Assessing the Resource Curse Question: A Case of Crude Oil Production in Nigeria

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Abstract

This research attempted to investigate the effects of oil production on the performance of the Nigerian economy, with a view to either accepting or rejecting the resource curse hypothesis (which states that countries with abundance of natural resources, such as crude oil, tend to grow at a rather sluggish pace compared to their counterparts with fewer resources). In doing this, time series data spanning between 1980 and 2015 (which included gross domestic product [GDP], oil revenue, expenditure on health and education, gross fixed capital formation, net trade, political instability, corruption, etc., extracted from World Development Indicators [WDI], Central Bank of Nigeria [CBN] Statistical Bulletin, and World Governance Indicators [WGI]; used to proxy economic performance, crude oil production, human capital development, capital formation/accumulation, trade openness, and institutional qualities) were assessed. An econometric approach was applied, with emphasis on the Autoregressive Distributed Lag (ARDL) Bound Test technique to cointegration (for its capacity of using variables, their lags as well as the lags of other variables in the series, endogenously; its general-to-specific framework and its adequate lag-order selection capacity). The findings showed that generally, crude oil abundance has positive effects on the Nigerian economy, however, the resource curse hypothesis was found to be present, and had been transmitted by institutional factors such as corruption, weak rule of law, government ineffectiveness, political instability/violence & terrorism and so on. It was suggested, amongst other things, that institutions and institutional quality should be strengthened and conscious efforts at diversifying the economy should be considered a matter of urgent importance, if the full benefits of crude oil abundance are to be accessed.

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1 Introduction

Common sense would suggest that oil wealth, in any country, should boost economic development and foster improvements in the wellbeing of citizens. Some development economists, e.g., Nurkse (1953) and Rostow (1960), have emphasized the positive role of natural resources in economic development, but it seems that not much of this reality can be said to have reflected on the Nigerian economy. The journey of crude oil production in Nigeria began right from the early part of the 20th century (1908 to be precise), though the possibility for benefits became clear in 1956 and subsequently, in 1958 when the first production took place. From thence, remarkable progress in crude oil production and wealth accumulation have been rather progressive, though there have been intermittent shocks in the sector. Despite the potential benefits associated with crude oil wealth, therefore (in terms of its impact on economic prosperity), evidence seems to suggest that Nigeria's economic progress has been rather sluggish over the year. Furtheremore, studies have underlined this situation for various resource-rich nations of the world, e.g. Sachs & Warner, 1995, 1997 & 1999a, Rodriquez & Sachs, 1999, Leite and Weidmann, 1999, and Gylfason, 2000 & 2001a.

Though Sachs and Warner (1995) believe that this is a historically common pattern, to many economists, the tendency of natural resource-rich countries to experience low economic growth is a conceptual puzzle. This is because economic theories and economists consider natural resources (crude oil in this case) to be a potential source of wealth (or income), some of which is saved and converted into capital to support increases in future output levels. For instance, resource rents may be used for the construction of roads, modernization of telecommunication systems, health and educational programmes. It is worrisome, therefore, that despite the advantages oil-resource wealth presents to

Nigeria, economic development and progress in the wellbeing of its citizens, seems to leave much to be desired. The begging question, therefore, is; what could be responsible for this outcome?

Most countries have benefited from their natural wealth. For example, the nineteenth century resource booms in Latin America stimulated economic progress. Ecuador, for instance, experienced a significantly higher income per capita level after its boom (Sachs and Warner, 1999a). Likewise, the industrial revolution in Great Britain and Germany was possible only because of their vast deposits of ore and coal (Sachs and Warner, 1995). Norway is a more recent example. It has managed its natural resource abundance well and has converted it into economic prosperity.

Nigeria as a nation, has attempted the development of itself and its people through different programmes, investing revenues from the wealth of crude oil production. These strides range from development plans to intervention programmes like The Green Revolution, Operation Feed the Nation, Structural Adjustment Programme (SAP), National Economic Empowerment and Development Strategy (NEEDS), etc. Also, target-specific agencies and parastatals have been established by the Government for targeted development, with the view to boosting growth. A few of them include the Tertiary Education Trust Fund (TETFUND), established with the aim of making a conscious and reasonable investment in tertiary education; the Niger Delta Development Commission (NDDC), targeted at developing the Niger Delta region where crude oil production takes place.

Others include the Universal Basic Education Commission (UBEC), targeted at ensuring basic primary education for every Nigerian child and even the recent Amalgiri Nomadic Education programme targeted at children of nomads in the northern region of the country, etc. Investments of resources from the national wealth stock, flowing from crude oil resources have gone into these programmes, but they seem to yield no commensurate outcome in terms of fostering economic progress. This situation calls into question the effectiveness of crude oil production in boosting economic progress in Nigeria, despite its potentials underlined in the literature, hence this research.

Though the underlining motivation for this study is the disproportional growth between oil production and economic growth in the Ni-

gerian economy, the expectation of more revealing outcomes drove our interest. This is because a few country-specific studies done on the resource curse for Nigeria seemed to address the resource curse question using similar techniques. For example, Odularu (2008), Obafemi, Ogbuagu Nathan (2013), Atima (2013) employed Ordinary Least Squares (OLS) technique, while Olusi and Olagunju (2005), Omodadepo and Akanni (2013), Akinlo (2012) and so on, used Vector Autoregressive (VAR) technique in examining the resource curse question. Our application of Autoregressive Distributed Lag (ARDL) technique, first, makes the difference in approach and second, expected outcomes. This line of thought further boosted our motivation for this study.

2 Literature Review

Economic theory suggests that large revenues from natural resource output should generate economic progress and development. Yet much evidence argues the opposite and that resource-rich countries suffer from 'resource curse'. Before the late 1980s, the orthodox view concerning the relationship between natural resource abundance and development was that the former was advantageous for the latter. Geographer, Norton Ginsburg in the 1950s argued for instance, that: 'The possession of a sizable and diversified natural resource endowment is a major advantage to any country embarking upon a period of rapid economic growth' (as cited in Higgins 1968). Similar views were also expressed by mainstream economists during this period (see, for instance, Viner, 1952 and Lewis, 1955):

In the 1960s, the prominent development theorist, Rostow (1961) (as cited in Rosser, 2006) went further to stipulate the fact that, natural resource endowments would enable developing countries to make the transition from underdevelopment to industrial 'take-off', just as they had done for countries such as Australia, the United States, and Britain. In the 1970s and 1980s, neoliberal economists such as Balassa (1980), Krueger (1980) and Drake (1972) put forward similar arguments, with the former, for instance, arguing that natural resources could facilitate a country's 'industrial development by providing domestic markets

and investible funds.' A number of radical economists challenged these views prior to the late 1980s, arguing that the structure of the global economy and the nature of international commodity markets put developing countries that were reliant on natural resource exports at a serious disadvantage (Singer 1950; Prebisch 1950). But theirs was a minority view – in general natural resources were seen as a blessing for developing countries.

Since the late 1980s, there has emerged much scholarly literature that has challenged this conventional wisdom. Rather than a blessing, this literature has suggested that natural resource abundance (or at least an abundance of particular types of natural resources, oil in this case) increases the likelihood that countries will experience negative economic, political and social outcomes including poor economic performance, low levels of democracy, and civil war. This literature has been extremely influential: the idea that natural resources are bad for development is now widely accepted by researchers and officials at the major international financial institutions, the World Bank and the International Monetary Fund (Bannon and Collier 2003; Sala-i-Martin and Subramanian 2003; Davis, Ossowski and Fedelino, 2003; Leite and Weidmann 1999; Sarraf and Jiwanji 2001: Isham, Woolcock, Pitchett and Busby, 2002; Eifert, Gelb and Tallroth, 2003; Gelb and Associates 1988), as well as by many NGOs (see, for instance, Save the Children 2003; Oxfam 2002). So, influential has this literature been that the conventional wisdom now is arguably the exact opposite of what it was prior to the late 1980s.

It is therefore clear that theories outlining growth path and growth components for economies abound. The impact of these theories held at different times in a nation's economic progress and resource abundance has always been seen as one of the boosts to any economic progress, especially, in terms of capital formation and investment. The emergence of the resource curse argument throws up a very complex growth dilemma opposing the conventional status quo. How? A closer view of some of the resource curse theories may shed more light.

2.1 Review of Resource Curse Theory

The theoretical literature on the resource curse contains many mechanisms that may explain why 'more leads to less'—in the sense that the general equilibrium effect of more natural resources may actually be lower income. The first wave of theoretical models to explain this was within what might be termed Dutch disease theory. Van Wijnbergen (1984) developed the first model showing how oil may reduce aggregate income through a learning-by-doing mechanism. When a country discovers oil, its population wants to spend part of the value of this as consumption of non-traded goods. Demand for these increases, pulling resources out of traded sectors, and decreasing production there. The decreased traded sector in turns means less learning by doing, and lower productivity growth than would otherwise be the case. This effect may be sufficiently strong to outweigh the initial increase in income that the oil discovery generated. Other models within the Dutch disease tradition include Krugman (1987); Matsuyama (1992); Sachs andWarner (1995); Gylfason, Herbertson and Zoega, (1999); Torvik (2001); Matsen and Torvik (2005) and Torvik (2009)[1]

The second wave of models explaining the resource curse consisted of rent-seeking models. A standard result in the rent-seeking literature is that when a new income possibility arises, this may lead to increased rent seeking that reduces the net increase in income for society. However, the extent of rent overindulgence falls short of one and so the net increase in income is still positive. The more agents that undertake rent seeking, the less total income increases. It must be noted that this does not mean that these theories have explained resource curse — that more natural resources decrease total income. The literature on rent seeking and the resource curse thus models different reasons why the extent of rent dissipation may exceed one—in which case more natural resources may push total income down.

The most famous paper within the rent-seeking tradition of the resource curse is Tornell and Lane (1999). They show how, in an economy with many groups, an increase in the marginal productivity may actual-

[1] Large part of the analysis gleans from Torvik (2001, 2002), Matson & Torvik (2005) and Torvik (2009)

ly reduce growth: when the marginal productivity increases, this means more income available for redistribution. Each group in the economy demands higher transfers, and the sum of these demands may make the tax rate go up sufficiently that the net marginal productivity of capital, and thus growth, is reduced. In Torvik (2002) we see that entrepreneurs can use their talent running modern firms or otherwise to undertake rent seeking in the hope of capturing some of the resource income of the economy. With more natural resources fewer entrepreneurs will run firms and more engage in rent seeking. In turn, this means that production in modern firms fall, reducing income and demand further, making it even less profitable to run modern firms. Through rent seeking more natural resources generate a negative multiplier effect, and the net result is lower income. Other resource-curse models within the rent-seeking tradition include, among others, Baland and Francois (2000); Hodler (2006); Mehlum and Moene (2006) and Wick and Bulte (2006).

2.2 Empirical Literature

After the ground-breaking work of Sachs and Warner (1995), the resource curse hypothesis has gathered a sizeable body of literature. Sachs and Warner (1997) also underline the fact that a large number of hypotheses that can be raised have explanations for the negative relationship the resource curse postulate reflects. One of the early clarifications of the phenomenon is social, that is, the result of easy wealth is slothfulness. Still, to scholars of the industrial revolution and economic historians, the traditional emphasis is that natural resource endowment is of great benefit to a nation. However, the unfortunate truth is that strong evidence – that is almost conventional - has emerged for the curse of natural resource, especially for developing economies. Some basic facts support this assertion, for instance, as cited in Robinson, Torvik and Verdier, (2006), Gylfason (2001) explains that GDP per capita for the entire OPEC members, has declined on the average by 1.3 percent each year since 1965. Cross-country empirical outcomes (e.g., Sachs & Warner,1995, 1999; Busby et al., 2004; Mehlum and Moene, 2006) support the assertion above. Also, several case studies involving resource dependent economies have linked resource abundance to poor

development (e.g., Gelb, 1988; Karl, 1997; Ross, 1999, 2001).

The empirical literature on the resource curse consistently emphasizes that resource dependent economies and resource booms seem to lead to highly dysfunctional state behaviour, particularly large public sectors and unsustainable budgetary policies. For example, Newberry (1986) feels there is a missing element in economists' explanation for the bad performance of many resource abundant countries, that is, their modelling of a world with no government, even when their behaviour is the apt factor and its impact conspicuous. He calls this "a large and obvious mistake" and Robinson et al (2006) opine that these large and obvious mistakes are those made clear by different oil exporting countries – Algeria, Ecuador, Indonesia, Trinidad and Tobago, Venezuela and Nigeria – revealed by Gelb (1986). In summarizing his study, Gelb (1986) concludes that the most essential recommendation that his study has is that spending levels needed to have adjusted to the swift rises in income levels more cautiously than they actually did. Lal and Myint (1996) in a World Bank project, arrive at the same conclusion since they identify policy failure as the prime cause of the underperformance of the resource abundant economies, and Auty (2001) shows similar evidence for resource abundant countries that have failed to grow in that there seems to be a chronic tendency for the state to become over expanded.

Robinson, Torvik and Verdier (2006), in their work *Political Foundation of the Resource Curse*, argue that political incentives that resource endowments generate are the key to understanding whether or not they are a curse. They show that: (i) politicians tend to over-extract natural resources relative to the efficient extraction path because they discount the future too much, (ii) resource booms improve the efficiency of the extraction path, (iii) resource booms, by raising the value of being in power and by providing politicians with more resources which they can use to influence election results, increase resource misallocation in the rest of the economy and (iv) overall impact of resource booms on the economy depends critically on institutions since these determine the extent to which political incentives factor into policy outcomes. Countries with institutions that promote accountability and state competence will tend to benefit from resource booms since these institutions ameliorate the perverse political incentives that such booms

create. Countries without such institutions however may suffer from a resource curse.

Similarly, Wiens, Poast and Clark (2014) in an empirical re-evaluation approach, found that an increase in resource dependence decreases an autocracy's likelihood of being democratic over both the short term and long term but has no appreciable effect on democracies' likelihood of persisting. In a related development, Korhonen (2004) utilizing a large and reasonably detailed dataset shows that a viable and strengthened democracy in a country's political institutions can quell the widely talked-about resource curse. He concludes that resource-abundant countries have a lower degree of democracy and political rights, and also a lower level of educational attainment. These factors inhibit growth.

Again, Polterovich, Popov and Tonis (2009) found that the probability of democracy preservation is decreasing per amount of resources if the institutional quality is low enough. They believe that stability in democracy does not depend on the amount of resources, if the institutional quality is higher than a threshold, though the level of the threshold, however, depends positively on resource wealth. They also found that under very low institutional quality, resource abundance will reflect a paradoxical effect: the probability of democracy preservation may decrease with small improvements of institutional quality.

Evidence also exist for corruption as a transmitter for the resource curse. It has been argued that issues of corruption may be particularly relevant in the context of natural resources, as natural resource exploration is an extremely high rent activity likely to foster rent-seeking behaviour. Aslaken (2010) complains that the existing literature on natural resources and corruption suffers from omitted variable bias. So, his work re-examines the effect of natural resource abundance on corruption using panel data estimation as well as new measures of resource endowments. His finding shows evidence indicating that both oil extraction and mineral income is associated with more corruption. He concludes that the adverse impact of oil on corruption is present both in democratic and nondemocratic countries.

The extensive literature on the resource curse has explored the relations between pointy natural resources, namely those resources extracted from a narrow geographic or economic area such as minerals

and fuels, and economic underdevelopment through various channels (Aslaken, 2010). One school of theories argues that the curse of natural resources arises not necessarily because of the Dutch disease but rather works through political mechanisms: resource rents undermine the quality of political institutions and increase the tendency of corruption, which consequently hamper economic growth (Robinson, Torvik, and Verdier, 2006; Leite & Weidmann, 1999; Bulte, Damania, and Deacon, 2005). However, it is important to note that, although the negative effects of corruption on economic performance have been commonly acknowledged and sustained by some empirical evidence (Mauro, 1995; Sala-i-Martin and Subramanian, 2003), the linkage between resources and corruption is yet to be fully explored and tested, and it is an important research topic in its own right.

Reasons for resource abundance inducing corruption have been identified in the literature. First of all, the most direct reason for why resource abundance induces corruption is that the presence of large resource windfalls creates enormous economic temptations as well as opportunities for corrupt behaviours by government officials (Karl, 1997; Leite and Weidmann, 1999). The abuse of resource rents by public officials is particularly facilitated by the state's ownership of resource industries in many developing countries. Second, the lack of market competition for rents fosters corruption (Ades and Di Tella, 1999). Resource-rich developing countries often see ill-defined property rights, imperfect or missing markets and lax legal structures, which make the rent seeking by politicians and bureaucrats even easier (Gylfason, 2001).

Third, another possible explanation resides in the competition for political positions. As the bulk of the rents created in resource economies are dispensed by bureaucrats who mostly come from dominant political groups (Mbaku, 1992), resource discovery or boom enhances the resources under the allocation of political elites and increases the value of being in power, and thus there comes intense competition for the access to powerful political positions. Moreover, the desire for political positions could also drive up corruption in the allocation of resources that could lead to political elite status, such as education opportunities (Vicente, 2010). Zhan (2011) draw the conclusion, evident from is work on China, that the abundance of and dependence on min-

eral resources undermine local political institutions by increasing the propensity for corruption.

Human development – resource abundance interactions also exist in the literature. Pineda and Rodriguez (2010) argue against a natural resource curse for human development. They find evidence that changes in human development from 1970 to 2005, proxied by changes in the Human Development Index, are positively and significantly correlated with natural resource abundance. While their results are consistent with those of other authors who have recently argued that natural resources do not adversely affect growth (e.g., Lederman and Maloney, 2008), they found strong evidence that natural resources have a positive effect on human development and particularly on its non-income dimensions. They concluded that natural resources may be a blessing rather than a curse for human development, primarily through its effects on education and health rather than income.

Behbudi, Mamipour and Karami (2010), investigate the relationship existing between natural resource abundance, human capital and economic growth, dividing petroleum exporting countries into (1) major petroleum exporters and (2) other petroleum exporters. They find that while physical investment and openness have a positive impact on economic growth, resource abundance and government expenditure are inversely related with economic growth. However, it was discovered that human capital has a different impact on the two groups. While human capital negatively interacts with economic growth in group one – major petroleum exporting countries – it positively relates with growth in the case of other petroleum exporting countries. The conclusion therefore, is that human capital can be used to explain the resource-curse transmission in a resource-abundant economy. On the other hand, countries that are rich in mineral and oil neglect the developing of their human resources by devoting inadequate attention and expenditure to education. So, these countries have a lower growth rate with respect to others.

Gylfason (2000) also finds a negative relationship flowing from natural resources, education and economic development. Assessing four main channels: The Dutch disease, rent seeking, overconfidence and neglect of education, he finds that public expenditure on education relative to national income, expected years of schooling for girls and gross

secondary enrolment are all inversely related to the share of natural capital in national wealth across nations. The picture therefore, is that natural capital appears to crowd out human capital, thereby resulting in sluggish economic development. Other research papers have reached a similar conclusion, e.g., Corden (1984); Bardhen (1997); Gylfason, Herbertsson, and Zoega, (1999); Herbertsson, Skuladottir, and Zoega, (1999); Frankel and Romer, (1999).

Evidence has also been presented in terms of rentier transmission and institutions. Torvik (2002) and Mehlum and Moene (2006) find a case where resource windfall become a curse by diverting entrepreneurial talent away from wealth-creating industrialization towards rent-seeking. Their models treat institutions as endogenous. Other models with similar treatment of institutions include Aslaksen and Torvik (2006), Caselli and Michaels (2009), Tsui (2010), Vicente (2010) and Deacon and Rode (2012). Ji, Magnus and Wang (2013) taking a cross-province approach, try to examine the interplay between resource abundance, institutional quality and economic growth for China. Employing two different measures (a stock: resource reserves; and a flow: resource revenues), and using different econometric approaches including varying coefficient models, they found a positive effect flowing from natural resource abundance to economic growth at the provincial level, between 1990 and 2008. Fan, Fang and Park (2010) arrived at similar conclusion for China.

Other empirical surveys have shown diverse resource curse channels and transmissions. Cai and Newth (2013), employing a mathematical modelling framework, show that when resources are monopolized by the elite, increased exportation leads to decreased domestic production. They point out that is due to under-provision of the resource-embedded energy and industrial infrastructure, which in turn decreases domestic production, lowers the marginal return on productive activities, and introduces unrest through insurgency. The resultant conflict further displaces human, built, and natural capital. It forces the economy into a vicious downward spiral. Again, Suleiman (2013) using heterogeneous panel analysis technique, concludes that oil as a resource, cannot be said to be responsible for the poor economic performance of most oil rich countries, but that perhaps could be attributed to a weak institutional base and oil price volatility which usually has an adverse effect

on long-term economic performance. Akanni (2007) examining the effect of oil rents on economic growth in oil exporting countries of Africa, also analyses empirically, the channels of transmission of resource curse of natural resources on growth in these countries. His major findings, amongst other things, are that (i) there was evidence of resource curse in oil exporting African countries, (ii) that the absence of democracy in oil exporting countries hinders economic growth, and (iii) that the despicable state of institutions in oil exporting countries encourages grabbing of public resources and oil rents through rent seeking hence retarding economic growth. The basic conclusion from this study is that for oil exporting African countries, as for other oil exporting countries, oil rents have failed to promote growth.

Satti, Farooq, Loganathan and Shahbaz (2014) investigate the relationship between natural resource abundance and economic growth for the Venezuelan economy. Employing the ARDL bounds testing approach to cointegration to examine its long run relationship amid the variables and VECM Granger causality test to test the direction of causality among the variables, within the period 1971–2011, their empirical evidence indicates that the variables are cointegrated. Their results confirm that natural resource abundance impedes economic growth; financial development, capital stock and trade openness enhance economic growth. The feedback hypothesis is also found between natural resource abundance and economic growth (Satti, Farooq, Loganathan and Shahbaz, 2014). Rocha (2010) examines natural resource curse in terms of externalities from natural resource exports. Using panel data regressions, he found that natural resource exports generate positive externalities that are at least as high as those generated by manufacture exports and, as a result, resource rich countries that manage to grow their exports at a fast rate do not suffer from the natural resource curse. This again adds to the literature that argue in favour of natural resource abundance not being a curse. Others include: Habakkuk (1962); Wright (1990); De Long and Williamson (1994); Carlo Bardini (1997); David and Wright (1997).

However, many empirical works have found a negative relationship flowing from natural resource abundance to economic growth. Damette and Seghir (2013), relying on the estimation of a Panel Smooth Transition Regression (PSTR) model, found strong evidence that oil revenues

non-linearly impacts economic growth and that resource curse only exists under the condition of high oil dependence. More precisely, below the level of 51% of oil dependence, oil revenues have a positive impact on economic growth, whereas above this level, it has serious drawbacks on economic growth through inefficiencies in the quality and the quantity of government expenditures, Damette and Seghir (2013). Other examples include, Gelb (1988); Auty (1990); Sachs and Warner (1995, 1999); Gylfason et al. (1999); Stijns (2000); Sachs and Warner (2001).

2.3.1 Empirical Literature on Nigeria

A few specific empirical investigations have been carried out on natural-resource wealth and economic growth for Nigeria. Oil, being the major natural capital for Nigeria, has had a handful of investigations done, that are target-specific, to ascertain its impact on economic growth. This subsection examines the outcomes and conclusions of those studies.

Olusi and Olagunju (2005) enquire into the existence or otherwise of the Dutch disease in Nigeria. Deploying a vector autoregressive (VAR) modelling technique consisting of impulse response functions and variance decomposition analyses, they found the presence of Dutch Disease in Nigeria, though? as a delayed occurrence. They concluded that diversification of the economy, especially to agriculture, was a necessity. Atima (2013) found a negative relationship between petroleum resource abundance, corruption and economic growth, using time series data spanning between 1980 and 2011. In the same vein, Ologunla, Kareem and Raheem (2014) examine the relationship that exists between institution and resource curse in Nigeria, considering time series data spanning 1986 to 2012. Their results indicate a negative relationship between institutions in Nigeria and resource curse. They concluded that institutions in Nigeria should be strengthened if resource curse is to be avoided.

Mahler (2010) investigated the resource curse hypothesis from the perspective of oil-related violence, with focus on the Niger Delta area of Nigeria. The results underline the fact that Oil has indirectly boosted the risk of violent conflicts through a further distortion of the national

economy. The study further argues that the distortion is fudged by weak democratic structures and rule, invested with corruption; corrupt politicians fuelling the violence and institutional weakness generally. Obafemi, Ogbuagu and Nathan (2013) also investigate resource curse in terms of petroleum resource abundance, institutional quality and economic growth., deploying an error correction technique on time series data. They found that the curse flows from weak quality of institutions, while ordinarily, petroleum resources would be a huge blessing for the economy. It is concluded in the study that:

> *petroleum sector in Nigeria need to be encouraged to play the leading role in the economic growth and development process by improving on the performance of institutions through less corrupt activities, effective governance and sound contract enforcement in order to have a sizeable positive effect on economic growth. Macroeconomic indicators like openness and inflation,* ***'which'***[2] *play crucial role to ensure regular and significant impact of petroleum resources on economic growth in Nigeria,* ***'should be properly managed'***[3].

Odularu (2008), using Ordinary Least Squares method, found a positive impact of crude oil export and consumption for Nigeria. This, lending a voice to some aspects of Obafemi et al. (2013)'s conclusions, adds to the mixed outcomes that flood the resource curse literature.

Omodadepo and Akanni (2013) examine the curse of oil wealth in Nigeria and compare it with the case of Norway, engaging human capital as a transmission channel. The study examines time series data (1970 - 2007) via VAR, and the result indicates that oil wealth led to economic growth in both countries. Oil wealth led to improved human capital in Norway, but led to negative human capital in Nigeria. They argue that though the result is not consistent with their expectation, human capital remains a transmission channel to growth in both countries. They also found a long run relationship among oil wealth, human capital and economic growth for both countries.

In a related study, Akinlo (2012), probed the significance of the Ni-

[2] The word in (' ') and boldfaced is that of the author.
[3] The phrase in (' ') and boldfaced is that of the author.

gerian oil sector in the economic development of the country over the period 1960–2009 by applying multivariate VAR model developed by Johansen and Juselius (1990, 1992). The results indicate a long run relationship among the variables. In addition, the fact that the oil sector can play a pivotal role to enhance economic growth by encouraging the non-oil sectors is underlined. It is evident from that fact that at the time of investigation the production of crude oil had significantly increased, which means a rise in the contribution of the oil sector in GDP. Nevertheless, the positive contribution of the oil sector to the manufacturing subsector left much to be desired. The situation of foreign direct investment in the oil industry of Nigeria has been improving and also contributes significantly to economic growth (Satti, Farooq, Loganathan and Shahbaz, 2014).

There are numerous other branches through which the oil industry of Nigeria has contributed in accelerating economic growth, namely: provision of cheap energy, availability of huge foreign reserves and provision of efficient labour force in the country (Odularo, 2008). Examining the relationship between crude oil revenues and economic growth in Nigeria, Asekunowo and Olaiya (2012), employing Johansen multivariate cointegration for the period 1974-2008, submit that variables are cointegrated for a long run relationship. Their empirical evidence supports the presence of the resource curse hypothesis due to weak and challenged institutions, 'voracity effect', excessive spending, fiscal volatility, excessive borrowing and fractionalization in Nigeria. Onyeukwu (2007), though using a different approach, draws a similar conclusion for Nigeria.

2.4 Summary

The tour of the literature reveals four basic facts: first, that the resource curse hypothesis has been proven to hold in many cases, second, that transmission channels have been identified as the obvious route through which the paradox thrives, third, that the effect of natural resource abundance on economic growth is methodology-sensitive as well as natural resource indicator-sensitive. Fourth, resource abundance in itself springs benefits, but the transmission channels not being

managed well turn these blessings to a curse. Also, basic measurement approaches and investigation techniques that are common in the literature have been identified. The gaps these approaches and techniques have left, especially for country-specific studies, have also been identified and are part of what this study intends to attempt to close.

Also, apart from the ground-breaking works of Sachs and Warner (1995, 1997, 1999a, 1999b & 2001) and Gylfason (2000, 2001a & 2001b), so many advances and breakthroughs have been recorded in the literature on the issues of growth and resource-abundance. Studies that cut across all dimensions of natural resources have been done and their impacts identified, e.g. (Satti, Farooq, Nathan & Shahbaz, 2014; Iimi, 2007; Konte, 2011, etc.), but all these studies have been panelled across countries and most of them are not done based on country-specific evaluations. Also, as Papyrakis & Gerlagh (2004) pointed out, the conditional convergence hypothesis, which states that different growth rates between different countries are explained by various characteristics of these countries, further validates the importance of this study to pinpoint what is Nigeria's situation.

The second point is the fact that the few country-specific works done on the resource curse for Nigeria have been foreign-based, e.g., (Mahler, 2010; Sala-i-Martin & Subramanian, 2003, etc.), and those done at home are relatively a handful, e.g., (Onyeukwu, 2007; Olusi & Olagunju, 2005; Akinwale, 2012; Akinlo, 2012; Ologunla, Kareem & Raheem, 2014; Omodadepo & Akanni, 2013; Obafemi, Ogbuagu & Nathan, 2013), with mixed outcomes and peripheral approach (for a few). This work is therefore necessary to lend more voice, boost empirical literature and possibly provide new evidence.

The third reason justifying this study is the potential for a country-specific study incorporating the peculiarities of the local macroeconomic environment into the process of investigations, since the macroeconomic environment of nations differ. It is therefore glaring that country-specific studies like this one can provide a useful policy insight about the impact of crude oil production on growth and development in a developing economy like Nigeria.

The fourth justification for this study lies in the fact that the relevant variables are proxied using current dataset that would provide basic reliable outcomes that can be relied on for policy fine-tunings. Again,

the application of ARDL Bound Testing technique lends a unique outlook to the investigation of the resource curse phenomenon, especially as it relates to other country-specific studies seen in the literature on Nigeria.

3 Method of Study

This research work was designed to be empirical in nature, employing mainly, secondary data from various sources. The data were sourced basically from officially published sources and they include; Central Bank of Nigeria Statistical Bulletin (CBN), World Development indicators (WDIs) and World Governance Indicators (WGIs), over various years. These data are carefully selected, using basic considerations, to proxy the macroeconomic variables this research work intends to test. The data was simulated and estimated using basic mathematical, statistical and econometric tools, while sufficiently relying on relevant economic theories for reliable outcomes. Detail description of these data, the construction, measurements, sources as well as a priori expectations, are presented in subsection 3.1.

3.1 Data construction, Measurements, Sources and A Priori Expectation

The data used for this study are mainly of secondary components. They are real GDP, proxy for oil resource abundance, trade openness (openness to external trade), human capital and capital. Other variables are institutional, aimed at deepening the investigation of resource curse channels. They include control of corruption, rule of law, regulatory quality, government effectiveness and political stability & absence of violence/terrorism. In the foremost equations structuring the models to be investigated in this work, apart from the response variable (real GDP) and oil resource abundance (being the lead variable in this work) that are explicitly expressed, others are captured as vectors (i.e. A and Z). However, they are clearly stated in subsequent expressions, but details

are withheld for this section.

Real GDP is the dependent variable used for this study, measuring economic growth over the period under investigation. The proxy is the logarithm of GDP per capita (current local currency unit) sourced from World Development Indicators (WDI) 2015. This data set is assumed to be unstable as it is common with time series, hence the need to log the set to derive stable elasticities of the coefficient when estimated. Next is petroleum resource abundance. To capture this variable, an important measure is employed, and this is oil revenue flows. This variable is necessary to capture the direct impact of petroleum resource inflows on the growth of the Nigerian economy and the general wellbeing of Nigerians.

Satti, Farooq, Loganathan and Shahbaz (2014) used this approach for Venezuela, Lay and Mahmoud (2004) also employed a similar approach (but for several natural resource rents) for a cross country assessment. A priori, following economic growth theories in the literature, it is expected that the impact of petroleum resources will be positive. However, following the literature on the resource curse hypothesis, the result is expected to be negative (e.g., Sachs and Warner, 1995a&b, 1997a&b, 1999, and 2001; Gylfason, 1999, 2001, 2002; Atkinson & Hamilton, 2003 and Satti, et al. 2014, amongst others). On the other hand, a few positive outcomes have been recorded in the literature, (e.g., Lederman &Melony, 2003; Sala-i-Martin, & Subramanian, 2003; Obafemi, Ogbuagu and Nathan, 2013). However, in this mixed circumstance, what would be the outcome for Nigeria in this study is left for empirical verification.

Human capital is constructed as one of the very essential variables in the model. The inclusion of this variable captures two strategic issues. First is the issue of direct effect where improvement or otherwise in the level of education and health of the people per capita is evaluated and second is the indirect (multiplier) effects flowing from the input of the educated and healthy population – including quality checks. The construct involves the sum of public expenditure on health and education divided by the total number of population. This approach captures the real cost of human capital, so as to reflect how much petroleum resources have impacted on it and how they can jointly foster economic progress in Nigeria. The a priori expectation is therefore a positive relationship running between economic growth and human capital de-

velopment. Growth theories clearly outline, among other indicators, a sizeable and viable human capital as a booster to growth and economic progress. The data was sourced from Central Bank of Nigeria's statistical bulletin (CBN, 2010, 2014 & 2015).

Another control variable - capital - is seen theoretically as an investment booster, thus, a sizeable capital build-up in the economy increases growth and development possibilities. A priori therefore, capital is supposed to relate positively with economic growth. Capital is measured by gross fixed capital formation (local currency unit) sourced from WDI (2015). The measure of this data is taken in log form to ensure stability of measurement.

Trade openness (a construction from terms of trade) would be captured as a control variable to measure the dimension of external trade growth and liberalisation. It is to measure the extent to which openness of the Nigerian economy can impact on economic growth and how this can jointly improve economic progress in the face of petroleum resource abundance. Its construct involves the sum of total exports and imports as a ratio of GDP. Its impact on growth is expected to be positive and significant if export volume is rising, and negative if it is otherwise, *cètèris paribus*.

Furthermore, channels of the resource curse captured as institutions, would be assessed in terms of quality. Five basic indicators are considered: *control of corruption, regulatory quality, rule of law, government effectiveness and political stability & absence of violence/terrorism*. The control of corruption is a variable expected to address the perception of the extent to which public power is used for private benefits. This has to do with all forms of corruption, including the few political class pocketing the state's resources for the purpose of accomplishing private goals and meeting personal targets. The case of regulatory quality entails the perception relating to the state of government's ability to formulate and implement sustainable policies and regulations that allow and foster private sector economic participation and development. The rule of law perceives the extent to which economic and political agents are confident of and abide by the body of rules governing society and institutions. This involve the quality of contract enforcement, property rights, the police, and the courts as well as the possibility of crime and violence.

Government effectiveness addresses the perception of the quality of the public service, civil service and the degree of independence of public and civil services from political manipulations and pressures, the quality of policy formulation, implementation and the credibility of the government's commitment to such policies. Political stability and absence of violence/terrorism indicates the perception of the likelihood that government will be destabilised or overthrown by unconstitutional or violent measures, including politically-motivated violence and terrorism. The entire institutional variables have their data drawn from World Governance Indicators (WGI) database. These variables are measured using percentile ranking on a scale ranging from 0 (corresponding to lowest rank) to 100 (corresponding to highest rank). This information can be accessed from www.govindicators.org. A priori, they are expected to be related positively and significantly with economic progress, if other things remain as they should be.

Note: It is important to mention the fact that data for the institutional variables are unavailable for the earlier years of the period this study covers. Thus, in order to get them amenable for time series econometric analysis, one of these two possibilities would be explored. (1) the size of other corroborating data sets may be reduced to the size of the institutional variables (in which case sequential or stepwise approach will be employed) and (2) dummy variables of 0&1 may be used to fill those gaps left in the early years. The choice and application of either of these two possibilities depends on the extent of alignment with basic OLS assumptions and rule-of-thumb for use.

3.2 Modelling Framework

The purpose of this study is to examine the relationship between petroleum resource abundance and economic growth in Nigeria. This is in a bid to ascertain the existence or otherwise of the resource curse in the case of Nigeria. Various growth theories have recognised the robustness of capital in fostering economic growth. As stipulated in the literature review, natural resources are basically defined, in most growth theories, as part of total capital formation – natural capital. But a new argument that natural capital abundance depletes growth rather than promotes

it, redirects theoretical focus, hence the need to model economic growth cautiously.

This work, therefore, follows Konte (2011) and other recent works that have used a mixture of regression methods to determine growth behaviour in the face of resource abundance. But, to analyse how petroleum resource abundance contributes to explaining long-term growth in the Nigerian economy – which is the broad objective of this study – the work follows the standard growth regression model as applied in Sachs and Warner (1995a&b, 1997a&b, 1999a, 2001), Sala-i-Martin, X and Subramanian (2003a&b), Papyrakis and Gerlagh (2004) and Obafemi et al. (2013). Often, the core growth theory associates growth performance with changes in investment in human and physical capital. Also, in line with Papyrakis and Gerlagh (2007), these core variables as well as trade openness are included in the model. Thus, the baseline growth equation is specified as:

$$Rgdp_t = Petroleum\text{-}resources_t + A_t \quad (1)$$

Where $Rgdp_t$ represents the real GDP for Nigeria at time t, petroleum resources are represented by oil revenue and (A) is a vector of control variables, of which most of them shall be examined as resource curse channels as found in the literature. Equation (1) is expected to examine the direct effect of oil production on economic growth. To examine the indirect effect of petroleum resource abundance on economic growth in the Nigerian economy, equation (1) is augmented as specified below:

$$Rgdp_t = Petroleum\text{-}resources_t + A_t + Z_t \quad (2)$$

Where Z_t is a vector of some institutional variables including control of corruption.

The estimated outcome of the equation is expected to address the question of Dutch disease[4] symptoms in Nigeria. The impact of petroleum-resource abundance on the Nigerian economy is expected to be

[4] Dutch disease explains the impact of excessive flow of income from natural-resource exports on other sectors – especially the manufacturing sector – that makes the productivity of such sectors dwindle. This will be as a result of rise in exchange rate (in terms of domestic currency) that will make export of tradable goods from domestic industries difficult.

either positive or negative. Following basic growth theories, the abundance of natural capital should expand the manufacturing subsector of the economy, diversify exports and quicken the entire real sector of the economy. Researchers, (e.g. Sachs and Warner, 1995a&b, 1997a&b, Gylfason, 2001 and Konte, 2011) saw the opposite in different resource-rich economies. A case of dwindling manufacturing sector output and a case of deteriorating manufacturing-sector dependent exports, steady rise in the exchange rate and other macroeconomic mark-ups that could promote growth. This situation was first identified in the Netherlands, hence the name the Dutch disease. The estimate of equation (1 & 2) above is therefore expected to reflect what the situation is for Nigeria.

3.2.1 Econometric Specification

For the equations above to be amenable for regression analysis, the econometric form of the equations has to be stipulated. We use log-linear specification for stable elasticities of the coefficients as well as consistency and efficiency of results gotten from the estimations. Empirically therefore, equations (1) and (2) are rewritten as:

$$lnY_t = \beta_1 + \beta_2\, lnPR_t + \beta' lnA_t + \varepsilon_t \tag{3}$$

$$lnY_t = \phi_1 + \phi_2 lnPR_t + \phi' lnA_t + \phi'' lnZ_t + \mu_t \tag{4}$$

equations (3) and (4) are the econometric forms of equations (1) and (2), rewritten more compactly with the variables being identified in the form above for simplicity. *lnY* in equation (3) and (4) represents the natural logarithm of real GDP. The natural logarithm of petroleum resources is given as *lnPR*, however, the vectors are as stated earlier - β & ϕ are the parameters to be estimated, while ε & μ represent the error terms with their well-behaved properties and t in the system measures time lags.

3.2.2 Method of Estimation

Ordinarily, equations (3) and (4) could be estimated using OLS – a basic econometric technique, but it may not yield efficient estimates of the parameters. This is not unconnected with basic problems associated with the estimation of time series data. To this end, the Autoregressive Distributed Lag (ARDL) bounds test procedure introduced by Pesaran, Shin and Smith (2001) is used to test the long run equilibrium relationship between economic growth, petroleum resource abundance and other explanatory variables for Nigeria over the period 1980 - 2014. As is clear in the existing literature, a variety of cointegration techniques for testing cointegration between series exist, but the ARDL bounds test technique is mostly preferred for its copious advantages over other techniques of cointegration. Some of these advantages are presented below.

First, ARDL can be applied irrespective of the order of stationarity of the underlying variables, as long as they are within the order I(0), I(1) or a combination of both (Pesaran and Pesaran, 1997, Jalil and Feridun, 2010). Second, the model takes a sufficient number of lags to capture the data generating process in general to specific modelling frameworks (Jalil and Feridun, 2010). Third, empirical studies with fewer observations find this econometric technique more appropriate as compared to traditional cointegration techniques (Haug, 2002, Satti, Farooq, Loganathan and Shahbaz, 2014). This implies that, the small sample properties of the ARDL approach are far superior to those of the Johensen and Juselius cointegration technique (Pesaran and Shin, 1999). Fourth, the error correction model (ECM) can be derived from ARDL through a simple linear transformation, which integrates short run adjustments with long run equilibrium without losing long run information (Jalil and Feridun, 2010). Fifth, the problem of endogeneity does not pose a threat when employing the ARDL technique because the technique is free of residual correlation. As Pesaran and Shin (1999) show, the appropriate lags in the ARDL model are corrected for both serial correlation and issues of endogeneity (Jalil and Feridun, 2010). Finally, the technique can identify between dependent and independent variables in a series.

The ARDL procedure therefore involves the estimation of equation (3) as shown below. The specifications are presented thus:

$$\Delta lnY_t = \beta_i + \vartheta_1 lnY_{t-1} + \vartheta_2 lnPR_{t-1} + \vartheta_3 lnHC_{t-1} + \vartheta_4 lnCP_{t-1} + \vartheta_5 lnTR_{t-1} + \sum_{i=1}^{p} \vartheta_i \Delta lnY_{t-i} + \sum_{j=1}^{q} \vartheta_J \Delta lnPR_{t-j} + \sum_{k=1}^{r} \vartheta_k \Delta lnHC_{t-k} + \sum_{l=1}^{s} \vartheta_q \Delta lnCAP_{t-l} + \sum_{m=1}^{u} \vartheta_o \Delta lnTR_{t-m} + \varepsilon_{it} \quad (5)$$

Where β_i are the drift components, ε_t captures the white noise in period t and Δ is the differenced operator. The terms with summation signs represent the error correction dynamics, while the first parts of the equations correspond to the long run relationship. The first step in the ARDL bounds test approach is to engage F-tests in tracing the existing long-run relationship among variables. The null hypothesis that there is no long-run relationship between the variables in Eq. (5) is H_0: $\vartheta_i = 0$ against the alternate hypothesis that there is, i.e. H_1: $\vartheta_i \neq 0$. The calculated F-statistic will be compared with two asymptotic critical values structured by Pesaran, Shin and Smith (2001). The decision whether the variables are cointegrated for long run relationship or not depends on the upper critical bound (UCB) and lower critical bound (LCB) of these critical values. It is more appropriate to use LCB to test the cointegration between the series if all the variables are stationary at I(0). Similarly, UCB is applied to investigate the long run relationship between the series if the variables are integrated at I(1) or I(0) or I(1)/I(0) (Satti, Farooq, Loganathan and Shahbaz, 2014). If the calculated F-statistic exceeds the upper critical value, the null hypothesis of no cointegration will be rejected irrespective of whether the variables are I(0) or I(1). If it is below the lower value, the null hypothesis of no cointegration cannot be rejected. If it falls within the critical value band, the test is inconclusive (Pesaran and Pesaran, 1997). However, F-statistic can be calculated by applying the following model: F_Y *(Y/PR, HC, CAP, TR)* up to the 9th equation.

In choosing the optimal lag length for each variable, the ARDL technique estimates $(P+1)^k$ number of regressions, where P is the maximum number of lags and k is the number of variables in the equation. The model can be selected on the basis of the Schwartz–Bayesian Criteria

(SBC) and the Akaike Information Criteria (AIC). The SBC is known as a parsimonious model, selecting the smallest possible lag length, while the AIC is known for selecting the maximum relevant lag length. However, considering the fact that our sample size is small, consisting of 35 observations for the period 1980 – 2014, the critical values generated by Pesaran, Shin and Smith (2001) are unsuitable, hence the use of upper and lower critical bounds generated by Narayan (2005). Satti, Farooq, Loganathan and Shahbaz (2014) point out that the critical bounds generated by Pesaran, Shin and Smith (2001) are appropriate for large samples (e.g., N = 500 to N = 4,000). Narayan and Narayan (2004) hold that the critical values computed by Pesaran, Shin and Smith (2001) might provide a biased decision about cointegration between the series. The critical bounds by Pesaran, Shin and Smith (2001) are extensively downwards. The upper and lower critical bounds calculated by Narayan, (2005) are more suitable for small samples ranging from N = 30 to N = 80 (Satti, Farooq, Loganathan and Shahbaz, 2014).

In the second step, as soon as it is ascertained that cointegration exists between abundance of petroleum resources, economic growth, human capital, capital, investment and trade openness, then we should examine the causal relation between the series over the period 1980–2014. To establish the existence as well as the direction of causal relations, according to Gujarati (2003), the Sims (1980) Vector Autoregression (VAR) approach will be employed. This is because the Granger causality test by Granger (1969) may not be able to provide reliable estimates for multiple variables in a set of equations (Gujarati, 2003). The equation in a five-variable case can be written as follows:

$$\begin{aligned} lnY = {} & \gamma_i + \sum_{i=1}^{l} \gamma_{11}\, lnY_{t-i} + \sum_{j=1}^{m} \gamma_{22}\, lnPR_{t-j} \\ & + \sum_{k=1}^{n} \gamma_{33}\, lnHC_{t-k} + \sum_{x=1}^{c} \gamma_{44}\, lnCAP_{t-q} \\ & + \sum_{v=1}^{a} \gamma_{55}\, lnTR_{t-v} + \pi_i ECT_{t-1} + \omega_{it} \end{aligned} \tag{6}$$

Where ω_{it} are impulses (or residual terms or innovations or shocks) and are assumed to be identically, independently and normally distributed, for all the five variables in the model. The statistical significance

of the lagged error term, that is, ECT_{t-1} further validates the established long run relationship between the variables. The estimate of ECT_{t-1} also shows the speed of convergence from short run toward long run equilibrium path in all models. Also, the statistical significance of the estimate of lagged error term, that is, ECT_{t-1} with negative sign confirms the existence of a long run causal relationship using the t-statistic. It is important to test the causal relation of the variables once the series are cointegrated and causality must be found at least from one direction. Further, apart from the test explaining the current value of the dependent variables in terms of its lags and the lags of the regressors, it treats the entire variables as a set of endogenous variables. It assumes no exogenous variables in the system. The significance of the t-statistic establishes the existence of causality. For example, the significance of γ_{22i},i $\neq$ 0 $\forall$ i implies that causality is running from natural resource abundance to economic growth and that economic growth causes natural resource abundance can be indicated by the significance of ρ_{22} i$\neq$0 $\forall$ i. The same inference can be drawn for the rest of the causality hypotheses. Finally, we use Wald or F-test to test the joint significance of estimates of lagged terms of independent variables. This further confirms the existence of short-and-long run causality relations and is known as a measure of strong causality.

3.3 Further Data Diagnostics

One of the basic rules of the application for ARDL is that the order of stationarity of the series must be I(0) and I(1), implying that any other level of integration excludes the ARDL method from being applied. To this end, it is pertinent to examine the data to ascertain if the series meet the primary requirement stated above. Also, the need to apply Ordinary Least Squares (OLS) technique in estimating equation (4) for the extended examination intended - where the variables will be added sequentially to shed light on the direct effects of these variables - brings to the fore the necessity for data diagnostics. Of course, this approach is necessary to really underline the effective channels of the curse in Nigeria's case (if any).

There is need, therefore, to control the nuisance associated with time

series data ranging from issues of multicollinearity, autocorrelation to issues of heteroskedasticity. By this, it is meant that to ensure the viability of the model, diagnostic and stability tests are to be conducted to examine models for serial correlation, functional form, non-normality, etc., aside the ones mentioned earlier. Pesaran and Pesaran (1997) suggest using the Brown, Durbin and Evans (1975) stability tests known as cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ). The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the breaks points (Jalil and Feridun, 2011). The null hypothesis: all the coefficients in the model are stable, cannot be rejected if the plots of the CUSUM and CUSUMSQ statistics stay within the critical bounds of a 5% level of significance.

3.3.1 Unit Root Test

Primarily, one of the necessary requirements in time series econometrics is to first examine the stationarity properties of the variables to avoid spurious estimation. A series is said to be (weakly or covariance) *stationary* if the mean and autocovariances of the series do not depend on time (Greene, 2003). Any series that is not stationary is said to be *nonstationary* and non-stationarity of a series would imply that the normal statistical approach to coefficient evaluation will not hold grounds in such circumstance. It is evident in the literature that most time series are often not stationary at levels, but at first differencing (see Kirchgassner & Wolters, 2007). In other words, a difference stationary series is usually said to be *integrated* and is denoted as I(*d*), where *d* is the order of integration. The order of integration is the number of unit roots contained in the series or the number of differencing operations it takes to make the series stationary (Akpan, 2012).

A variety of tools exists for testing a series for the presence of unit root. For our present purpose, we applied the standard Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979). The ADF test is based on running the following regression:

$$\Delta y_t = a_0 + a_1 t + \vartheta y_{t-1} + \sum_{i=1}^{q} \gamma_i \, \Delta y_{t-i} + \delta_t \qquad (7)$$

Where Δ represents the first difference operator, y_t represents the relevant variable under consideration and δ_t is a random error term. The ADF test statistic is a one-sided test whose null hypothesis is $\vartheta = 0$ against the alternative that $\vartheta < 0$. Under the null, y_t must be differenced at least once to achieve stationarity; under the alternative, y_t is already stationary and no differencing is required.

It is important to note that unit roots test type like the Dickey-Fuller and Augmented Dickey-Fuller (to some extent) are structural-break sensitive. Such tests confuse structural breaks with non-stationarity (Geda, Ndung'u and Zerfu, 2012). This means that a truly stationary variable with structural breaks may be identified as non-stationary. Scholars in recent times have developed tests to check these distortions (e.g. Adrews and Zivot, 1992, and Clemente, Montanes &Reyes, 1998), but we adopt the Phillip-Perron (PP) tests developed by Phillip (1987), Phillip & Perron (1988) and sharpened by Perron (1997) for its properties that enhance its capacity to handle these shocks. Herzer, Nowark-Lehmann and Silverstove (2004) and Akpan (2011) also noted that, the test examines the time series properties in the presence of structural changes at random (unknown) points in time, thereby internalising the structural breaks. The specification is thus:

$$t_{\pi}^{*} = t_{\pi}\left[\frac{\gamma_o}{f_o}\right]^{\frac{1}{2}} - \frac{K(f^o - \gamma^o)\,[se(\hat{\pi})]}{2f_o\frac{1}{2}s} \tag{8}$$

Where $\hat{\pi}$ is the estimate, and t_{π} is the t-ratio of π, se($\hat{\pi}$) is the coefficient standard error, and s is the standard error of the regression equation. Also, γ_o is a consistent estimate of the error variance, while f_o is the residual spectrum at frequency zero.

3.3.2 Preliminaries

Before the actual empirical investigations, we shall take a preliminary assessment of the structure of our data set. Before the unit root analysis, first of all, the summary statistics of the entire variables included in the models would be examined. Second, the correlation matrix as well as covariance matrix shall be assessed to ascertain the ac-

tual structure of interactions among the data sets. It is hoped that these preliminaries will shed more light on the real nature of the relationship among the key variables.

3.3.3 Robustness Check

To verify if the results from the estimated models could be useful for meaningful policy analysis and decision-making, a number of diagnostic tests for each of the estimated models would be applied where necessary. These include the standard (Adjusted) R-squared statistic for the goodness of fit test, the F-test for the significance of the overall results, and the *RESET* test for the correctness of model specification, amongst others. Equally, the estimation of the extended specification would provide a sensitivity check on the basic specification for robust policy conclusions.

4 Results and Analysis of Findings

4.1 Preliminaries

In our assessment of the resource curse hypothesis to uphold or reject, in the case of Nigeria, the relationship between crude oil production and economic growth was examined, using a combination of some basic econometric techniques as described in section three of this work. The results are presented and analysed herein. In Table 4.1, the descriptive statistic and the correlation matrix are being reported. The Jarque-Bera statistic shows that all the series are normally distributed with zero mean and constant variance. The correlation coefficients indicate that crude oil production (in terms of Naira) and other macroeconomic variables (used in the work), correlate positively and significantly with economic growth and with each other.

Table 4.1. Descriptive Statistics and Correlation Matrix

	lnY	*lnPR*	*lnHC*	*lnTR*	*lnCAP*
Mean	9.7239	5.7996	2.6741	-0.9701	26.1408
Median	10.1337	6.0131	2.9086	-0.7672	26.1685
Maximum	13.1380	9.0914	6.3463	-0.3549	30.0925
Minimum	6.5251	1.9814	-1.4696	-2.2006	22.8979
Std. Dev.	2.2630	2.5423	2.7751	0.5359	2.3334
Skewness	-0.0726	-0.2494	-0.2790	-0.9489	-0.2722
Kurtosis	1.6455	1.5955	1.6230	2.6332	1.8928
Jarque-Bera	2.7063	3.2394	3.2191	5.4493	2.2200
Probabilty	0.2584	0.1979	0.1999	0.0655	0.3295
lnY	1.000000				
lnPR	0.987720	1.000000			
lnHC	0.974641	0.972441	1.000000		
lnTR	0.832671	0.860846	0.803995	1.000000	
lnCAP	0.985196	0.959428	0.949119	0.817568	1.000000

Note: computed using E-views version 9.

After normal distribution of the series and positive correlation was established, we investigated the existence and direction of causal relations among the series. Table 4.2 shows the existence of causality among the series, employing Sims'VAR Causality Tests approach[5].

From the results presented in Table 4.2, individually, lnY regression indicates that lnY at lag 1 and lnPR at lag 2 were statistically significant at 5% and 10% respectively. In lnPR regression, only lag 2 of lnHC was found to be statistically significant at 5% level of significance, implying a unidirectional causation process (for example, flowing from PR to Y).

There was no statistically significant causation of the lags in the case of lnHC regression, but in the case of lnCAP regression, lnPR at lag 2 and lnCAP at lag 1 period (including the constant term) were statistically significant at 10% and 5% levels of significance. lnTR regression shows that only lags 1 and 2 of the logged-linear values of human capital (lnHC) were statistically significant at 5% and 10% levels of significance respectively, again, confirming a unidirectional significance.

[5] The impulse response graphs for the VAR estimates are presented in appendix 1

Table 4.2. Sims'VAR Causality Estimates

Lags	lnY	lnPR	lnHC	lnCAP	lnTR
Constant	1.4763	5.6746	-4.6751	4.6525***	3.0940
	[0.8154]	[1.7023]	[-0.8479]	[1.9079]	[1.5807]
lnY(-1)	1.1889**	0.8814	1.2500	0.4084	0.5328
	[3.8527]	[1.5514]	[1.3300]	[0.9827]	[1.5971]
lnY(-2)	-0.4503	-0.5659	0.1140	-0.4468	-0.5139
	[-1.3808]	[-0.9424]	[0.1148]	[-1.0172]	[-1.4576]
lnPR(-1)	-0.1804	0.5164	0.7365	-0.2471	-0.1381***
	[-1.115]	[1.7277]	[1.4896]	[-1.1302]	[-0.7869]
lnPR(-2)	0.3137***	0.0491	-0.1437	0.4225***	0.0124
	[1.9573]	[0.1666]	[-0.2945]	[1.9573]	[0.0718]
lnHC(-1)	0.0251	0.1593	0.0726	0.0151	0.1290***
	[0.3973]	[1.3646]	[0.3760]	[0.1770]	[1.8820]
lnHC(-2)	0.0715	0.2021***	-0.3016	0.0518	0.2078**
	[1.1420]	[1.7529]	[-1.5815]	[0.6144]	[3.0696]
lnCAP(-1)	-0.0133	-0.0576	0.0316	0.9166**	0.0657
	[-0.0718]	[-0.1687]	[0.0559]	[3.6698]	[0.3280]
lnCAP(-2)	0.0182	-0.2169	-0.4000	-0.1228	-0.2238
	[0.0991]	[-0.6410]	[-0.7147]	[-0.4961]	[-1.1264]
lnTR(-1)	-0.0196	-0.3398	-0.6569	0.0629	0.0872
	[-0.1010]	[-0.9473]	[-1.1072]	[0.2400]	[0.4140]
lnTR(-2)	-0.0760	0.2536	-0.3186	-0.1436	0.3013
	[-0.4634]	[0.8393]	[-0.6375]	[-0.6497]	[1.6985]
R^2	0.99	0.98	0.96	0.99	0.89
Adj. R^2	0.99	0.97	0.94	0.98	0.84
F-Statistic	372.88	136.77	57.80	229.84	17.91

Note: ** and *** represent significance at 5% and 10% levels. Values in parenthesis [] are t-statistics.

However, though most of the lags have not been individually statistically significant, the robustness of the F statistics in the regressions shows that, collectively, the lagged terms are statistically significant.

Primarily, ARDL Bounds Testing approach to Cointegration is often applied to investigate long-run relationship among variables. One of the preconditions for employing this technique is that the integrating order of the series must be I(0) or I(1) or both, hence the need to test the integrating order of the series, since the ARDL bounds test becomes inappropriate if any variable is stationary at I(2) or beyond that order of integration in the series. Augmented Dickey-Fuller Test (ADF) and Phillip-Perron Test (PP) for integration have been applied and the results are presented in Table 4.3. The results show that all the variables

were stationary at first difference [I(1)] except human capital (HC) and capital (CAP) that are stationary at both levels [I(0)] and first difference [I(1)]. These orders of integration uphold the need to apply ARDL Bounds Testing technique in examining cointegration in the series.

Table 4.3. ADF and PP Unit Root Analysis

Variables	ADF Test with Intercept and Trend		PP Test with Intercept and Trend		
	T-Statistic	Prob. values	T-Statistic	Prob. Values	Order of Integration
lnY	-2.5317(0)	0.3119	-2.6077(1)	0.2795	I(1)/I(1)
	-5.3375(0)	0.0007*	-5.3282(2)	0.0007*	
lnPR	-1.7568(0)	0.7032	-1.7637(1)	0.6999	I(1)/(1)
	-4.9252(1)	0.0020**	-6.4950(6)	0.0000*	
lnHC	-4.0076(0)	0.0179***	-3.9018(4)	0.0229***	I(0)/I(0)
	-5.4477(3)	0.0006*	-12.5736(16)	0.0000*	I(1)/I(1)
lnTR	-4.3143(0)	0.0086**	-4.3512(3)	0.0079**	I(0)/I(0)
	-4.0621(8)	0.0196***	-4.3143(4)	0.0002*	I(1)/I(1)
lnCAP	-2.9717(0)	0.1545	-2.9765(3)	0.1532	I(1)/I(1)
	-4.3590(1)	0.0081**	-4.5915(3)	0.0045**	
lnPOL	-2.0066(0)	0.5590	-2.0652(1)	0.5291	I(1)/I(1)
	-4.5968(1)	0.0113***	-7.3196(16)	0.0001*	
lnGEFF	-2.6643(0)	0.2601	-2.7277(1)	0.2381	I(1)/I(1)
	-4.0428(0)	0.0279***	-4.3819(4)	0.0153***	
lnREQTY	-2.4733(0)	0.3351	-2.4733(0)	0.3351	I(1)/I(1)
	-4.5916(0)	0.0105***	-4.8283(3)	0.0068**	
lnRLAW	-2.7182(1)	0.2420	-2.1091(1)	0.5069	I(3)/I(1)
	-4.3915(0)	0.0162***	-8.6977(15)	0.0000*	
lnCorruption	-1.5887(0)	0.7566	-1.7137(1)	0.7026	I(1)/I(1)
	-3.4694(0)	0.0754***	-3.4665(1)	0.0758***	

Note: Optimal Lag length (band width) of ADF(PP) unit root test is presented in brackets. *, ** and*** represent 1%, 5% and 10% significant levels respectively. Test assumptions for ADF(PP) include intercept and trend and are computed using E-views version 9.

4.2 Analysis of ARDL Bounds Test Results

The bounds test to cointegration investigates the existence of cointegration among variables in the series. Since it is necessary to get information on the lag order of variables, we used the unrestricted VAR[6] model which helps us in computing the F-statistic to assess the existence or otherwise of cointegration within the series. We employ Akaike Information Criterion (AIC) for its strong precision power while providing better and consistent results for small samples. We compare the computed F-statistic with the critical bounds values generated by Narayan (2005). The critical bounds values provided by Narayan (2005) is more apposite for small samples than Pesaran and Smith (2001). The ARDL Bounds Test result is presented in Table 4.4.

To check the robustness of the bounds testing procedure, the varying dependent variable technique was employed, following Ang (2008 a,b) and Ang (2010). The empirical results show that the computed F-statistics are greater than critical bounds provided by Narayan (2005) for economic growth (Y), Crude Oil Production (PR) and Trade Openness (TR) respectively, as the dependent variables and independent variables. The null hypothesis of no cointegration was rejected at 1% level of significance. This confirms the presence of cointegration in the variables. Following these results, it can be concluded that there is a long-run relationship between crude oil production, economic growth and trade openness in the case of Nigeria over the period 1980 – 2015. However, no evidence of cointegration was obtained for human capital and capital, thus, for human capital and capital, the null hypothesis could not be rejected since the computed F-statistics are smaller than critical bounds developed by Narayan (2005), for the series.

[6] The accompanying impulse response results are made available in the appendix.

Table 4.4. Bounds Test to Cointegration

Estimated Models	Y_t= $f(PR_t, HC_t, CAP_t, TR_t)$	PR_t= $f(Y_t, HC_t, CAP_t, TR_t)$	HC_t= $f(PR_t, Y_t, CAP_t, TR_t)$	CAP_t= $f(PR_t, HC_t, Y_t, TR_t)$	TR_t= $f(PR_t, HC_t, Y_t, CAP_t)$
Optimal Lag Structure	(1, 2, 4, 3, 0)	(3, 4, 4, 0, 0)	(2, 0, 1, 0, 2)	(4, 4, 2, 1, 4)	(2, 4, 3, 4, 0)
	12.8268*	16.4666*	1.6292	2.5271	6.1271*
Significant	Critical values (T = 35) †				
level	Lower bounds, I(0)	Upper bounds, I(1)			
1%	5.14	6.61			
5%	3.57	4.66			
10%	3.03	3.99			
R^2	0.9984	0.9967	0.9635	0.9978	0.9654
Adj R^2	0.9971	0.9934	0.9493	0.9942	0.9203
F-stat(prob. Value)	753.7751* (0.0000)	306.0975* (0.0000)	67.6294* (0.0000)	274.6947* (0.0000)	21.3910* (0.0000)
D-W	2.0560	2.1681	1.9937	1.9140	2.3603

Note: The asterisk (*, **) denotes significance at 1% and 5% level. The optimal lag structure is determined using AIC. Probability values are in parenthesis.
† critical bounds value computed by Narayan (2005) following unrestricted intercept and restricted trend.

4.3 ARDL Result for Generalised Effects

After establishing the issue of cointegration of the variables in the series, especially the two lead variables, it was necessary to estimate a generalised stable ARDL model to reflect generally, the initial effect of natural resource abundance (crude oil production in this case) on economic performance in Nigeria within the period under investigation. This first stage ARDL regression is to examine the interactions of the variables in the model, directly with economic performance in the short run. The result is presented in Table 4.5.

Evidence from the table shows that crude oil production (proxied by oil revenue) has positive and significant effect on economic growth in Nigeria (GDP). The result indicates that 38.34% of the growth in the Nigerian economy generally is brought about by crude oil production (oil revenue) and was significant at 1% level. The implication is that naturally, natural resource abundance should boost economic growth by boosting capital and expanding investment and consumption, *ceteris paribus*. The literature is flooded with theories and findings that

Table 4.5. ARDL Result Underlining Petroleum Resources & Economic Growth

Dependent Variable lnY				
Variable	*Coefficient*	Std. error	T-statistic	Prob. Value
Constant	-3.9480	1.4338	-2.7534	0.0141***
lnPR	0.3834	0.0886	4.3246	0.0005*
lnHC	0.0033	0.0393	0.0862	0.9324
lnCAP	0.3791	0.0887	4.2737	0.0006*
lnTR	-0.2319	0.1493	-1.5526	0.1401
R^2	0.9984	*Adj.* R^2	0.9971	
F-statistic	753.7751*	*D-WStat.*	2.0560	
B-G LM	0.0498	*J-B Test*	0.0808	
Test	(0.9516)		(0.9603)	
ARCH	0.1506	*B-P-G*	1.4130	
	(0.7008)	*Test*	(0.2516)	

Note: * and *** represents 1% and 10% level of significance respectively, P-values are in brackets and are computed using E-views version 9.

agree with this conclusion (e.g. Viner, 1952; Lewis, 1955; Ginsburg in Higgins, 1968; Rostow, 1961 in Rosser, 2006; Drake, 1972; Balassa, 1980; Krueger, 1980; Odularu, 2008 and so on). However, other scholars have argued that natural resource abundance depletes growth, especially in developing economies, due to defective structures such has weakness of institutions. Example of such studies include, Singer (1950), Prebisch (1950); Sachs and Warner (1995; 1997) Gylfason (2001) Robinson, Torvik and Verdier (2006), Olusi and Olagunju (2005), Mahler (2010), Atima (2013) and so on.

Human Capital Development (HCD) was found to have an estimated coefficient of 0.0033 and was found to be statistically insignificant. This would mean that a percentage change in human capital would only create a minute effect on the wellbeing of the economy, as reflected in the infinitesimal value of the coefficient and the insignificant status in terms of the statistic. This could be attributed to the insignificant level of investment in human capital development from the proceeds of the oil resources. This is, presumably, unconnected with the self-seeking attitude of natural resource managers that distorts the distribution and redistribution of wealth from natural (crude oil) resources.

This implies that the distortion in crude oil wealth distribution affects much that would have gone into human capital development that

would have resulted in economic growth. Behbudi, Mamipour and Karami (2010) concluded that countries that are rich in mineral and oil neglect the development of their human resources by devoting inadequate attention and expenditure to education. So these countries have lower growth rates with respect to others.

However, the positive sign indicates the fact that if adequate attention was given to human capital development, it would have impacted positively on the economy. Scholars like Sachs and Warner (2001), Gylfason (2000), Jalil and Feridun (2014) and so on, do not hold this view, they consider human capital as one of the resource curse channels, and Gylfason (2000) found that natural resource abundance crowds out human capital.

Capital as a variable (proxied by gross fixed capital formation) had a positive and very significant effect on economic growth. With an estimated coefficient of 0.3791 at 1% level of significance, the result shows that channelling revenue flows from crude oil production into capital accumulation has the capacity of growing the economy. It shows that a percentage growth in capital accumulation will result in about 37.91% growth in the economy generally. This is because, theoretically, the accumulated capital from the proceeds of crude oil exports is expected to be channelled into investments (e.g. in the manufacturing sector to boost industrial output) and capital expenditure such as road construction, rail line construction, dams/power plant construction, and so on, to boost output and subsequently, economic progress. This conclusion is consistent with the views of Ginsburg in Higgins, (1968); Viner, (1952); Lewis, (1955); Rostow, (1961) in Rosser, (2006); Balassa, (1980); Krueger, (1980); Odularu, (2008).

However, the negative coefficient and statistical insignificance of trade openness (TR) is not out of place. Though a priori, the coefficient is expected to be positively signed, it should be noted that an economy that is completely open without a strong manufacturing sector may not benefit much from international trade interactions, rather it may run a persistent balance of trade deficit or at most, short term equilibrium. Another fact is the consideration of the market system that characterises Nigeria's natural resource (crude oil, within the ambit of this study). The crude oil market has exogenous control component (especially for the OPEC members of which Nigeria is one), therefore, since

this resource serves as a major commodity in Nigeria's export basket, trade openness may not reflect much beneficial effects.

In general, adjusted R^2 was robust – about 99%. This reflects a very strong explanatory power of the model. It indicates that about 99% of the systematic variation in the dependent variable (economic growth Y) is jointly explained by the set of explanatory variables in the model. In the same vein the F-statistic further reinforces the influence of the explanatory variables in the model. The empirical evidence shows that the model is free of serial correlation. This is reflected in the Durbin – Watson (D-W) statistic of 2.0560, showing that there is no evidence of serial correlation in the model.

Other diagnostic tests show a well-behaved model. Jarque-Bera (J-B) test statistic for normality indicates that the residuals of the error term are normally distributed, thus, the null hypothesis of normality in the distribution of the residuals is accepted. Also, the Breusch-Godfrey (B-G) LM Test statistic shows that the residuals pass the test of autocorrelation and as a result are serially uncorrelated, hence the acceptance of the null hypothesis of no serial correlation in the residuals. This further lends support to the D-W statistic result reported above. Finally, the ARCH Test for heteroscedasticity; the null hypothesis of no heteroscedasticity in the residuals was accepted, leading to the conclusion that the residuals are homoscedastic, with constant mean and variance.

4.4 ARDL Long-run and Short-run Analysis

As was already explained in section three of this work, the Autoregressive Distributed Lag (ARDL) Model attempts to investigate the existence of long-run interactions between variables in a series. The technique is important for the possibility of using variables endogenously, their lags and the lags of other variables in the series. Also, it general – to – specific framework, the unrestricted version of the ARDL which selects adequate lag order to capture the data generating procedure, necessitated the application of the ARDL technique for this work. The long-run and short-run ARDL results are presented in Table 4.6.

Table 4.6. ARDL Long-run and Short-run Results

Models	(1)	(2)	(3)	(4)	(5)
	Long-run	Analysis			
Constant	-4.5516***	8.7455**	-6.1095	14.5949**	-0.45737***
	(1.1031)	(2.3273)	(3.8981)	(3.2916)	(2.5635)
LnY	…	0.6834***	0.6573	1.3949**	-0.6125***
		(0.2697)	(0.4678)	(0.3745)	(0.3021)
lnPR	0.4392*	…	0.6573***	-0.3452	0.5933***
	(0.0690)		(0.2791)	(0.4574)	(0.2249)
lnHC	0.0838	0.5039***	...	0.0749	-0.0728
	(0.0505)	(0.1899)		(0.2847)	(0.2201)
lnCAP	0.4337*	-0.3669***	-0.0757	...	0.2266
	(0.0478)	(0.1296)	(0.2603)		(0.1476)
lnTR	-0.1706	1.0217**	0.2656	-0.4241	...
	(0.1164)	(0.3089)	(0.6056)	(0.9208)	
	Short-run	Analysis			
Constant	0.0679***	8.1244**	-8.3709	5.4887***	-4.0685***
	(0.0306)	(2.2366)	(5.7208)	(2.4387)	(2.2664)
ΔlnY	...	1.1446*	0.8940	0.7856**	-0.5077
		(0.2742)	(0.6409)	(0.2525)	(0.2969)
ΔlnPR	0.2593**	...	0.0744	-0.2962	0.5706**
	(0.0775)		(0.4545)	(0.1919)	(0.1369)
ΔlnHC	0.0232	0.0001	...	-0.0441	0.0407
	(0.0283)	(0.0677)		(0.0735)	(0.0564)
ΔlnCAP	0.3567*	-0.3408***	-0.1037	...	0.2015
	(0.0820)	(0.1255)	(0.3596)		(0.1195)
ΔlnTR	0.0188	0.9491*	0.2656	0.0941	...
	(0.0887)	(0.2128)	(0.6056)	(0.2390)	
ECT_{t-1}	-0.2628***	-0.9289*	-1.3701*	-0.3760***	-0.8895**
	(0.1393)	(0.1760)	(0.2596)	(0.1864)	(0.2231)
R^2	0.6410	0.9967	0.9635	0.9978	0.9654
R^2 *Adj.*	0.5769	0.9934	0.9493	0.9942	0.9203
F-statistic	10.0020*	306.0975*	67.6294*	274.6947*	21.3910*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
D-W Stat.	1.8670	2.1681	1.9937	1.9140	2.3603
B-G LM Test	0.2190	0.9168	0.0166	0.1637	4.9659
	(0.8962)	(0.4241)	(0.9835)	(0.8515)	(0.2910)
Ramsey RESET Test	5.1573	0.6925	0.9628	3.3431	4.4733
	(0.2383)	(0.4999)	(0.3461)	(0.1175)	(0.1008)
B-P-G(F-stat)	1.4130	1.0567	1.5707	0.5306	0.7652
	(0.2516)	(0.4582)	(0.1830)	(0.8914)	(0.7022)
ARCH(F-stat)	0.1506	6.9857	0.0575	1.5840	1.4648
	(0.7008)	(0.1133)	(0.8120)	(0.2186)	(0.2363)
Normality Test	7.2698	3.1802	4.7878	2.7217	2.1904
	(0.2263)	(0.2039)	(0.0913)	0.2564	(0.3343)

Note: *, ** and *** represent 1%, 5% and 10% level of significance respectively, computed using E-Views version 9. Standard errors are in parenthesis, except for F-statistic, B-G test statistic, RESET test statistic, B-P-G test, ARCH test and Normality test which have their probabilities in parenthesis.

The long-run results for the five-variables models 1 - 5 indicate mixed outcomes. A positive and significant effect run from crude oil production to economic growth and from crude oil production to human capital development, meanwhile, a negative effect flows from crude oil production to capital accumulation while a positive and significant effect flows from crude oil production to trade openness.

The direction of crude oil production – economic growth interactions rejects the existence of resource curse hypothesis for Nigeria. For instance, a percentage increase in crude oil earnings results in about 43.92% growth in the Nigerian economy, *ceteris paribus*.

This is contrary to the trending argument that countries with abundant natural resources tend to record slow pace in economic growth and development, in other words, that natural resource abundance might be a curse rather than a blessing. Viner (1952), Lewis (1955), Rostow (1961), Krueger (1980), Balassa (1980), Rosser (2006) and so on, are some of the outcomes that support the result analysed above. Other works in Nigeria also ended up with similar results. They include: Onyeukwo (2007), Odularu (2008), Odularo (2008), Akinlo (2012), Asukunowo and Olaiya (2012) and Omodadepo and Akanni (2013). For instance, Omodadepo and Akanni (2013) examined the curse of oil wealth in Nigeria and compared it with the case of Norway, engaging human capital as a transmission channel. The study examined time series data (1970 - 2007) via VAR, and the result indicated that oil wealth led to economic growth in both countries. Oil wealth led to improved human capital in Norway, but led to negative human capital in Nigeria. Their argument was that though the result was not consistent with their expectation, human capital remains a transmission channel to growth in both countries. They also found a long run relationship among oil wealth, human capital and economic growth for both countries.

The result also indicates that crude oil production interacts positively and significantly with human capital development. It shows that a 10% increase in crude oil production would boost human capital growth by 65.73% - a very significant improvement. This agrees partly with Omodadepo and Akanni (2013) in the case of their conclusion about Norway and negates their conclusion in the case of Nigeria. This could be attributed to some education and training programmes of the oil companies amidst scholarship floats from these companies, and

these are expected to transmit growth in the economy.

Trade openness also had a positive interaction with petroleum resource abundance but negative interaction with economic performance. The result shows that a 10% increase in crude oil production will result in about 59.33% rise in international trade volume Nigeria may record. However, this long-run result confirms the outcome of the generalised short-run ARDL regression. In Table 4.5., the trade openness estimate shows a negative but very significant relationship with economic performance. Showing that openness to trade is a veritable macroeconomic tool for growth, if and only if a viable industrial sector cum export component are in place.

The positive relation with crude oil production is indicative of its prime place in Nigeria's export basket, but in terms of transmitting economic progress, much is left to be desired. Part of the reason is because the actual production of crude oil, in terms of technology and other components are actually imported. Also, export of crude to import the petroleum products may not really benefit the economy much since the crude oil market has so much external control. This underlines the fact that there is a need for a change in approach from exporting crude oil to exporting petroleum products as this will make Nigeria's openness to trade more of a benefit, aside from the basic prerequisite of developing/expanding technology as well as developing/expanding the industrial or manufacturing subsector of the Nigerian economy. It means, therefore, that export of petroleum products more than the export of crude or at least the production of petroleum products enough to stop imports of the same, will benefit the Nigerian economy and the Nigerian people more.

However, capital[7] moved against a priori expectation. It shows a negative relationship between oil production and capital accumulation. This would have meant that total capital accumulated in the nation would deplete by 34.52% if there is increase in crude oil production, except that the coefficient was statistically insignificant. This result could been seen as negating the beliefs of Lewis (1955), Drake (1972), Balassa (1980) and Krueger (1980), that natural resource abundance should promote the accumulation of capital for investments, produc-

[7] It is important to note that capital and other intervening variables in the models are discussed as transmission mechanisms.

tivity and growth. However, recklessness and impropriety on the part of resource managers as well as high external dependence in terms of technology could be responsible (in part) for this outcome (the negative sign).

The second part of Table 4.6. presents the short-run dynamic relationship between crude oil production, human capital, capital formation/accumulation, trade openness and economic growth in Nigeria. The interactions between these variables are not different from what was obtained in the long-run analysis, except that the estimated coefficients of the dynamic models are smaller than that of the long-run estimates. This confirms that the results are products of stable models and suggests reliability. The negative and statistically significant estimates of the error correction terms (for instance -0.2628 for economic growth equation) further affirm the existence of a long-run relationship among the variables in the case of Nigeria. The coefficient, which is statistically significant at 10% level, implies that short-run deviations are adjusted (corrected) toward a long-run equilibrium path, after the short run shocks, at the rate of 26.28%.

The short-run diagnostic tests show that error terms of the short-run models are normally distributed and are homoscedastic. The errors are free of serial correlation and ARCH problems in the models, the Ramsey reset test results imply that the functional forms of the short-run models are well specified. Also, the stability of the short-run and long-run parameters is investigated by examining the significance of the cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) graphs. CUSUM and CUSUMSQ tests results suggest stability of the long- and short-run parameters as shown in figures 4.1 and 4.2. The graphs of the CUSUM and CUSUMSQ test lie within the 5% critical bounds which confirm stability of parameters (Bahmani-Oskooee and Nasir, 2004). It shows therefore that the models are well specified.

Figure 4.1. Plot of Cumulative Sum of Recursive Residuals.
The straight lines represent critical bounds at 5% significant level.

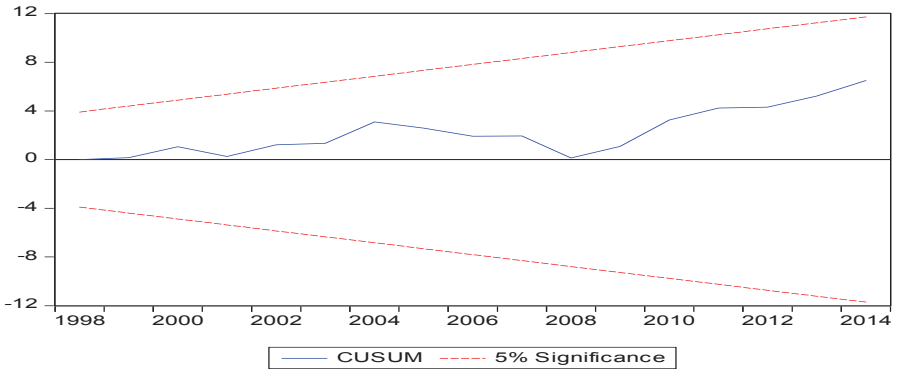
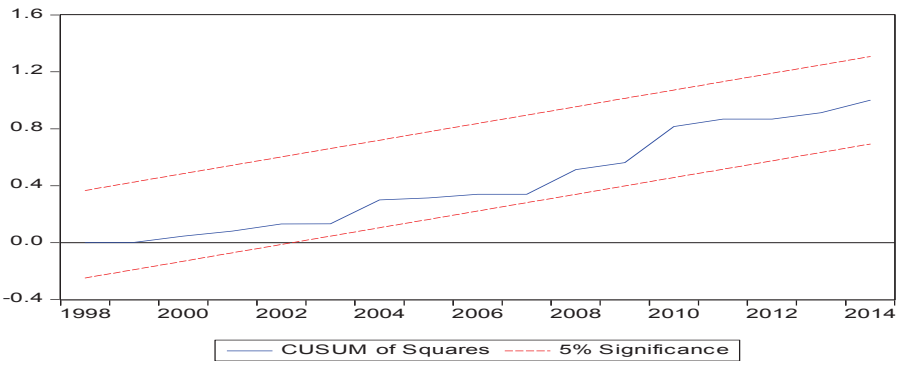


Figure 4.2: Plot of Cumulative Sum of Recursive Squared Residuals.
The straight lines represent critical bounds at 5% significant level.



4.5 Institutional Channels of Resource Curse

The analysis so far shows that natural resource abundance can actually be a source of growth for the economy, in other words, a blessing as should have been expected. *"Oil discovery cannot and should not be a curse to society. It is its poor management that usually turns oil resource into a curse rather than a blessing"*[8] However, it has also been

[8] A participant at an International Conference "Fuelling the World-Failing the Region? New Challenges of Global Energy Security and Resource Governance and in the Gulf of Guinea, organised by Friedrich-Ebert-Stiftung, 25th-26th may, 2010, Abuja, Nigeria, culled from

argued in the literature that this positive outlook is mostly as always, truncated by institutional ineptitude, hence the need to consciously investigate resource curse existence in Nigeria through institutional channels. To achieve this, the institutional variables *(control of corruption, regulatory quality, rule of law, government effectiveness and political stability & absence of violence/terrorism)* were introduced sequentially (that is a stepwise approach) into the mainline equation to: first, identify the individual impact of those variables in transmitting the curse of natural resource abundance (crude oil) and second, avoid the problem of multicolliniarity in the model. The result is presented in Table 4.10.

The results from the six sequential (stepwise) regressions show that crude oil production has a negative effect on economic growth, indicating the presence of resource curse in Nigeria. For instance, equation (2) shows negative estimated coefficients of -0.1640 and -0.1305 for crude oil production and political stability respectively. This implies that if the economy is politically unstable to the tune of 13.05%, a percentage rise in crude oil production will deplete growth in the economy at the rate of 16.40%, *ceteris paribus*. This indicates that a politically stable economy is a necessity for benefiting from natural resource (crude oil) abundance. This will involve a stable political system with effective electoral structure, free and fair elections that are devoid of violence, bribery and other unwholesome practices.

This finding and conclusion are consistent with the finding and conclusion of Polterovich, Popov and Tonis (2009), that the probability of democracy preservation is decreasing per amount of resources if the institutional quality is low enough. They believed that stability in democracy does not depend on the amount of resources, if the institutional quality is higher than a threshold, though the level of the threshold, however, depends positively on resource wealth. They also found that under very low institutional quality, resource abundance will reflect a paradoxical effect: the probability of democracy preservation may decrease with small improvements of institutional quality.

The situation was not different at the introduction of government effectiveness. Table 4.10. shows that there were negative estimates for

Kuzu and Nantogmah (2010).

government effectiveness (-0.1899) and crude oil production (-0.0370). It means that if there is 18.99% fall in government effectiveness in the management of the economy, the benefits that crude oil production would have brought for the economic wellbeing of the nation would drop by 0.37%. The implication of this outcome is the fact that no economy without a viable administrative system and effective governance may really enjoy the full benefits of natural (crude oil) resource abundance. To benefit from nature's blessings, therefore, requires building and/or strengthening the nation's institutions of governance.

Column (4) of Table 4.7., shows a positive output for regulatory quality but a negative result for crude oil resource abundance. The estimate of regulatory quality (0.0063) was positive but insignificant, showing that adequate regulations in the economy such as regulation of appropriate terms of contracts; laws and procedures guiding exploration, production and export of crude; laws that guide the distribution and redistribution of resource wealth from crude oil abundance, etc., has the capacity of fostering benefits from the crude oil resource wealth. Thus, the weakness of such institutional factors, therefore, results in drops in oil benefit.

This is evident in the negative and insignificant estimate of crude oil production, showing that the benefit of oil resource is not reflected on the economy, despite its continuous large share contribution to total export earnings for Nigeria. Crude oil production estimate from Table 4.10. (4) was -0.1333, meaning that weakness of regulatory quality to the tune of about 0.06% will bring about a fall in benefits of oil production to the tune of about 13.33% in the economy. This is a proof of a transmitted curse of crude oil abundance.

Column (5) of Table 4.7. reports negative and insignificant results for the rule of law variable and crude oil production. It indicates estimates of -0.1332 and -0.0193 for the rule of law and crude oil production. The results show that inadequate management, appropriation and implementation of the rule of law to about 0.19% will reduce the potential of wealth from oil resource being a blessing to the Nigerian economy and the people at about 13.32%, *ceteris paribus*. This brings to the fore the importance of the institution of law and strict adherence to the rule of law in the management of natural resource wealth and effective distribution of this wealth for a better economy.

Table 4.7. Estimated Results (with Resource Curse Channels)

Dependent Variable (Y)	(1)	(2)	(3)	(4)	(5)	(6)
lnPR	-0.1346	-0.1640	-0.0370	-0.1333	-0.1332	0.1399
	(0.1025)	(0.1007)	(0.1467)	(0.1087)	(0.1062)	(0.1061)
lnHC	0.3814*	0.3412*	0.3047***	0.3816*	0.3785*	0.3688*
	(0.0730)	(0.0755)	(0.1101)	(0.0756)	(0.0771)	(0.0807)
lnCAP	0.4106*	0.4307*	0.1426*	0.4094*	0.1424*	0.4188*
	(0.0269)	(0.0293)	(0.0271)	(0.0354)	(0.0295)	(0.0338)
lnTR	1.1907*	1.1907**	1.1082	1.1858*	1.1952**	1.2912**
	(0.2856)	(0.2990)	(0.0024)	(0.3093)	(0.2962)	(0.3770)
lnPOL		-0.1305				
		(0.0889)				
lnGEFF			-0.1899			
			(0.2033)			
lnREGQTY				0.0063		
				(0.1168)		
lnRLAW					-0.0193	
					(0.1049)	
lnCorruption						-0.0311
						(0.0732)
R^2	0.9875	0.9891	0.9882	0.9875	0.9875	0.9876
Adj. R^2	0.9850	0.9860	0.9848	0.9839	0.9839	0.9841
D-W Stats.	2.2359	1.9531	1.8682	2.2396	2.2361	2.3318
B-G LM Test	1.9680	1.2247	1.1916	2.0445	1.9651	2.5420
	(0.3738)	(0.5421)	(0.5511)	(0.3598)	(0.3743)	(0.2805)
F-Statistics	89.626	47.222	39.711	74.114	25.213	56.215
	(0.0000)	(0.0000)	(0.0000)	(0.0014)	(0.0000)	(0.0011)

Note: *, ** and *** represent 1%, 5% and 10% level of significance respectively, computed using E-Views version 9. Standard errors are in parenthesis and for B-G LM test, p-values are presented in parenthesis.

The negative and insignificant estimate of the rule of law as a variable in our model points to the weakness of this institution in Nigeria. The implication could be the transmission of the curse, since stability in the rule of law, in any economy, is very apt in the distribution and redistribution of oil wealth for economic development. The estimate of control of corruption stood at –0.0311 and was insignificant. Also, the estimate of crude oil production remained negative and insignificant. The estimate stood at -0.1399. This outcome implies that about 0.31% rise in corruption will enforce the curse of crude oil resource abundance to about 13.99%. This percentage difference is relatively quite

high underlining the fact that corruption has the capacity to incapacitate economic progress. There are arguments that the abundance of crude oil resources can in turn induce corruption, which will result in retarding economic progress.

Reasons for resource abundance inducing corruption have been identified in the literature. First of all, a most direct reason for why resource abundance induces corruption is that the presence of large resource windfalls creates enormous economic temptations as well as opportunities for corrupt behaviours by government officials (Karl, 1997; Leite and Weidmann, 1999). The abuse of resource rents by public officials is particularly facilitated by the state's ownership of resource industries in many developing countries. This, invariably, becomes a threat to economic progress given such unfortunate state of resource management. Aslaken (2010) also stressed this point. He pointed out that both oil extraction and mineral income is associated with more corruption. He concludes that the adverse impact of oil on corruption is present both in democratic and nondemocratic countries.

One school of theories argues that the curse of natural resources arises not necessarily because of the Dutch disease but rather works through political mechanisms: resource rents undermine the quality of political institutions and increase the tendency of corruption, which consequently hamper economic growth (Robinson, Torvik, and Verdier, 2006; Leite & Weidmann, 1999; Bulte, Damania, and Deacon, 2005). It is important to note, therefore, that the negative effects of corruption on economic performance have been commonly acknowledged and sustained by some empirical evidence (Mauro, 1995; Sala-i-Martin and Subramanian, 2003), the linkage between resources and corruption is yet to be fully explored and tested, and it is what this work has attempted.

In summary, it is clear that, the estimated coefficient of crude oil production (PR) however remained negative and insignificant in the entire set, indicating the fact that as long as these institutions remain distorted, weak, vulnerable and incapacitated, natural resource abundance (crude oil) will always deplete growth in varying degrees in the economy, all other things remaining the same. This outcome agrees with the globally held observation that countries with natural resource abundance record sluggish economic growth rates with evidence from

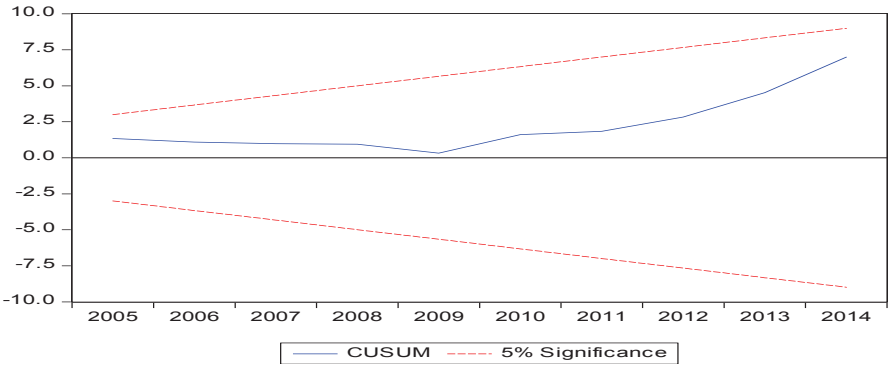
many countries around the world.

It reinforces the emerging idea that natural resources might be a curse rather than blessing in the natural resource abundant countries (e.g. Nigeria), especially if there are no viable institutions. Scholars have identified various reasons for the negative impact of oil revenue on economic growth for the different countries including Nigeria. The reasons include volatility of exchange rate, inefficient allocation of resources due to corruption, false sense of economic security due to abundance of natural resources, parents' inability or refusal to invest in children's education and lack of priority and political will in developing the human capital and all these issues identified are institution-based.

Haaparanta (2004) also underline the fact that less education establishes a negative relationship between natural resources and economic growth. These findings are in line with the existing array of empirical studies viz: Papyrakis and Gerlagh (2004; 2007) for US; Asekunowo and Olaiya (2012) for Nigeria. Several other authors have arrived at similar conclusions. Chief among them are; Karl (1997) Korhonen (2004); Bulte, Damania and Deacon (2005); Robinson, Torvik and Verdier (2006); Polterovich, Popov and Tonis (2009); Leite & Weidmann (1999); Caselli and Cunningham (2009); Aslaken (2010); Vincente (2010) and Zhan (2011). Others found direct evidence for Nigeria, ? focusing? on natural resource abundance – institutions – economic growth transmission trends, with specific conclusions. These studies include Mahler (2010), Atima (2013), Obafemi, Ogbuagu and Nathan (2013), Ologunla, Kareem and Raheem (2014) and so on.

The adjusted R^2 for the six sets of equations indicate the robustness of the explanatory variables at explaining the variations in dependent variable (economic growth), it measures the goodness of fit of those sets of equations. The D-W statistics for the equation sets underline the fact that the models are serially uncorrelated. The result of no – serial - correlation is further enforced by the B-G LM test results, while the robustness of the F – statistic estimates, points to the overall significance of the results of the estimated equations in the set. The CUSUM test result (figure 4.3) indicates that the equations are well specified and are stable.

Figure 4.3: CUSUM Test for Stability of the Models (with Resource Curse Channels)



5.1 Summary

This study has endeavoured to evaluate the effect of natural resource (crude oil) abundance on economic growth in Nigeria, with focus on establishing the validity or otherwise of the resource curse hypothesis in Nigeria. Building on some major relevant macroeconomic variables (human capital, capital and trade openness) as channels/interveners, as is in the literature, the study also incorporated some specific institutional variables that could drive the resource curse scenario in Nigeria into the series for more revealing outcomes. To attain this focus, annual time series data spanning the period of 34 years (1980 – 2015) was used for investigations.

The ADF and PP tests statistics were employed to examine the time series properties of the variables, while ARDL Bounds Testing approach was employed to test for long-run cointegration relationship. Though there was no evidence of cointegration for human capital and capital in the series, overall, the results showed that other variables (especially the frontline variables) were cointegrated. The study also employed the Granger vector error correction model to check the direction of causality among the variables and it was discovered that predominantly, the causal interactions were unidirectional. The ARCH tests statistic was employed to check for the problem of heteroscedasticity and autocorrelation, amidst other diagnostic assessments. Over-

all, our results from all analyses showed that petroleum resource has the potential of impressing positively on economic growth other things remaining the same. The key findings emanating from the study were outlined as follows:

First, the outcome of the study shows that, ceteris paribus, a rise in oil production (i.e crude oil abundance) in Nigeria may lead to economic growth and expansion. This is expressed in the generalized ARDL results presented in Table 4.5. in section four of this study. Second, the improvement in the national economy that can be occasioned by crude oil production, can only be possible if it can improve basic macroeconomic variables such as human capital, capital formation/accumulation, and competitive trade structure. Third, the positive, but insignificant relationship human capital reflected points to the fact that if the revenues from oil production were consciously channeled to massive human capital build-up, it would have transmitted to a significant growth in the economy.

The fourth finding drawn from this study is the fact that, the positive and significant effect of capital on economic growth affirms the argument held by various scholars (e.g.: Viner, 1952; Lewis, 1955; Rostow,1961 and Krueger, 1980), that natural resources boost capital accumulation for investments, and a priori, this transmits to growth in the economy. The fifth finding is that, the negative and insignificant effect of trade openness shows that if openness of an economy to trade is without competitive and diversified trade interactions, then the abundance of natural resources may not boost growth in the economy.

The crude oil production – trade openness positive relations also show that a change in approach from exporting crude oil to exporting petroleum products will make Nigeria's openness to trade more of a benefit, aside the basic prerequisite of developing/expanding technology as well as developing/expanding the industrial or manufacturing subsector of the Nigerian economy. Thus, openness of the Nigerian economy to trade, with crude oil still remaining the most significant item in Nigeria's trade bundle would result in trade imbalances, leading to depletion in economic growth.

Six, the results show that the curse of crude oil production is evident in Nigeria and is reflected (transmitted) through institutions, the conclusion is therefore that despite the potential of petroleum resource

abundance to boost economic growth, weak institutions will turn it into a curse over time. For instance, intensity of corruption tends to dwindle the positive effects of crude oil abundance in Nigeria, hence a curse.

In view of the findings in this study and their attendant implications for the Nigerian economy, it is recommended that resolute efforts be made at improving the equality of some basics in the economy. This includes, structuring a good human capital development strategy, redistributing wealth from oil (revenue) to boost capital formation/accumulation and strategic manipulation of some basic accessible trade mechanism that will make openness to trade beneficial to the Nigerian economy, amongst others. These actions and policy pursuit are necessary if oil resource abundance is to bring tangible benefits to the Nigerian economy.

5.2 Conclusion

Even within the realm of common sense, the abundance of natural resource should be a boost to growth and development. From the standpoint of theory, natural resource abundance should be a boost to capital formation/accumulation, boost investments, create employment as well as improve the general wellbeing of the people and by extension, grow the economy. The opposing theory is of the opinion that natural resource abundance is a curse to the economy. This study has attempted an assessment of both ends of the arguments and found them to be true in the case of Nigeria. The empirical outcomes from this study have shown that, other things remaining the same, abundance of petroleum resource is a vital growth booster to the Nigerian economy. However, the weakness of institutions and in some cases, complete incapacitation, drown what would have been a blessing thereby reflecting a curse. It is however recommended that if Nigeria is to enjoy the full benefits of natural (crude oil) resource abundance, conscious efforts and resoluteness should be invested in restructuring and revamping ailing institutions as well as ridding the system of inherent corruption.

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Appendix

Impulse Response Graph for VAR