) is applied to decide the likelihood of the existence of cointegrating relation. The *F*-statistics is applied for the join significance of the coefficients. The decision is that the null of the inexistence of cointegrating relationship is tested against the alternative hypothesis denoted by:

$$H_0 : \alpha_Y = \alpha_N = \alpha_I = \alpha_T = \alpha_O = \alpha_L = 0$$
$$H_1 : \alpha_Y \neq \alpha_N \neq \alpha_I \neq \alpha_T \neq \alpha_O \neq \alpha_L \neq 0$$

Nonetheless, the value of the computed *F*-statistics is compared with the lower and upper asymptotic critical values (see, Pesaran et al., 2001; Narayan, 2005). If the value of *F*-statistics is more than the upper asymptotic critical value, we conclude no cointegrating relation is rejected upon the alternative hypothesis that a cointegrating relation exists. On the contrary, if the value of the computed *F*-statistics is less than the lower asymptotic critical value, the null hypothesis is accepted implying the absence of cointegrating relation. Nonetheless, an inconclusive cointegrating relation is obtaining if the *F*-statistics fall between the upper and the lower asymptotic critical values.

To improve the power of the ARDL cointegration result, we employ the recent combined cointegration test developed by Bayer and Hanck (2013). This cointegration test is made up of individual cointegration tests that provide robust conclusive results. It is based on joint test statistics for the null of inexistence of cointegration based on Engle and Granger (EG), Johansen (JOH), Peter Boswijk (BO), and Banajee (BDM) test. The combined cointegration test suggested by Bayer-Hanck is calculated using the Fisher's equation specified as:

$$EG - JOH = -2[\ln(PEG) + (PJOH)] \tag{3}$$
$$EG - JOH - BO - BDM = -2[\ln(PEG) + (PJOH) + (PBO) + (PBDM)] \tag{4}$$

where *PEG, PJOH, PBO* and *PBDM* represents the probability values of different model for the cointegration tests. The decision is that if the value of the Fisher statistics is greater than the critical values tabulated by Bayer and Hanck (2013), we can conclude that the null hypothesis of no cointegration is rejected. Nonetheless, once cointegration relation is determined, the next stage is to integrate short run model into long run model (eq. 2) specified as:

$$\begin{aligned}
\Delta \ln Y_t &= \alpha_0 + \alpha_1 \ln Y_{t-1} + \alpha_2 \ln N_{t-0} + \alpha_3 \ln I_{t-0} + \\
&\alpha_4 \ln T_{t-0} + \alpha_5 \ln O_{t-0} + \alpha_6 \ln L_{t-0} + \\
&\sum_{i=1}^{p} \alpha_{7,t} \Delta \ln Y_{t-1} + \sum_{i=0}^{p} \alpha_{8,t} \Delta \ln N_{t-0} + \sum_{i=0}^{p} \alpha_{9,t} \Delta \ln I_{t-0} + \\
&\sum_{i=0}^{p} \alpha_{10,t} \Delta \ln T_{t-0} + \sum_{i=0}^{p} \alpha_{11,t} \Delta \ln O_{t-0} + \sum_{i=0}^{p} \alpha_{12,t} \Delta \ln L_{t-0} + \vartheta ect_t + \mu_t
\end{aligned} \tag{5}$$

The existence of unique order of integration and cointegrating relation suggests Granger causality test base on VECM framework. Theoretically, causality describes that a variable X_t to be causal for a variable Y_t if the past values of X_t can uphold in predicting the forecast value of Y_t (Granger, 1969). Afterward, Engle and Granger (1987) and (Granger, 1988) proposed a standard causality test with an augmented lagged error correction term which measures the long run causal relation base on *t* statistics. They stated that causality can hold either uni-directional or bi-directional in the presence of cointegrating relation among series that share common stochastic trend and integrated at first difference. The VECM Granger causality test is estimated by considering each variable interchangeably to serve as dependent variable. However, *p*-values is use for the significance of the short run causality and *t*-statistics of the error correction term is use to determine the long run causality. Thus, the empirical VECM Granger causality test is specified as:

$$(1-L)\begin{bmatrix} \Delta \ln Y_t \\ \Delta \ln N_t \\ \Delta \ln I_t \\ \Delta \ln T_t \\ \Delta \ln O_t \\ \Delta \ln L_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \\ \alpha_5 \\ \alpha_6 \end{bmatrix} + \sum_{i=1}^{k}(1-L)\begin{bmatrix} \lambda_{11,i}\lambda_{12,i}\lambda_{13,i}\lambda_{14,i}\lambda_{15,i} \\ \lambda_{21,i}\lambda_{22,i}\lambda_{23,i}\lambda_{24,i}\lambda_{25,i} \\ \lambda_{31,i}\lambda_{32,i}\lambda_{33,i}\lambda_{34,i}\lambda_{35,i} \\ \lambda_{41,i}\lambda_{42,i}\lambda_{43,i}\lambda_{44,i}\lambda_{45,i} \\ \lambda_{51,i}\lambda_{52,i}\lambda_{53,i}\lambda_{54,i}\lambda_{55,i} \\ \lambda_{61,i}\lambda_{62,i}\lambda_{63,i}\lambda_{64,i}\lambda_{65,i} \end{bmatrix} + \begin{bmatrix} v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \\ v_6 \end{bmatrix} ect_{t-1} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \\ \mu_{5t} \\ \mu_{6t} \end{bmatrix} \tag{6}$$

where $(1-L)$ is a difference operator, $i(i=1,...,k)$ define the optimum lag selected using Akaike Information Criteria (AIC). The ect_{t-1} stand for the one period lagged error correction term for the long run cointegrating relationship using the autoregressive distributed lag model, $v\,(i = 1, 2, 3, 4, 5, 6)$ is the intercept and μ_1 *and* μ_6 are the serially stochastic error terms with zero mean and finite covariance matrix.

4. Results and Discussion

We begin our empirical analysis by ascertaining the stationarity of the variables specified in equation (2). Table 1 presents the Ng-Perron unit root test result with the constant and trend. All the six variables - economic growth, natural resource abundance, investment, trade openness, terms of trade and labour force have unit root at level. Withal, after carrying out the first difference test the variables become stationary at most 10 percent significance level. This validates that all variables have unique order of integration. Considering our finite samples and the homogeneous inferences reported by the Ng-Perron test, we employ ARDL cointegrating approach. This approach has superior advantages over other conventional cointegration test such as Engle and Granger and Johansen and Juselius. First, it provides both long run and short run coefficients simultaneously. Second, it is applicable regardless of whether the series under consideration are *I*(0), *I*(1) or mixed (Pesaran et al., 2001).

Table 1: Ng-Perron unit root test

Variable	At level				At first difference			
	MZa	MZt	MSB	MPT	MZa	MZt	MSB	MPT
ln$Y$	-2.361	-0.944	0.399	32.626	-21.397	-3.258	0.152	4.331
ln$N$	-1.523	-0.510	0.335	29.824	-38.093	-4.354	0.114	2.445
ln$I$	-1.871	-0.917	0.490	45.224	-21.563	-3.280	0.152	4.241
ln$T$	-7.574	-1.915	0.252	12.099	-22.178	-3.329	0.150	4.110
ln$O$	-7.167	-1.724	0.240	12.965	-20.860	-3.220	0.154	4.422
ln$L$	-2.658	-1.138	0.428	33.766	-21.203	-3.255	0.153	4.299
Asymptotic critical values					Asymptotic critical values			
Case: p=0, $\bar{C}$ = -7.0					Case: p=0, $\bar{C}$ = -13.5			
1%	-13.800	-2.580	0.174	1.780	-23.800	-3.420	0.143	4.030
5%	-8.100	-1.980	0.233	3.170	-17.300	-2.910	0.168	5.480
10%	-5.700	-1.620	0.275	4.450	-14.200	-2.620	0.185	6.670

As a preliminary step in estimating the cointegrating relation, an optimum lag length must be choosen. In doing so, 3 lag lengths were preferred based on the minimum value of Akaike Information Criteria (AIC). Table 2 presents the results of the cointegrating relation in panel A and B. In both results, the null hypothesis of inexistence of cointegration is rejected. For instance, Panel A shows the ARDL calculated F-statistics of 6.445 is higher than the upper bound value at the 1 percent level. For the robustness check, Panel B presents the newly Bayer-Hanck combine cointegration result. It can be observed that the computed Fishers statistics of 58.781(EG-JOH) and 121.305 (EG-JOH-BO-BDM) are higher than the Bayer-Hank critical values at the 1 percent level. This establishes the presence of cointegration relation among the candidate variables under investigation.

Table 2: Cointegration tests result, 1970-2016.

Panel A: ARDL cointegration test					
Model	Lag	F-stat.		Inference	
$F_Y(Y\|N, I, T, O, L)$	3	6.445***		Cointegrated	
	Critical values				
	Pesaran et al. (2001)		Narayan (2005)		
Significance level	LBV, I (0)	UBV, I (1)	LBV, I (0)	UBV, I (1)	
1 percent significance level	3.41	4.68	4.030	5.598	
5 percent significance level	2.62	3.79	2.922	4.268	
10 percent significance level	2.26	3.35	2.458	3.647	
Panel B: Bayer-Hanck combined cointegration test					
Model	EG-JOH	EG-JOH-BO-BDM	Inference		
$F_Y(Y\|N, I, T, O, L)$	58.781	121.305***	Cointegrated		
Significance level	Critical values				
1 percent significance level	19.423	41.561			
5 percent significance level	13.785	28.038			
10 percent significance level	7.290	18.965			

*Notes: Panel A: k = 5 (regressors). The asymptotic critical bounds values are available in Pesaran et al. (2001), Pp 300 and Narayan (2005), Pp 1988. LBV and UBV indicate Lower Bound Value and Upper Bound Value. Panel B: *** indicate cointegration at the 1 percent level.*

Table 3 presents the long run analysis. It appears that the coefficient of natural resources (ln$N$) is 0.657, negative and statistically significant at the 1 percent level. This implies that a 1 percent change in natural resource would slower economic performance by 0.66 percent. This result substantiates the fact that resource abundance is a curse not a blessing in Nigeria. The negative effect is not surprising as similar results have been confirmed by others (see, Sachs and

Warner, 1995, 2001; Sala-i-martin and Subramanian, 2003; Kangning and Jian, 2006 among others). This also confirms the Sachs and Warner's resource curse hypothesis, which affirm that natural resource abundance does not assure rapid economic growth. We can also relate this problem to poor resource management and governance, rent seeking behaviour and acute corruption (Anugwom, 2011). The estimated coefficient of public investment (ln*I*) is 0.130, positive and significant at the 1 percent level, which implies that a 1 percent increase in public investment would increase economic growth by 0.13 percent. Similar results have been disclosed in a number of studies (see, Gylfason and Zoeg, 2006; Adamu and Rajah, 2016 and Sachs and Warner, 1995; 2001). In contrast, change in the terms of trade (ln*T*) is 0.903, positive and statistically significant at 1 percent level indicating that an improvement in the terms of trade signifies an increase in resource export particularly oil by 90 percent. This indicates that for every unit of oil exports, Nigeria will spend much on imports of other goods from other countries. Trade openness (ln*O*) is negative but insignificant. The coefficient of labour force (ln*L*) is 3.143, positive and significant in a statistical sense of 1 percent level. A 1 percent increase in labour force influences growth by 3.14 percent, which suggests that labour force influences growth. This is contrary to the views by Feder (1982) that in the long run labour force could affect the developing countries negatively.

Table 3: Long run coefficients, dependent variable-ln*Y*

Variable	Coefficient	Std. error	T-ratio	Prob.
Constant	1.0052	0.7866	1.2774	0.2126
ln*N*	-0.6576	0.1463	-4.4941	0.0001***
ln*I*	0.1306	0.0368	3.5430	0.0015***
ln*T*	0.9035	0.0704	12.8336	0.0000***
ln*O*	-0.1000	0.1116	-0.8966	0.3781
ln*L*	3.1439	0.5287	5.9458	0.0000***

*Note: *** indicates 1% level.*

Table 4 presents the short run analysis in the first difference form. Like the long run coefficients, natural resource is negative and statistically significant at 1 percent level. The coefficient of public investment is positive and significant at 1 percent level. The term of trade is negative and statistically significant at 1 percent level. The effect of trade openness is positive but insignificant. Labour force is also positive and statistically significant at 1 percent level. The error correction term (ect_{t-1}) that shows the speed of adjustment of the dependent variable ($\Delta\ln Y$) from the short run to its long run equilibrium after shock is -0.899, and highly significant at 1 percent level. This indicates that a deviation from the long run equilibrium is corrected by 90 percent annually. Furthermore, the significant of the ect_{t-1} substantiate the existence of long run relationship among the candidate variables. Moreover, a battery of sensitivity tests is applied to examine the validity and robustness of the dynamic model. The results are presented at the lower portion of Table 4. The outcomes imply that the estimated short run model is independent and free from serial correlation, non-normality, heterocedasticity (ARCH) and Ramsey RESET. The value of the *R*-square is 89 percent, indicating a good fit to explain the variation of the control variables on economic growth. For model stability test, cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) recursive residuals proposed by Brown et al. (1975) is used. The result reported in Figure 1 suggests that the band is within the 5 percent significance, which implies the stability and reliability of the short run model.

Table 4: Short run coefficient, dependent variable - $\Delta\ln Y$

Variable	Coefficient	Std. error	T-ratio	Prob.
$\Delta\ln N_t$	-0.3178	0.0931	-3.4115	0.0021***
$\Delta\ln I_t$	0.2049	0.0700	2.9271	0.0070***
$\Delta\ln T_t$	0.8131	0.1048	7.7552	0.0000***
$\Delta\ln O_t$	-0.0900	0.1006	-0.8946	0.3792
$\Delta\ln L_t$	2.8291	0.5308	5.3291	0.0000***
ect_{t-1}	-0.8998	0.1021	-8.8050	0.0000***
Diagnostic checks:		F-ratio	Prob.	
χ^2 Serial correlation F[2, 37]		1.2515	0.3027	
χ^2 J-B Normality test		0.2504	0.8822	
χ^2 ARCH, F[1, 42]		1.2650	0.2678	
χ^2 Ramsey RESET, F[1, 38]		0.0407	0.8415	
CUSUM & CUSUMSQ		Stable		

Note: *** indicates 1% level. R-squared (0.894); R-bar squared (0.871); SE of regression (0.119); F-statistics [139.914(0.000)***]; Sum of Squared Residual (0.370); Durbin Watson statistics (2.087); AIC (-2.671) and SBC (-1.334).

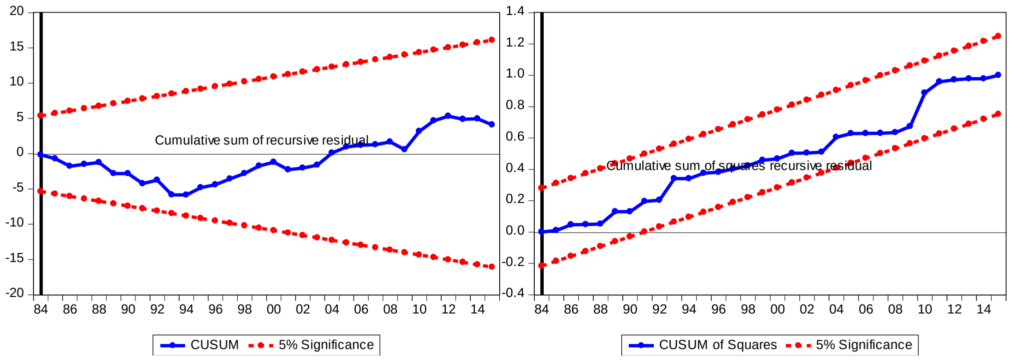

Figure 1: Residual plots for CUSUM and CUSUMSQ stability test

Table 5 reports the VECM Granger causality results among natural resource abundance, public investment, trade openness, term of trade, labour force and economic growth as specified in equation (6). To begin with the short run, when economic growth is dependent, except openness and labour force, natural resource, public investment and terms of trade Granger cause growth. In the Natural resource equation only openness is significant, which indicate openness Granger cause natural resources. For investment equation, it is indicated that natural resource and labour force Granger cause investment. Interestingly, all the variables Granger cause trade openness while none among the variables Granger cause openness. Labour force is Granger cause by economic growth, natural resource and openness. Turning to the long run, except investment and terms of trade, the one period error correction terms are negative and significant in all the models. This implies that these variables have causal relation in the long run. The results also suggest that models will converge to the long run equilibrium by 0.13% (economic growth), 0.31% (natural resources), 0.19% (openness) and 0.11% (labour force) after shock to the system.

Table 5: VECM Granger causality results

Dependent variable	Short run causality						Long run causality
	χ^2 statistics of lagged first difference term (*p*-value)						ect_{t-1}
	$\Delta \ln Y_t$	$\Delta \ln N_t$	$\Delta \ln I_t$	$\Delta \ln T_t$	$\Delta \ln O_t$	$\Delta \ln L_t$	*t*-statistics
$\Delta \ln Y_t$	----------	5.0953* (0.0783)	5.0793* (0.0789)	6.4575** (0.0396)	1.2282 (0.5411)	2.6422 (0.2668)	-0.1316*** [-2.0466]
$\Delta \ln N_t$	1.5718 (0.4557)	----------	1.8442 (0.3977)	2.4757 (0.2900)	6.7144** (0.0348)	1.1185 (0.5716)	-0.3098*** [-3.2265]
$\Delta \ln I_t$	2.9460 (0.2292)	10.8341*** (0.0044)	----------	0.7097 (0.7013)	3.2699 (0.1950)	7.4639*** (0.0239)	0.2758 [2.9820]
$\Delta \ln T_t$	6.5676** (0.0375)	5.0730* (0.0791)	5.2126* (0.0738)	----------	10.2121*** (0.0061)	11.2054*** (0.0037)	0.0216 [0.3300]
$\Delta \ln O_t$					-----------		-0.1881*** [-2.7466]
$\Delta \ln L_t$	12.2836*** (0.0022)	14.4160*** (0.0007)	2.8232 (0.2438)	3.5462 (0.1698)	8.2566** (0.0161)	----------	-0.1056*** [-6.2053]

*Note: ***,** and * indicates 1%, 5% and 10% significance level respectively. p-values are in parenthesis (…) and the figure in square bracket […] indicate t-statistics.*

5. Conclusions

This study reports an appealing example of Nigerian case of whether natural resource abundance have been a curse or a blessing using annual data over the period 1970 through 2016. Our mode of analysis is autoregressive distributed lag (ARDL) approach augmented by combined cointegration test. The famous resource curse and Dutch Disease theory have been our source of theoretical support. Our empirical results indicate that cointegration relation exist among the variables. Furthermore, there exists a negative and significant link between natural resource abundance and economic growth in Nigeria. This substantiates the findings of the majority of the studies that have reached the same conclusion that majority of the resource abundance countries experience slower growth. In other word, resource abundance happened to be a curse than a blessing.

Hence, our empirical results have fundamental policy implications to draw on the continuing discussion on the impact of natural resource abundance on economic growth in Nigeria. First, it is clear that Nigeria suffer from de-industrialisation following the resource boom (oil in particular) of the 1970s, therefore, policy makers should be mindful in reviving the non-oil sectors through the introduction of tax concession and appropriate policy to promote exports. This will enhance investment in other sectors of the economy and gradually convert the *curse* into *blessing* and pave the way to sustain growth. Second, it is well known that Nigeria has been facing infrastructure deficit, yet, a greater portion of resource revenues should be channeled into the provision of basic infrastructure development rather than being spent in private consumption as practice in the previous. While doing so, will intensify infrastructure development and support productive sectors of the economy.

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