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Original Research Article

Oil Rents and Human Development Outcomes in Nigeria: Evidence from a Non-Linear Bounds Approach to Cointegration

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Abstract

In this study, the asymmetric relationship between oil rents and human development in Nigeria was examined between 1981 and 2020. Specifically, the nonlinear autoregressive distributed lag (NARDL) model was employed to ascertain how the partial sums of positive and negative changes in oil and gas rents contributed to the human development index (HDI) with time-series data obtained from the United Nations Development Programme (UNDP) Human Development Report and World Development Indicators (WDI). In addition, unit root and bounds cointegration tests were employed to determine the stationary properties and long-run relationships among the variables. It was found from the unit root test that the variables were fractionally integrated. It is also evident from the bounds cointegration results that HDI has a long-run relationship with oil and gas rents. The findings revealed that oil rent has not yielded the intended and desired positive benefits in terms of improving human development given its insignificant positive contribution to HDI. On the other hand, HDI responded positively to positive changes in natural gas rents and this finding was statistically significant at a 5 per cent level. This implies that an increase in natural gas rents plays a significant role in improving human development. Given the findings, this paper recommends proper management and accountability of the oil rents to create better opportunities for human development. It is also recommended for government to mitigate gas flaring and create enabling environment for more investments in gas resources to provide a roadmap for more investments in human development.

Keywords: Oil rents, gas rents, human development, investments, Nigeria.

1. INTRODUCTION

There has been growing concern on the centrality of oil in the Nigerian economy and the role it plays in making available resources for economic and human development. It is unarguable that Nigeria is richly endowed with oil resources as the Organization of Petroleum Exporting Countries (OPEC, 2016) ranked the country as the largest oil producer in Africa and 13th highest producer in the world. The OPEC statistics further revealed that Nigeria has proven crude oil reserve of 37,062 million barrels and natural gas reserve of 5,284.3 billion. This explains the centrality of oil and gas in the Nigerian economy. It worthy of note that Nigeria largely depends on crude oil for export earnings, revenue generation and external reserve build-up, consequently annual budgets are usually prepared and tied to a given expected price and production level of crude oil. This has put the economy in a vulnerable position and exposes it to the vagaries in the international oil market.

As a rentier state, Nigeria derives a large portion of its revenues from oil rents. The rents accrue directly to the country and its leaders, and there have been controversies on the management of the oil rents following the pervasiveness of corruption and rent seeking interests in the oil and gas sector. For instance, the resource curse hypothesis has triggered a substantial amount of theoretical and empirical literature from both economic and political angles. Most of the existing studies establish a statistical connection between large resources and poor economic growth and development. This casts doubts on the effectiveness of the abundant oil resources and the associated rents in providing supports for rapid and sustainable development. However, Mohamed (2020) posits that resource revenues and taxes enable the governments to fund

infrastructure projects and human capital formation, which drive the process of economic growth. Additionally, Venables (2016) describes revenues from natural resources in capital-deficit developing countries as helpful for boosting the fiscal capacity of governments for investments in human capital assets

As evidenced in the available statistics, Nigeria has relied heavily on oil meeting the growing fiscal obligations and the share of oil rents to GDP have varied as reported in Figure 1.

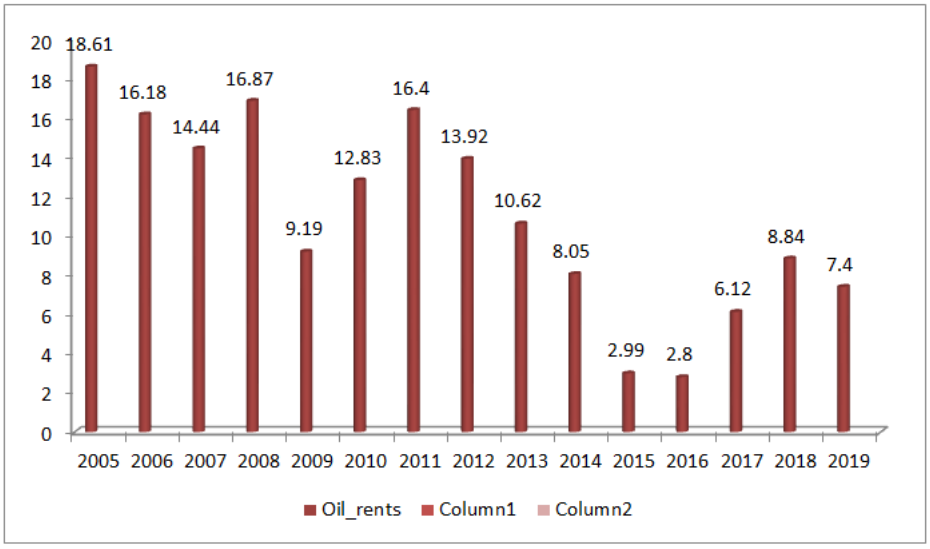

Figure 1: Trajectory of oil rents (% of GDP) in Nigeria (2005-2019)
Source: Author's compilation based on data obtained from WDI

A cursory look at Figure 1 shows that oil rents fluctuated during the study period. As a per cent of GDP, oil rents declined from 18.61 per cent in 2005 to 14.44 per cent in 2007. It rose to 16.4 per cent in 2011 and trended downward during 2012-2015 and reached a record low level of 2.8 per cent in 2016. This could be attributed to the increasing costs associated with oil exploration and managerial inefficiency in the oil industry. The oil rents increased to 8.84 per cent in 2018 and declined marginally to 7.4 per cent in 2019. Despite the revenue available to Nigeria from oil rents, the UNDP (2019) Human Development Report showed that Nigerian's HDI score increased marginally from 0.465 in 2015 to 0.539 in 2019, thus putting the country in the low human development category. The key question is, how has the available oil rents contributed to the process of human development in Nigeria? Based on the foregoing, this paper explored the asymmetric effects of oil rents on HDI in Nigeria.

2. REVIEW OF RELATED LITERATURE

2.1 Theoretical Literature

The resource curse popularly known as the paradox of plenty assumes that resource-abundant countries tend to experience poor level of development in infrastructure and human resources. In other words, the majority of many resource-rich countries do not benefit fully from their natural resource wealth. It also assumes that governments in these countries fail to respond effectively to public welfare needs. The implication of this is that these countries are compelled to a large extent to depend on other countries for a wide variety of goods and services; and may in fact end up with a net loss at the end of the year. According to Auty (1998), the resource-curse theory describes countries endowed with rich natural resources were unable to use the wealth to boost their economies. These countries are often characterized by low economic growth than countries without large natural resources. This was exemplified in the Dutch Disease syndrome, a situation which makes it difficult to diversify the economy, generally undermining non-oil activities.

Numerous studies such as Sachs and Warner (2001), and Le Billon (2001), have all shown a link between natural resource abundance and poor economic growth. Hardin (1968) on his part opines that in the traditional common problems, free access to a finite resource ultimately poses a threat to the resource sustainability due to over exploitation. In addition, Collier and Hoeffler (2002) argue that the abundance of natural resources can and often do provoke conflicts within the society as different groups and factions fight for their share as expressed. This tends undermine the effective and optimal use of the resources to foster economic and social development with greater opportunities for improved human development. Therefore, the intended and desired development outcomes linked to the abundance of resources in resource-rich countries are unrealistic due to conflict, authoritarianism, poor institution and lower rates of economic stability and economic growth. It is also argued that the governments in the resource-rich have a tendency to over-spend on government salaries,

inefficient fuel subsidies and large monuments and to underspend on health, education and other social services. This often poses a threat to the process of economic and human development. Unlike the advocates of the resource curse theory, the proponents (Mackintosh, 1967; Sid-Ahmed, 1989) of the staples theory argue that natural resource exports drive the process of economic development in countries with limited local market and large natural resources in relation to labour and capital.

2.2 Empirical Literature

Eregha and Mesagan (2020) examined the effect of oil resource abundance and deficit finance on per capita GDP growth in selected oil-rich African countries between 1980 and 2017. The study analyzed panel data from Algeria, Angola, Egypt, Libya, and Nigeria using the dynamic heterogeneous panel approach. Results showed that oil production positively enhances GDP growth in the panel, Algeria, Angola, Egypt, and Libya, except in Nigeria. Oil rents adversely affect growth in Algeria, Angola, Egypt, and Libya, while net oil export negatively affects GDP growth in the short- and long-run in Africa, Angola, Egypt, Libya, and Algeria, but positive in Nigeria. Lastly, deficit finance is growth-enhancing in Algeria and Egypt, but growth-reducing in Libya, Nigeria, and Angola. The study, therefore, recommended for these countries to invest their oil largesse in boosting the productive base of their economies to lower fiscal deficits during periods of crude oil price uncertainties and boost GDP growth.

Olomola (2017) examined the effect of oil rents on economic growth in oil exporting African countries. It also attempts to provide both theoretical and empirical analysis of the channels of transmission of resource curse of natural resources on growth in these countries. The study adopted a panel data regression analysis for the period 1970 to 2000 for 47 oil exporting countries including Africa, and 13 non-oil exporting countries. The major findings are that there was evidence of resource curse in oil exporting countries, including oil exporting African countries, exchange rate and the Dutch disease syndrome do not explain the resource curse in these countries, including Africa, the absence of democracy in oil exporting countries hinders economic growth, and the despicable state of institutions in oil exporting countries encourage grabbing of public resources and oil rents through rent seeking hence retarding economic growth. The basic conclusion from the study is that for oil exporting African countries, oil rents have failed to promote growth.

Ilo, Elumah & Sayanolu (2018) examined the relationship between oil dependence and financial development in a developing oil producing economy taking into consideration, the banking sector and capital market forces for the period 1981-2015. The techniques employed include Johansen Cointegration test, vector error correction model and granger causality test. The results revealed the existence of a long run relationship between oil dependence and financial development in Nigeria; oil rent has a short run effect on banking sector development, and the absence of a short run relationship between oil rent and capital market development. Based on these findings, it is recommended that oil rents should be better managed due to the uncertainty and volatility in the oil market and distortion in the extracting of crude oil. Furthermore, the Nigerian government should provide and increase financial sector credit for productive investment purposes that can support economic growth to reduce oil dependency and encourage diversification in economic activities.

Okonkwo & Madueke (2016) used single linear regression models to test the impact of petroleum revenue on economic development of Nigeria, between 1980 and 2013. Economic development was proxied by two variables: real per capita Gross Domestic Product (GDP) and unemployment rate. Petroleum revenue was proxied by the contribution of petroleum sector to the GDP. The results showed that petroleum revenue has an insignificant effect on economic development of Nigeria in the short run. In the long run there is no significant correlation between petroleum revenue and economic development of Nigeria. There is no causal relationship between petroleum revenue and economic development of Nigeria. Government must therefore diversify the economy via promotion and creating enabling environment for non-oil sector development in Nigeria; reduce the size of the public sector and increase budgetary capital expenditure especially in the areas of providing sustainable power supply and means of transportation as well as information technology; intensify efforts aimed at combating corruption; and encouraging the federating units to contribute to the revenue of the country.

3. METHODOLOGY

3.1 Research Design

Considering the nature of this paper, an ex post facto research design was followed. The choice of this research design resonates from the fact that the data required for the empirical investigation were sourced from secondary sources, which cannot be manipulated.

3.2 Model Specification

In accordance with Shin, Yu & Greenwood-Nimmo (2014), the NARDL model for this paper which involves the decomposition of the independent variables in equation (1) into partial sums of positive and negative changes in the underlying measures of external trade is specified as follows:

$$\Delta HDI_t = \alpha_0 + \alpha_1 HDI_{t-1} + \beta_1^+ OIL_{t-1}^+ + \beta_2^- OIL_{t-1}^- + \beta_1^+ GAS_{t-1}^+ + \beta_2^- GAS_{t-1}^- + + \sum_{j=1}^{p} \lambda_1 \Delta HDI_{t-j} + \sum_{j=1}^{q} \left(W_1^+ \Delta OIL_{t-j}^+ + W_1^+ \Delta OIL_{t-j}^- \right)$$

$$+ \sum_{j-1}^{q} \left(W_1^+ \Delta GAS_{t-j}^+ + W_2^- \Delta GAS_{t-j}^- \right) + U_t \qquad (1)$$

Where
HDI = Human development index
OIL^+ and OIL^- = partial sums of positive and negative changes in oil rents
GAS^+ and GAS^- = partial sums of positive and negative changes in natural gas rents
$\beta_1^+ and \beta_2^-$ = Long run parameters linked to the partial sums of positive and negative changes in the explanatory variables.
$W_1^+ and W_2^-$ = shot run parameters.
P and q = lag lengths for the regressors
U_t = serially uncorrelated error term with zero mean and constant variance and covariance.
Δ = first difference operator

3.3 Method of Data Analysis

This paper applied NARDL method popularized by Shin *et al.* (2014) to estimate the asymmetric effect of external trade on poverty. The appeal for the NARDL is that it captures nonlinearity by means of partial sum decompositions in a coherent manner. In other words, it allows for capturing both the short-run and long-run asymmetries in a single equation set up. An empirical precondition for the application of the NARDL model requires that all variables should be stationary at levels and/ or first difference (Mihajlović & Mihajlović, 2020). The presence of the long run asymmetry relationship was examined by testing the null hypothesis of equality between the long-term coefficients of positive and negative changes using bounds cointegration test. Additionally, the Kwatkowski, Phillip, Schemidt and Shin, (KPSS, 1992) approach to stationarity test was employed for the unit root test. Thus, the general model for the KPSS model is of the form:

$$Y_t = r_t + \beta_t + e_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where
Z_t = economic or financial time series under investigation
B_t= deterministic trend
r_t = random walk
e_t = stationary error

Again, the descriptive statistics formed the basis for analyzing the distribution of the variables.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The descriptive statistics for the variables are summarized in Table 1.

Table 1: Summary of descriptive statistics

	HDI	OIL	GAS
Mean	0.477308	11.82795	0.487179
Median	0.461000	10.62000	0.410000
Maximum	0.540000	26.43000	1.670000
Minimum	0.443000	1.510000	0.000000
Std. Dev.	0.027514	5.932764	0.502876
Jarque-Bera	8.446449	0.775839	4.554835
Probability	0.014651	0.678467	0.102549
Observations	39	39	39

Source: Author's computation based on data from UNDP Report and WDI

The mean distribution of the variables showed that HDI averaged 0.477 during the study period, which indicates that Nigeria lies with the low human development category. At the same time the mean values of oil and natural gas rents are 11.83 and 0.487 per cent respectively. This is a pointer that oil rents more than doubled the natural gas rents as it accounted for 11.83 per cent of the GDP on the average during the study period. The standard deviations showed that the distributions for HDI and oil rents clustered around their respective mean value while that of natural gas rents deviated from its mean value. The results further revealed that oil and natural gas are normally distributed at 5 per cent level. However, HDI is not normally distributed, which could be attributed to large outliers in the observation over the study period.

4.2 Unit Root Tests

The KPSS unit root test method was applied in this paper and the results are summarized in Table 2.

Table 2: KPSS unit root test results

Null hypothesis: Variable is stationary					
Variable	Levels test results		First difference test results		Order of Integration
	LM statistic	5 Percent Critical value	LM statistic	5 Percent Critical value	
HDI	0.590	0.463	0.408	0.463	I(1)
OIL	0.162	0.463	NA	0.463	I(0)
GAS	0.671	0.463	0.189	0.463	I(1)

Source: Author's computation based on data from UNDP Report and WDI
Note: NA denotes not available due to evidence of stationarity at the levels test result.

The results of the KPSS unit root tests showed that only oil rent is stationary at levels. Consequently, the hypothesis of stationary process in the series cannot be rejected. On the other, HDI and natural gas rents were not stationary at levels given that their LM statistics exceed the corresponding critical values at 5 per cent level. However, they were found to be stationary at levels. With the evidence of levels and first difference stationary processes, the variables are considered to be fractionally integrated. While oil rent is integrated of order zero [I(0)], HDI and natural gas rents are integrated of order one [I(1)]. Thus, the bounds approach to cointegration is considered to ascertain if the variables are cointegrated.

4.3 Cointegration Test Results

With evidence of fractional integration in the series, the bounds test approach to cointegration was applied and the results are reported in Table 3.

Table 3: Bounds countegration test result

Null Hypothesis: No evidence of long relationship		
Series: HDI OIL GAS		
Test Statistic	Value	K
F-statistic	5.411	4
Critical Value Bounds		
Significance Level	Lower Bound I(0)	Upper Bound I(1)
10%	2.45	3.52
5%	2.86	4.01
1%	3.74	5.06

Source: Author's computation based on data from UNDP Report and WDI

As observed from Table 3, the computed F-statistic (5.411) is greater than the upper bound critical value at 5 per cent level. This implies that the variables are cointegrated. The evidence of cointegration provides the empirical condition for rejecting the null hypothesis of no evidence of long relationship in the model. In other words, HDI has a long run relationship with oil and natural gas rents, which provides the basis for fitting the NARDL model.

4.4 Model Estimation

The asymmetric short and long run estimates are summarized in Table 4.

Table 4: Summary of asymmetric results

Dependent Variable: HDI				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OIL_POS)	-0.000044	0.000209	-0.210332	0.8347
D(OIL_NEG)	0.000043	0.000232	0.186014	0.8536
D(GAS_POS)	0.010215	0.004301	2.375235	0.0237
D(GAS_NEG)	-0.002811	0.006219	-0.451973	0.6543
CointEq(-1)	-0.329018	0.148390	-2.217244	0.0338
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
OIL_POS	-0.000134	0.000622	-0.214569	0.8315
OIL_NEG	0.000131	0.000714	0.183309	0.8557
GAS_POS	0.031048	0.014479	2.144296	0.0397
GAS_NEG	-0.008543	0.016900	-0.505470	0.6167
C	0.461253	0.008457	54.542987	0.0000

Source: Author's computation based on data from UNDP Report and WDI

The results showed that HD responded negatively to positive changes in oil rents in the long and short run, but it is not statistically significant at 5 per cent level. It was also found that HD responded

positively to negative changes in oil rents in the long and short run. This finding indicates that oil rents have not contributed significant to HDI, which could be attributed to the systemic corruption and mismanagement of oil revenue in Nigeria. The results further showed that HDI responded positively to positive changes in natural gas rents and this finding statistically significant at 5 per cent level. This implies that increase in natural gas rents plays a significant role in improving human development. In other words, Nigeria can leverage the natural gas rents to boost its achievements on life expectancy, educational attainment and standard of living through investments critical economic infrastructure and social services. The error correction coefficient showed that the model can adjust to long run equilibrium position at a speed of 32.9 per cent. This is a corroboration of the evidence of long run dynamic relationship among the variables.

5. Concluding Remarks

The thrust of this paper is to deepen the understanding of the asymmetric relationship between oil rents and human development in Nigeria. This resonates from the unimpressive HDI outcomes despite the strategic position of the oil and gas industry as a major source of government revenue and foreign reserve accumulation in Nigeria. The findings revealed that oil rents have not yielded the expected positive benefits in terms of improving the HDI during the study. This finding supports the resource-curse theory that oil rich countries do optimize the benefits of oil revenue in improving their level of socio-economic development. However, it was evident from the results that natural gas rents played substantial role in enhancing the HDI. This finding underscored Nigeria's improved management of her gas resources and its consequent meaningful contribution to human development. Given the findings, this study concludes that Nigeria is yet to optimize the benefits of its abundant oil resources to promote critical and sustainable investments in economic infrastructure and social services for improved human development. To this end, this paper recommends for proper management and accountability of the oil rents to create better opportunities for human development. It is also recommended for government to mitigate gas flaring and create enabling for more investments in gas resources to provide a roadmap for more investments in human development.

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