Impact of Crude Oil Exports and Corruption on Economic Growth in Nigeria: Using ARDL Bound Test

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Abstract
This study investigated the impact of crude oil exports and corruption on economic growth in Nigeria. Annual time series data is utilized over the period 1996 to 2015 using Autoregressive Distributed Lag (ARDL) approach to Cointegration and Error Correction Model, developed by Pesaran, Shin and Smith (2001). The results indicate a long-run relationship between GDP, crude oil export and corruption. Also, the study further reveals an insignificant negative impact between crude oil export and corruption on GDP growth. Moreover, the coefficient of error correction model suggests that the speed of adjustment in the estimated model had the expected level of significance and negative sign. Major findings of this study shows that crude oil export has positive impact on GDP growth in the short run and negative impact in the long run. Also, corruption has negative impact on GDP growth in both short run and the long run. Results portraits that in the short-run oil export has positively impacted on the economic growth despite its effect by corruption which appears to be negatively related to GDP growth and crude oil export. Similarly, in the long-run crude oil export and corruption deter GDP growth, both have negatively impacted on the economic growth because of high level of corruption in the oil and gas sector as the mainstay of the Nigerian economy. The study therefore recommends that government should diversify its economic based of different oil and non-oil sectors in the economy, export promotion strategy of this sectors should be taken seriously by the government in order to effect a positive change in revenue generation. Government should further endeavor to strengthen the effectiveness of other sectors to accelerate economic growth to improve meaningful youth economic inclusion and employment in the other sectors of the economy.

Keywords: ADF, Phillip-Perron, ARDL Bound Test, Granger Causality

Introduction
This study intends to investigate the impact of crude oil export and corruption on economic growth in Nigeria using annual time series data from 1996 to 2015. The Nigeria economy has undergone numerous phases in the premise of diagnoses, it is said that the country, is a monoculture economy. In spite of structural changes over the years the economy has been relying of a single sector for her foreign exchange. Before the oil boom era, Nigeria was predominantly known for some non-oil export products which also contributed to the growth of the economy. During that period, there was more provision for bulk foreign exchange earnings, employment and possibly government revenue. When Nigeria got their
independence, the government depended much on agricultural produce until the early 1970’s when crude oil was discovered at Oloibiri in Niger delta in the year 1956 (Sanusi, 2003). Before then, Nigeria was one of the exporters of agricultural produce like groundnut, cotton, cocoa, palm oil, timber, hides and skins which are used in most manufacturing industries within and outside the country. In today economy, the Agriculture industry has effectively been replaced by the oil industry in terms of revenue yield and it has really increased the strength of the federal government. In the year 2007, the oil revenue accounted about 80 percent of the government revenue and 95 percent of export earnings (Sanusi, 2003). Despite the significant expansion of oil towards Nigerians economy, the structural development has been poor and has even worsened the administrative position in Nigeria due to the level of corruption and oil policy implementation. Oil products are distilled from crude oil which comprises of petrol, natural gas, kerosene, bitumen etc. All these products are of necessity to the entire world because they are used in the production of goods used by most individuals and also for domestic use.

In the International market, the instability in price of crude oil has really affected the economy and has been like a challenge towards achieving desired revenue which will help in developing the manufacturing and production sector. The foreign exchange rate often affects the price of oil within and outside the country due to the fact that Nigeria don’t have enough and efficient number of refinery for more massive production and to meet up the demand for oil by other countries. The revenue recovered from export of crude oil only benefits about one percent of the entire population in Nigeria due to the level of corruption involved in the system. The economic reforms has failed to achieve its full economic potentials due to inappropriate or mismanagement over the previous years (Eze, 2015). Despite the enormous resources endowment, the level of development in Nigeria is not really encouraging. The gross domestic product is increasing but the masses are still suffering from poverty, insecurity, unemployment, underdevelopment etc. which is not meant to be. That is why corruption has eaten deep into the economy. The revenues are not properly distributed rather it circulates in the hands of opinion shapers and few Nigerians. Looking at the GDP of the emerging Asian Tigers (china, Malaysia, Thailand, India and Indonesia) which were far behind Nigeria as of 1970, they have creditably transformed their economies and are far much better than Nigeria even though they are part of the major players on the global economy (Sanusi, 2003). Revenues recovered from crude oil export is not properly monitored and published, payments made to government for the oil exploration are kept secret and the Oil and gas companies always protect the identities of their shareholders unnoticed. For the fact that most oil firms do not publish their financial statement and information country by country, there will always be corruption in terms of hiding the amount of fees and taxes paid as well as their royalties. Despite the fact that literature on economic growth is well established and the issue of crude oil export, corruption and economic growth is extensive, such literature on Nigeria is very sparse. This study will investigates the relationship between crude oil export, corruption and economic growth in Nigeria. The important role crude oil export play in promoting economic growth, as the main objective of every economy in the world. Secondly, the debate concerning the relationship between crude oil export and economic growth has gained considerable attention from a wide range of researchers over the years but the results and findings still remain mixed and inconclusive. Although relevant empirical studies in this area have been conducted in Nigeria by (Idowu, 2005; Akanni, 2004; Mohammed and Amira, 2010; Khadijat Afolabi. 2011; Oludaru, 2010; Eze, 2015). The weaknesses identified with these studies reiterate the need for further
research in this area. For instance, most of these pioneering studies in this area, Idowu (2005); Akanni (2004); Oludaru (2010); Khadijat Afolabi. (2011); Eze, (2015) investigated the impact relationship between crude oil export and economic growth nexus. These studies regression, models and augment the variables without knowing the behavior of the data whether is stationary or non-stationary series of crude oil export, corruption and economic growth. Even though attempts have been made by using OLS, game theory approach, Harrod-Domar theory and solow’s theory of economic growth and Cobb Douglass production function to account for the potential endogeneity of economic growth. These non-stationary time series data using these methods, Cobb Douglas production function, game theory approach and single least square (OLS) techniques does not capture the full interaction among crude oil export, corruption and economic growth. However, Khadijat Afolabi do not consider Corruption as one of her respective independent variables. Therefore, this study intends to fill this gap in the literature.

Some studies argue that crude oil exports and corruption affects economic growth positively (Idowu 2005; Akanni 2004; Khaled 2010 and Odularu 2010). In contrast, other studies proved otherwise (Mohammed and Amirahi 2010; Murphy 1993; Mandapaka 1995; and Triere 1996). The problem with the previous studies is that, there is no conclusion on how crude oil export and corruption affects economic growth (Andvig 1990; Laffont 1991; Basu 1992 and Mookherjee 1995). Also, economists till today hold different opinions regarding the causal nexus between crude oil export and economic growth. The issue of causality has remained inconclusive (See: Samad 2011; Gemechu, 2002 and Eze, 2015). Therefore, because of the above issues raised due to the critical role of crude oil export on economic growth in relation to Nigeria, only few studies were conducted in Africa and particularly with regard to Nigeria by some few researchers such as Gemechu (2002), Idowu (2005), Odularu (2010), Khadijat Afolabi (2010) and Eze (2015). However, most of these studies present inconclusive and contradictory results over the impact of crude oil export and corruption on economic growth and as such more studies are needed in this area and this justify the need for this research.

A promising way of describing the crude oil export, corruption-economic growth relationship is to use a bound test of cointegration by explicitly modelling for economic growth, crude oil export, corruption and other variables concerned. ARDL bound test of cointegration was adopted developed by Pesaran, et al. (2001). However, this bound test of cointegration is far superior to OLS, Harrod-Domar theory and solow’s theory of economic growth, Cobb Douglas production function and conventional methods of cointegration such as (Engle-Granger 1981, Johansen 1988, Johansen and Juselius 1990 and Gregory and Hansen 1996). The justification of using ARDL model over conventional cointegration method is that the results of ARDL is more robust over the conventional cointegration even with small samples.

It is in the light of these conflicting views on the positive and negative relationships, the possible long run and short run relationship that may exist between crude oil export, corruption and economic growth, and the recent improvement in cointegration, ARDL-VECM model developed by Pesaran, Shin and Smith (2001) that has called for this study, and hence, the study aims to contribute in that way. The study examines the impact of crude oil export, corruption on economic growth in Nigerian following a bound test cointegration approach, while improving on the variables and the time period are taking into considerations, the periods of crude oil exploration and its level of corruption over the study period, its effect on the growth of the Nigeria economy as regard returns and productivity that
has not been covered by other researches, hence, the need to examines the relative impact of crude oil on the economy. Therefore, the objectives of this study is to empirically assess the impact of crude oil export and corruption on economic growth in Nigeria and to determine the direction of causality relationship between crude oil export, corruption and economic growth in Nigeria. This study was guided by the following research questions: 1) what is the impact of crude oil export and corruption on economic growth in Nigeria? 2) What is the direction of causality relationship between crude oil export, corruption and economic growth in Nigeria?

In line with the research questions, this study tested the following hypotheses: H01: There is no significant impact between crude oil export and corruption on economic growth in Nigeria. H02: There is no causality relationship between crude oil export, corruption and economic growth in Nigeria. Major findings of this study shows that crude oil export has positive impact on economic growth in the short run, while in the long run both crude oil export and corruption have negative impact on the economic growth. Results portraits that in the short-run oil export has positively impacted on the economic growth despite its effect by corruption which appears to be negatively related to GDP growth and crude oil export. Similarly, in the long-run crude oil export and corruption deter GDP growth, both have negatively impacted on the economic growth because of high level of corruption in the oil and gas sector as the mainstay of the Nigerian economy. The paper is organized into five sections given the introduction as section one. The rest of the paper is organized as follows: Section two presents the literature review. In section three, the methodology adopted for this study is presented. Presentation of results is done in section four and conclusion is drawn in section five with policy implication.

**Literature review**

The empirical literature provides mixed and conflicting evidence with respect to the crude oil export, corruption-economic growth nexus (see Murphy, 1993; Triole, 1996; Mauro, 1997; Gemechu; 2002; Idowu, 2005; Hadi et al., 2009; Akanni, 2004; Mohammed and Amirahi, 2010; Samad, 2011). This phenomenon can be attributed to a number of factors, including estimation techniques and or statistical/econometric technique, choice of variables, study period, and level of development of the country being studied, among other things. Research related to economic growth and its link to different economic phenomena had been prominent. Several empirical studies have been conducted over decades to examine the relationship between crude oil export and economic growth in both oil rich developed and developing countries. However this study reviewed some of the related literatures concerning their impact and relationship for specific and cross countries studies for different sample periods from different part of the world. Only a summary discussion of the literature on this theme is presented here.

A number of empirical research works confirm the strong impacts of crude oil export on economic growth. Akanni (2004), examines if oil exporting countries grows as their earnings on oil rents increases, using PC-GIVE10, OLS regression. The result shows that there is a positive and significant relationship between investment and economic growth and also on oil rents. In conclusion, oil rents in most rich oil developing countries in Africa do not promote economic growth. Though this methodology does not captured relationship of non-stationary variables. Mohammed and Amirahi (2010), examines if factors such as oil price, world oil supply and demand, production capacities enhanced export growth in Iran using Error Correction Version of ARDL. It was found that there is an inverse relationship between oil
products consumption and oil export revenues. Iran had a significant positive growth in its oil revenues. Idowu (2005), a causality approach examines that there is a relationship between exports and economic growth in Nigeria. Using Johansen's multivariate co-integration technique. The result shows that there is stationary relationship between exports and gross domestic product (GDP). There is feedback causality between exports and economic growth. Hadi, et al (2009), investigate the impact of income generated from oil exports on economic growth in Iran. Using Cobb-Douglas production function, the economy of Iran adjusts fast to shocks and there is progress in technology in Iran. Oil exports contribute to real income through real capital accumulation.

According to Odularu (2010), used Harrod-Domar theory and solow’s theory of economic growth used Ordinary Least Square regression and Cobb-Douglas production function were employed to test the impact of crude oil on Nigeria economic performance. The result shows that crude oil production contributed to economic growth but have no significant improvement on economy growth of Nigeria. Samad (2011), tested the hypothesis that there exist relationship between exports and economic growth in Algeria, using VEC Granger causality and block exogeneity Wald test. Augmented Dickey-Fuller test was used to run the regression. The result shows that the variables are non-stationary. It was concluded that there is causal relationship between economic growth, exports and imports. Gemechu (2002), using co-integration and error correction approaches in the regression analysis examine the policies and test for the relationship between exports and economic growth. The result shows that export significantly affected economic growth in the short-run. There is causality runs from exports to economic growth. Khaled, et al (2010), tested if export enhanced economic growth in Libya Arab. Using co-integration with granger causality. The results show that income, exports, and relative prices are co-integrated. It was concluded that both export and growth are related to each other. Rahmaddi (2011), examine the exports and economic growth nexus in Indonesia employing vector autoregressive (VAR) model. The findings indicate the significance of both exports and economic growth to economy of Indonesia as indicated in GIRF analysis. It was concluded that exports and economic growth exhibits bidirectional causal structure, which is Export Led Growth in long-run and Growth Led Export in short-run. Khadijat and Afolabi (2011) carried out an empirical research on the impact of crude oil export on Nigeria economy using the Ordinary least square method (OLS) as her econometric technique to test its significance. From her result, it shows that some of the explanatory variables (labour, domestic consumption, crude oil export and total production) are statistically significant while capital is statistically insignificant. Khadijat concluded in her research that there is apparently a significant relationship between oil export and economic growth in Nigeria. Muhammad and Sampata (1997), investigate if there is clear proved that exports led to economic growth, through the use of granger(1969) causality. ADF is used to test for co-integration. The result shows that unidirectional causality from exports to GDP with positive relationship between the two variables are found. Eze (2015) analyses the impact of crude oil export on Nigeria economy and its level of corruption. The study focused mainly on the revenue generated from oil export with the purpose of assessing oil exploration and corruption with the objective of investigating Nigeria’s oil export and its contribution to the growth of economy. Major finding of this study is that oil export has significantly impacted on the economy despite its effect by corruption which appears to be negatively related to other economic variables.
Implementation of Ogoni Clean Up in the Niger Delta, South South Region
According to United Nation Environmental Programme (UNEP), there is environmental degradation in that area due to oil exploration, oil spill and oil retail activities, this affects the life span of the people in the region, age between 40 to 50 years become ancestors. The federal government of Nigeria in the month of May 2016 launched the flag up of the UNEP report by the Vice president Professor Yemi Osinbanjo in Niger Delta Region to begin to improve their living income and improve their wellbeing of life. The following are the UNEP report implemented by the federal government of Nigeria:
- Creation of Ogoni Restoration Authority
- Creation of Environmental Restoration Fund
- Emergency measures in drinking water and health
- Repair, maintain and decommissioning non-producing facilities
- Taking proactive stance against theft and illegal refining

Nigeria Petroleum Industry Bill (PIB)
This Bill is piece of legislation in Nigeria which has been the talk of the day in the oil sector, given its far reaching reform that is proposed to an oil industry as the most significant contributor to the economy of the nation. This Bill was originally introduced in year 2008. This bill has undergone several reviews just to get approval and enacted. The former president of Nigeria, Goodluck Jonathan presented a new version of Petroleum Industry Bill to the National Assembly for consideration and enactment. This version of PIB presented contains some salient features like:
- The deregulation of the downstream sector
- The reformation of the existing joint ventures between NNPC and the Multi-national oil companies.
- Promotion of openness and transparency in the industry which will help to reduce corruption.
- To encourage the development of Nigerian content
- To establish commercially oriented and profit driven oil and gas entities.

Despite the number of reviews done by the National assembly, the bill has still not been approved and enacted due to so many reasons given by them like the existence of different versions of the PIB. The essence of this Petroleum Industry Bill is to enable the oil industry boost up crude oil revenues and also the daily production capacity so that they will gain more revenues that will accrue to the government. Still in July 2016, the National Assembly reviewed the bill and may consider part of the version of the PIB.

In order to capture this phenomenon, from the theoretical and empirical literature reviewed on the impact of crude oil export and corruption on the Nigeria economic growth, the theoretical framework for this research work was established based on the review of Mohammed and Amirah (2010)

\[
RGDP_t = \beta_o + \beta_1 COEXP_t + \beta_2 CORR_t + \mu_t, \ldots \ldots \ldots \ldots \ldots \ldots .(1)
\]

Where:
- \( RGDP \) = “Real Gross Domestic product” which is the proxy for Economic growth
- \( COEXP \) = “Crude Oil export” which is an independent variable
- \( CORR \) = “Corruption” also an independent variable (percentile rank for Nigeria among countries ranging from 0 (highest corrupt) to 100 (lowest corrupt)).
- \( t \) = Time trend
- \( \mu \) = error term or stochastic term at time “t”.

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Materials and Methods

Data
Annual time series data were collected on real gross domestic product (GDP) as a proxied of economic growth. The choice was based on the fact that it encompasses all economic activities such as agriculture, industrial, manufacturing, and service sector. The annual data covers the period 1996 to 2015. Also, crude oil export (COEXP) and corruption (CORR) included as independent variables. The choice of this period was guided by data availability considerations. The data were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, National Bureau of Statistics (NBS), World Development Indicator (WDI), and Corruption Perception Index of Transparency International.

Estimation Procedure and Robustness Test
The analysis begins with ascertaining the order of integration of the variables. The procedure adopted in this study involves the use of the Augmented Dickey Fuller Test (1979) ADF Test and Phillips-Perron (1988) PP Test. The null hypothesis of both the ADF and PP tests are non-stationarity, thus failure with respect to rejection implies unit root in the series. Following these unit root tests, the Autoregressive Distributed Lag (ARDL) bound cointegration Models as well as Error Correction Model is employed to examine the presence of any long-run association among the variables. To account for the sensitivity of results using this approach to cointegration to the automatic choice of lag length, the schwarz information criterion (SIC) is used. Since it has been discovered there is cointegration among the variables which suggests that there must be Granger causality in at least one direction, however, it does not indicate the direction of causality among the variables. Therefore, the Pair-wise Granger causality test has been applied to test for causality between crude oil export, corruption and economic growth. The analysis of the data has been done using the EVIEWS 9 econometric package.

Method of Data Analysis
Cointegration – ARDL-Bounds Testing Procedure
In this regard, by applying the model suggested by Gudarzi and Sadr (2012) the recently developed Autoregressive Distributed Lag (ARDL)-Bounds testing approach is used to examine the long-run relationship between crude oil export, corruption and economic growth. The ARDL modelling approach was originally introduced by Pesaran and Shin (1999) and later extended by Pesaran et al. (2001).

\[ \Delta \text{RGDP}_t = \alpha_0 + \alpha_1 \text{RGDP}_{t-1} + \alpha_2 \text{COEXP}_{t-1} + \alpha_3 \text{CORR}_{t-1} + \sum b_1 \Delta \text{RGDP}_{t-1} + \sum b_2 \Delta \text{COEXP}_{t-1} + \sum b_3 \Delta \text{CORR}_{t-1} + \psi \text{ECM}_{t-1} + \epsilon_t \] (2)

\[ \Delta \text{COEXP}_t = \alpha_0 + \alpha_1 \text{COEXP}_{t-1} + \alpha_2 \text{RGDP}_{t-1} + \alpha_3 \text{CORR}_{t-1} + \sum b_1 \Delta \text{COEXP}_{t-1} + \sum b_2 \Delta \text{RGDP}_{t-1} + \sum b_3 \Delta \text{CORR}_{t-1} + \epsilon_{t-1} + \psi \text{ECM}_{t-1} \] (3)

\[ \Delta \text{CORR}_t = \alpha_0 + \alpha_1 \text{CORR}_{t-1} + \alpha_2 \text{RGDP}_{t-1} + \alpha_3 \text{COEXP}_{t-1} + \sum b_1 \Delta \text{CORR}_{t-1} + \sum b_2 \Delta \text{RGDP}_{t-1} + \sum b_3 \Delta \text{COEXP}_{t-1} + \psi \text{ECM}_{t-1} + \epsilon_t \] (4)

Where: RGDP= Real gross domestic product; COEXP= Crude oil export; CORR= Corruption; \( \mu \) represents the white noise error term; \( \Delta \) represents the first difference operator. The parameters b’s are the short-run coefficients and \( \alpha \)’s are the corresponding long-run multipliers of the underlying ARDL model.
The bounds testing procedure is based on the joint F-statistic (or Wald statistic) for cointegration analysis. The asymptotic distribution of the F-statistic is non-standard under the null hypothesis of no cointegration between examined variables. Pesaran and Pesaran (1997) and Pesaran et al. (2001) report two sets of critical values for a given significance level. One set of critical values assumes that all variables included in the ARDL model are I(0), while the other is calculated on the assumption that the variables are I(1). If the computed test statistic exceeds the upper critical bounds value, then the Ho hypothesis is rejected. If the F-statistic falls into the bounds then the cointegration test becomes inconclusive. If the F-statistic is lower than the lower bounds value, then the null hypothesis of no cointegration cannot be rejected (Gudarzi and Sadr (2012)).

Granger Non-Causality Test
The existence of cointegration relationships indicates that there are long-run relationships among the variables, and thereby Granger causality among them in at least one direction. The ECM was introduced by Sargan (1964), and later popularized by Engle and Granger (1981). It is used for correcting disequilibrium and testing for long and short run causality among cointegrated variables. This is done using the following VAR system of equations as follows:

\[ \text{RGDP}_t = \alpha_0 + \sum \alpha_1 \text{RGDP}_{t-1} + \sum \delta_1 \text{COEXP}_{t-1} + \sum \delta_2 \text{COEXP}_{t-1} + \text{ECM}_{t-1} + \mu_2t \]  

\[ \text{COEXP}_t = \alpha_0 + \sum \beta \delta_1 \text{COEXP}_{t-1} + \sum \delta_2 \text{COEXP}_{t-1} + \sum \gamma_1 \text{RGDP}_{t-1} + \sum \gamma_2 \text{RGDP}_{t-1} + \text{ECM}_{t-1} + \mu_2t \]  

\[ \text{CORR}_t = \alpha_0 + \sum \beta \delta_1 \text{CORR}_{t-1} + \sum \delta_2 \text{CORR}_{t-1} + \sum \gamma_1 \text{RGDP}_{t-1} + \sum \gamma_2 \text{RGDP}_{t-1} + \text{ECM}_{t-1} + \mu_2t \]  

Where: \( \text{ECM}_{t-1} \) = the lagged error-correction term obtained from the long-run equilibrium relationship; \( \alpha_0 \) = constant parameter; \( \alpha \) = vector of the parameters of the lagged values of the RGDP; \( \delta \) = vector of the parameters of the lagged values of COEXP and CORR; \( \beta \) = vector of the parameters of the lagged values of COEXP and CORR; \( \gamma \) = vector of the parameters of the lagged values of RGDP.

Although the existence of a long-run relationship between COEXP, CORR and RGDP suggests that there must be Granger-causality in at least one direction, it does not indicate the direction of temporal causality between the variables. The direction of the causality in this case can only be determined by the F-statistic and the lagged error-correction term. It should, however, be noted that even though the error-correction term has been incorporated in all the equations (5) – (6) – (7), only equations where the null hypothesis of no cointegration is rejected will be estimated with an error-correction term (Odhiambo, 2010).

In each equation, change in the endogenous variable is caused not only by their lags, but also by the previous period’s disequilibrium in level. Given such a specification, the presence of short and long-run causality could be tested (Aktaş, Cengiz and Yılmaz, Veysel., 2008).

ADF and Phillip-Perron Unit Root Tests
Nelson and Plosser (1982) argue that almost all macroeconomic time series typically have a unit root. Thus, by taking first differences the null hypothesis of non-stationarity is rejected for most of the variables. Unit root tests are important in examining the stationarity of a time series because non-stationary regressors invalidates many standard empirical results and thus
requires special treatment. Granger and Newbold (1974) have found by simulation that the F-statistic calculated from the regression involving the non-stationary time-series data does not follow the standard distribution. This nonstandard distribution has a substantial rightward shift under the null hypothesis of no causality.

For this purpose, the study uses the conventional Augmented Dicky-Fuller (ADF) and Phillips-Perron unit root tests as a tool for identifying stationarity (or non-stationarity) of a variable by running OLS regression of levels variables on their lag values.

Consider a variable $Y$ that has unit root represented by a first-order autoregressive AR (1):

$$
\Delta Y_t = \alpha + \beta Y_{t-1} + \sum_{j=1}^{p} y_j + \Delta Y_{t-j} + \epsilon_t \tag{8}
$$

$$
\Delta Y_t = \alpha + \beta t + \gamma y_{t-1} + \epsilon_t \tag{9}
$$

Where $\alpha$ and $\beta$ are parameters, $\epsilon_t$ is assumed to be a white noise, $\Delta Y_{t-j}$ expresses the first difference of the variable with $p$ lag, $\Delta Y_t = Y_t - Y_{t-1}$. $Y$ is a stationary series if $-1 < p < 1$. If $p = 1$, $Y$ is a non-stationary series; if the process is started at some point, the variance of $y$ increases steadily with time and goes to infinity. If the absolute value of $p$ is greater than one, the series is explosive. Therefore, the hypothesis of a stationary series can be evaluated by testing whether the absolute value of $p$ is strictly less than one. If the series is correlated at higher order lags, the assumption of the white noise disturbance is violated. The ADF test takes the unit root as the null hypothesis $H_0: P = 1$. Since explosive series do not make much economic sense, this null hypothesis is tested against the one-sided alternative $H_1: p < 1$. The null hypothesis of a unit root is rejected against the one-sided alternative if the t-statistics is less than the critical value. Consequently, under the co-integration test we examine whether or not there exists a long run relationship between variables.

**Empirical Results and Discussion**

This study commence it empirical investigation by first testing the properties of the time series, used for analysis. We perform a unit root test on each of the variable since the variables are time series in nature. This enables us to avoid the problems of spurious result in the time series models. The test is conducted using two different unit root models. That is, the Augmented Dickey Fuller (ADF) model and the Philips-Perron (PP) model. The essence of using the two test is for confirmatory testing and the result of the unit root test is shown in table 1 below:
Table 1: Results of Augmented Dickey-Fuller Unit Root Test

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>Augmented Test @ LEVEL</th>
<th>1ST DIFFERENC BE</th>
<th>STAR US</th>
<th>Phillip-Perron (PP) Test @ LEVEL</th>
<th>1ST DIFFERENC BE</th>
<th>STAR US</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>-3.982287*</td>
<td>-6.832538*</td>
<td>I(0)</td>
<td>-3.982287*</td>
<td>-15.21130*</td>
<td>I(0)</td>
</tr>
<tr>
<td>COEXP</td>
<td>-5.168738*</td>
<td>-5.782767*</td>
<td>I(0)</td>
<td>-5.953367*</td>
<td>-10.50156*</td>
<td>I(0)</td>
</tr>
<tr>
<td>CORR</td>
<td>-2.222998</td>
<td>-5.512857*</td>
<td>I(1)</td>
<td>-2.234787</td>
<td>-5.669223*</td>
<td>I(1)</td>
</tr>
</tbody>
</table>

Source: Researcher’s computation using EVIEW 9 software.
*** indicates level of significance at 1%, ** at 5%.

Interpretation of ADF and PP Unit Root Tests Results

Notes: * indicates significant at one percent or a rejection of the null of no unit root at the one percent level. ** indicates significant at five percent or a rejection of the null of no unit root at the five percent level. Number of maximum lags length of four was automatically selected based on Schwarz Information Criterion (SIC) for ADF and Newey-West Bandwith for PP. Before performing the Bounds test, it is essential to check for the stationarity of the data series to be used. This is important in order to obtain an unbiased estimation from the Granger causality tests, and also because the Bounds test is used only when variables are I(0) or I(1).

From the result presented in table 1 above, shows that ADF and PP unit root tests on the variables at their level and difference values has been conducted. The summary of the result reveals that GDP and crude oil export variables are stationary in the level values and Corruption was found to be non-stationary. However, the stationarity property is found after taking the first difference of the corruption variable at 1% critical level. As stated earlier, it is necessary to first perform unit root tests on the variables in order to ensure that none of the variables is integrated of order two I(2) or beyond. It was observed that the Corruption variable is not stationary at level meaning that the null hypothesis of unit root cannot be rejected since the asymptotic critical values is less than the calculated value for ADF and PP. After the variable is transformed to it first difference, the null hypothesis is rejected and became stationary. Therefore, it can be said to maintain stationary at an integration of order one, I (1). According to Ellahi (2011), in presence of I(2) variables the computed F-statistics of the bounds test are rendered invalid because they are based on the assumption that the variables are I(0) or I(1) or mutually cointegrated. ARDL Bound Cointegration Tests Having established the unit root properties of the variables, the combination of non-stationary variables could however be stationary if these series share a common long-run equilibrium relationship. In this case, these variables are said to be cointegrated. Thus, given the time series characteristics of the variables, this study further investigates employing automatic inbuilt Asymptotic critical values of F-statistics test, 10%, 5%, 2.5% and 1% in Eview 9 by comparing asymptotic lower critical bound I(0) and upper critical bound I(1) values using ARDL methodology proposed by Pesharan et al. (2001). Hence, the result of the Bound F-Test for co-integration (that is the existence of a long term linear relation) is established in the table 2 below:
Table 2: Result of Bounds F-Test for Cointegration

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<thead>
<tr>
<th>Variables</th>
<th>Function</th>
<th>F-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>FGDP(GDP</td>
<td>COEXP,CORR)</td>
</tr>
<tr>
<td>COEXP</td>
<td>FCOEXP(COEXP</td>
<td>GDP,CORR)</td>
</tr>
<tr>
<td>CORR</td>
<td>FCORR(CORR</td>
<td>GDP,COEXP)</td>
</tr>
</tbody>
</table>

Asymptotic critical value

<table>
<thead>
<tr>
<th>Significance</th>
<th>I(0) Bound</th>
<th>I(1) Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>2.63</td>
<td>3.35</td>
</tr>
<tr>
<td>5%</td>
<td>3.10</td>
<td>3.87</td>
</tr>
<tr>
<td>2.5%</td>
<td>3.55</td>
<td>4.38</td>
</tr>
<tr>
<td>1%</td>
<td>4.13</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Source: Researcher’s computation using EVIEW 9 software,
****indicates the level of significance at 1%, *** 2.5%, **5% and *10%

Interpretation of the Bounds F-Test for Cointegration Results

After determining the order of integration of the variable in Table 1, we apply a bound F-test in order to establish a long-run relationship among the variables in Table 2. The results of the bounds test for cointegration alongside with critical values are reported in Table 2 above. The bounds test indicates that cointegration is only present when GDP is the dependent variable and the long run forcing variables are crude oil export and corruption. This is because the computed FGDP(GDP|COEXP,CORR) is 7.2258, which is higher than the upper bound critical value at 1% significance level, suggesting the rejection of the null hypothesis that there is no long run relationship between crude oil export, corruption and GDP. However, the bounds test results indicates that when the crude oil export and corruption are taken as dependent variables, the computed F-statistics: FCOEXP (COEXP|GDP,CORR), FCORR (CORR|GDP,COEXP) are all significance at different level. Higher than the upper bound critical value at 1% levels respectively, indicating that the null hypothesis is also rejected which states that there is no long run relationship between GDP and crude oil export and corruption. Therefore, there is evidence of cointegration when these variables are treated as the dependent variables, meaning that there is other long run relationship among the variables under study.
Table 3 Results of Estimated long-run Coefficients Using ARDL Approach ARDL (2,0,0) Selected based on Akaike Information Criterion

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>T-Ratio</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable; GDP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COEXP</td>
<td>-0.269465</td>
<td>1.846700</td>
<td>-0.145917</td>
<td>0.8858</td>
</tr>
<tr>
<td>CORR</td>
<td>-1.285423</td>
<td>3.308822</td>
<td>-0.388484</td>
<td>0.7028</td>
</tr>
</tbody>
</table>

***indicates the level of significance at 1%, **5% and *10%

Interpretation of Results of Estimated Long run Coefficients based on ARDL (2,0,0)

Having determined the existence of a long run equilibrium when GDP serves as dependent variable, the long run coefficients and short run coefficients are estimated using the associated ARDL and ECM. The ARDL model is estimated by automatic selection of maximum lag length of 3 and using Akaike information criteria in selecting the optimum lag order for the model. The specification finally selected is ARDL (2,0,0), the derived long run elasticities are presented in Table 3. Based on the table above, the results of the long run elasticities on the GDP in Nigeria are negative. The long run impact of crude oil export on GDP is around -0.269465 and statistically insignificant, meaning that a 1% increase in crude oil export will decrease 26.95% in GDP. Similarly, the long run impact of Corruption index on GDP is negative and statistically insignificant with the value -1.285423. Therefore, 1% increase in corruption will decrease GDP to Nigeria by 100 percent. Corruption has accounted greatly to the underdevelopment of Nigeria.

Table 4 Vector Error Correction Model for the Selected ARDL Model, ARDL (2,0,0) Selected Based on Akaike Information Criterion

These variables are treated as the dependent variables, meaning that there is other long run relationship among the variables under study.

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>T-Ratio</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: ΔGDP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D(COEXP)</td>
<td>0.475247</td>
<td>1.273187</td>
<td>0.373274</td>
<td>0.7138</td>
</tr>
<tr>
<td>D(CORR)</td>
<td>-0.140434</td>
<td>5.030053</td>
<td>-0.027919</td>
<td>0.9781</td>
</tr>
<tr>
<td>CointEq(-1)</td>
<td>-0.949096</td>
<td>0.254832</td>
<td>-3.724402</td>
<td>0.0018***</td>
</tr>
</tbody>
</table>

CointEq(-1)= GDP-(-0.2695*COEXP-1.2854*CORR+35.5031)

Source: Researcher’s computation using EVIEWS 9 software

***indicates the level of significance at 1%, **5% and *10%

Interpretation of Results of Error Correction Representation for the Selected ARDL Model (2,0,0) Selected Based on Akaike Information Criterion
The presence of cointegration between variables suggests a long term relationship among the variables under consideration. The results of the short run dynamic coefficients associated with the long run relationships obtained from the cointegrated equation (Error Correction Model) are presented in Table 4. The signs of the dynamic impacts are maintained to the long run. Again, the crude oil export and corruption variables were not significant. Crude oil export shows a positive impact on GDP in the short run. However, corruption variable has a negative impact in the short run on GDP. The vector error correction coefficient in column five in both equations, estimated -0.95 (0.0018) is highly significant, has the correct sign, and imply a fairly high speed of adjustment to equilibrium after a shock. Approximately 95% of disequilibria from the previous year’s shock converge back to the long run equilibrium in the current year. The results of the estimation R-squared show that the explanatory variables account for about 90 percent variation in economic growth in Nigeria and 10 percent can be due to other factors not captured in the model. Taking into consideration the degree of freedom, the adjusted R-squared shows that 93 percent of the dependent variable is explained by the explanatory variables.

Table 5: Diagnostic Tests of Selected ARDL Model LM Test Statistics

<table>
<thead>
<tr>
<th>LM Test Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Correlation CHSQ (2) = 0.8158[0.8659]</td>
</tr>
<tr>
<td>Normality CHSQ (2) = 121.4285[0.000000]</td>
</tr>
<tr>
<td>Heteroscedasticity CHSQ (3) = 0.0065[0.0051]</td>
</tr>
</tbody>
</table>

Source: Researcher’s computation using EVIWES 9 software

Normality Test:

Fig 1 Normality Test

Stability Test:
Interpretation of Results of Selected ARDL Model Diagnostic Tests

In this study, the selected ARDL model passes the goodness of fit and standard diagnostic test of serial correlation, normality, heteroscedasticity and cusum test as presented in Table 5 and Figures 1 and 2.

- For serial correlation, the probability value $0.8659 = 87\%$ is greater than $0.05 = 5\%$, meaning that we can’t reject null hypothesis rather we accept null hypothesis that the model has no serial correlation.
- A non-graphical way to detect Heteroscedasticity is the Breush-Pagan test. The null hypothesis is that residuals are homoscedastic, Ho: constant variance. Therefore, we fail to reject the null hypothesis, we accept Ho and concluded that residuals are homogeneous.
- Stability test, cusum test shows the line trend (blue) is within the two red line, meaning that our model is stable at 5% significant.
- Normality test, it test the hypothesis that the distribution is normal, in this case the null hypothesis (Ho) is that the distribution of the residuals is normal.

Granger Causality Test

Granger causality had therefore been employed in ‘first difference’ on the dependent variable (GDP) and the independent variables (COEXP, CORR). The next step of our analysis is to test for causality between GDP growth, crude oil exports and corruption in Nigeria for which they are related in the long run. The results are presented in Table 6 below:
Table 6 Results of Granger Causality Tests

<table>
<thead>
<tr>
<th>Pairwise Granger Causality Test</th>
<th>Obs</th>
<th>F-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>COEXP does not Granger Cause GDP</td>
<td>19</td>
<td>3.84573</td>
<td>Reject</td>
</tr>
<tr>
<td>GDP does not Granger Cause COEXP</td>
<td>19</td>
<td>0.27056</td>
<td>Accept</td>
</tr>
<tr>
<td>CORR does not Granger Cause GDP</td>
<td>18</td>
<td>0.42512</td>
<td>Accept</td>
</tr>
<tr>
<td>GDP does not Granger Cause CORR</td>
<td>18</td>
<td>1.97822</td>
<td>Accept</td>
</tr>
<tr>
<td>CORR does not Granger Cause COEXP</td>
<td>18</td>
<td>4.31256</td>
<td>Reject</td>
</tr>
<tr>
<td>COEXP does not Granger Cause CORR</td>
<td>18</td>
<td>5.83707</td>
<td>Reject</td>
</tr>
</tbody>
</table>

$F_{0.05} = 2.76$

Source: Researcher’s computation using EViews 9 software

Interpretation of Results of Granger Causality Tests

From the result of the Granger causality test in Table 6, it was revealed that a unidirectional causality run from crude oil export to GDP growth. This result is in line with Muhammad and Sampata (1997) in developing countries, Gemechu (2002) in Nigeria, Khaled et al. (2010) in Libya. The decision on the direction of causality was made from the probability value of the test. On the other hand, the result reveals bidirectional causal relationship between corruption and crude oil export. This confirm the result findings of Rahmadi (2011) in Indonesia and Idowu (2005) in the case of Nigeria. In contrary, the Granger causality result of the GDP growth to corruption indicates there is no evidence of causality run from GDP growth to corruption. Therefore, the result shows that changes in the past values of crude oil export can be used to explain changes in the present value of GDP growth in Nigeria. Also, changes in the past values of corruption can be used to explain changes in the present value of crude oil export and similarly, changes in the past values of crude oil export can be used to explain changes in the present value of corruption in Nigeria. The short-run causality is found to run from crude oil export to economic growth, and the long-run causality is also found to run from corruption to crude oil export and from crude oil export to corruption in Nigeria. This explains the reason for high level of exclusive GDP growth with high level of corruption in Nigeria. Crude oil export has a positive short run impact on GDP growth, similarly, crude oil export and corruption therefore have negative long run impact on GDP growth into Nigeria.

Discussion of Findings

This study reassessed the relationship between crude oil export, corruption and GDP growth in Nigeria by using the developed ARDL bound testing procedure. An ARDL bounds testing procedure that allows testing for a level relationship irrespective of the order of integration of the underlying series has been applied on the data to ascertain the long run impact relationship between crude oil export, corruption and GDP growth in Nigeria. Applying a bounds F-test, the results of this test suggest a negative long run relationship between crude oil export and corruption and GDP growth in Nigeria. This result indicate that the crude oil export and corruption can be treated as a long run forcing variable explaining GDP growth. This result is consistent with the findings of Muhammad and Sampata (1997), Mohammed and Amirah (2010), Murphy (1993), Mandapaka (1995), and Triole (1996) who found negative long run relationship between crude oil export and GDP growth. The finding however, contradict the findings of Idowu (2005), Akanni (2004), Khaled et al. (2010) and Odularu (2010) who found positive long run relationship between crude oil export and GDP.
growth. Furthermore, the finding disputes the findings of Andvig (1990), Laffont (1991), Basu (1992) and Mookherjee (1995), who found absent of long run relationship between crude oil export and GDP growth. The Granger causality tests between crude oil export, corruption and GDP growth is conducted using pairwise Granger Causality Tests. The results evidenced unidirectional causality run from crude oil export to GDP growth in Nigeria. This result is consistent with the findings of Muhammad and Sampata (1997) in developing countries, Gemechu (2002) in Nigeria, Khaled et al. (2010) in Libya who found unidirectional causality run from crude oil export to GDP growth. However, this finding contradict the findings of Idowu (2005) who found bidirectional causality between crude oil export and GDP growth. On the other hand, the result evidenced bidirectional causality run from corruption to crude oil export in Nigeria. This confirm the result findings of Rahmaddi (2011) in Indonesia and Idowu (2005) in the case of Nigeria who found bidirectional causality between corruption and crude oil export.

Conclusion and policy implications
The study has examined the impact of crude oil export and corruption on GDP growth in Nigeria during the period 1996-2015. The ARDL bounds test and error correction model (ECM) are employed. From the cointegration test results, the study found that crude oil export and corruption have had negative long run impact relationship with the GDP growth, also in the short run the study found that crude oil export has a positive impact relationship with the GDP growth, while corruption shows a negative impact relationship with the GDP growth in both the long run and the short run in Nigeria. Moreover, the results of error correction coefficients, which determine the speed of adjustment, had an expected and highly negative sign. Secondly, causal relationship between crude oil export and GDP growth is unidirectional, implying that it is crude oil export that affects GDP growth and not the other way round. Similarly, causal relationship between corruption and crude oil export is bidirectional also, implying that corruption affects crude oil export and also crude oil export affects corruption in Nigeria. Thirdly, crude oil export and corruption can be treated as the ‘long run forcing’ variable explaining GDP growth in Nigeria. In other words, there is long run relationship between crude oil export, corruption and GDP growth in Nigeria.

From the result, since the crude oil export has a positive impact in the short run on economic growth and also, corruption had a negative impact in both the short-run and the long-run in Nigeria; it means that empirically crude oil export has contributed the growth of economy while corruption has affected the growth rate of the economy negatively in the long-run. But if the percentage contribution of other sectors in the economy, growth of non-oil export are accommodated simultaneously on the same level with crude oil export, the reduction in crude oil export will not really affect the growth of the economy in the long run.

The study therefore recommends that government should ensure that the policy of crude oil and non-oil exports promotion strategy should be taken serious for a positive change in the sector for more revenue generation. Hence, since the non-oil sector is contributing to the economic growth, the study suggest that the government should pay more attention to these sectors particularly agricultural, mine and steel, art and culture, entertainment industry and manufacturing etc., by injecting more money into the economy to improve the revenue based in exportation and impact in the economic growth of Nigeria. Also, more emphasis on mechanization and financial support should be provided for the agricultural and manufacturing sectors to provide reasonable percentage on economic growth and the revenue.
generated from crude oil export should be used to set up more active refineries and refurbish the old ones to help increase the bonds of crude oil produced every day. Of course, with these, government should carefully restructure the management of NNPC and review their mode of operation by publishing their books for transparency and accountability to curb the level of corruption within the oil sector in order to control its high effect on the economic growth in Nigeria.

Certain policy implications are evident from the study. Since there is long run negative impact of crude oil export, corruption and GDP growth in Nigeria, appropriate economic diversification policy measures should be pursued. Relating the economy through investment oriented policies should be instituted and ensure diversification in the system from the much overrated crude oil. This is to decelerate the consequential effect of high rate of corruption in the over dependents oil and gas sector known as rented seekers, paying less attention to non-oil export which is the major employer of labor in the economy. Government should further endeavor to strengthen the effectiveness of other sectors to accelerate economic growth to improve meaningful youth economic inclusion and employment in the other sectors of the economy.

References


The Transparency International Corruption Index (CPI), 1998; pp.234-236

The Transparency International Corruption Index (CPI), 2016; pp.234-236