Oil and Gas Reserves and Economic Growth in Nigeria (1981 – 2015): Matters Arising

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Abstract: Nigeria had over the years depended on oil and gas reserves for economic growth and development. With the dwindling oil prices, economic growth of Nigeria has been depressed. However, the focus of this research was to examine Oil and Gas reserves and economic growth in Nigeria. Specifically, this paper determined the relationship between oil export and economic growth in Nigeria for a period of 35 years (1981 - 2015). Secondary data were obtained from CBN statistical bulletin. Multiple regression analysis was used to determine the relationship of oil and gas revenue; oil and gas export; exchange rate and economic growth proxy by Real Gross Domestic Product (RGDP). Also, Stepwise regression was employed to isolate the relationship between the independent variables and the dependent variable. The result of the data analysis showed that oil and gas export and exchange rate have a positive relationship with economic growth while oil and gas revenue is negatively related to RGDP. It was recommended among others that Security should be put in the high sea where crude oil products are usually smuggled; this will help to reduce the loss from illegal export of crude oil products from Nigeria. The Nigerian National Petroleum Corporation (NNPC) should diversify its export baskets through downstream production; this will enhance the refining of petroleum products for exports.

Keywords: RGDP, Oil and Gas Revenue, Oil Export and Exchange Rate, Economic Growth

1. Introduction

Exploration for oil and gas in Nigeria began in 1908, with the first discovery in the Niger Delta in 1956. Nigeria's first refinery began operations in 1965, with a capacity of 38,000 bbl/day and it was enough to meet domestic requirements at the time. The demand and production of oil in Nigeria has been increased tremendously, such that Nigeria's current daily production is estimated at about 2.5 million bbl/day, with a domestic consumption level of 279,000 bbl/day. As at 2010, Nigeria's proved oil reserves were estimated to be 37.2 billion barrels, which amounts to 2.68 per cent of the world's reserves. Key participants in the Nigerian upstream sector include Shell, Mobil, Chevron, Elf, Agip and Total. The crude oil produced in Nigeria is classified as 'sweet', as it is largely sulphur-free. Eighty percent (80%) of production wells are located in the Niger Delta region in the southern part of the country, with notable projects which include the Afam Integrated Oil and Gas Project operated by Shell and the Bonga Deep Water Project.

Due to the lack of gas infrastructure and the widespread flaring of associated gas, the Nigerian gas sector has been relatively underdeveloped and surveys have put the country's proved natural gas reserves at about 5.29 trillion cubic metres – about 2.82 per cent of the world's gas reserves. In a bid to tackle this underdevelopment, the federal government prepared a Gas Master Plan in 2008, the implementation of which is currently in progress. The initiative is geared at promoting natural gas production, and encouraging the supply of natural gas to domestic power stations so as to alleviate the country's energy shortage. As part of the Gas Master Plan, the National Gas Supply and Pricing Policy (Gas Pricing Policy) and the National Domestic Gas Supply and Pricing Regulations (Policy Regulations) have been issued by the government and both instruments impose obligations on gas producers to set aside a predetermined portion of their gas production for supply to the domestic market.

In this respects, the Nigerian economic future is

inextricably tied to what it does with its petroleum industry. For example, the oil industry remains the most important income earner for the government even though oil and gas contribution to the Gross Domestic Products (GDP) represents about 14%. The Nigerian oil and gas industry has had many triumphs and set-backs. Recently, it has emerged from the scourge of militancy in the Niger-Delta when the production level was 1.6 million barrels per day in 2009 but the current levels of about 2.5 million barrels per day is attributable to the government's amnesty program.

1.1. Statement of the Problem

With the discoveries of tight oil, shale oil and gas in the United States of America (USA), the import of light crude oil has declined by 10% in the last two years. The impact of US shale oil can be seen in decline in exports, dwindling oil revenue. Between 2002 and 2011 where US shale gas share of total gas supply increased from 8% to 32%, pipeline and liquefied natural Gas (NLG) import share of total gas supply declined from 16% to 3% and 12% to 1% in 2007 and 2015 respectively. Consequently, the unprecedented growth in US gas reserves inevitably eliminates USA as a destination for the Nigerian gas. Also, the nation has lost over 136 million barrels of crude oil estimated at $10.9 billion through pilfering and sabotage from 2009 to 2011 [11]. These have posed a problem to economic growth of Nigeria. Following the challenges in the oil and gas industry in Nigeria, the country is committed to finding new market for its crude and processing of her crude domestically to meet the growing demand for its refined products. Hence, in this paper, the relationship between oil and gas reserves and economic growth in Nigeria from 1981 to 2015 will be examined; with the basic assumption that oil and gas export has not significantly contributed to economic growth.

1.2. Objectives of the Study

The main objective of this study is to examine the oil and gas reserves and economic growth in Nigeria. The specific objectives are to:
- determined the relationship between oil and gas export and economic growth of Nigeria
- evaluate the relation between oil and gas revenue and economic growth of Nigeria.

1.3. Literature Review and Theoretical Framework

Petroleum is currently the most important and valuable natural resource in Nigeria. It is exploited in ways that maximized benefits to the nation through economic rents and a fair share of profits while offering stable and attractive terms for investors. For the producing nations, petroleum is an important source of foreign revenue and this is the reason why such an important resource should be properly accounted for to enable the government and citizens of oil producing nations maximize the benefits derivable from the natural endowment [11]. Nigeria's petroleum is classified as "sweet", meaning the oil is largely free of sulphur. Nigerian

grades have API gravities ranging from 35-45 degree ranking them among the lightest and sweetest in the world. The sweet crude tends to command higher prices than sulphurous grades. This crude oil is known as "Bonny light". Other Nigerian crudes are named according to export terminal and they are Qua lboe, Escravos blend, Brass River, Forcados, and Pennington Anfan production averages around 1.6million barrels per day.

Revenues from extractive industries (oil & gas development and mining) are sources of income for governments of the producing nations. When properly managed and developed with the participation of affected communities, these revenues will serve as a basis for poverty reduction and economic growth. Too often, though, these revenues are squandered due to, corrupt practices, conflict and social divisiveness. The petroleum industry is the most strategic industry all over the world. The role of oil and gas in the Nigerian economy cannot be over emphasized. The need to reverse the parlous state of the downstream sector, optimize the stake of Nigeria in the upstream sector and eradicate corruption in the sector led President Olusegun Obasanjo to embark on some reforms from 1999 to 2007. These include: Increases in the pump prices of petroleum products; Purchase of crude at international market price by NNPC; Deregulation of the downstream sector; Liberalization; and Privatization of the downstream sector of the NNPC, which saw Eleme Petrochemicals buy-over by. Others include Creation of Petroleum Products Pricing and Regulatory Agency (PPPRA) to regulate the downstream sector; Extractive Industry Transparency Initiative (EITI); and The creation of the Economic and Financial Crimes Commission (EFCC) [11].

According to [7], it is necessary to ensure transparency in the oil industry of Nigeria through the reconciliations of data held by different entities performed on a regular basis. New information structures are required to achieve this, including a wide-ranging review of the information and management systems of the key sources of revenue, namely; the sale of equity crude by Crude Oil Marketing Division (COMD), the management of petroleum resources by Department of Petroleum Resources (DPR), the management of taxation by Federal Inland Revenue Service (FIRS). Also, the Accountant General of the Federation must have access to current information, to enable him to perform his record keeping function.

Generally there is scope to make much greater use of IT systems to improve controls, to eliminate inconsistencies arising from duplicated information and to improve transparency by making possible a wider sharing of data. Private companies file tax returns and royalty statements respectively with the (FIRS) and the regulator, the (DPR). NNPC sells the crude from the government's share of joint venture production and Payments are made to the Central Bank of Nigeria (CBN) via the Federal Reserve accounts in New York, which channel most of the funds to Nigerian's federation account, managed by the Accountant General of the Federation (AGF). The federation account is jointly

owned by the three tiers of government: the Federal, the State and the Local Governments. The Federation Accounts Allocation Committee distributes the revenues to the three tiers of government. In theory, the CBN's receipt must agree with the companies' payment records and its data should be consistent with the advice sent and received by FIRS and DPR. The AGF must receive copies, to remain informed of the flow they must be managing on the government's behalf [11].

However, according to [2], increase in natural resources income does not result in increase in economic growth. This is so because they found that 23.0 per cent of countries that are dependent on oil exports are likely to experience civil war in any five-year period compared to 0.6 percent for countries without natural resources. During each of these periods, there was no economic growth. [14] also supported the argument that increase natural resources income does not result in increases in economic growth but that it result in vicious development cycle (that is violent and adverse development).

[4] and [3] models state that growth is directly related to savings (unspent income). These theories of economic growth have suggested that significant relationship exist between national income and economic growth, that is, when income is invested in an economy, it results in the growth of that economy. In the same vein, [14] suggests that income from a nation's natural resources (for example petroleum products) has a positive influence on economic growth and development. A contrary opinion is that natural resources income influences growth negatively, that is, an increase in income from natural resources does not necessarily result in an increase in economic growth. This was found out by [10] using a sample of 95 developing countries that included Indonesia, Venezuela, Malaysia, Cote d' Ivoire and Nigeria.

Historically, crude oil has been found by empirical methods in subsurface reservoirs and other underground formations. Two geological explanation models have attempted to explain how petroleum was formed. These two theories can be called the biogenic and the abiotic (alternatively abiogenic or nonbiogenic) models for petroleum formation. The biogenic theory states that petroleum products originates from remains of biological matter, while the abiotic theory claims that petroleum product are derived from non-biological processes. Although scientific evidence and supporting observations can be found for both theories, the amount of evidence for a biogenic origin is overwhelming in comparison to that of the abiotic theory. However, petroleum products are generated from biological matter as well as non-biological matter [9].

The genesis of petroleum is an important topic in oil exploration, as noted by [8]. According to [5], abiotic petroleum gives no reason to worry about, and even less to plan for, any predicted demise of the petroleum industry based upon a vanishing of petroleum reserves. [6] opines that abiotic oil could lead to an increasing or potentially everlasting availability of petroleum.

Also, "peak oil" theory states that the world's oil production will reach a maximum value when approximately half of the existing resources have been extracted. Peak oil doesn't mean "running out" of oil, as it is sometimes wrongly stated. It simply means that the yield of extraction, in economic and energy terms, gradually declines to the point that it is not convenient any longer to invest the huge amounts of financial resources that would be needed to keep production increasing. The concept of peak oil is often regarded as controversial but it is a direct consequence of the fact that it is impossible to extract larger amounts of crude oil than nature has created. The exact date of the world peak is obviously uncertain, although the available data indicate that the peak of production for conventional oil may have been passed in 2005. Despite this uncertainty, peak oil is a major challenge for the future of our hydrocarbon-based society. Nevertheless, not everyone agrees that oil is a finite resource. These speculations are often based on the so-called "abiotic" oil formation theory.

However, [13] claim that the present peak oil debate is underpinned by a biogenic paradigm of oil formation. In contrast, [1] concluded that abiotic oil formation is irrelevant to the peak oil debate unless it occurs at extremely rapid rates, much faster than conventional oil creation theory would dictate. The rate of formation compared to extraction is essential for future production projections and, as long as the extraction process is significantly faster than the creation process, fossil fuels must be categorized as non-renewable and subject to depletion regardless of their biogenic or abiotic origin. So far, there is no discussion in the literature on how the concept of abiotic oil, and the related claims of great abundance affect the concept of peak oil.

2. Methodology

The descriptive research design is adopted in this study. Secondary data were obtained from CBN statistical Bulletin 2015. The Ordinary Least Square is the analytical tool used for this study. Also, a Stepwise Multiple regression is also employed to examine the relationship of some of the independent variables with the dependent variable. However, oil and gas export, revenue from oil and gas and exchange rate are the independent variables while Economic growth proxy by Real Gross Domestic Product (RGDP) is the dependent variable.

Model Specification

$$RGDP = \alpha_0 + \alpha_1 OGEXP + \alpha_2 OGREV + \alpha_3 EXCHR + e \quad (1)$$

$$RGDP = \beta_0 + \beta_1 QPTEXP + \beta_2 EXCHR + e_1 \quad (2)$$

$$RGDP = \gamma_0 + \gamma_1 OILEXP + e_2 \quad (3)$$

Where:
RGDP = Real Gross Domestic Product
OGEXP = Oil and Gas Export
OGREV = Oil and gas revenue
EXCHR = Exchange rate

3. Data Analysis and Results

Table 1. *RGDP = α_0 + α_1 OGEXP + α_2 OGREV + α_3 EXCHR + e.*

Dependent Variable: RGDP				
Method: Stepwise Regression				
Date: 11/28/16 Time: 07:45				
Sample: 1981 2015				
Included observations: 35				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	17861.77	1842.754	9.692975	0.0000
OGREV	-8.76E-06	9.84E-06	-0.889513	0.3806
OGEXP	3.660129	0.258675	14.14954	0.0000
EXCHR	20.30905	27.21125	0.746348	0.4611
R-squared	0.914434	Mean dependent var		33017.88
Adjusted R-squared	0.906154	S.D. dependent var		18783.35
S.E. of regression	5754.155	Akaike info criterion		20.26044
Sum squared resid	1.03E+09	Schwarz criterion		20.43820
Log likelihood	-350.5577	Hannan-Quinn criter.		20.32180
F-statistic	110.4316	Durbin-Watson stat		1.661376
Prob (F-statistic)	0.000000			

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The estimated model is:

$$RGDP = 17861.78 - 8.76E\text{-}064 \text{ OGREV} + 3.660136 \text{ OGEXP} + 20.30868 \text{ EXCHR} + e$$

Adjusted R^2 = 0.906154 which implies that the independent variables accounted for approximately 91% of the variations in the dependent variable. However, OGREV is negatively significantly related to RGDP imply that revenue from oil and gas in Nigeria is not properly managed by past Nigerian leaders as a result of corruption and oil and gas cabalism. The value of Akaike info criterion (20.43820) and Schwartz criterion (20.43820) indicate that the model is significant. Dublin Watson (DW) value of 1.661382; which is within the acceptable range of 1 (lower limit) and 4 (upper limit); indicates that there is no evidence of autocorrelation among the independent variables. Hence, the estimates are statistically significant.

Table 2. *RGDP = β_0 + β_1 OGEXP + β_2 EXCHR + e_1.*

Dependent Variable: RGDP				
Method: Stepwise Regression				
Date: 11/28/16 Time: 07:56				
Sample: 1981 2015				
Included observations: 35				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	17872.93	1836.691	9.731050	0.0000
EXCHR	22.31105	27.02941	0.825436	0.4152
OILEXP	3.566792	0.235664	15.13505	0.0000
R-squared	0.912250	Mean dependent var		33017.88
Adjusted R-squared	0.906766	S.D. dependent var		18783.35
S.E. of regression	5735.354	Akaike info criterion		20.22850
Sum squared resid	1.05E+09	Schwarz criterion		20.36182
Log likelihood	-350.9988	Hannan-Quinn criter.		20.27452
F-statistic	166.3370	Durbin-Watson stat		1.662857
Prob (F-statistic)	0.000000			

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From Table 2 above the estimated model is:
$$RGDP = 17872.94 + 22.31078 \text{ EXCHR} + 3.566796 \text{ OGEXP} + e_1$$

In a stepwise regression, eliminating OGREV, the result shows that adjusted R^2 = 0.906766 which implies that the independent variables (EXCHR, OGEXP) account for about 91% variations in RGDP. That is, Oil export is positively related to economic growth. Akaike info criterion and Schwarz criterion indicate that the model significance is further confirmed by the p-values. DW value of 1.662857 indicates that there is no autocorrelation between the independent values. Hence, the estimates are statistically significant.

Table 3. *RGDP = γ_0 + γ_1 OGEXP + e_2.*

Dependent Variable: RGDP				
Method: Stepwise Regression				
Date: 09/22/16 Time: 08:50				
Sample: 1981 - 2015				
Included observations: 35				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	18992.94	1231.879	15.41786	0.0000
OGEXP	3.667935	0.200332	18.30925	0.0000
R-squared	0.910382	Mean dependent var		33017.88
Adjusted R-squared	0.907666	S.D. dependent var		18783.35
S.E. of regression	5707.605	Akaike info criterion		20.19243
Sum squared resid	1.08E+09	Schwarz criterion		20.28131
Log likelihood	-351.3676	Hannan-Quinn criter.		20.22311
F-statistic	335.2286	Durbin-Watson stat		0.693299
Prob (F-statistic)	0.000000			

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$$RGDP = 18992.94 + 3.667935 \text{ OILEXP} + e_2$$

Oil and Gas Export (OILEXP) 3.667935 coefficients further confirms that oil and gas export contributes significantly to economic growth of Nigeria. Adjusted R^2 of 0.907666 implies that approximately 91% variations in the dependent variable (RGDP) is accounted for by the independent variables. The calculated F-statistic (F_{cal}) of 18.30925 is greater than the critical F-statistic (F_{tab}) of 2.69. Hence, the basic assumption of this paper that there is no significant relationship between oil and gas export and economic growth; proxy by RGDP; in Nigeria is rejected.

4. Discussion of the Findings

The study explored the association between crude oil production and economic performance in Nigeria. Our results have shown that capital, labour force and oil production can surely lead to economic growth. The paper focused on the impact of oil and gas export; and oil and gas revenue on economic growth with the exchange rate as a control variable. The findings reveal that while oil export positively contributes to economic growth, Oil revenue was negatively related to economic growth. The assumption that Oil and gas export has not contributed to the economic development of Nigeria is rejected. The findings of this study corroborate with that of [10].

5. Conclusion and Recommendations

In this research work, the relationship between oil and gas reserves and economic growth is empirically examined. The aim of the study is to ascertain the impact of crude oil on the Nigerian economy. However, based on the results obtained and the interpreted data it is concluded that the production of crude oil (domestic consumption and export) have positive effect on the growth of the Nigerian economy and that revenue generated has not significantly improved the growth of the economy.

Based on the findings of this research, the following recommendations are made:

- Security measures should be put in the high sea where crude products are usually smuggled. This will help to reduce shortage in export of crude products that leads to reduction in oil and gas revenue.
- Government should encourage more private company participation; so that better equipped refineries can be built and the cost of refining crude oil will reduce.
- The Nigerian National Petroleum Corporation (NNPC) should diversify its export baskets through downstream production; this will enhance the refined petroleum product for export.
- Government should fight corruption by establishing institutions that will check corrupt practices in the oil sector in Nigeria and monitor the activities of anti-corruption institutions to ensure their effectiveness in their primary assignment.
- There is an urgent need for Nigeria to diversify her export market especially the oil market; also, priority should be given to Africa markets instead of concentrating on Europe and the United States markets.
- Government should divert the focus of Nigerian economy from oil to agriculture and other sectors such as the solid mineral.

Appendix

Appendix 1. *Data for Oil and Gas export, RGDP, Exchange rate & Oil and Gas revenue.*

Year	OGEXP	RGDP	EXCHR	OGREV
1981	10.7	15,258.00	110.39	12353.3
1982	8.0	14,985.08	109.86	8564.4
1983	7.2	13,849.73	109.84	7814.9
1984	8.8	13,779.26	113.2	7253
1985	11.2	14,953.91	99.9	8269.2
1986	8.4	15,237.99	51.89	10923.7
1987	28.2	15,263.93	14.72	8107.3
1988	28.4	16,215.37	12.97	19207
1989	55.0	17,294.68	8.88	19831.7
1990	106.6	19,305.63	7.72	39130.5
1991	116.9	19,199.06	6.34	71881.1
1992	201.4	19,620.19	3.74	82666.4
1993	213.8	19,927.99	2.97	1640748.1
1994	200.7	19,979.12	2.96	162102.4
1995	927.6	20,353.20	0.74	160192.4
1996	1,286.2	21,177.92	30.17	324547.6
1997	1,212.5	21,789.10	28.83	408783
1998	717.8	22,332.87	28.32	416811.1
1999	1,169.5	25,267.54	73.91	324311.2

Year	OGEXP	RGDP	EXCHR	OGREV
2000	1,920.9	28,957.71	77.21	724422.5
2001	1,839.9	31,709.45	81.3	1591675.8
2002	1,649.4	35,020.55	88.95	1707562.8
2003	2,993.1	37,474.95	100.63	1230851.2
2004	4,489.5	39,995.50	107.07	2074280.6
2005	7,140.6	42,922.41	106.58	3354800
2006	7,191.1	46,012.52	105.02	4762400
2007	8,110.5	49,856.10	106.41	5287566.9
2008	9,861.8	54,612.26	80.03	4462910
2009	8,105.5	57,511.04	96.21	6530630.1
2010	11,300.5	59,929.89	96.89	3191937.98
2011	14,323.2	63,218.72	101.35	5396091
2012	14,260.0	63,218.72	98.72	3191937.98
2013	14,131.8	63,218.72	96.84	655396091
2014 [1]	12,007.0	67,152.79	95.77	65630630.1
2015 [2]	8,184.5	69,023.93	107.34	73191937.98

CBN STATISTICAL BULLETIN, 2015

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