DOI: 10.20472/EFC.2016.005.007

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CRUDE OIL DEPENDENCE, DEINDUSTRIALIZATION AND ECONOMIC GROWTH IN NIGERIA.

Abstract:

Crude oil is a commodity of very great value. Its utility in almost all the sectors of 21st century economies is not substitutable as of yet. That is why its demand is relatively inelastic. Crude oil as a natural resource is supposed to stir economic growth and propagate overall development for countries that are lucky enough to be endowed with this commodity. However recent and past empirical research in this area has shown that resource rich countries develop slower than resource poor countries and that resource dependence has a negative relationship with economic growth. One of the mechanism of transmission is through the crowding out of the manufacturing and agricultural sectors through the process of direct and indirect de-industralization. In light of these developments this research primarily aims to capture the relationship between oil dependence the manufacturing sector and economic growth in Nigeria. Utilizing the Autoregressive distributed lag bounds testing cointegration techniques a model was constructed, oil dependence was proxied as the ratio of oil rents to GDP and it was discovered that oil dependence had a significant negative relationship with GDP which is robust to the 2 specified models . Also the manufacturing sector had no significant relationship with GDP in the long run but had a positive significant relationship with GDP in the short run. This gives ample evidence to the existence of the dutch disease in Nigeria. The study recommended the sterilization of oil revenues abroad and the development of Foreign Direct Investment through the fostering of Incentives to multinationals in order to reduce the negative impacts of crude oil instigated capital inflow and oil price shocks in the Nigerian economy.

Keywords:

Bounds Testing,Co-integration,Crude Oil, De-industrialization , Dutch disease, Economic growth.

JEL Classification: O13, O40, Q33

1. Introduction

It is a widely held belief that oil resources are a viable force in the development process of any economy that is lucky enough to possess such resources. This argument is largely based on the premises of logic than of evidence because the consequences of oil dominated development initiatives tend to contradict this view. Impeded real growth rates, high levels of poverty, inequality, corruption at the highest levels of government, rent seeking culture and conflict are some of the socio-economic ills which usually characterize oil dominated economies.

As of 2000, Nigeria's oil and gas exports accounted for over 98% of export earnings and about 83% of federal government revenue, as well as generating more than 40% of the GDP. It also provides 95% of foreign exchange accruals, and about 65% of government budgetary revenues. Nigeria's proven oil reserves are estimated by the U.S. United States Energy Information Administration (EIA) to be between 16 and 22 billion barrels albeit other sources claim there could be as much as 35.3 billion barrels. The oil reserves make Nigeria the tenth most petroleum-rich nation, and by far the most affluent in Africa. In mid-2001 Nigeria's crude oil production was averaging around 2.2 million barrels (350,000 m^3) per day. The rest of the study is divided into; Oil dependence and Industrial decline; Data and Methodology; Results and Discussion and Conclusion.

2. Oil dependence and industrial decline

Dependence on oil as a revenue source can have severe economic consequences through the volatility of the terms of trade and the contraction of the industrial sector of an economy (Sachs and Warner. 1995). At low levels of Per capita income, industry accounts for only a small share of GDP. But as the share of industry to GDP rises, per-capita income also rises with it. This in essence shows that higher shares of industrial output to GDP resulted in higher per-capita income .However the greater the concentration of natural resources in exports the smaller the share of industry to GDP (Kaplinsky. 2011). This would consequently entail lower levels of per-capita income. In 2009, the Manufacturers Association of Nigeria (MAN) stated that 820 manufacturing firms have shut down in almost a decade preceding 2008 (between 2000 and 2008) and rendered thousands of people jobless (Sangosanya. 2011). Lack of physical infrastructure, insufficient demand, limited access to credit and the high costs of inputs both domestic and foreign were amongst some of the biggest problems faced by manufacturing firms in Nigeria (Malik, Teal and Baptist, 2006). The lack of physical infrastructure stems from government neglect during boom periods and government incapability to finance capital projects during bust cycles. Also the high cost of inputs both locally and internationally arise from the abnormal movement of the real exchange rate as it responds to oil price.

Singer (1950), Hirschman (1958) and Matsuyama (1992) are among a diverse set of economists that emphasize the superiority of industrial led economic development as against commodities and natural resource led development because of the learning by doing component that generally characterize industrial led development initiatives and the Schumpeterian innovation rents that accrues to the industrial sector.

The current study will try to provide direct evidence on the relationship between oil dependence, de-industrialization and economic growth in Nigeria, between the periods 1970-2011. A lot of related studies tend to utilize static models in order to analyze the nature of the relationship between resource dependence and economic growth and this may not necessarily capture the real underlying relationship between these variables, a lot of these studies also do not control for industrial input in order to access the effect of de-industrialization on the economy. Little has been done in the area of utilizing dynamic models to explain the relationship between resource dependence and growth in Nigeria while controlling for the relevant macroeconomic variables that are prone to the damaging effects of resource dependence like the manufacturing and agricultural sectors. This study intends to fill this gap. In essence the present study will try to capture whether or not oil dependence has impeded economic growth and how this phenomenon has affected the Nigerian industrial sector.

3. Data and methodology

The data utilized for this study where obtained from the World Bank World Development Indicators, the United Nations Statistical Database and Freedom House.

World Bank World development indicators (WDI);

- The Naira/Dollar nominal exchange rate **;** The United states Consumer Price Index**;** The Nigerian Consumer Price Index**;** The share of oil rents in GDP

The United Nations Statistical Database (UNSTAT)

- The Gross Domestic product in US Dollars; The Export sector contributions to GDP in US Dollars; The Import sector Contributions to GDP in US Dollars; The Manufacturing sector contributions to GDP in US Dollars; The Agricultural sector contributions to GDP in US Dollars.

The US Energy Information Agency (EIA)

- The real Brent Crude oil price.

The freedom house database

Institutional quality

3.1 Model Specification and Estimation

Utilizing the ARDL model, the following models where constructed;

Model 1

$$\Delta lrgdpk_{t=}\delta+\sum_{i=0}^{m}\beta_{1i}\Delta lrexr_{t-i}+\sum_{i=0}^{m}\beta_{2i}\Delta oildepp_{t-i}+\sum_{i=0}^{m}\beta_{3i}\Delta lrlag_{t-i}+$$

$$\sum_{i=0}^{m}\beta_{4i}\Delta lrimpts_{t-i}+\sum_{i=0}^{m}\beta_{5i}\Delta lroil_{t-i}+\sum_{i=0}^{m}\beta_{6i}\Delta lr\exp ts_{t-1}+\sum_{i=0}^{m}\beta_{7i}\Delta inst_{t-1}+\Phi ECM_{t-1}$$

Where$\Phi ECM_{t-1}= lrgdpk_t$ –

$$(\beta_1+\sum_{i=1}^{p}\alpha_{1i}lrgdpk_{t-i}+\sum_{i=0}^{m}\alpha_{2i}lrexr_{t-i}+\sum_{i=0}^{m}\alpha_{3i}oildepp_{t-i}+\sum_{i=0}^{m}\alpha_{4i}lrlag_{t-i}+$$

$$\sum_{i=0}^{m}\alpha_{5i}lrimpts_{t-i}+\sum_{i=0}^{m}\alpha_{6i}lroil_{t-i}+\sum_{i=0}^{m}\alpha_{7i}lr\exp ts_{t-1}+\sum_{i=0}^{m}\alpha_{8i}inst_{t-1}) \quad (1)$$

Model 2

$$\Delta lrgdpk_{t=}\delta+\sum_{i=0}^{m}\beta_{1i}\Delta lrexr_{t-i}+\sum_{i=0}^{m}\beta_{2i}\Delta inst_{t-i}+\sum_{i=0}^{m}\beta_{3i}\Delta oildepp_{t-i}$$

$$+\sum_{i=0}^{m}\beta_{4i}\Delta lragric_{t-i}+\sum_{i=0}^{m}\beta_{5i}\Delta lrrmanu_{t-i}+\sum_{i=0}^{m}\beta_{6i}\Delta lroil_{t-i}+\Phi ECM_{t-1}$$

Where $\Phi ECM_{t-1} = lrgdpk_t -(\beta_{1+}\sum_{i=1}^{p}\alpha_{1i}lrgdpk_{t-i}+\sum_{i=0}^{m}\alpha_{2i}lrexr_{t-i}+\sum_{i=0}^{m}\alpha_{3i}inst_{t-i}+\sum_{i=0}^{m}\alpha_{4i}oildepp_{t-i}$

$$+\sum_{i=0}^{m}\alpha_{5i}lragric_{t-i}+\sum_{i=0}^{m}\alpha_{6i}lrrmanu_{t-i}+\sum_{i=0}^{m}\alpha_{7i}lroil_{t-i}) \quad (2)$$

Equation (1) and (2) above represents the ARDL model. β is the intercept term. The α components are the *i* period lagged values of the level variables of the model where *i* can take the values of 1 to *p* for $\alpha_1 lrgdpk$ and 0 to *m* for the rest of the variables in the model. The equations within the *ECM* represent the long run relationships of the model. The *ECM* represents the error correction mechanism, Φ denotes the speed of adjustment parameter, it captures the speed at which deviations of *lrgdpk* from its equilibrium levels are corrected within a period. The *ECM* coefficient must be negative, less than one in absolute values and statistically significant to show that the model is co-integrated, stable and correcting.

The variables in the model include;

lrgdpk - Natural log of real per-capita GDP

lrexr - Natural log of real US/Nigerian bilateral exchange rates

oildep - Oil dependence (ratio of oil rents to GDP)

lrexpts - Natural log of exports real value added to GDP.

Lrrmanu - Natural log of manufacturing real value added to GDP.

Lrimpts - Natural log of imports real value added to GDP

Lroil - Natural log of Brent crude oil price in real terms .

Lrlag - Aggregates of the agricultural and manufacturing sector contributions to GDP.

Inst - Institutional quality

ε_t - Stochastic white noise process which is independently and normally distributed.

The ARDL model was utilized because it is the more statistically significant approach to establish the co-integration relation in small samples (Ghatak and Siddiki. 2001), while the Johansen co-integration techniques calls for large data samples for validity. It also yields reliable estimates of the long run parameters that are asymptotically normal regardless of the order of integration, that is whether variables are I(0), I(1) or mutually integrated hence there is no need for unit root pretesting, however the estimation will be augmented with unit root tests in order to reduce the likelihood of utilizing I(2) variables in the model.

4. Results and Discussion

4.1unit root tests

One of the tests to check for the stationarity of the variables in the model is Augmented Dickey Fuller test proposed by Dickey and Fuller (1981). According to Gujarati (2003), in the condition that ε_t are correlated, Dickey and fuller have built the Augmented Dickey Fuller test. The standard model specification for the ADF (Augmented Dickey Fuller) unit root test is of the following form:

$$\Delta y_t = \beta_1 + \beta_2 + \delta y_{t-1} + \alpha_i + \sum_{i=1}^{m} \Delta y_{t-1} + \xi_t \qquad (3)$$

Where ;

ΔYt - the difference between variable yt and its own lag

β1 - a drift or constant trend

β2 - the parameter of the time trend,

δ - the unit root

$\sum_{i=1}^{m} \Delta y_{t-1}$ -lag order of the autoregressive process

ξ_t - pure white noise error term.

In order to have the correct specification for the model in the ADF test, we have to ascertain whether or not the variable is a pure random walk, random walk with drift trend or the variable is a random walk with drift trend and time trend. In addition, we also have to analyze the suitable number of lags to be included in the model. When we test the joint hypothesis *(β1= β2=0)* which stipulates that the model is without drift term and time trend, we use the restricted F test. Dickey and Fuller have built critical F values for this condition.

In order to access the order of integration, the Augmented Dickey Fuller unit root test was performed on each of the variables with a null hypothesis (H_0) of the presence of a Unit root.

It can be seen from Table 1(In Appendix) that all the variables except oil dependence where integrated of order 1 [I(1)] ,Oil dependence was integrated of order 0 [I(0)]. This however doesn't pose a problem for the model because the ARDL model can accommodate variables of different order of integration as long as the null of no co-integration can be rejected when they all go through the bounds testing procedure which is explained below.

4.2 Bounds Testing for Co-integration

To probe the presence of a long-run relationship among the following β variables, the bounds testing procedure developed by Pesaran, et al. (2001) was utilized. The bounds testing procedure is based on the F-test. The F-test is in fact a test of the hypothesis of no co-integration among the β variables against the existence or presence of co-integration among the variables, denoted as:

Ho: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$

i.e., there is no co-integration among the variables.

Ha: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq 0$

i.e., there is co-integration among the variables.

This can also be denoted as follows:

F_{lrgdpk} (*lrgdpk*│*lrexr, loildep, lrexpts,lrrmanu,lrimpts,lroil*).

In Table 2 (In Appendix) the result of the bounds testing procedure shows that the variables are co-integrated, which means that all the *α* variables in equation 1 and 2 are jointly long run forcing.

4.3 ARDL Model 1 Estimated Long Run Coefficients

From Table 3 (In Appendix) all the coefficients except institutional quality were significant at the 1% and at the 5% levels. Institutional quality (INST) however was not significant but had a positive relationship. From the estimated results in table 5 it can be seen that oil dependence (OILDEPP) has a significant relationship with per Capita GDP in the long run which is negative. This is in line with Sachs and Warner (1995, 1997) and Olomola P.A (2007) this entails that holding every other factor constant a unit standard deviation increase in Oil dependence would reduce per-capita GDP by about 0.044 percentage points (0.044=0.09*-0.49) in the long run and this is statistically significant at 1%. Imports has a significant negative relationship with per-capita GDP as a 10% increase in imports brought about a 2% reduction in per-capita GDP in the long run, ceteris paribus. LRLAG which is the log of the aggregate of the manufacturing and agricultural real contributions to GDP has a positive and statistically significant relationship with real per capita GDP while controlling for oil dependence. The Naira/Dollar bilateral real exchange rates had a significant positive relationship with per capita real GDP. Holding other factors constant a ten percent increase in real exchange rates appreciation accounted for about a one percent increase in real GDP per capita.

4.4 Error Correction for Model 1

From the results in table 4 (Appendix) it can be easily deduced that in the short run the oil dependence variable utilized for this research has no significant relationship with economic growth. The coefficient on the lag variable however is quite sizable and significant. The coefficient on institutional quality was however insignificant. The ***ecm*** has a significant negative coefficient which is less than one in absolute values which shows that 87% of disequilibrium in *lrgdpk* from its co integrating values are corrected within a single period.

4.5 ARDL Model Estimated Long Run Coefficients for Model 2

From the long run model estimates in Table 5 (appendix) it can be seen that the manufacturing sector has no significant relationship with economic growth. The agricultural sector is also seen to have a significant relationship with economic growth.

4.7 Error Correction for Model 2

From Table 6 (Appendix) it can be seen that the error correction representation for the second model has a good fit with the absence of serial correlation. The ecm is negative and less than one in absolute values showing that about 63% of disequilibrium in *lrgdpk* from its co-integrating values is corrected within a single period. And also in the short run, the manufacturing sector has a significant relationship with economic growth.

5. Conclusion

Going by the findings from the study it would then be safe to conclude that oil dependence exerts a significant negative impact on the growth of the economy and its transmission is from the exchange rates down to the manufacturing sector and to the balance of payments. The development of the manufacturing sector is impeded because the government cannot maintain any effective developmental policy due to its dependence on the highly volatile oil price and as such industrial development remains retarded. In the process industrialization becomes a very difficult policy to implement.

The expansion of the import sector brings about balance of payments deficits that reduce economic growth. Also exchange rate depreciation can make imports more expensive resulting in the increase in prices of imported manufacturing inputs in the country.

Based on the empirical findings for this study, it has been discovered that the agricultural sector has a statistically significant positive relationship with economic growth. This may be because of the food crops component of this sector. The food crops component of the agricultural sector such as staple foods and grains has a relatively lower cost of production compared to the manufacturing sector and it requires very little human capital investment as opposed to the manufacturing sector. And as such it will enjoy the spending effect that is instigated by resource booms because of its import substitutability. The spending effect would increase domestic demand for local agricultural products although it would reduce the production of agricultural export commodities because of the crowding out effect and the fact that domestic utilization of agricultural cash crops like cocoa and rubber require the existence of domestic industries that will utilize these commodities as factor inputs.

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Appendix.

Table 1: ADF Unit Root Test Results

Variables	At levels	At first difference	Order of Integration
lrgdpk	Cannot reject H_0	Reject H_0	I(1) ***
oildepp	Reject H_0	Reject H_0	I(0) ***
lrexpts	Cannot reject H_0	Reject H_0	I(1) ***
lrimpts	Cannot reject H_0	Reject H_0	I(1) ***
inst	Cannot reject H_0	Reject H_0	I(1) ***
lrexr	Cannot reject H_0	Reject H_0	I(1) ***
lroilp	Cannot reject H_0	Reject H_0	I(1) ***
lrlag	Cannot reject H_0	Reject H_0	I(1) ***
lrmanu	Cannot reject H_0	Reject H_0	I(1) ***
lragric	Cannot reject H_0	Reject H_0	I(1) ***

Source: Author's computations **** Denotes significance at the 1% level.*

Table 2: Bounds Testing For Cointegration

Models	F. Statistic	Lower bounds	Upper bounds	Status
Model 1	F(8,12)=6.4545	2.96***	4.26***	Cointegrated***
Model 2	F(7,15)=3.9925	2.75**	3.61**	Cointegrated**

*Source: Author's computation, ** and *** denotes significance at the 5% and 1% levels respectively*

Table 3: Long Run Coefficients Model 1

Regressors	**Coefficients**
Lrexr	.13141***
Oildepp	-.49143***
Lrlag	.57263***
Lroilp	.13121**
Lrimpts	-.21120***
Lrexpts	.58037***
Inst	.0062227
c	-1.3598

Table 4: Long Run Coefficients Model 2

Regressors	**Coefficients**
Lrexr	.064
Oildepp	-.8235**
Lrmanu	.024
Lroilp	.42958***
Lragric	.59793***
Inst	.018834**
c	5.1269

*Source: Author's computation, ** and *** denotes significance at the 5% and 1% levels respectively*

Table 5: Error Correction Model 1

Regressor	coefficient	
dlrexr	.11507	***
doildepp	-.10083	
dlrlag	.50146	***
dlroilp	.11489	**
dlrimpts	-.18493	***
dlrexpts	.31482	***
dinst	.0054487	
dc	-1.9907	
ecm(-1)	-.87563	***
Rsquared	.96465	
R-Bar-Squared	.95155	
F-stat. F(8 , 29)	92.0937	***
DW-statistic	1.6824	

Table 6: Error Correction Model 2

Regressor	coefficient
dlrexr	.040656
doildepp	.043616
doildepp 1	.27095
dlrmanu	.22527 ***
dlrmanu1	.092845
dlroilp	.27169 ***
dlragric	.37817 ***
dinst	.011912**
dc	3.2426 ***
ecm(-1)	-.63247 ***
Rsquared	.93799
R-Bar-Squared	.91175
F-stat. F(8 , 29)	43.6953 ***
DW-statistic	2.0150

*Source: Author's computation, ** and *** denotes significance at the 5% and 1% levels respectively*