Effects of Oil Revenue and Institutional Quality on Economic Growth with an ARDL Approach

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ABSTRACT
This article examines the effects of oil revenue and institutional quality on economic growth in Nigeria using annual data from 1984 to 2014. The ARDL model employed shows the existence of long-run equilibrium among oil revenue, institutional quality, and economic growth. The short-run analysis indicates that institutional quality measured by corruption index promotes economic growth, while institutional quality retards economic growth in the long run. Also, oil revenue promotes economic growth in the short run and reduces it in the long run, thereby confirming the existence of the resource curse hypothesis in Nigeria. The impulse response analyses further support the ARDL results. The article, therefore, concludes that institutional quality is important in explaining the relationship between oil revenue and economic growth in Nigeria. We recommend that the government should institute anti-corruption policies to mitigate corruption and to improve institutional quality in the country in order to ensure sustainable growth per capita, to protect existing investment, and to attract new investment in the country at large.

1. Introduction
Studies have shown that countries with abundant natural resources can have substantially high growth rates or low economic growth depending on how the revenue accruable from these natural resources are harnessed and used.1,2 One such natural resource is oil. Oil production and export play a dominant role in Nigeria’s economy and account for about 90% of its gross earnings.3

The oddity of resource-poor economies outperforming resource-rich economies has been a constant subject of debate in the literature. For instance, some oil-rich nations such as Nigeria,1 Ghana, and Angola with weak rule of law, corruption, and poor institutions that invite grabbing have low economic growth, while countries with fewer natural resources such as Asian tigers—Korea, Taiwan, Hong Kong, Singapore, and the newly industrialized countries (NICs) of the world—with strong and better institutions have high economic growth.4 Another example is Norway, one of Europe’s poorest countries in 1900 but now one of its richest. The growth was led by natural resources such as timber, fish, and hydroelectric power and, more recently, oil and natural gas. Norway is considered one of the least corrupt countries in the world.5,2 See Table 6 and Figures 8, 9, and 10 in the Appendix.

The resource curse scenario, a situation where countries with abundant resources have low growth rate, may be experienced if there are differences in the institutional quality among countries. Institutional arrangements can be grabber friendly or producer friendly depending on the quality control put in place by the resources and economic managers of such institutions in a particular country.2,6 Grabber-friendly institutions are usually the results where there are weak rule of law, malfunctioning bureaucracy, and corruption. Grabber-friendly institutions can be bad for growth when resource abundance attracts scarce entrepreneurial resources out of production and into unproductive activities. However, with producer-friendly institutions, rich resources attract entrepreneurs into production, resulting in higher growth.7 Recent studies have shown that Nigeria as a nation is suffering from the Nigerian disease rather than the Dutch disease.8 The Nigerian disease is another explanation of the resource curse by a recent study. It shows that abundance of natural resources leads to poorer governance, corruption, embezzlement, and conflicts. It gives rise to governments that are less accountable to the people, have little incentive for institution-building, and fail to implement growth-enhancing reforms.8

Also, many studies have shown that abundant natural resources coupled with effective institutions are necessary drivers of economic growth. For instance, Botswana, with 40% of its GDP stemming from diamonds, has had the world’s highest growth rate since 1965.4 This is a result of better institutions in the management of those resources.

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Acemoglu, Johnson, and Robinson\(^9\) attribute this remarkable performance to the good institutions of Botswana. The notion of Nigerian disease caused by corruption due to poor institutional quality has given the need to investigate the role of institutional quality in the relationship between oil revenue and economic growth in Nigeria. However, previous studies on resource curse and institutions in Nigeria as carried out by Ologunla et al.\(^10\); Nigeria and petroleum resource curse by Bamiduro\(^11\); Dutch disease and Nigeria oil economy by Otaha\(^12\); and empirical analysis of resource curse in Nigeria also done by Akinwale\(^13\) have not adequately explained the oil–institutions–growth nexus. The role of institutions has not been clearly and adequately captured in the past studies. Furthermore, Odularu,\(^3\) Adedokun,\(^14\) and Akinlo\(^15\) have examined the effect of oil on growth in Nigeria without considering the interactive impact of institutional quality. Thus, to the best of our knowledge, none of these studies has explicitly considered the role of institutions in the management of the Nigerian oil resources and revenue. In view of this, it is imperative to establish empirically the relationship among oil revenue, institutional quality, and economic growth in the Nigerian economy. This article specifically used autoregressive distributed lag (ARDL) with bound test co-integration method and found long-run relationships among the variables of interest. The error correction term (ECT) was used to track the short-run dynamics, while the VAR impulse response function was employed to capture the response of GDP per capita to shocks from institutional quality, gross capital formation, and oil revenue. Our findings show that quality of institutions affect negatively the GDP per capita than oil revenue. We therefore conclude that institutional quality has more impact on the resource curse syndrome than natural resources in Nigeria.

2. Literature Review

The literature in this area of research consists of the role of institutions on natural resource abundance, on the one hand, and the relationship between natural resource abundance and economic growth on the other. Few studies have examined the effects of both institutions and natural resource abundance on economic growth as shown in the literature. Auty\(^6\) examined the role of institutions in the resource curse problems of many abundant natural resource countries. Their findings showed that many of the economic and political factors played a role in the poor performance of resource-abundant economies. In a related study, Sachs and Warner\(^4\) examined natural resource abundance and economic growth. Their result showed that economies with a high ratio of natural resource exports to GDP in 1971 (the base year) tended to have low growth rates during the subsequent period 1971 to 1989. The negative relationship holds true even after controlling for variables found to be important for economic growth, such as initial per capita income, trade policy, government efficiency, investment rates, and other variables.

Following the same trend, Lane and Tornell\(^17\) also studied the relationship between institutions and resource curse issues among the resource-abundant countries. Their results showed that resource-rich economies are subject to more extreme rent-seeking behavior than resource-poor economies, as national politics is oriented to grabbing the rents earned by the natural resource endowments. In a later study, Sachs and Warner\(^16\) explored whether natural resource abundance gives rise to the Dutch disease by looking at the annual growth rates of a sample of 95 developing countries from 1970 to 1990 using natural resource–based exports as a percentage of GDP. They state that the rate of growth of natural resource abundant countries is lower due to the direct impact emanating from rent-seeking, corruption, and poor governance and the indirect impact through reduction in investment demand.

In a similar study, Anderson, Jacob, and Charles\(^18\) compared the world’s fastest-growing economies such as Japan, Hong Kong, Singapore, Taiwan, South Korea, and China, which are densely populated and have scarce natural resources and agricultural land, with land-abundant countries such as Argentina, Australia and New Zealand, and sub-Saharan African countries. The authors found that the major causes of the relatively slow growth of resource-abundant countries are not declining terms of trade, positive spillovers, or protectionism abroad, but distortions. And the removal of these distortions in Australia and New Zealand elevated them from poorest-performing countries to best-performing countries. In a related study, Stijns\(^19\) investigated how resource-rich Britain, Germany, and the US became world leaders in industrial production, while other resource-abundant countries have lower growth rates. He stated that the formulation of a well-defined property rights system ensures that a natural resource boom does not lead to a war of attrition. But the lack of such a system results in rent seeking, income inequality, lack of consensus on economic policy formulation, etc. The author concluded that fuel and mineral abundance are not important determinants of growth. Gylfason\(^20\) studied 65 natural resource–rich countries (including Nigeria) and observed that only four countries managed to attain long-term investments above 25% of the gross domestic product and per capita income growth above 4 percent per annum on average between 1970 and 1998. These countries are Botswana, Indonesia, Malaysia, and Thailand; the other 61 countries failed to attain these levels because they built the base of their economies around their natural capital. That is, the countries rely solely on the exploitation of their natural resource endowments, thereby completely neglecting or devoting inadequate attention to investment in the development of other economic resources. Also, Leite and Weidmann\(^21\) examined the impact of natural resource abundance on economic growth of some resource-rich nations and found no direct impact of natural-resource abundance on economic growth from 1970 to 1990, but they showed an important indirect effect through the impact of those resources on corruption, which in turn negatively affects growth.

Collier and Hoffler,\(^22\) on the other hand, showed that natural resources considerably increase the chances of civil conflict in a resource-abundant country, and their estimates showed that natural resources have a strong and non-linear effect on conflict. They therefore suggest that natural resources play a great role in affecting institutional quality. In a study by Torvik,
who presents a model with rent-seeking issue on economic growth of resource-rich nations where a greater amount of natural resources increases the number of entrepreneurs engaged in rent-seeking and reduces the number of entrepreneurs running productive firms. With a demand externality, it is shown that the resulting drop in income is higher than the increase in income from the natural resource. Therefore, it is concluded that more natural resources lead to lower welfare.

Papyrakis and Gerlach examined the resource curse hypothesis and its transmission channels. Their findings showed that natural resources have a negative impact on growth if considered in isolation, but a positive direct impact on growth if other explanatory variables such as corruption, investment, openness, terms of trade, and schooling are included. In a study by Isham et al., the influence of natural resources on broader indicators of institutional quality and policies were examined. The result confirmed that for a given level of institutional quality, natural-resource abundance has no direct impact on growth. Rather, resource abundance retards growth indirectly through institutional quality. Accordingly, Ding and Field explained the variations in average annual growth rates in per capita GDP during 1970–90 by using initial GDP, investment rate, openness, rule of law, changes in terms of trade, resource dependence, and resource endowments as explanatory variables. In their estimation, resource dependence was found to have a significant negative impact on growth, but a re-estimation of the equation by the use of a recursive model shows that resource dependence and resource endowment do not have a significant impact on growth. However, all the other variables such as human capital and physical capital have a positive and significant impact on growth.

According to Acemoglu and Robinson, who examined the relationship between institutions and economic growth of resource-rich countries, their result showed that institutions are the fundamental cause of economic growth, and, therefore, this is the reason for the differences in different levels of economic development across countries. Further, the differences in institutions across countries may help explain differences in human capital, physical capital, and technology across countries, all of which bring about economic growth. Recently, Elhannani investigated the resource curse by showing the importance of macroeconomic variables such as real GDP growth, oil price volatility, government expenditures, financial development, and oil share to GDP in Venezuela. Empirical evidence confirmed the presence of the resource curse hypothesis due to high oil price volatility and abundance of oil as oil abundance has an inverse impact on economic growth. Financial development and government development expenditures spur economic growth.

In the same line, Ross critically evaluated the resource curse hypothesis in Venezuela and claimed that abundance of natural resource is caused by bad democracy and weak institutions and creates violence within the society. Furthermore, he exposed that an abundance of petroleum wealth makes society more durable, corrupt, authoritarian, and violent. Similarly, the role of institutions was examined by Sarmidi, Law, and Jafari while investigating the relationship between the resource curse hypothesis using data of 90 countries over the period 1984–2005. They found that an abundance of natural resources affects economic growth positively after a threshold level of institutional quality.

For Nigeria, Ogbogbo studied the relationship between oil resource and economic growth. The article succinctly described this paradox in these words: "Rather than the fortunes of the people increasing with the coming of crude oil exploitation and production, their situation became worse." Oil production has also contributed to unprecedented crisis flash points in the Niger Delta. In the midst of these, Nigeria is ranked among the poorest countries of the world (resource curse). In the same line, Victor, Vladimir, and Alexander examined whether resource abundance is a curse or blessing. They found that in resource-rich countries, domestic fuel prices are lower and energy intensity of GDP is higher. But there is higher investment in research and development (R&D) and fixed capital stock, larger foreign exchange reserves, and more inflows of FDI. They also found lower budget deficits and lower inflation in such resource-rich countries. These are conducive for long-term growth. They also find that in resource-rich countries, the real exchange rate is generally higher, accumulation of human capital is slower, and institutions are worse, especially if they were not strong initially, which is detrimental for growth.

In a related study, Robert examined the political economy of the resource curse and the Niger Delta crisis in Nigeria. His findings agree with the core issue of the resource curse that instead of ushering in development, poor management of resources, greed, and bad governance in a third world country such as Nigeria contribute greatly to underdevelopment, strife, and poverty, in the midst of abundant natural resources. In the same vein, Akinwale examined the empirical analysis of the resource curse in Nigeria. The result of his findings showed that corruption and weak institutions, poor level of technology, and Dutch disease have a direct and significant impact on the resource curse in Nigeria, while the volatility of crude oil prices does not have a significant impact on the resource curse in Nigeria. However, the article concluded that most of the solutions suggested in combating the resource curse would not be realistic if corruption and weak institutional frameworks as well as poor technological development continue to dominate the Nigeria system.

Similarly, Bamiduro examined the petroleum resource curse in Nigeria and what Ghana can learn for improved management of oil and gas revenues. His casual observation showed that the exploitation of natural resources such as oil leads to an increase in income with positive knock on effects to poverty reduction. However, research shows that developing African countries that have at least 25% of their exports from natural resources are more likely to have conflicts. Resource conflicts seem to be driven by poor governance, greed, and corruption. Improved governance of income from petroleum resources in Ghana could reduce the risk of conflict in Ghana provided the Ghanaian government is ready to learn from Nigeria’s bitter experiences.

Also, Ologunla, Kareem, and Raheem studied the institutions and the resource curse in Nigeria. The results showed that there is a negative relationship between the strong institutions of Nigeria and the resource curse with coefficients of 0.003874 between EFW (Economic Freedom of the World)
and OE (crude oil export). The results concluded that there is a need to strengthen the institutions (size of government, legal structure and security of property rights, regulation of credits, etc.) in Nigeria with a view to avoiding the pitfall of the resource curse.

Finally, Godwin and Chuka examined natural resources, human capital, and economic development in Nigeria by tracing the linkages. Their results found evidence to support that natural resource abundance, through its adverse effects on institutional quality, crowds out human capital and affects economic growth negatively.

3. Nigerian oil sector

The history of the petroleum industry in Nigeria reveals that oil was discovered in Nigeria in 1956 at Oloibiri in the Niger Delta. The discovery was made by Shell-BP. Nigeria joined the ranks of oil producers in 1958 when its first oil field came on stream, producing 5,100 barrels per day. After 1960, exploration rights in onshore and offshore areas adjoining the Niger Delta were extended to other foreign companies. In 1970, Nigeria was able to reap instant riches from its oil production. The country joined the Organization of Petroleum Exporting Countries (OPEC) in 1971 and established the Nigerian National Petroleum Company (NNPC) in 1977, a state-owned and controlled company that is a major player in both the upstream and downstream sectors. By the late 1960s and early 1970s, Nigeria had attained a production level of over 2 million barrels of crude oil per day. Although production figures dropped in the eighties due to an economic slump, the year 2012 further saw some improvements in oil production to a record level of 2.5 million barrels per day.

In the 1980s, petroleum has had many problematic issues. There is the issue of subsidy, the issue of scarcity, the issue of sharing revenues accruing from petroleum, the fuel subsidy issue, which in December 2011 generated social and political problems that paralyzed economic activities nationwide, the issue of probits in the downstream petroleum subsector, and, recently, the issue of privatization and deregulation of the Nigerian oil industry. It appears these problematic issues may have arisen due to some unfavorable characteristics of petroleum policies in Nigeria. The contribution of a product or sector to the national economy can be measured by its size in the GDP. The contribution of oil to the GDP in Nigeria increased steadily over the study period. As evidenced in recent studies, oil accounted for just 3.43% of the GDP in 1965. The share of oil in the GDP increased from 9.27% in 1970 to 19.37% in 1975. The figure increased to 38.87% in 2005. The share of oil in the GDP decreased marginally to 37.44% in 2009 and subsequently increased in 2014.

One major issue in the Nigerian oil sector is the issue of importation of refined petroleum products. In September 2013, the then–Minister of Industry, Trade, and Investment Olusegun Aganga said that the Federal Government of Nigeria would by 2017 stop importation of refined petroleum products as its crude oil would be processed locally. This involves the refurbishing and picking up of the existing refineries to work at their full capacities. Currently, efforts are ongoing for the overall haulage and maintenance of these refineries to achieve the target objective of stoppage of oil importation by 2017.

Another major issue in the Nigerian oil sector is the activities of the NNPC in terms of remittance of crude oil sales to the government coffer. In February 2014, remittance of oil proceeds to the Federation Account by the Nigerian National Petroleum Corporation (NNPC) has been enmeshed in controversy. The then–Central Bank Governor Mallam Sanusi Lamido Sanusi raised the alarm that a huge sum of the proceeds had developed wings without any trace in the Federation Account where it is supposed to be domiciled. But the management of NNPC came up to say no single amount is missing. Thus, in terms of remittance of crude oil sales to the government coffer, NNPC’s activities and its operations are questionable.

4. Theoretical Framework

In order to analyze the effects of oil revenue and institutional quality on economic growth in Nigeria, this study employs the endogenous growth theory, developed by Arrow, Romer, and Lucas. The theory explains that long-run economic growth is achievable, and it emanates from forces that are internal to the economic system such as economic institutions, policies, institutional quality, and the accumulation of human capital, particularly, those forces governing the opportunities and incentives to create technological knowledge.

Specifically, we adopt the AK model developed by Aghion and Howitt and Romer, which can be written as:

\[ Y = AK \]  

(1)

\( Y \) represents output (GDP), by combining capital (K) and technology (A), the production function assumes increasing returns to scale. However, in line with the time series nature of this study, the model can be respecified as:

\[ Y_t = AK_t \]  

(2)

The capital stock (K), according to Romer and Aghion and Howitt, is divided into both physical capital (\( K_P \)) and human capital (\( K_H \)), and thus, when incorporated into the model, we have:

\[ Y_t = AK_{P(i)}K_{H(i)} \]  

(3)

This implies that the production function exhibits increasing returns to scale in both physical capital (\( K_P \)) and human capital (\( K_H \)).

Notably, corrupt and rent-seeking attitude (institutions) affects both human and physical capital development. For instance, high corrupt practices reduce economic growth and development through the diversion of funds meant to improve the quality of lives, to improve educational quality, and to build infrastructure and the diversion of funds to unproductive activities such as embezzlement, money laundering, wasteful spending, weak investment, and other corrupt practices. Hence, human capital development in the model can be represented by institutional quality that is proxy by corruption (CORR) as follows:

\[ K_{H(i)} = \text{CORR}_t \]  

(4)
Also, oil revenue (OREV) is one of the major drivers of economic growth in Nigeria and an important variable in the achievement of the objective of this study. Thus oil revenue (OREV) is included in equation (3). The physical capital (Kf) in the estimation model is proxy by Gross Capital Formation (GCF), while technological progress (A) in the model is exogenously determined because Nigeria is a developing nation that adopts its technologies from developed countries. Thus technology is assumed to be constant.

Meanwhile, in order to capture economic growth and, by extension, the standard of living of Nigerians, the output (Y) in equation (3) is measured by real GDP per capita.

By substituting equation (4), oil revenue variable (OREV), and Gross Capital Formation (GCF) into equation (3), the model becomes:

\[ Y_t = f(GCF_t, CORR_t, OREV_t) \]  

(5)

Taking natural logarithm of equation (5), we have:

\[ \ln Y_t = \ln GCF_t + \ln CORR_t + \ln OREV_t \]  

(6)

In econometrics format, the linear equation in (6) is expressed as follows:

\[ \ln Y_t = \alpha_0 + \alpha_1 \ln GCF_t + \alpha_2 \ln CORR_t + \alpha_3 \ln OREV_t + \epsilon_t \]  

(7)

In equation (7), Gross Domestic Product (Y) depends on Gross Capital Formation (GCF), institutional quality (proxy by CORR), and oil revenue (OREV), while \( \epsilon_t \) is the error.

4.1 Data Source and Variable Measurement

Secondary data is used for Gross Domestic Product (GDP) per capita (Y), oil revenue (OREV), and gross capital formation (GCF) from 1984 to 2014. The study period is chosen based on data availability. Specifically, the oil revenue variable is sourced from Central Bank of Nigeria (CBN) Statistical Bulletin, while both GDP and GCF are sourced from World Development Indicators. In addition, the level of corruption (CORR), which is a measure of institutional quality, is sourced from the International Country Risk Guide and updated with World Governance Indicators.

The variables used in this article and their measurements are highlighted as follows:

- Real GDP Per Capita (Y): This is the value of total annual output in local currency unit (Naira) in Nigeria. It is measured as the final market value of productive activities divided by the population in Nigeria. This is adopted to capture the real output per person in order to account for the real standard of living and economic wellbeing of Nigerians.
- Oil Revenue (OREV): This is the total amount of income derived from the sales of crude oil/refined petroleum products annually in the country both internally and internationally in local currency unit (Naira). We expect either a negative or positive relationship with the real GDP per capita due to the resource curse hypothesis.
- Corruption (CORR): This is used to measure institutional quality, and it measures the level of corruption in the Nigerian economy. A high corruption index means low institutional quality and vice versa. Corruption measures such unproductive activities in the Nigerian oil sector such as rent-seeking, embezzlement, bribery, and other corrupt practices. We expect the corruption index to have a negative effect on the real GDP per capita in the sample country. We follow Rosser and Mustapha and Mash, who have also used the corruption index to measure institutional quality in their studies on Nigeria.
- Physical Capital (Kp): Gross capital formation consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and work in progress. Data are in local currency (Naira). It is expected that physical capital will promote GDP per capita in the sample country.

4.2 Descriptive Statistics

Table 1 provides the descriptive statistics of our data series in their units. For all the variables, the mean and median values are very close, which indicates symmetry. Corruption is the least volatile variable with a standard deviation of 6.387923, while gross capital formation is the most volatile variable with a standard deviation of 3.67E+12. The probability that the Jarque-Bera statistic exceeds 5% significance level for all the series was tested, and we found that the Jarque-Bera statistical values for all the variables were above the 0.05 significance level. This suggests the acceptance of the null hypothesis of normal distribution at 5% significance level. This indicates that all the variables of interest satisfy the condition of normal distribution. In conclusion, all the variables of interest meet the condition of symmetry and normal distribution.

4.3 Unit Root Test

In an attempt to ascertain the stationarity properties of our variables, this study employed both the Augmented Dickey-Fuller (ADF) test and the Phillips-Peron (PP) test with all
the variables expressed in logarithm form. The results of the ADF and the PP tests as shown in Table 2 show that per capita GDP (Y), gross capital formation, (GCF) and corruption (CORR) are all non-stationary in their level form, that is, I(0). They become stationary at their first difference, that is, I(1). Oil revenue (OREV), on the other hand, is stationary at level for both the ADF and the Phillips-Perron (PP) tests, that is, I(0).

### 4.4 Structural Breaks

Following Perron⁵⁰ that structural changes and unit roots are closely related such that structural breaks can induce unit root. We therefore further conduct a unit root test with structural breaks to ascertain if our variables truly follow the order of integration reported in Table 2. The Zivot and Andrew⁵¹ that incorporates both the mean and slope in ADF model is adopted, and it is given as:

\[ y_t = \mu + \beta t + \delta y_{t-1} + \alpha DU_t + \theta DT_t + \sum_{i=1}^{k} \eta_i \Delta y_{t-i} + \epsilon_t \]  

(8)

Where \( DU_t = 1 \) if \( t \geq TB \) and 0 for all the dates prior to the break and \( DT_t = t - TB \) if \( t \geq TB \) and 0 for all the dates prior to the break. The unit root test with breaks is presented in Table 3. The unit root result with breaks shows that all the variables of interest are stationary in levels except gross capital formation. This result is, however, contradictory to the unit root results without break, yet the use of ARDL is still possible given the combination of I(0) and I(1) of our variables.

### 4.5 Methodology

The mixed stationarity of our variables allows the use of ARDL bounds testing approach developed by Pesaran, Shin, and Smith.⁵² The ARDL model can be used irrespective of the order of stationarity of the variables except for I(2) variables. The ARDL model can be specified following Pesaran et al.⁵² as:

\[ \Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 GCF_{t-1} + \alpha_3 CORR_{t-1} + \alpha_4 OREV_{t-1} + \sum_{i=1}^{n} \phi_i \Delta Y_{t-i} + \sum_{j=1}^{n} \pi_j \Delta GCF_{t-j} + \sum_{i=1}^{n} \tau_i \Delta CORR_{t-i} + \sum_{i=1}^{n} \ell_i \Delta OREV_{t-i} + \mu_t \]  

(9)

where \( \Delta \) is the differenced operator, \( \alpha_1, \alpha_2, \alpha_3, \alpha_4 \) are the long-run estimates, \( \phi_i, \pi_j, \tau_i, \ell_i \) are short-run estimates, and \( \mu_t \) is residual term in period \( t \). The ARDL chooses its appropriate lag length automatically. The suitable calculation of the F-statistic depends on the appropriate lag order selection of the series included in the model. The null hypothesis of no cointegration among the variables in Eq. (8) is \( H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0 \) against the alternate hypothesis of no cointegration, i.e., \( H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0 \). Two asymptotic critical values generated by Pesaran et al.⁵² are compared with the F-statistic to establish cointegration. The condition for cointegration is that the F-statistics be greater than the upper and lower bound (3.23) at the 5% significance level. This implies the rejection of the null hypothesis of no long-run relationship.

### 5. Empirical Results and Discussions

The bound test cointegration developed by Pesaran et al.⁵² as presented in Table 4 shows evidence of cointegration as the F-statistic (4.37) is greater than the upper (4.35) and the lower bound (3.23) at the 5% significance level. This implies the rejection of the null hypothesis of no long-run relationship.
among the variables. This result indicates that there is a long-run relationship among oil revenue, institutional quality, and economic growth over the study period in Nigeria. This is in contrast with the results by Mustapha and Masih\(^8\) for Nigeria. They found no cointegration among oil revenue, exchange rate, agricultural output, and corruption used in their study.

As a result of the presence of cointegration among oil revenue, institutional quality, and economic growth, we proceed to the short-run, the error correction term (ECM), and the long-run estimates of the effects of oil revenue and institutional quality on economic growth in the sample country. The result is presented in Table 5. The short-run result shows that the real GDP per capita is significantly explained by the third lag of institutional quality at the 5% significance level. This means that a 1% increase in corruption (low institutional quality) increases GDP per capita significantly by 0.23% in the short run in Nigeria. This can be explained in light of the temporary growth brought about in resource-abundant economies through rent-seeking activities and grabber-friendly institutions. On the contrary, gross capital formation has significant positive effects on the real per capita in the short run. This implies that a 1% increase in investment increases real GDP per capita by 0.08% at the 1% significance level. Moreover, we found up to the first past values of oil revenue to positively and significantly explain the real GDP per capita in the short run. Specifically, a 1% increase in the first past value of oil revenue brings about 0.08% decrease in the real GDP per capita at the 5% level of significance. This finding is in line with the result obtained in Botswana by Acemoglu et al.,\(^9\) Halvor et al.,\(^2\) in Netherlands, and Sachs and Warner\(^4\) in which they found that a short-run relationship exists among oil revenue, institutional quality, and economic growth. Meanwhile, Steven,\(^5\) Akinwale,\(^13\) and Ologunla et al.\(^10\) found evidence for a short-run relationship in Nigeria. The error correction term that corrects for equilibrium is correctly signed and significant. The error correction term, with a negative and significant value of 0.22%, further confirms our earlier findings of a significant long-run cointegration relationship among the variables of interest. The error correction term suggests a slow speed of adjustment of the dependent variable to equilibrium after a deviation as a result of shocks.

However, the long-run result shows a contrary outcome. The institutional quality obtained from corruption index is negatively related to growth per capita in the long run. This result follows prior expectation. The results show that a 1% reduction in corruption (increase in institutional quality) leads to a 1.21% increase in economic growth. This can be explained to mean that an increase in institutional quality increases the real GDP per capita in Nigeria in the long run. On the other hand, gross capital formation has a significant and positive effect on the real GDP per capita at the 1% significance level. This implies that a 1% increase in gross capital formation increases real GDP per capita by 0.38%. Also, the effect of oil revenue on the level of growth in the long run is negative and significant. It indicates that a 1% increase in oil revenue results in a 0.32% fall in per capita growth in the economy in the long run. This establishes the resource curse hypothesis in Nigeria that slow growth is usually experienced in the resource-abundant economies especially in the long run. This result is in line with the conclusions of other authors such as Baghebo and Atima\(^14\) that examined the impact of petroleum on economic growth in Nigeria; the resource curse and institutions in Nigeria by Ologunla et al.\(^10\); and Nigerian disease or Dutch disease by Mustapha and Masih.\(^8\) We found the effects of institutional quality to real GDP per capita to be higher than that of oil revenue. Although the error correction model (ECM) explains the long-run adjustment at a point in time, it is not capable of explaining such long-run equilibrium over time. As such, we employ the impulse response function (IRF) that is capable of explaining the response of the dependent variable to shocks from the independent variables over time.

The impulse responses of real GDP per capita to institutional quality, gross capital formation, and oil revenue are presented in Figures 1 to 3. The response of real GDP per capita to gross capital formation is positive throughout the period of study. It is close to 0.04% in the second and third year, after which it reduces to 0.02 and becomes stable over the remaining period. This positive contribution of gross capital formation to the real GDP per capita corresponds to the positive relationship earlier derived from the short- and long-run results. The response of real GDP per capita to oil revenue is presented in Figure 2. We found oil revenue to initially have a positive effect on real GDP per capita up till the fourth period with the value close to 0.02%, after which it becomes negative over the period of study with a value of almost 0.01%. Last, Figure 3 shows the negative response of real GDP per capita to institutional quality. A negative value of 0.02 is found between real GDP per capita and institutional quality over the period of time. The negative response of real GDP per capita to institutional quality confirms the earlier long-run negative effect of institutional quality on real GDP using the ARDL model.

### Table 4. Bound Test Cointegration Result Dependent Variable: Real GDP per capita.

| F-statistic | 4.37 | 3 |
| F-statistic | I(0) Lower Bound | 2.72 | 3.77 |
| F-statistic | I(1) Upper Bound | 3.23 | 4.35 |
| F-statistic | 2.5% | 3.69 | 4.89 |
| F-statistic | 1% | 4.29 | 5.61 |

Note: K is the number of independent variables in the ARDL model.

### Table 5. The Short-run and the Long-run results.

| ARDL\(^2\) (1,4,0,2) Dependent variable: Real GDP per capita | Variables | coefficients | std. error | t-statistic | prob |
| | D(CORR) | -0.0117 | 0.0859 | -1.3621 | 0.1921 |
| | D(CORR) | 0.0251 | 0.0324 | 0.7337 | 0.7383 |
| | D(GCF) | 0.0325 | 0.0494 | 2.4765 | 0.0248** |
| | D(GCEV) | -0.0056 | 0.0302 | -0.1942 | 0.8485 |
| | ECT(-1) | 0.0797 | 0.0294 | 0.27085 | 0.0155** |
| | CORR | 0.2194 | 0.1009 | 2.1531 | 0.0469** |
| | GCF | 0.0162 | 0.0639 | -1.1868 | 0.0775*** |
| | ODEV | 0.3754 | 0.1202 | 3.1231 | 0.0066* |
| | OREV | -0.0385 | 0.153 | -2.0803 | 0.0539** |

*, **, and *** indicate 1%, 5%, and 10 percent level of significance.
6. Conclusion

In this article, the effects of oil revenue and institutional quality on economic growth are examined for the period from 1984 to 2014. Using the ARDL model, we found long-run cointegration among the variables of interest. The short-run result shows that the corruption index (low institutional quality) promotes economic growth in Nigeria, while it retards economic growth in the long run. In a similar vein, oil revenue also promotes economic growth in the short run and reduces growth in the long run. This establishes and confirms the resource curse, the Dutch disease, and the Nigerian disease hypothesis. The study concludes that oil revenue has a smaller significant effect on growth in Nigeria compared to institutional quality. We conclude that institutional quality is more important in explaining the contribution of oil revenue to economic growth. We recommend that more attention be given to the development of strong institutions by setting up anti-corruption agencies to prosecute corrupt individuals in order to strengthen the oil sector, whose impact remains important to the per capita growth level in the country. Second, the government should improve its revenue collection mechanism through the proper monitoring and strict implementation of the oil agencies such as NNPC, DPR Department of Petroleum Resource (DPR), and Petroleum, Products Pricing Regulatory Agencies (PPPRA) so as to reduce embezzlement of funds and corrupt practices and to block revenue leakages. Last, the government should ensure through its institutions that the revenues from oil are invested in productive sectors through budgetary allocations that must be monitored for proper implementation to attract more investment into the country. Finally, the government needs to protect the investment interest of existing international investors by strengthening its institutions and engaging in capacity building both in human and physical capital to attract new foreign investment. Finally, the government can also partner with foreign anti-corruption agencies to monitor and thereby reduce money laundering activities from the oil sector to foreign countries.

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## Appendix

### Table 6. Serial Correlation Test.

| Sample: 1984–2014 |
|--------------------|
| Included observations: 30 |
| Q-statistic probabilities adjusted for 1 dynamic regressor |
| Null Hypothesis: no serial correlation |

| Autocorrelation | Partial Correlation | AC  | PAC  | Q-Stat | Prob* |
|-----------------|---------------------|-----|------|--------|-------|
| -0.061          | 0.065               | 0.2398 | 0.887 |
| -0.059          | 0.052               | 0.3629 | 0.948 |
| -0.086          | -0.084              | 0.6344 | 0.959 |
| -0.035          | -0.033              | 0.6827 | 0.984 |
| -0.013          | -0.024              | 0.6899 | 0.995 |
| -0.088          | -0.102              | 1.0149 | 0.995 |
| -0.025          | -0.03               | 1.0415 | 0.998 |
| -0.123          | -0.146              | 1.7304 | 0.999 |
| -0.102          | -0.116              | 2.2269 | 0.994 |
| -0.108          | -0.154              | 2.8201 | 0.993 |
| -0.097          | -0.157              | 3.3235 | 0.993 |
| -0.064          | -0.157              | 3.5534 | 0.995 |

*Probabilities may not be valid for this equation specification.

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**Figure 4.** The break point test for real GDP per capita.

**Figure 5.** The break point test for oil revenue.

**Figure 6.** The break point test for gross capital formation.
Figure 7. The break test for institutional quality.

Figure 8. CUSUM model of stability test.

Figure 9. CUSUM of Square model of stability test.

Figure 10. Schwarz Criteria ARDL stability Test.