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Does the twin growth catalyst of oil rent seeking and agriculture exhibit complementary or substitute role? New perspective from a West African country

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Abstract

Over the last 3 decades, oil rent seeking has emerged to be a key driver of most economies around the globe. Prior to the oil boom, agriculture remain main stay of most economies especially developing economies. This present study seeks to revisit the contribution of both oil and agriculture sector in Nigeria by augmenting the neo-classical growth model by the inclusion of agriculture and oil rent as growth drivers. To do this, recent time series data from 1990 to 2017 is employed. This study adopts the use of contemporary econometrics test to investigate the theme holistically. First, stationarity test was conducted with a battery of both stationarity and unit root tests. Subsequently, Pesaran's auto regressive distributed lag bounds testing traces long-run equilibrium relationship between agriculture, oil rent, capital, labor and economic growth over the sampled period. Empirical piece of results validate the agriculture induced economic growth hypothesis, which aligns with the physiocracy school of thoughts ideology. This is against previous study; the resource curse hypothesis was not validated for this current study. Our study results show statistical significant relationship in both long- and short-run between oil rent and economic growth. These outcomes are quite revealing for decision makers and stakeholders since both sector contributes to economic growth. Based on these results, policy mix strategies were suggested in the course of the main text. Among such policies are reinforcing government and private sector participation in both sector given they show complementary role and not substitute to economic output.

Keywords Agriculture · Oil rent seeking · Sustainable development goal · Economic growth · Nigeria

JEL Classification O13 · Q32 · Q33

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1 Introduction

The increasing rate of the world's population necessitates an important insight on how to improve the economic performance of the global world. With Africa population of 1.3 billion which accounts for 16.64% of the world total population, Nigeria, one of the countries in Africa, has around 200 million citizens which is equivalent to 2.6% of the total world population. Sadly 94 million of around 47.7% of the total population of the country live in poverty. This answers why there are many studies on how to improve the growth of the country. Indeed, the economy needs strong and solid policy recommendations to operate with in other to improve the condition of the economy.

Nigeria is one of the Africa's largest economies that rely heavily on oil. Oil remains the main source of foreign exchange earnings and government revenues for the country (Sertoglu et al. 2017). Since the global food crises in early 2006–2008 as well as the financial global crises that rocked around mid-2008–2009 as a result of the Lehman brothers crash, the economic growth of this country has since been driven by growth in agriculture, telecommunications and services, with much reliance on oil. Unfortunately, more than 2 decades' reliance on oil production and revenue have not brought satisfying result or success to spurring the economic growth of the country. Many factors are responsible for this. They range from internal factors to external factors and they all call for attention as negligence to them create more negative ripple effects on the economy. These factors include corruption, political instability, violence, marginalization, gender inequality, prevalence of HIV/AIDS pandemic, high mortality and morbidity, among many others.

The challenge of how to improve the economy still remains. Many policies have been suggested and there has been many debate by scholars, practitioners and development specialists on the way forward. Despite this, the problem persists and diversification seem to be the way out as suggested in many studies (Dim and Ezenekwe 2013; Uzonwanne 2015; Sertoglu et al. 2017; Alola and Alola 2018, 2019; Uzuner and Adewale 2019). Agriculture serves as a panacea to poverty reduction especially in developing countries as outlined in the studies of Matahir (2012), Uzonwanne (2015), Christiaensen and Martin (2018). Agriculture as put forward by Johnston and Mellor (1961), Schultz (1964), Haggblade et al. (2007), Schneider and Gugerty (2011) is said to contribute to the growth of other sectors in the economy. Revolutionary school of thoughts has it that development of nation rests entirely on the agricultural sector (Burkett 2003). Agriculture, according to Hirschman (1958), is one of the most central driving forces of economic growth and it contributes to poverty reduction (Haggblade et al. 1991; Sertoglu et al. 2017). Agriculture is of great importance in achieving "shared growth" (Ravallion and Chen 2003; Kraay 2006). Bekun and Akadiri (2019) opines that agricultural development policy tackles poverty problem in the short-run and therefore suggests long-run economic strategies to complement agricultural development in the struggle to boost economic growth. Uzonwanne (2015) study affirms the existence of a positive relationship between Nigeria

economic growth and diversification of other sectors. And reference was made to state of proper human resources management, huge investment and concentration on agriculture. As a result of this, the economy of Nigeria was vibrant and healthy. The study of Chaudhuri and Rao (2004) reveals a bidirectional causality between the services, agricultural and industrial sectors. Triffin and Irz (2006), Valdés and Foster (2010), Awokuse and Xie (2015), and Balsalobre-Lorente et al. (2019) among many others, reveal a causality relationship between agriculture and economic growth for developing countries like Nigeria. According to Matahir (2012), there is co-movement of the services sector, industrial sector and agricultural sectors in the long-run. It is, therefore, imperative to suggest that investment on agriculture should be considered complimentary to investment in oil production. Reason being that agriculture over time has proven to be vital to an economy in many ways. Agricultural sector supplies raw materials for non-agricultural production and other industries. Agriculture provides food for the subsistence of the society. Agriculture creates employment opportunities. With a viable agricultural sector in place, food insecurity would appear least in the set of challenges facing the economy. Agriculture makes home market for local industrial output. Good investment in agriculture encourages more exportation and less importation, and as well provides foreign earnings courtesy of exportation surpluses.

It is in line with this that the study proposes agricultural sector be considered as complimentary industrial sector. Various studies have examined the nexus between oil dependency and agricultural commodities prices, but none, to the authors' best knowledge, has investigated the relationship between these variables using the latest techniques and updated data engaged in this study.

It is on the above premise, that the current study examines the contribution of agriculture and oil rent in a neoclassical growth setting which has received little or no attention in the agricultural economics literature especially Sub-Saharan Africa and much more Nigeria that has been plagued with heavy oil price fluctuation and agriculture neglect. Thus, the present study seeks to fill the identified gap as well as avoided for omitted variable bias by the incorporation of capital, labour and oil rent to the model framework which previous studies fail to address. This study also seeks to serve as a blue print and policy document to decision makers and government administrator on both oil and agriculture.

The current study affirms against previous study that both the agriculture and oil sector play a pertinent role for economic growth. This is revealing in times of dwindling oil prices as well as huge paradigm shift of most economies to other sectors like service, manufacturing among others.

The remainder of this study is outlined as follows. Section 2 renders the data and econometrics steps while Sect. 3 deals with the interpretation of results. Finally, Sect. 4 provides the concluding remarks as policy direction.

2 Methodological procedure and data source

2.1 Data

This current study explores the dynamic relationship between agriculture, economic growth in a neo-classical setting by the inclusion of capital, labour, oil rent and agricultural value added. The data for this study includes economic growth measured by real gross domestic product (constant 2010$), agriculture is accounted for by a composite variable that includes agriculture, forestry, fishery value added constant (2010$) while capital is measure by real gross capital formation (constant 2010$), labour is proxy by total labour force as percentage total and oil rent (% of GDP). All data were retrieved from the World Bank development indicators (www.data.world bank.org) with the exception of oil rent that was sourced from the US Energy Information Administration database (https://www.eia.gov/). The variables span from 1990 to 2017.[1]

2.2 Empirical test process

The empirical path of the current study follows four steps. First, preliminary analysis like graphical plot, descriptive statistics and correlation coefficient analysis. Second, investigation of stationarity and unit root test of the variables under consideration with the traditional unit root test like Augmented Dickey–Fuller (ADF) Phillips–Perron (PP), Dickey–Fuller generalized least square (DF-GLS), Elliot, Rothenberg and Stock (ERS), Kwiatkowski, Phillips, Schmidt and Shin (KPSS) in conjunction with Zivot and Andrews (ZA) unit root under single structural break. Third, the investigation of long run equilibrium (cointegration) relationship via the ARDL bounds testing approach and finally detection of causality with the Granger causality test.

2.3 Model specification

The functional form that expresses the relationship for the underlined variables are rendered as:

$$RGDP = f(GCF, LFT, AVA, OR) \tag{1}$$

$$LnRGDP_t = \alpha + \beta_1 LnGCF_t + \beta_2 LnLFT_t + \beta_3 LnAVA_t + \beta_4 LnOR_t + \varepsilon_t \tag{2}$$

Here, α and β's are intercept and partial slope parameters to be estimated respectively.

Based on economic intuition and logical reasoning we expect as a priori signs for β_1 and β_2 to be > 0. That is, we expect a positive contribution for both proxies of capital and labour. This is consistent with the Solow growth model (SGM) assertion,

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[1] The choice of the time span is credited to the availability of data for proxy for labour and uniformity of all variables.

Table 1 Unit root tests

Variables	ADF	PP	ERS	DF-GLS	KPSS	ZA
AVA	− 1.8054	− 1.8823	1.1546	− 1.6683	0.1929***	− 2.8895 (1) [2002]
ΔAVA	− 4.6825*	− 4.6825*	7.4436*	− 5.5332*	0.1314	− 7.0425* (1) [2002]
RGDPC	− 2.1601	− 2.2409	1.8799	− 2.7377	0.1311	− 2.3209 (1) [2013]
ΔRGDPC	− 4.3641*	− 4.3066*	5.5422*	− 4.5239	0.1767**	− 5.2061** (1)[2002]
LFT	0.5006	− 0.1717	1.4464	− 2.0021	0.1183	− 3.4666 (1) [2004]
ΔLFT	− 3.2646***	− 3.3649***	7.6446*	− 3.4221**	0.1531**	− 5.9182* (1) [2003]
GCF	− 2.7162	− 2.1021	2.5677	− 2.0322	0.1435	− 3.7656 (1) [2006]
ΔGCF	− 5.7744*	− 5.1431*	5.9376*	− 4.1633*	0.5000*	− 9.3196* (1) [2007]
OR	− 1.5165	− 2.8434	1.2503	− 1.6683	0.1171	− 2.8401 (1) [2010]
ΔOR	− 6.1804*	− 4.8257*	4.5831*	− 5.5332*	0.3838*	− 7.5247* (1) [1999]

*, **, *** represent 1%, 5% and 10% statistical significance level respectively. () and [] represent the optimum lag length and break year respectively. All tests were conducted with model of both intercept and trend specification

that a substantial input of capital and adequate labour mix with engender economic output. However, the expectation for β_3 and β_4 could be ambiguous as a positive sign for agriculture spell agriculture induced growth while same applies for oil rent. However, this could also be negative as seen in previous empirical studies given the volatile nature of both sectors. This also informed the need to carry out further econometrics tests to either validate or repute the above prepositions.

3 Results and discussion

This section of the study focuses on the discussion of the empirical results. The present study sets off with preliminary analysis of graphical plots of the variables under consideration. All variables exhibit positive trend with the exception of oil rent over the investigated period. Agriculture and economic growth trend positively over the investigated period as well as capital and labour. However, an inverse negative trend is seen for oil rent. The negative trend of oil revenue is credited to the dwindling volatile nature of oil at the international market across the globe. As most nations have found alternative and complementary driver of their economic growth.

Table 1 represent a battery of both stationarity and unit root tests. All test statistics are in harmony with first difference stationarity. The break years reported by ZA unit root test reflect significant events in Nigeria. For instance, in 1999, there was political regime switch from military regime to democratic rule. Similarly, the 2006/2008 global food crisis was also captured by the ZA unit root test. These dates reflect both political and economic episodes in Nigeria. For confirmation analysis in terms of stationarity properties of the variables, the KPSS stationarity test was conducted in conjunction with the ZA unit root test under single structural break. Both test affirms that all variables are stationary after first difference.

Table 2 ARDL Bounds testing

Test statistic	Value	Null hypothesis: no levels relationship		
		Significance (%)	I(0)	I(1)
Asymptotic: n = 1000				
F-statistic	6.976912	10	2.2	3.09
k	4	5	2.56	3.49
		2.50	2.88	3.87
		1	3.29	4.37

Table 3 ARDL short-run and long-run analysis

| Model	RGDP = f(LNAVA, LNGCF, LNLFT, LNOR)		
Variable	Coefficient	SE	t-stat
Short-run analysis			
ECT(− 1)	− 0.2458***	0.0336	− 7.3136
ΔLAVA	0.2613***	0.0439	5.9443
ΔLNGCF	0.0373**	0.0157	2.3641
ΔLNLFT	5.6681***	0.9148	6.1958
ΔLNOR	0.0154*	0.0074	2.0811
Constant	− 3.3433**	1.2606	− 2.6521
Long-run analysis			
LNAVA	0.4761**	0.1924	2.4747
LNGCF	0.1517*	0.0820	1.8495
LNLFT	0.7234**	0.3118	2.2479
LNOR	0.1901*	0.0936	2.0309
Constant	− 1.3965**	0.6416	− 2.1765

***, **, * represent 1%, 5% and 10% statistical significance level respectively

The next step is investigation of long run relationship between the variables. The Pesaran bounds test reported the outcomes in Table 2. The test statistics trace long run equilibrium relationship among the variables.

Furthermore, the short run and long run regression model is reported in Table 3. The regression suggests a low speed of converge between the underlined variables to its long run equilibrium path by the contribution of its regressors namely agriculture, capital, labor and oil rent on an annual frequency. The pace of convergence known as speed of convergence, which is negative, and statistically significance take approximately 25% to correct for disequilibrium over the sampled period. We observe that agriculture is positive and statistically significant in the short run. Thus, 1% increase in agriculture value added increase economic growth by 0.2613%. Similarly, a positive statistical relationship is also seen in the long-run. However, the magnitude is much as a 1% increase in the long-run translates into over 0.4761% increase in economic output. These results are not new in the agricultural economics

Table 4 Residual diagnostic check results

Test	Coefficient	*p* value
Heteroscedasticity (ARCH)	0.3089	0.5835
Normality	2.1896	0.3346
Autocorrelation	2.1724	0.1463
Functional form (Ramsey RESET)	0.1001	0.7556
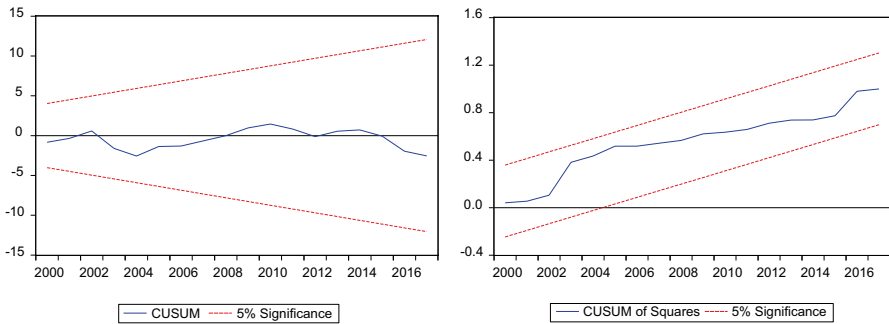
Fig. 1 Stability of graphical plot of CUSUM and CUSUMsq

literature as previous studies such as (Sertoglu et al. 2017; Bekun and Akadiri 2019; Bekun et al. 2018) validate the role of agriculture sector to economic growth. The new finding from the current study against previous argument is that agriculture still contribute gross output of the economy. This is very instructive to government administrator that agriculture is still a driver for economic progress. This outcome is in line with the physiocracy school of thoughts (Higgs 1897). Furthermore, the present study aligns with the workhorse growth model known as Solow growth model (SGM), as we observe that both inputs (capital and labour) are crucial to economic growth. This implies that capital stock in terms of human capital, input capital and effective labour are pertinent for sustainable economic growth in Nigeria over our study time frame.

Further empirical piece of evidence shows that revenue or rent from oil in Nigeria engenders economic growth. This outcome is contrary to previous studies like (Gokmenoglu et al. 2016). The expectation is that oil rent seeking might crowd out agricultural sector and other sectors like manufacturing, service and the likes. This is because government administrator will focus on the oil sector, given the boom. We observe that in both short and long run period, over our study increase economic output by 0.0154% and 0.1901% respectively. Thus, our study finding does not validate the resources course hypothesis in Nigeria. This means that both agriculture and oil sectors plays complementary rather than the substitute as previously believe. This is a call for key plays in both sectors to synergize for increase in economic output and sustainable growth. The fitted model is free and satisfactorily passes all the residual diagnostic tests like serial correlation, heteroscedasticity, normality tests and properly functional form all outlined

Table 5 Granger causality test

Null hypothesis	Causality	F-statistic	Prob.
LNAVA $\neq$ > LNRGDP	AVA $\rightarrow$ RGDP	12.4893***	0.0017
LNRGDP $\neq$ > LNAVA		0.19574	0.6621
LNGCF $\neq$ > LNRGDP	GCF $\leftrightarrow$ RGDP	7.72345**	0.0104
LNRGDP $\neq$ > LNGCF		12.3892***	0.0018
LNLFT $\neq$ > LNRGDP	LFT $\rightarrow$ RGDP	5.4357**	0.0285
LNRGDP $\neq$ > LNLFT		2.41469	0.1333
LNOR $\neq$ > LNRGDP	OR $\neq$ RGDP	1.90342	0.1804
LNRGDP $\neq$ > LNOR		2.62769	0.1181
LNGCF $\neq$ > LNAVA	GCF $\leftrightarrow$ AVA	3.32496*	0.0807
LNAVA $\neq$ > LNGCF		9.64871***	0.0048
LNLFT $\neq$ > LNAVA	LFT $\neq$ AVA	2.87652	0.1028
LNAVA $\neq$ > LNLFT		1.17886	0.2884
LNOR $\neq$ > LNAVA	OR $\neq$ AVA	0.00026	0.9872
LNAVA $\neq$ > LNOR		1.52703	0.2285
LNLFT $\neq$ > LNGCF	LFT $\leftrightarrow$ GCF	4.90791**	0.0365
LNGCF $\neq$ > LNLFT		5.4159**	0.0287
LNOR $\neq$ > LNGCF	OR $\neq$ GCF	0.01389	0.9072
LNGCF $\neq$ > LNOR		2.77998	0.1084
LNOR $\neq$ > LNLFT	OR $\neq$ LFT	1.01744	0.3232
LNLFT $\neq$ > LNOR		2.75365	0.1100

***, **, * represent 1%, 5% and 10% statistical significance level respectively. $\neq$>, $\neq$, $\rightarrow$ and $\leftrightarrow$ represent 'does not granger cause', 'no Granger causality', 'unidirectional causality' and 'bi-directional causality' respectively

in Table 4. Also, the stability of the fitted model is also tested via the CUSUM and CUSUMsq tests confirms the stability of the model, as the test statistics fall within the 5% threshold as shown in Fig. 1. This implies that the model is stable and suitable for policy direction.

Table 5 presents the Granger causality test. This is necessary given that general regression does not depict causation. The Granger causality test helps to ascertain predictability power of variables considered. The test aid in predictability of say variable X on another variable Y. That is, both contemporaneous and past realization of X are better predictor of variable Y over investigated period. Table 5 shows that there is a one-way causality running from agriculture to economic growth. This suggests that agriculture is a key predictor for economic growth. This result is consistent with the findings of (Katircioglu 2006). This is also true for the study of Awokuse and Xie (2015) for selected African countries, as agriculture was echoed as panacea for economic growth for the selected countries over the sampled period. Furthermore, we also observe feedback causality between economic growth and capital formation while one-way causality is seen for between labor and economic growth. These outcomes are in line with the SGM preposition that adequate amount of capital and labour stock accumulation

are determinants for economic growth. Also, between capital and labor, two-way causality is seen while a unidirectional causality is also demonstrated between labor and economic growth (GDP). These outcomes are insightful, as we see a connection between these outlined variables. However, in the short run we fail to see any causality traits from oil to economic growth (GDP). This is revealing as oil only gain dominance in recent years in Nigeria as key drivers of economic growth. As such the need to blend both the oil and agricultural sector is crucial for sustainable economic growth in terms of the "no poverty" and "zero hunger" goals of the sustainable development goals (SDG) 1 and 2 respectively.

4 Conclusion

For over few decades back, as emphasized by the physiocracy school of thoughts, the growth of the economy, especially that of the developing countries that strides on her primary sector like agriculture sector. Nigeria, been an agrarian country is massively endowed with natural resources, however these resources are not well harnessed and utilized. Many issues among which are corruption, unstable government regimes and political rule, answer for reason behind resource-curse in the Nigeria. The discovery of petroleum and the operation in the oil industry brought about neglect of the agricultural sector by the government. Unfortunately, both the decline in the production of crude oil and the decline in the agricultural produce have brought about decrease in the GDP of the country as against the supposed increase, which could have been achieved as a result of the country's natural endowments. This bottleneck initiates the motivation for this study.

The quest for sustainable economic growth has made government officials across economies on the path to increase economic output. This task has led economies to search for growth drivers. Agriculture and oil sector have been indented as catalyst for economic growth (Katircioglu 2004, 2006; Turan 2006; Allan et al. 2015). Thus, this present study examines the long run and causality relationship between agriculture, oil rent capital and labour in Nigeria over recent time span. The study is timely and worthwhile after the food crisis of 2006–2008 and global financial crisis in the mid 2008–2009 to arm stakeholder with all insight for better decision-making and strategies.

Empirical results trace long run equilibrium relationship between the underlined variables over the investigated period. Thus suggesting the importance of the variables to economic growth in Nigeria. The long run regression results also reinforce that both the agriculture and oil sector trigger economic growth in Nigeria. This is indicative to the Nigeria government administrators and policymakers as against previous belief that the oil boom in the mid 1960–1970s crowded other sectors of the economy especially the agricultural sector. Thus, the need for more budgetary allocation for the promotion of the dual sectors (agricultural and oil sectors) is key for the actualization of sustainable growth and development in Nigeria (Tijani et al. 2015). This means that both the agricultural and oil sectors play complementary role and not substitute.

The take home for stakeholders like government officials, farmers and investors in both sectors value chain is to foster information dissemination rather than information asymmetry that hinders economic growth. Also, the need to intensify more capital stock and effect labour accumulation is also identified by the current study to increase economic output over the investigated period.

Compliance with ethical standards

Conflict of interest We have no conflict of interest to disclose.

Ethical approval Ethical approval does not applicable for this study.

Informed consent Informed consent does not applicable for this study.

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