Akungba Journal of Economic Thought
Volume 9, Number 2 2017: 14 - 27
ISSN: 2006-9995

OIL RESOURCES, EXCHANGE RATE AND ECONOMIC GROWTH: A PANEL DATA ANALYSIS FOR OIL RESOURCE ABUNDANCE COUNTRIES

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ABSTRACT

There is a paucity of empirical studies directly addressing oil resource abundance, exchange rate and economic growth in developing countries. The few existing studies on resource abundance do not combine exchange rate, oil resources and economic growth. Therefore, it is necessary to verify the relationship that exist among these macroeconomic variables in developing oil resource abundance countries The present study has applied panel data analysis for finding the relationship among these variables. For this purpose, this study utilized annual data set ranging from 1980 to 2012of 22 oil resource abundance countries and time series properties of data are explored prior to estimation. The study used both fixed and random effect model of panel data to examine the effect of these variables on economic growth in developing oil producing countries. This study concludes based on empirical findings that the abundance of oil resources does not impose resource curse on developing nations. The coefficient of exchange rate is positive as most of the developing countries take advantage of the foreign income from oil exporting as a substantial medium for increase in real gross domestic product and at long run yield a desired economic growth in their various countries. Also, improved foreign exchange position leads to capital inflow as indicated by the fixed effect result; a unit change in the exchange rate (ER) will lead to 5.7 % increase in economic growth of the oil producing countries. To demonstrate vividly that resource abundance is indeed a curse, and that the results prominent in the literature are not spurious, future empirical analysis needs to be based on indirect effect of oil resources on economic growth.

Keywords: Oil resource abundance, exchange rate and economic growth.

INTRODUCTION

Exchange rate is an important macroeconomic variable. It affects inflation and other economic activities of a nation. Analysis of the relationship between oil resources and economic growth has remained one of the most researched topics in economic literature because it has serious implications for exchange rate and income distribution. The determinants of a country's external reserves were also widely debated all over the world, if a country's external reserve is high, the value of her currency rises. This occurs due to increase in the purchasing power. Also, it is widely believed that prices of oil trigger inflation and exchange rate volatility. There is a tendency for the real exchange rate to become overly appreciated in response to the positive shocks which leads to a contraction in the tradable sector. For example, the impediments of oil revenue to economic growth and development of oil-dependent states is also cumulatively called Dutch Disease in the literature of development economics. It can be explained further that Dutch disease can cause a huge rise in exchange rate.

High exchange rate promotes adverse balance of payments as the cost of imports rises. Despite the fact that there has been strong theoretical and empirical evidence indicating that natural resource abundance has a positive impact on economic growth, the reality is often to the contrary as growth cannot be considered in the real sense without development. Mineral resources were heavily extracted in the Netherlands and in the Scandinavian countries, and the export of these resources replaced manufacturing and other sectors (Sachs and Warner, 1997). Though these areas specialized in different raw materials, a common thread unites them over time their economies suffered as a result of the specialization in the production and processing of a particular resource. While the discovery of a desirable resource initially produced positive economic growth, over time resource intensive economies tend to be stagnant.

However, a large number of empirical studies have shown that resource rich countries have performed poorly in terms of growth compared to resource-poor countries. The observation that resource-rich economies can sometimes have low growth is a critical issue especially in the developing nation. Typically some of these nations since their independence have been experiencing economic growth from various contribution of agricultural produce, which are the focus and the major source of the nation's wealth and capital, Nigeria for example. The country is equipped with both physical and human material that are tangible sources for generating wealth and capital, but the truth is that improved economic growth associated with increment in oil resources are short lived in real terms. This fact is a great tragedy that needs to be clarified and examined.

During the nineteenth and first half of the twentieth centuries, there were several experiences of development where natural resources seem to have been the engine of economic growth. However, it is hard to find successful experiences of development in the second half of the twentieth century. In fact, it is easy to find experiences where this sector has been blamed for the underdevelopment or low growth rates of some economies. For example in most countries that are rich in oil, minerals, and other natural resources, economic growth over the long time tends to be slower than in other countries that are less well endowed.

According to the resource curse, natural resources and economic growth vary inversely. As the amount of natural resources increases, the rate of economic growth falls. This pattern is counter-intuitive, because economic theory predicts, ceteris paribus, that natural resources enhance an economy's production possibilities, thus augmenting the potential for economic growth. The mere presence of natural resources does not cause economic stagnation. Rather, natural resource abundance induces certain distortions in the economy, which then serve as transmission mechanisms, which, in turn, affect economic growth. These transmission mechanisms directly influence economic growth whereas natural resources only exert an indirect impact via the transmission mechanisms.

Experience seems to indicate that it is not so much the existence of natural resources that really hurts growth but rather the failure of public authorities to meet the policy challenge posed by natural resource abundance and to correct institutional and market failures that cause the damage. Some transmission mechanisms include: the Dutch Disease, rent seeking, government mismanagement, and low levels of human capital (Gylfason, 2001). Many studies, including Boye (2001),Olomola and Adejumo (2006),Odusola and Akinlo (2001) have examined the relationship between oil price and macroeconomic variables. Though the literature have a long standing in oil price volatilities and macroeconomic performance, previous studies have concentrated on oil price and macroeconomics variables in Nigeria. Also the fact that some of these studies have been done long ago makes a new study in this area very imperative. In addition, considering several researches on resource course from Nigeria, it is clear that many have not used the panel data analysis as a methodology in finding out resource curse validation in developing nations. This paper fills this gap.

This work is also unique as it focused on developing nations, studying the state of underdevelopment in relation to their riches in resources both in minerals and in human resources. The study therefore examines the validity of resource curse, Dutch disease, and their relationship with real exchange rate and economic growth in developing oil resource nations. This study is organized under five sections. Following this is section two which reviews the relevant literature. Theoretical framework and research methodology are presented in section three. Empirical results and policy recommendations are discussed in section four and five respectively.

CONCEPTUAL, THEORETICAL AND EMPIRICAL REVIEW

Economists use the term “Dutch disease” to describe a reduction in a country’s export performance as a result of an appreciation of the exchange rate after a natural resource such as oil has been discovered. It is expected of any economy that is endowed with abundance of natural resources to have an increasing rate of growth on a yearly basis as the contribution of each natural resource will add to the economic growth of the economy, but however, in the case of the Nigerian economy, the adverse has been the case. Economies that have abundance of natural resources have tended to grow slower than economies without substantial natural resources (Sachs and Warner, 1995). The abnormality of resource-poor economies outperforming resource-rich economies has been a recurring keynote of economic history. In the seventeenth century, resource-poor economies like Netherlands eclipsed Spain, despite the overflow of gold and silver from the Spanish colonies in the New World. In the nineteenth and twentieth centuries, resource-poor countries such as Switzerland and Japan pitch ahead of resource abundance economies such as Russia. In the past thirty years, the world’s star performers have been the resource-poor comprising the Newly Industrializing Economies of East Asia -- Korea, Taiwan, Hong Kong, Singapore -- while many resource-rich economies such as the oil-rich countries of Mexico, Nigeria, and Venezuela, are still facing challenges with growth and development of their economies.

The negative association between resource abundance and growth in recent decades certainly poses a conceptual puzzle. After all, natural resources increase wealth and purchasing power over imports, so that resource abundance might be expected to raise an economy's investment and growth rates as well. Many oil-rich countries have aimed to use their vast oil revenues to finance diversified investments and a "big push" in industrial development. Moreover, when a natural resource has high transport costs, then its physical availability within the economy may be essential for the introduction of a new industry or a new technology. As a key historical example, coal and iron ore deposits were the prerequisite for the development of an indigenous steel industry in the late nineteenth century. In view of this, resource-rich economies such as Britain, Germany, and the U.S, experienced particularly rapid industrial development at the end of the last century with falling transport costs. However, the physical availability of resources within the national economy is rarely as decisive today as it was a century ago. Thus, Japan and Korea have succeeded in becoming world-class steel producers despite their virtual complete dependence on imports of iron ore. Nevertheless, even if natural resources are no longer a decisive advantage to economic growth, it is surely surprising that they might pose an actual disadvantage. The first explanations of the resource curse were based on the structuralist thesis of the 1950s, focusing on the decline in the terms of exchange between primary and manufactured products, the volatility of primary product prices, or the limited linkages between the natural resource sector and the rest of the economy (Hirschman, 1958). However, none of these explanations was unequivocally confirmed by empirical tests (Behrman, 1987; Dawe, 1996).

The term "resource curse" therefore describes the notion that resource-rich areas tend to be poor and often politically oppressed. Although it seems paradoxical, the idea of a resource curse is difficult to ignore. Angola, Congo, Nigeria, Venezuela, and the Middle East are notable examples of places that are rich in natural resources, but also plagued by low or negative GDP growth, widespread poverty, state failure, civil war, corruption, and political oppression. Nigeria is an often-cited example: its per capita GDP in 2000 was 30% lower than in 1965, despite oil revenues of roughly $350 billion (1995$) during the intervening period.

The resource curse, also known as the paradox of plenty, refers to the paradox that countries and regions with an abundance of natural resources, specifically point-source non-renewable resources like minerals and fuels, tend to have less economic growth and worse development outcomes than countries with fewer natural resources. It is also seen as a surprising empirical result that depicts a negative relationship between countries' natural-resource abundance and dependence and their economic growth after controlling for other relevant variables. This finding was confirmed by a large number of cross-section studies initiated by Sachs and Warner (1995, 1997, 1999), considering different country samples and extended periods, and thus became a stylized fact (e.g., Auty and Mikesell, 1998; Sachs and Warner, 1999).

This is hypothesized to happen for many different reasons, including a decline in the competitiveness of other economic sectors (caused by appreciation of the real exchange rate as resource revenues enter an economy, a phenomenon known as Dutch disease), volatility of revenues from the natural resource sector due to exposure to global commodity market swings, government mismanagement of resources, or weak, ineffectual, unstable or corrupt institutions (possibly due to the easily diverted actual or anticipated revenue stream from extractive activities).

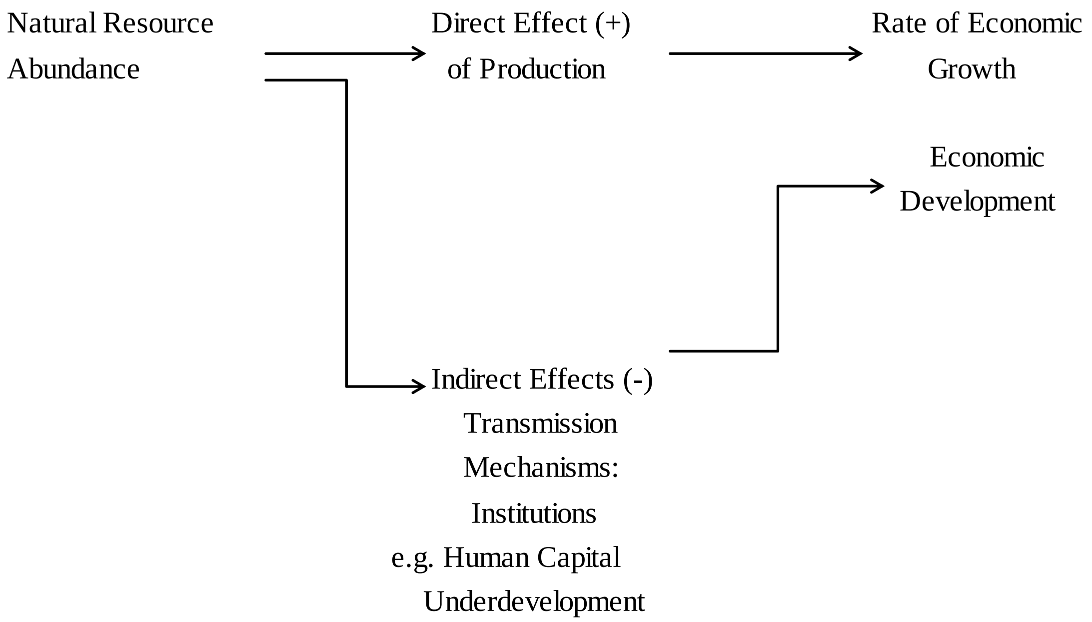
Alichi and Arezki (2009) provide an alternative explanation for the "resource curse" based on the income effect resulting from the high level of government current expenditures in resource rich economies. Using a simple life cycle frame work, we show that private investment in the non-resource sector is negatively affected by current transfers financed through natural resource revenues. This happens because expectation of transfers dampens savings within the economy. They showed that higher degrees of openness and forward altruism reduce this adverse effect. They also found empirical support for the main theoretical predictions by estimating non hydrocarbon sector growth regressions using panel data for 25 oil-exporting countries over the period 1992 to 2005. Policy implications for dampening this channel of resource curse would be to limit current transfers, further liberalize international goods and capital movements and introduce policies that promote domestic private investment.

Some authors have shown that the hypothesized contraction of the manufacturing sector with the simultaneous expansion of the service sector does exist. Further, natural resources have been found to be negatively correlated with growth both cross-nationally (Jonas, 2011) as well as within individual countries. More so the manufacturing sector in Norway actually benefitted from the discovery of natural resources.

Sachs and Warner (1995) initially work to investigate what some authors called a ‘conceptual puzzle’ and ‘oddity’, the negative relationship between natural resource intensity and subsequent economic growth already suggested by the case studies of Gelb (1988),Auty (1995) among others, together with initial cross-section empirical analyses by Wheeler (1984) and Auty and Evans (1994). The oil crisis in the 1970s and 1980s reversed the benign view of resource-based growth that predominated in the early 1900s, namely due to the enthusiasm with Canada’s favorable growth trajectory (Keay, 2007).

The global commodity price booms of the 1970's promoted additional research about the economics of natural resource booms. The question about the long-term growth effects of natural resource production and/or natural resource booms was studied implicitly through the issue of whether natural resource production promoted de-industrialization (the Dutch disease). The Dutch disease is the apparent relationship between the increase in the exploitation of natural resources and a decline in the manufacturing sector (or agriculture). According to Neary and van Wijnbergen(1986), the Dutch disease thesis sustains that natural resource booms hinder the industrial sector, assumed as the main driving force of the economy, either through real exchange rate appreciation or the absorption of production factors. Furthermore, the Dutch disease mechanism is that an increase in the natural resource revenue (or foreign aid inflows) will make a nation’s currency to become more stronger compared to other nations (manifest in an exchange rate), resulting in the nation’s other exports becoming more expensive for other countries to purchase, which make import cheaper, and hence, makes the manufacturing sector less competitive. Thus, the expansion of the natural-resource sector is not enough to offset the negative effect of deindustrialization on economic growth. In addition, there is a change in composition of exports in favour of raw materials, or even a drop in total exports, thus reducing economic growth.

Direct and Indirect Effects of Natural Resources



Source: Authors intuition

THEORETICAL FRAMEWORK AND RESEARCH METHODOLOGY

The growth theory has evolved over the years as a major feature of development economics. The evolution of an economic growth model is the examination of a hypothetical economy over time as the qualities and/or quantities of several inputs into the production process and the method of using those inputs changes. One of the popular and earliest attempts to model economic growth is referred to as the Solow-Swan model, named after Robert (Bob) Solow and Trevor Swan, which identifies the channels through which macroeconomic variables affect economic growth. For a growth theory, a natural starting point is the aggregate production function, which relates the total output of a country to that country's aggregate inputs of the factors of production. Solow's model of economic growth is based on the principle that output in an economy is produced by a combination of labour (L) and capital (K). Thus, the combination of labour and capital by efficiency (A) can be used to determine the quantity of output (Y). Solow assumed that the production function exhibits constant returns to scale, that is, if all inputs are increased by a certain multiple, output will increase by exactly the same multiple.

Consider the aggregate production function:

$$Y_t = F\,(A_t, L_t, K_t). \qquad (1)$$

Therefore,

Y_t is the gross domestic product at time t. A_t is technology at time t which has no natural unit. It is a shifter of the production function. L_t is the total labour employment. K_t is the stock of capital which also corresponds to the quantity of equipment e.g. refineries (or more explicitly, machines and structures) used in production, and it is typically measured in terms of the value of that equipment.

Imposing some standard assumption on the production function as to possess;

Continuity, Differentiability, Positive and Diminishing Marginal Products, and Constant Returns to Scale.

Differentiate with respect to L and Kfor both first and second derivatives:

First derivative:

$$Y_L(A, L, K) = \frac{\partial Y(A, L, K)}{\partial L} > 0 \quad (2)$$

$$Y_K(A, L, K) = \frac{\partial Y(A, L, K)}{\partial K} > 0 \quad (3)$$

Second derivative:

$$Y_{LL}(A, L, K) = \frac{\partial^2 Y(A, L, K)}{\partial L^2} < 0 \quad (4)$$

$$Y_{KK}(A, L, K) = \frac{\partial^2 Y(A, L, K)}{\partial K^2} < 0 \quad (5)$$

Hence, Y exhibits constant returns to scale in K and L.

First, the notation Y implies that the production function takes non-negative arguments (L, K) and maps to non-negative levels of output (Y). It is natural that the level of labour employed and the level of capital should be positive. Since A which is technology has no natural units. The second important aspect of assumption 1 above is that, Y is differentiable and it is a continuous function. It is also specified in assumption 1 that marginal products are positive (so that the level of production increases with the amount of inputs) and that the marginal product of both labour and capital are diminishing i.e. Y_{KK}<0andY_{LL}<0, so that more labour, holding everything else constant, increases output by less and less, and the same applies to capital. This property is sometimes also referred to as diminishing returns to labour and capital.

Raw labour (i.e. labour without the use of machineries) and labour related technology are assumed to grow according to the following functions:

$$L_t = L_0 e^{nt} \quad (6)$$

$$A_t = A_0 e^{gt} F^{\alpha} P^{\alpha} \quad (7)$$

where n is the exogenous rate of growth of labour force, g is the exogenous rate of technological progress, F is the degree of openness of the domestic economy to foreign trade and P is the level of government fixed investment in the economy.

Where:

A represents technology, overall efficiency and quality.

The exponents (α, β) in the aggregate production function are regarded as factor shares.

However, to determine the per-capita term, divide each variable by the number of labour.

$\frac{Y}{L}$ = y $\frac{N}{L}$ = n $\frac{K}{L}$ = k

Therefore,

$$y = An^{\beta}K^{1-\alpha-\beta} \quad (9)$$

From equation 9 above, an increase in the parameter β connotes that the economy now depend more heavily on natural resources in production of output while increase in *N*means that there is an increase in the supply of natural resources. Parameter β as regarding natural resources (simply crude oil) can be considered to be increase in the number of oil fields and oil wells and also increase in the number of refineries, all these together with the increase in the supply of *N* will make the economy to rely more on natural resources.

According to the neoclassical growth theory, technological progress is the only cause of continuity and increase in economic growth. An improvement in technology is defined as a gain in total factor productivity which signifies increment in output while certain sum of the inputs to production is held constant. As the level of technological knowledge rises, the functional relationship between productive inputs and output changes (Stern, 2004). Greater quantities or better qualities of output can be produced from the same quantity of inputs and more also, output increases at a decreasing rate as the amount of capital employed rises.

The Model

In functional form of the model is expressed as:

$DEV = f\,(OR, ER)$ …………………………………....... (10)

$DEV_{it} = \alpha + \mu_{OR}.OR_{it} + \mu_{ER}.ER_{it} + e_{it}$…….…........…….. (11)

Where:

- *DEV_{it}= Real Gross Domestic Product as a measure of economic growth for country i, in period t.*
- *α= Parameter of equation for country i, which is the Intercept of the model.*
- *OR_{it}= Is the vector of independent variable "Oil rent" as a measure of oil resource abundance.*
- *μ= vector of coefficients that are common among the countries or Measure of the slope/ regression coefficients*
- *ER_{it}= Is the vector of independent variable "Exchange Rate" and*
- *e =Is error term /Stochastic variable/Random variable in the equation for country i in the period t.*

Taking the natural logarithm of equation (3.2) it gives:

$logDEV_{it} = \alpha + \mu_{OR}.logOR_{it} + \mu_{ER}.logER_{it} + e_{it}$…….……….. (12)

The a priori expectations of the behavior of the independent variables in terms of their parameters to be estimated are:

$$\mu_{ER} = \frac{\delta DEV_{it}}{\delta ER_{it}} > 0$$

$$\mu_{OR=\frac{\delta DEV_{it}}{\delta OR_{it}}>0}$$

The panel estimators that are presented in this study, however, do control for unobservable individual heterogeneity. First, some notation is established:

y_{it} = the value of the dependent (continuous) variable for cross-section individual country i at time t where i = 1, …, n and t = 1, …, T

X^j_{it}= the value of the j^{th} explanatory variable for individual country i at time t. There is K Explanatory variables indexed by j = 1… K.

The discussion of the models here is restricted to the case of balanced panels. That is, there is the same number of observations for each individual. The total number of observations thus is n × T. Typically; the data are organized by decision units. Therefore,

$$\mathbf{y}_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ \vdots \\ y_{iT} \end{bmatrix} \qquad \mathbf{X}_i = \begin{bmatrix} X^1_{i1} & X^2_{i1} & \cdots & X^K_{i1} \\ X^1_{i2} & X^2_{i2} & \cdots & X^K_{i2} \\ \vdots & \vdots & \ddots & \vdots \\ X^1_{iT} & X^2_{iT} & \cdots & X^K_{iT} \end{bmatrix} \qquad \mathbf{e}_i = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \vdots \\ \varepsilon_{iT} \end{bmatrix}$$

where e *it* is the error term for individual *i* at time *t*. Usually, the data are arranged to form

$$\mathbf{y} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} \qquad \mathbf{X} = \begin{bmatrix} \mathbf{X}_1 \\ \mathbf{X}_2 \\ \vdots \\ \mathbf{X}_n \end{bmatrix} \qquad \mathbf{e} = \begin{bmatrix} \mathbf{e}_1 \\ \mathbf{e}_2 \\ \vdots \\ \mathbf{e}_n \end{bmatrix}$$

Where **y** is nT□1, **X** is nT□□k , and **e** is nT□1. The standard linear model can then be written as

$$\boldsymbol{y} = \boldsymbol{X\beta} + \boldsymbol{e}$$

Where $\boldsymbol{\beta}_1 = (\beta_1, \beta_2, \ldots\ldots.\beta_k)$

All models that are presented subsequently are variants of the model above. The differences between the models are mainly due to different assumptions about the error term **e**.

Random Effect Model:

Panel data estimator comprise of random and fixed effect model: Random effect model allows for random deviation of individual intercept from the mean value. It also considers the individual cross-country effect as latent of the random variables and to formally incorporate them into the residual term of a linear model. This method or approach allows for non-observable heterogeneity of error term.

The random estimator is written as:

$$Y_{it} = \alpha + \beta_{it} X_{it} + \mu_{it}$$

In this case, Y_{it} is the dependent variable; β_{it} is the parameter of interest to be estimated $X_{it}$is the explanatory variables. The Random effect assumes that the term α_{it} is the sum of a common constant and time-invariant variable μ_t that is correlated with the residual ε_{it} . Therefore, instead of treating β_{it} as fixed we assume that it is a random variable (consisting the cross-country effect with a mean value of β_t (no subscript i) and the intercept value for an individual country can be expressed as

$$\beta_{it} = \beta_i + \varepsilon_i \qquad t = 1, 2, 3, \ldots\ldots\ldots N$$

Where, ε_I is a random error term with a mean value of zero and variance of σ^2 ε.

In essence, the whole oil producing countries drawing as a sample have a common mean value for the intercept (i.e. β_i) and the individual country differences in the intercept values of each country are reflected in the error term ε_i. However, a panel data is suitable to analyse data observed for a relatively small number of cross sectional units. The estimator is the generalized least square method. It allows for group-wise heteroscedasticity, cross-group correlation and within group autocorrelation.

The Fixed Effects Model

One of the (two) most important potential sources of bias in cross-sectional econometrics is the so called heterogeneity bias arising from unobserved heterogeneity related to both *y* and *x*. If we assume that the unobservable element correlated with *x* does not change over time, we can get rid of this source of bias by running the fixed effect model (FEM). The fixed effects model is useful in a wide variety of situations, and it can be applied to panel data with any number of individual, cross sectional observation. Unbalanced panels, where *T* differs over individuals, are no problem for the FE-estimator. Also, time-constant unobserved heterogeneity is no problem for the FE-estimator. FE as well allow for serial autocorrelation (AR (1)), individual specific constant, which will capture all time-constant (unobserved) characteristics.

However, the assumption that will be made for this study will be that, the intercept and slope co-efficient are constant across time and space and the cross term captures differences over time. This approach is to disregard the space and time dimension of the pooled data and just estimate the usual OLS regression. Therefore, given the small number of countries included here and the differences in their economic features, the fixed effect estimator seems to be suitable for the analysis of this study as it allows for serial autoregressive of order 1, AR (1).

Hausman Specification Test: The test evaluates the significance of an estimator versus an alternative estimator. It helps one evaluate if a statistical model corresponds to the data. This test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model (Hausman 1978). If correlated (H0 is rejected), a random effect model produces biased estimators, violating one of the Gauss-Markov assumptions; so a fixed effect model is preferred.

EMPIRICAL RESULT

In order to avoid bias estimate of the panel data, test for stationarity was done for the differenced data set, the result below indicate the outcome of Augmented Dickey Fuller test for Unit root.

Table 4.1: Augmented Dickey Fuller test for Unit root for the time series

Variablies	**Test Statistics**	**1% critical value**	**5% critical value**	**10% critical value**	**macKinnon approximate p-value Z(t)**
RDEV	-5.196	-3.709	-2.983	-2.623	0.0000
OR	-7.174	-3.709	-2.983	-2.623	0.0000
ER	-6.789	-3.709	-2.983	-2.623	0.0000

Ho: There is unit root

Hi: There is no unit root.

This is the result of Augmented Dickey Fuller test for unit root of the differenced time series data which revealed that the data is stationary and this is justified by comparing the t-statistics and the critical values. Therefore going by the rule of thumb, that if the t-statistic is greater than the critical values, we reject the null hypothesis that there is unit root and accept the alternative hypothesis.

Panel Analysis Of The Study

Table 4.2: Panel Unit Root Test

Variables	Im,Pesaran and Shin	Augmented Dickey Fuller	Phillips-Perron
Exchange Rate (ER)	-2.04 (0.02)	82.69 (0.08)	211.71 (0.00)
Oil Rent (OR)	-1.04 (0.15)	89.04 (0.02)	78.19 (0.11)
Real Gross domestic Product (DEV)	5.73 (0.00)	174.65 (0.00)	253.07 (0.00)

The table reports results of panel unit root tests, all of which test the null-hypothesis of unit root. P-values are reported in parenthesis. The test statistics correspond to the w-stat in Im, Pesaran and Shin's (2003) test together with the Fisher Chi-square statistic in the ADF- and PP-tests for individual unit root processes. Lag-lengths are selected according to the Schwartz criterion and all tests include a constant but no trend.

The regression result below shows that the R^2 values for the fixed and random effect regressions are 0.737 and 0.676 respectively, while the pooled least square is 0.552. Apart from taking account of time and country specific effect, the fixed effect panel regression has a better fit than the OLS and random effect. The result of R^2 shows that it is statistically significant at 74% meaning that 74% of the total variance in development in the selected oil producing country is explained by the model. Thus, the single- cross-country regression result can be misleading when unobserved country-specific effects and the problem of endogeneity are ignored. However, the authors used the result obtained from fixed effect regression as the basis for the discussion.

Table 4.3

Explanatory variables	**Pooled least square estimator**		**Fixed effect (corrected for autocorrelation)**		**Random effect**	
	Coefficient estimate	*p*- value	Coefficient estimate	*p*- value	Coefficient estimate	*p*- value
OR	-0.078261	0.0001	0.071232	0.005**	0.523185	0.005
ER	-0.003069	0.0000	0.057159	0.000***	0.531821	0.000
CONST	2.124671	0.000	2.10000	0.001***	1.65000	0.001
R^2	0.552		0.737		0.676	
Adjusted R^2	0.489		0.651		0.599	
No of cross section.	19		19		19	

* = significant at 10% **= significant at 5% *** = significant at 1%

Source: Authors compilation from the pool result.

From the table, the oil rent is positive and statistically significant. Oil rents are the difference between the value of crude oil production at world prices and total costs of production. It is argued to have a relationship with country's economic development. Thus, the result shows that there is a strong relationship between Gross Domestic product and Oil rent. The result shows that a unit change in oil rent (OR) will lead to 7.1% change in the economic growth of the selected oil producing countries.

The official exchange rate is positive and highly statistically significant. The coefficient of exchange rate is expected to be positive as most of the developing countries take advantage of the foreign income from oil exporting as a substantial medium for increase in real gross domestic product and at long run yield a desired development in the economy of the exporting countries. So as indicated by the fixed effect result, a unit change in the exchange rate (ER) will lead to 5.7 % increase in economic growth of the oil producing country.

To decide which model is the best between the fixed effect and random effect model, we set the following hypotheses:

1. H_0: Random effects model is the preferred model
   H_a: Fixed effect model is the preferred model

2. H_0: The unique errors (ui) are correlated with the regressors
   H_a: The unique errors (ui) are not correlated with the regressors

Table 4.4: Hausman Fixed and Random effects

	Coefficients			
	(b)	(B)	(b – B)	S.E
Variable	Fixed	Random	Difference	
OR	329.42	82.40	247.02	106.83
ER	-0.0000516	-0.0000356	-0.0000159	1.92 e- 06

b = consistent under H Ho and Ha

B = Inconsistent under Ha, efficient under H_0

X^2 (2) = (b –B) = 14.79

Prob> X^2 = 0.0006 (B is not positive definite)

Following the rule of thumb, Prob> X^2 = 0.0006< 0.05, we reject Ho and accept Ha. This implies that the fixed effect model is best and the unique errors (ui) are not correlated with the regressors.

CONCLUSION AND POLICY RECOMMENDATION

As it has been shown, the abundance of raw materials does not impose resource curse on developing nation, future research arguably should be based on other indirect measurement of resource abundance. To demonstrate vividly that resource abundance is indeed a curse, and that the results now so prominent in the literature are not spurious, future empirical analysis needs to be based on measures of resource stocks,e.g general public, high-level decision makers, policy analysts.About the significance of resource stock with respect to economic and environmental issues of concern,diversification of the resource base of the economy pathways can be adopted to enhance economic robustness of a country and also significantly change the political dynamics within it. Thus, mechanisms toward this end appear to be promising.

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