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Effects of oil resource endowment, natural gas and agriculture output: Policy options for inclusive growth

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A G D I Working Paper

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Effects of Oil Resource Endowment, Natural Gas and Agriculture Output: Policy Options for Inclusive Growth ¹

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Effects of Oil Resource Endowment, Natural Gas and Agriculture Output: Policy Options for Inclusive Growth

Ekundayo P. Mesagan & Juliet I. Adenuga

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Abstract

The fact that inclusive growth involves the width of growth, benefit-sharing, and human development pertaining to health care makes this study to examine the impact of crude oil, natural gas and agriculture output on inclusive growth in Nigeria between 1970 and 2017. We use employment, life expectancy, and income per capita to capture inclusive growth, from where we compute inclusive growth index using the Principal Component Analysis. The result of the Autoregressive Distributed Lag suggests that crude oil and natural gas production insignificantly impact inclusive growth while agriculture output is significant. It means that oil resource wealth has neither been maximised to widen growth contribution nor used to deepen the growth spread in Nigeria whereas the agriculture resource is critical for inclusive growth. It is important to focus on expanding human capacity by improving employment, health care delivery, and investing in modular mechanised farming for agriculture graduates to promote inclusive growth.

Keywords: Crude Oil Production; Natural Gas; Agriculture Output; Inclusive Growth

JEL Classification: O13, Q10, Q32, Q33

1. Introduction

Nigeria is richly endowed with different natural resources, comprising oil resources and non-oil resources. These natural resources can be found in different locations across Nigeria. It is appropriate to expect proper exploitation of these natural resources to assist in speeding up the rate of economic growth and facilitate inclusive growth in the country. In real terms, Jack *et al.* (2016) confirmed that in Enugu, Kogi, Niger, Lagos and Abuja, over 3 billion metric tons of iron ore deposits are in existence. Rock salt is found to be domiciled in Benue State while salt springs can be found in Abakaliki, Awe (Plateau State), and Uburu (Ebonyi State). Similarly, there are deposits of talc to the tune of over 40 million tons in Osun, Niger, Ogun, Kaduna and Kogi States. Furthermore, over 7.5 million tons of baryte are domiciled in Taraba and Bauchi States. Bentonite reserves totalling about 700 million tons are domiciled in several states of the federation (Adesopo & Asaju, 2004). Also, bitumen deposits are estimated to be about 42 billion tons within the nation while crude petroleum and natural gas are largely deposited in southeastern states of the country (Adekoya *et al.*, 2003; Isola & Mesagan, 2014). However, several of these natural resources are either poorly tapped or unexploited in the country.

Currently, the country only explores crude oil, which has provided the mainstay for the Nigerian economy. Along with crude oil is agriculture resources, which used to generate the main foreign exchange earnings for the country before the discovery of crude oil in large quantity. Hence, crude oil resources such as oil and gas, as well as, agriculture resources attract the attention of this present study. This is because apart from crude oil that is abundant in the Niger Delta region of the country, agriculture resources are found in most areas of Nigeria. For instance, cocoa is largely concentrated in Anambra, Oyo, Edo, Imo, Osun, Kwara, Ondo and Ogun States while oil palm is concentrated in Abia, Akwa-Ibom, Anambra, Imo and Oyo States. Groundnut is readily available in Ebonyi, Kano, Katsina, Niger and Sokoto States, while cotton is found in Kano, Katsina, Kwara, Niger and Sokoto States. Rubber thrives well in Edo, Ogun, Delta, and Cross River States, while coffee is easily grown in Bauchi, Kwara and Osun States. Timber is also found in large quantities in Delta, Edo and Ogun States, while kolanut is highly concentrated in Kwara, Ogun, Osun and Oyo States. Tobacco is highly concentrated in Kwara, Osun, Oyo and Sokoto States, while Carrot is highly available in Borno. Sugarcane is highly available in Gombe, Bauchi, Adamawa, Sokoto States and Plantain readily found in Oyo, Ogun and Osun States (Jack *et al.*, 2016).

According to Charles *et al.* (2018), before the 1980s, the opinion of natural resources scholars is that natural resource wealth is very critical in boosting the welfare of citizens in a country. However, the inability of resource-rich countries to translate resource wealth into long term growth has engendered conflicting results about the actual impact of natural resources on an economy. This has therefore intensified the discussion about the resource curse syndrome. The resource curse syndrome, according to Sachs & Warner (2001), is a situation where abundant natural resources fail to translate to the economic progress of a resource-rich country. It is also a term used to denote the paradox existing between economic welfare improvement and resource abundance (Mesagan, Isola & Ajide, 2019). Most especially, resource-rich developing nations are ensnared by their abundance of resources, thereby leading to conflicts and mismanagement of natural resource proceeds (Shao & Yang, 2014; Eregha & Mesagan, 2016; Charles *et al.*, 2018). For instance, in the oil-producing region of Nigeria, the issue of militancy against oil exploration is very rampant as the locals opine that both the Federal government and the oil companies have not done enough in enhancing the welfare of those in the oil-producing communities. This has often led to the vandalisation of installed crude oil facilities in the Niger Delta region of the country, as well as, deteriorate environmental condition in the country at large (Mesagan & Adeniji-Ilori, 2018). The inability of resource-rich countries to transmit resource wealth to growth has impeded their ability to develop human capital, boost employment generation and enhance the income earning potentials of their citizens. In short, the promotion of an all-inclusive growth in several resource wealthy developing nations, especially Nigeria, has largely remained a mirage (Mesagan & Dauda, 2016).

The fact that natural resource endowment has significant implications for promoting inclusive growth cannot be over-emphasised (Collier & Laroche, 2015; Mesagan & Eregha, 2019). Despite these abundant natural resources, the poverty rate in Nigeria is still very high, the standard of education is weak, the health sector is in comatose, and the unemployment rate is very high. It is therefore very crucial to determine the effect of oil resource abundance and agriculture resources on inclusive growth in Nigeria. Specifically, the study examines the impact of oil production on inclusive growth and also determines the effect of agriculture output on inclusive growth. Theoretically, inclusive growth is about how wide the growth process is in terms of the number of people that are involved in growth contribution (Ali & Son, 2007). It also involves benefit-sharing regarding the number of people that benefit from the growth process (Anand *et al.*, 2013). Moreover, inclusive growth pertains to the degree of

access to societal opportunities by a nation (Raheem *et al.*, 2018), and it also concerns the extent of utilisation of natural resource endowment in enhancing industrial production for growth promotion (Mesagan & Bello, 2018). This implies that inclusive growth should focus on the expansiveness of growth as well as the full employment of both human and natural resources for the benefit of all.

Again, growth inclusiveness revolves around the pace and structure of growth. According to Spence (2008), growth is inclusive when it promotes full employment, equality of opportunity, market protection, and equity. Therefore, efficient utilisation of natural resource endowment provides a pointer to inclusive growth. Furthermore, Ravallion & Chen (2003) opined that inclusive growth is referred to as pro-poor growth in that it benefits the poor in absolute terms by aiming at poverty eradication. However, it also offers a relative benefit when it reduces inequality by increasing the ratio of poor people's wealth relative to the entire population. Thus, growth inclusiveness should include clear-cut productivity increase and diverse job creation rather than just income redistribution. Thus, the study examines the inclusivity of growth in Nigeria vis-à-vis natural resource endowment by considering several indicators that proxy inclusive growth. An index for inclusive growth is then computed from employment, average real income, and human capital using the Principal Component Analysis (PCA). The rest of the study is organised into literature review in section 2, research methodology in section 3, empirical result in section 4, and conclusion in section 5.

2. Literature Review

2.1 Theoretical Issues

2.1.1 Inclusive growth

According to Ianchovichina & Lundstrom (2009), Inclusive Growth can be described in terms of the pace and pattern of the growth recorded in an economy. The pace and pattern of economic growth are very crucial in the quest to make growth sustainable and substantially reducing the level of inequality and poverty. According to Spence (2008), "inclusiveness" encompasses equality of opportunity, employment generation, equity, and market protection, which all form important ingredients for the successfulrealisation of any growth strategy. Moreover, the Commission opined that the systematic inequality of opportunity is harmful and will, therefore, be inimical to the achievement of long-run growth because it may engender conflicts and distorts the political process. Thus, inclusiveness emphasizes the equality of opportunity regarding market access, unprejudiced regulatory environment and

full resource employment. According to Sarfati (2009), inclusive growth considers growth from a long-run perspective. That is, it is the growth that focuses on productive employment rather than direct income redistribution. It is not that income redistribution cannot be used to kick-start growth inclusiveness, but the sustainability of such a strategy could be in the long-run. For poorer nations, income redistribution strategy can impose on their budgets, thereby intensifying poverty the more. Hence, it might not be realistic to poverty reduction and ⁴shared growth through income redistribution. Again, Sarfati (2009) affirmed that even in the industrialised economies, income redistribution strategies are not the most significant measure to lower poverty rates in several segments of the populace.

According to Ravallion & Chen (2003), inclusive growth can be explained as absolute pro-poor growth, in which the poor enjoys growth benefit in absolute term. Conversely, relative pro-poor growth occurs when the incomes of the poor increase at a faster rate than those of the entire population, signalling a clear decline in income inequality (Anand *et al.*, 2013; Mesagan & Dauda, 2016). Thus, absolute pro-poor growth favours the approach for a direct redistribution of income. To guarantee the existence of inclusive growth, productivity must improve, and actual job opportunities must be created (Ali & Son, 2007). The reason being that inclusive growth enlarges the capacity of the economy to guide against recycling economic resources and that it should be able to increase the economic growth pace, enhance the investment climate and create employment opportunities in real terms. According to the Lopez (2004), when the main target is poverty reduction, it is more important to define pro-poor growth in absolute terms because absolute definition targets poverty reduction through increases in the growth rate. However, inclusive growth is more encompassing as it seeks how to boost growth by accommodating more people in its participation and benefit-sharing rather than mere poverty reduction (Eregha & Mesagan, 2019). Therefore, inclusive growth should emphasise equal opportunities for everyone, not only the poor, since it is concerned with creating opportunities and making them accessible to all (Ali & Zhuang, 2007).

2.1.2 Resource Curse

The endowment of natural resources does not automatically translate to economic success for a country. This paradox is borne out of the fact that several resource-poor economies often out-perform their resource-rich counterparts. As identified in Sachs & Warner (2001),

⁴Shared growth can be misrepresented as meaning a scheme meant for income distribution, making inclusive growth a preferable term.

countries with high export earnings from natural resource-based export experienced economic growth drag. Also, as identified in Eregha & Mesagan (2016), there is a high level of conflicts and poverty resource-abundant African countries, thereby placing a significant restriction on economic well-being. Several people in Nigeria, Angola, Algeria and Egypt live below the poverty line. However, resource-poor countries in East Asia like Korea, Japan, Taiwan, Singapore and Hong Kong performed better in terms of economic well-being. Therefore, the natural resource curse is used to characterise the situation where resource abundance fails to yield economic prosperity but rather becomes a curse (Auty, 1997). According to Sachs & Warner (2001), the negative correlation between resource abundance and growth poses a conceptual puzzle. Natural resources, they maintained, should enhance wealth and raise the country's level of growth and investment over time. Thus, oil resource abundant nations are expected to sow oil revenues seeds by using their huge crude oil earnings to diversify their investment base and promote a big push for industrialisation, but this has been largely a mirage in several resource-rich countries. The odd reality of resource-poor countries outperforming their resource-rich counterparts has been a reoccurring feature in economic history. In the seventeenth century, it was the resource-poor Netherlands that over-performed Spain, notwithstanding that gold and silver were overflowing from the Spanish colonies then. Nineteenth and twentieth centuries witnessed resource-poor Switzerland and Japan surge ahead of resource-rich Russia (Schubert, 2006). In recent decades, the Asian Tigers, consisting of Korea, Taiwan, Hong Kong, Japan and Singapore, are fast industrialising while their resource-rich counterparts like Nigeria and Mexico are still under-industrialising.

2.2 Empirical Review

Empirically, the discourse about the link between resource abundance and economic performance has often taken central attention in the past. Some of the studies linking resource abundance to growth include Sachs & Warner (2001), Papyrakis & Gerlagh (2004), Norrbin *et al.* (2008), Papyrakis & Gerlagh (2007), among others. For instance, Sachs & Warner (2001) opined that the pace of growth in resource-rich nations is usually slower than those in resource-poor nations. Kim & Kim (2008) compared the situation in Latin America and Developed countries and found similar results with Sachs and Warner that huge natural resource exports negatively affected economic growth. Norrbin *et al.* (2008) examined similar models relating to Sachs and Warner and also tested the robustness of the negative effect of natural resources on growth for 94 countries between 1970 and 2000. It was

observed that the resource curse exhibited sensitivity to the sample of countries used in the study as the impact of the curse reduced as countries samples were updated. However, when some fast-growing countries were removed from the sample and growth rate was varied across decades, the study confirmed the robustness of the negative impact of resource abundance on growth. A recent study by Mesagan, Yusuf & Ogbuji (2019) confirmed the Dutch disease in Nigeria and Angola, while the resource curse was found in South Africa.

Moreover, Papyrakis & Gerlagh (2004) conducted a cross-country analysis and found that when controlled for, natural resources negatively affect economic growth, but when considered with trade, corruption, education and investment, it has a direct positive effect on economic growth. Again, the study examined the transmission channels and found that the positive direct impact of resource-abundance on growth is significantly lower than its negative indirect impacts on growth. Also, Papyrakis & Gerlagh (2007) focused on the United States and found that resource-wealth negatively affected economic growth. Raheem *et al.* (2018) examined the situation in eighteen Sub-Sahara African countries (SSA) by looking at the nexus between human capital, natural resource rents and inclusive growth. The result suggested that inclusive growth becomes more realistic by augmenting natural resources with government health spending. However, government investment in human capital alone was found to be insignificant in impacting inclusive growth in SSA.

To analyse the link between resources and growth, several other studies identified institutions as an important channel to explain the resource curse. For instance, Sala-i-Martin & Subramanian (2013) beamed searchlight on Nigeria and identified weak institutions as the primary factor responsible for resource curse in resource-endowed nations. The study also established that corruption and waste caused resource abundance to negatively impacted growth in Nigeria rather than Dutch disease. Brunnschweiler & Bulte (2008) observed that the link between economic growth and resource wealth is very thin as natural resource abundance did not influence economic growth. The study confirmed that resource wealth positively impacts institutional quality and growth while growth is not affected by resource dependence. Butkiewicz & Yanikkaya (2010) test the competing explanations of the resource curse using panel data and found that developing resource-rich countries with weak institutions experienced both the resource curse and Dutch disease syndrome. Moreover, Eregha & Mesagan (2016) examined similar concerns for the African continent and found that there exists resource curse among resource-rich African countries and that institutions are

weak in reversing the curse associated with the oil-wealthy African nations. Studies like, Papyrakis & Gerlagh (2006) focused on the saving and investment channel through which resource rents affects long-term growth in mineral-producing nations. It was observed that savings reduced with increases in natural resource earnings; investment had an automatic adjustment to savings and overall productivity reduced. It was also confirmed that while resource-wealth reduced growth in the long-run, it augments growth in the short-run. Ding & Field (2005) estimated two models to distinguish between resource endowment and resource dependence. In the study, it was confirmed that natural resource endowment positively enhanced economic growth while natural resource dependence is in tune with the resource curse syndrome because it has negative impacts on growth. Bulte *et al.* (2005) found that resource-rich nations are associated with weak human development at a given level of income. It also observed the absence of a direct link between resource abundance and welfare but confirmed that an indirect link exists between both via the institutional channel.

From the preceding review of the literature, the line of thought of the previously related studies is clear. In discussing the factors militating against resource-rich nations in translating resource abundance to economic progress, previous studies have mostly focused on the nexus between abundant resources and growth. Examples of such studies include Sachs & Warner (2001), Papyrakis & Gerlagh (2004), Norrbin *et al.* (2008), and Papyrakis & Gerlagh (2007). To trace the channel through which resource wealth affect growth, studies like Sala-i-Martin & Subramanian (2013), Bulte *et al.* (2005), Brunnschweiler & Bulte (2008), Butkiewicz & Yanikkaya (2010) and Eregha & Mesagan (2016) controlled for institution in their models to obtain a more comprehensive result. While these previous studies have examined the growth impacts of resource abundance, the link between resource abundance and inclusive growth has not been dealt with in the literature. Therefore, this present study tries to assess the effect of resource abundance on inclusive growth to determine the link between both and fill a noticeable gap in the literature. Also, the effect of agriculture output is often omitted in the discussion, and the fact that the agriculture sector is crucial to developing countries like Nigeria, its impact on inclusive growth cannot be ignored. Again, the only study that has come close is Raheem *et al.* (2018). However, the paper focuses more on oil resource rents and not resource production, bearing in mind that resource production is critical to output composition, which is important in inclusive growth. Again, Raheem *et al.* (2018) failed to account for the role of agriculture in its model. This present study fills this gap and extends the frontiers of knowledge on the inclusive growth discourse. Hence, we test the effect of oil

resource abundance and agriculture production on inclusive growth parameters like income, human capital and employment and also compute an index for inclusive growth to determine the direct effect of natural resources on inclusive growth. This has not been done at all in previous related studies and represents our main contribution to the literature.

3. Research Methodology and Method of Estimation

3.1 Methodology

This present study examines the effect of natural resources abundance on inclusive growth in Nigeria. In a recent study by Sugiawan & Managi (2019), solely relying on per capita GDP for gauging inclusiveness is faulted. Thus, unlike several inclusive growth studies that are modelled on the Solow Growth Neoclassical Model and GDP per capita, this paper leans on the model used in Ali & Son (2007) and later expanded by Anand *et al.* (2013). Similar studies like Mesagan & Dauda (2016), as well as Raheem *et al.* (2018), have also employed the inclusive growth model built by Ali & Son (2007), which captured inclusive growth by equity and income-per-capita as:

$$\phi^* = \infty \times \phi \quad (1)$$

With ∞ being regarded as the income equity index, ϕ is the amount of income per person, and ϕ^* is the dependent variable used to denote inclusive growth in the study. According to Ali & Son (2007), for growth to be inclusive, ϕ^* must be increasing rapidly. The ways for doing this include: (i) boosting the average income by raising and sustaining an increase in the real gross domestic product; (ii) increasing the equity index of income distribution (∞), and by (ii) by increasing both income distribution equity index and per capita income. Thus, by differentiating equation (1) using total derivative, it becomes:

$$d\phi^* = \infty.d\infty + \phi.d\phi \quad (2)$$

Where $d\phi^*$ represents the degree of change in inclusive growth. Moreover, in line with the proposition of Ali & Son (2007), Anand *et al.* (2013), and Mesagan & Dauda (2016), the level of growth inclusiveness is expected to increase as $d\phi$ tends to positive values (i.e. $d\phi > 0$). Regarding the second equation specified, inclusive growth in this study is decomposed into growth participation rate, income growth, and the extent of development of human capital. This leads to the specification of equation (3):

$$\phi^* = \{ICG\} = f\{INC, EMP, HCP\} \quad (3)$$

Where ICG represents inclusive growth, INC stands for income per person, EMP is employment generated by growth, and HCP represents human capital developed by proceeds of growth. It thus implies that we capture inclusive growth with employment (which is used

to capture the number of people that participate in the growth process), real income per capita (used to capture the benefit-sharing), and life expectancy (used to denote human capital development). To achieve the specific objectives of this research, natural resources abundance variables like crude oil production, natural gas production, and agriculture output are regressed on inclusive growth together with other control variables. Hence, the estimated model becomes:

$$ICG = \alpha_0 + \alpha_1 Oil + \alpha_2 GAS + \alpha_3 AGR + \alpha_4 EX + \alpha_5 INT + \alpha_6 INV + \varepsilon \quad (4)$$

In equation (4), all the variables remained as explained earlier. However, the inclusive growth variable (ICG) is a vector of income Per Capita, employment, and human capital development. Whereas EX represents total exports, INT stands for interest rate, INV denotes the volume of investment in physical capital proxied with gross fixed capital formation, and ε is the error term. Total exports, interest rate and investment, are used as control variables in the model. The Principal Component Analysis (PCA) is used to compute an index of inclusive growth from income per capita, employment, and human capital development while the autoregressive distributed lag (ARDL) bounds testing approach is employed as the estimation technique. If long-run relationship exists, then, the ARDL makes it possible to determine the long run impact of natural resource abundance on inclusive growth in Nigeria.

3.2 Estimation Technique

According to Pesaran & Shin (1998) and Pesaran *et al.* (2001), the Autoregressive Distributed Lag (ARDL) bounds testing approach is built on the F-statistic to examine the impact of the lagged estimated variables on the dependent variable in an unrestricted dynamic error correction model [ECT(-1)]. Thus, the study uses the standard t-test and F-test to obtain the strength of the lagged regressors in the first difference estimation. The ARDL is important in that both the t-test and F-test generated are valid for the $I(0)$ and $I(1)$ regressors. Therefore, based on the model specified in equation (4) and following Pesaran and Shin (1998), we specify the following unrestricted error correction model:

$$\Delta ICG_t = \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta ICG_{t-i} + \sum_{i=1}^p \alpha_2 \Delta Y_{t-i} + \beta_1 ICG_{t-1} + \beta_2 Y_{t-1} + \varepsilon_t \quad (5)$$

Where ICG represents dependent variables vector, Y is used to denote the regressors, P represents the lag structure, Δ represents the difference terms, β_1 and β_2 represents the long-run coefficients, α_1 and α_2 represents the short-run coefficients, and ε_t is the residual term.

The hypothesis to be tested include:

$H_0: \beta_1 = \beta_2 = \dots = \beta_n = 0$ (i.e. no long-run relationship)

$H_1: \beta_1 \neq 0; \beta_2 \neq 0 \dots = \beta_n \neq 0$ (i.e. there is long-run relationship)

In this study, the ARDL Fischer's test values (F statistics) are compared with the two asymptotic critical values (case II) of the Pesaran *et al.*(2001). The condition for accepting the hypothesis is that if the estimated F statistic is higher than the upper critical value, we reject H_0 and accept otherwise. The result of the test is inconclusive when Fischer's statistic falls between the two critical values.

Thus, following Pesaran *et al.* (1999, 2001), the reduced form model is:

$$\begin{aligned} \Delta ICG_t = & \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta ICG_{t-i} + \sum_{i=1}^p \alpha_2 \Delta OIL_{t-i} + \sum_{i=1}^p \alpha_3 \Delta GAS_{t-i} + \sum_{i=1}^p \alpha_4 \Delta AGR_{t-i} + \sum_{i=1}^p \alpha_5 \Delta EX_{t-i} + \\ & \sum_{i=1}^p \alpha_6 \Delta INT_{t-i} + \sum_{i=1}^p \alpha_7 \Delta INV_{t-i} + \beta_1 ICG_{t-1} + \beta_2 OIL_{t-1} + \beta_3 GAS_{t-1} + \beta_4 AGR_{t-1} + \beta_5 EX_{t-1} + \\ & \beta_6 INT_{t-1} + \beta_7 INV_{t-1} + \varepsilon_t \end{aligned} \quad (6)$$

Where; Δ stands for the first difference operator; α_0 captures the drifts; α_{1-7} represents the short run estimates of the ARDL model; β_{1-7} are the long-run estimates; t captures the time, and ε_t is the disturbance term. All the other variables remained as explained earlier. We collect data for the gross fixed capital formation, employment, life expectancy, interest rate and total exports from the World Bank's World Development Indicators (WDI, 2018). While those for natural gas production and crude oil production are sourced from the BP Statistical Review of World Energy (BPS, 2017). Lastly, data on income per capita and agriculture output are sourced from the Statistical bulletins of the Central Bank of Nigeria (CBN, 2017).

4. Empirical Result

In this scientific enquiry, we present the result starting with the pre-estimation tests. This includes the descriptive statistics of all variables employed, followed by the correlation matrix to determine if perfect multicollinearity is found among the variables, and then the stationarity test using both the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and the Augmented Dickey-Fuller (ADF). Furthermore, we use the bounds test critical values of Pesaran *et al.* (2001) to determine if long-run relationship exists among the variables. Finally, we present the result of the ARDL and then conduct some post-estimation tests to determine the suitability of the estimated model.

4.1 Pre-estimation Tests

Table 1: Descriptive Analysis of the Regressors

Variables	Description	Measurement Unit	Mean	Max.	Min.
<i>OIL</i>	Crude Oil Production	Million Barrels	1.996	2.527	1.084
	Natural Gas	Million Tonnes Oil			
<i>GAS</i>	Production	Equivalent	12.6	45.1	0.1
<i>AGR</i>	Agriculture Output	₦ Billion	3,921	21,523	5.58
	Human Capital				
<i>HCP</i>	Development	Years	46.8	53.4	40.9
<i>INT</i>	Interest Rate	Percentage (%)	-1.62	25.3	-43.6
<i>INV</i>	Investment	₦ Billion	3,581.3	9,792.0	214.1
<i>EX</i>	Total Exports	₦ Billion	3,812	22,824	0.75
<i>INC</i>	Income Per Capita	₦ Thousand	261.2	385.2	173.0
<i>EMP</i>	Employment	Million	29.3	45.2	13.9

Source: Authors' Computation (2019)

In Table 1, we present the descriptive statistics of all the variables employed in the study. As shown in Table 1, in average terms, the value of crude oil production, natural gas production, human capital development, and employment generated in Nigeria between 1970 and 2017 is 1.996 million barrels, 12.6 million tonnes, 46.8 years, and 29.3 million respectively. Still, in average terms, agriculture output, investment, total exports, per capita income, and interest rate in the country is ₦ 3,921 billion, ₦ 3,581.3 billion, ₦ 3,812 billion, ₦ 261.2 thousand, and -1.62% respectively over the same period. Again, when considered in terms of their maximum values, crude oil production, natural gas production, human capital development, and employment generated in Nigeria is 2.527 million barrels, 45.1 million tonnes, 53.4 years, and 45.2 million respectively while those of agriculture output, investment, total exports, per capita income, and interest rate is ₦ 21,523 billion, ₦ 9,792 billion, ₦ 22,824 billion, ₦ 385.2 thousand, and 25.3% respectively between 1970 and 2016. Moreover, considering their minimum values, crude oil production, natural gas production, human capital development, and employment generated in Nigeria is 1.084 million barrels, 0.1 million tonnes, 40.9 years, and 13.9 million respectively while those of agriculture output, investment, total exports, per capita income, and interest rate is ₦ 5.58 billion, ₦ 214.1 billion, ₦ 0.75 billion, ₦ 173 thousand, and 13.9% respectively, over the period of study.

Table 2: Correlation Matrix of Regressors

	<i>EMP</i>	<i>INC</i>	<i>HCP</i>	<i>OIL</i>	<i>GAS</i>	<i>AGR</i>	<i>EX</i>	<i>INT</i>	<i>INV</i>
<i>EMP</i>	1.000								
<i>INC</i>	0.491	1.000							
<i>HCP</i>	0.301	0.512	1.000						
<i>OIL</i>	0.489	0.319	0.611	1.000					
<i>GAS</i>	0.143	0.031	0.381	0.442	1.000				
<i>AGR</i>	0.382	0.525	0.621	0.006	0.218	1.000			
<i>EX</i>	0.343	0.492	0.551	0.402	0.631	0.243	1.000		
<i>INT</i>	0.252	0.617	0.437	0.045	0.412	0.476	0.397	1.000	
<i>INV</i>	0.297	0.591	0.453	0.417	0.332	0.236	0.604	0.513	1.000

Source: Authors' Computation (2019)

To examine the possibility for multicollinearity among the regressors, we present the correlation matrix in Table 2. As presented in Table 2, employment, income per capita, human capital development, crude oil production, natural gas production, agriculture output, total exports, interest rate, and investment do not have a strong correlation. The implication is that no perfect multicollinearity exists among the regressors chosen for the study. Again, it posits that we can progress with our analysis.

Table 3: Stationarity Test using the ADF

Variables	Levels		First Difference		Stationarity Status
	ADF	KPSS	ADF	KPSS	
<i>EMP</i>	-0.243	0.864	-4.201**	0.113**	<i>1st Diff.</i>
<i>INC</i>	-1.261	0.817	-5.742**	0.231*	<i>1st Diff.</i>
<i>HCP</i>	-0.372	0.806	-6.623**	0.164*	<i>1st Diff.</i>
<i>OIL</i>	-0.287	0.571	-5.934**	0.103**	<i>1st Diff.</i>
<i>GAS</i>	-1.372	0.773	-6.623**	0.339**	<i>1st Diff.</i>
<i>AGR</i>	-0.342	0.655	-5.165**	0.554*	<i>1st Diff.</i>
<i>EX</i>	-2.372	0.648	-6.663**	0.212**	<i>1st Diff.</i>
<i>INT</i>	-0.623**	0.620*	-4.732**	0.500**	<i>Level</i>
<i>INV</i>	-1.372	0.816	-6.281**	0.142**	<i>1st Diff.</i>

*Note: ** and * denotes significance level at 1% and 5% respectively.*

In Table 3, the result of the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and the Augmented Dickey-Fuller (ADF) stationarity tests are presented. Table 3 displays the unit root test for both levels and at first difference. In presenting the stationarity tests, we use both the 1% and 5% critical levels for the KPSS and the ADF. Thus, the result confirms that employment, income per capita, human capital development, crude oil production, natural gas production, agriculture output, total exports and investment are not stationary at levels for the linear trend and no trend. It is only the rate of interest that is stationary at levels for both the KPSS and

the ADF tests. However, when first differenced, all the series became stationary for both tests. Therefore, we confirm that the series employed in the study are stationary for both the KPSS and the ADF tests. Having confirmed the stationarity, we proceed to estimate the ARDL bounds test to confirm the existence of a long-run relationship among the regressors.

Table 4:ARDL bounds test result for cointegration

Dependent variables	Functions				F-statistics	
Inclusive Growth Model	$F_{ICG}(ICG / INV, AGR, OIL, GAS, EX, INT)$				10.814***	
Human Capital Development Model	$F_{HCP}(HCP / INV, AGR, OIL, GAS, EX, INT)$				3.3101**	
Employment Model	$F_{EMP}(EMP / INV, AGR, OIL, GAS, EX, INT)$				3.9243**	
Income Per Person Model	$F_{INC}(INC / INV, AGR, OIL, GAS, EX, INT)$				3.4057**	
	1%		5%		10%	
	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$
Critical bound values	2.88	3.99	2.27	3.28	1.99	2.94

Note: ***, **, * denote rejection of null hypothesis at 1%, 5%, and 10% levels of significance respectively.

To examine if long-run relationship exists between the explanatory variables and the dependent variables, Table 4 presents is used to present the various bounds test results for the four models. The null hypothesis of no long-run relationship is tested against the alternative hypothesis of the existence of long-run relationship using the Pesaran *et al.* (2001) for the restricted intercept and no trend (i.e. case II) critical bounds values. In Table 4, the Akaike Information Criterion (AIC) was used to select the appropriate lag length, and the various hypotheses are tested with $k = 6$. Then, each computed F statistics is tested against the specified critical bounds. For the four models, the ARDL bounds test results confirm that the computed F-statistics are higher than the critical values of the upper bound tests; hence, we reject the null hypotheses of no cointegration across the four models. Specifically, there are cointegrations in the human capital model, employment model, and income model at 5% significance levels while there is cointegration in the inclusive growth model at 1% level of significance. We then conclude that there is a unique and stable long-run relationship between natural resource abundance and inclusive growth in Nigeria. Having confirmed the existence of a long-run relationship, we present the long-run coefficients of the ARDL results in Table 5. Even though we only need the result of the inclusive growth model, the results of

human capital development, employment, and income per person are also presented for sensitivity and robustness.

Table 5: Long-run ARDL Results of Natural Resource Abundance and Inclusive Growth

Independent Variables	Dependent Variables			
	<i>Inclusive Growth</i>	<i>Human Capital Development</i>	<i>Employment Generation</i>	<i>Income Per Capita</i>
	I	II	III	IV
Constant	-9.603*** (-0.867)	4.495** (9.817)	40.32** (1.024)	2.074** (0.299)
OIL	2.780 (1.453)	-0.106 (-1.381)	-3.721 (-0.706)	2.005 (1.665)
GAS	0.609 (0.815)	0.059 (0.885)	0.554 (0.506)	-0.050 (-0.146)
AGR	0.249*** (3.709)	-0.004 (-1.750)	-0.025 (-0.518)	0.078** (2.708)
INV	1.552 (1.712)	0.069*** (4.047)	-0.385 (-0.365)	0.406 (0.716)
INT	-0.138** (-2.623)	-0.002 (-1.613)	-0.032** (-0.510)	0.006 (0.234)
EX	-1.038** (-2.219)	-0.018** (-2.205)	0.282 (0.681)	-0.346 (-1.295)

Note: ***, **, () denote statistical significance at 1% and 5% critical levels, t-statistics, respectively

In Table 5, the result of the long-run impacts of natural resource abundance on inclusive growth is presented. Based on the result, we find that both crude oil production and natural gas production have a positive impact on inclusive growth. However, both of them are not significant in determining inclusive growth in Nigeria. The result of agriculture output suggests that agriculture production has a positive and significant effect on inclusive growth. The intuition is that although oil resource abundance has the potential to enhance inclusive growth in Nigeria but its effect in promoting inclusive growth has been very weak. This is still in line with the resource curse debate that resource abundance has been found wanting in significantly promoting growth in resource-rich nations, especially in developing countries. Therefore, this result is in tune with (Brunnschweiler & Bulte, 2008; Eregha & Mesagan, 2016) that resource abundance has insignificant impact on growth in less developed resource-rich countries, but it is at variance with (Papyrakis & Gerlagh, 2004; Papyrakis & Gerlagh, 2006), which found that resource abundance has a significant positive impact on growth. It also confirms the result of Ding & Field (2005) that resource abundance positively impacts growth. Having observed an insignificant long-run impact of oil resource wealth on inclusive growth, our results negate that of Papyrakis & Gerlagh (2006), which found that natural

resource abundance positively and significantly enhanced long-run growth. Again, one main contribution of this study comes from the inclusion of the agriculture output. It implies that endowment in agriculture significantly contributes to enhancing inclusive growth in Nigeria. This result is very crucial as the agriculture sector has often suffered neglect in favour of the crude oil sector. Hence, the result testifies to the fact that for Nigeria to be able to promote all-inclusive growth, the agriculture sector holds the ace and should set the pace for guaranteeing such.

Table 6: Stability and Diagnostic Tests of the Models

Statistics	Dependent Variables			
	<i>Inclusive Growth</i>	<i>Human Capital Development</i>	<i>Employment Generation</i>	<i>Income Per Capita</i>
	I	II	III	IV
Functional form	4.472 (0.217)	5.174 (0.089)	2.742 (0.371)	4.824 (0.416)
Serial Correlation	10.14 (0.042)	7.942 (0.075)	4.617 (0.093)	12.63 (0.084)
Normality	7.183 (0.532)	3.391 (0.293)	5.253 (0.421)	1.528 (0.529)
Heteroskedasticity	2.612 (0.174)	4.003 (0.372)	1.723 (0.832)	4.528 (0.759)
CUSUMQ	Stable	Stable	Stable	Stable
CUSUM	Stable	Stable	Stable	Stable
ECT(-1)	-0.106*** (0.0025)	-0.311*** (0.0048)	-0.168** (0.0123)	-0.125** (0.0236)

Key:***, **, () denote rejection of null hypothesis at 1%, 5% critical levels, probability values for tests.

Regarding the result of human capital development, employment generation, and average income, the results show that crude oil production has a negative and insignificant impact on human capital and employment generation in Nigeria while it has a positive but insignificant effect on income per person. For natural gas production, evidence confirms that it has a positive and insignificant impact on human capital and employment, and a negative and insignificant impact on income. Intuitively, it means that crude oil and natural gas production have insignificant impacts on all the three indicators of inclusive growth used in the study. This means that oil resource abundance has not been very effective in promoting inclusive growth in Nigeria over the study period. About agriculture output, we find that abundant agriculture resources negatively impacts both human capital and employment generation while it positively and significantly impacts income. It thus follows that the subsistence

nature of the Nigerian agriculture sector hindered its potentials from developing human capital and significantly enhance employment generation. However, its impact on income suggests that it is an important contributor to the gross output in the country and if well harnessed, it could promote inclusive growth in the country, going by its impact on the index of inclusive growth.

To confirm that the estimated models are not spurious, we present the stability tests and diagnostic tests of the various models in Table 6. A cursory look at Table 6 suggests that the error correction terms of the estimated bounds tests for the four models are negative and significant. The ECT(-1) conducted for the inclusive growth model, human capital development model, employment model, and income per capita model is -0.106, -0.311, -0.168, and -0.125 respectively. Since inclusive growth and human capital models are significant at 1% while employment and income models are significant at 5% and are negative, it implies that all the four models converge to the long run. Again, their various speed of adjustment is fast at 10.6%, 31.1%, 16.8%, and 12.5% respectively. This also confirms that the ARDL models are well specified. Regarding the various diagnostic tests conducted, the serial correlation tests confirm that the models are free from serial correlation. The heteroskedasticity tests confirm that the four models are homoscedastic while the normality tests confirm that the models are multivariately normal. Finally, CUSUMQ and CUSUM tests imply that both the cumulative sum statistic and the cumulative sum of squared statistic are stable as they are within the 5% critical levels. This indicates that the models are stable while the functional form tests confirm that all four models are well specified.

5. Conclusion

This scientific enquiry has focused basically on the effect of oil resource endowment, natural gas and agriculture on inclusive growth in Nigeria. The scope of the study covers a period of 1970 to 2017 and secondary data for the various series were analysed. Such series include crude oil production, natural gas production, and agriculture output while the control variables include export, investment, and interest rate. Inclusive growth was generated from life expectancy, employment generation, and income per capita through the principal component analysis (PCA). The ARDL bounds testing to cointegration approach was employed as the estimation technique, and the long-run result presented showed oil resource endowment and natural gas were less important in influencing inclusive growth in Nigeria,

whereas, agriculture resources positively and significantly impact inclusive growth over the study period. Therefore, oil resource endowment and natural gas only cannot be used to significantly stimulate inclusive growth in the country, thereby giving credence to the resource curse proposition that abundance of resources might not be able to promote economic growth significantly. Also, it supports the fact that oil resource abundance has an insignificant impact on growth in resource wealthy developing countries. It means that depending on crude oil endowment as a means for generating inclusive growth might not be realistic for Nigeria. Hence, to promote inclusive growth, agriculture resource endowment is very important and as such should provide the needed impetus to promote inclusive growth in the country.

Summarily, the insignificant impact of crude oil resources on inclusive growth means that oil resource wealth has not been used effectively to widen the growth process in the country by improving employment generation. Also, it has not been used to develop human capacity and make them available to boost economic growth in the country. Thirdly, it intuitively means that oil resource wealth has not been dependent on to spread the proceeds of economic growth in the country as provided by its inability to contribute to income per capita significantly. Bearing the result of this research in mind, it becomes crucial for Nigeria to put measures in place to use crude oil earnings to improve health care delivery in the country. The government should also focus on increasing its financing of education with resource proceeds to boost human capital development. It can also create an enabling environment for private investment in education by not only granting tax rebates but also using crude oil proceeds to provide grants for students as well as provide training for the unskilled and make them fit to participate in long term economic growth process. Since agriculture output is an important natural resource as epitomised by the effect it has on inclusive growth, the government should encourage more graduates of agriculture to set up modular mechanised farms. The modular mechanised farms should entail the cultivation of large hectares of land, which should be divided into crop sections. Then, each crop section is to be managed by different individuals who should be operate at a low cost with tax rebates. Government should also provide the operators with improved inputs to reduce further their production costs. This will not only improve employment generation in the country, but will also enhance the growth participation, improve benefit-sharing, and expand the width of growth in Nigeria.

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