The Effects of Global Oil Price on Government Investment the Nigerian Agricultural Sector

Chuka Obiofuma

Professor Gale Boyd, Faculty Advisor

Professor Alison Hagy, Independent Study Advisor

Honors Thesis submitted in partial fulfillment of the requirements for Graduation with Distinction in Economics in Trinity College of Duke University.

Duke University

Durham, North Carolina

2016

Acknowledgements

I could not have written this paper without the knowledge and guidance that I have received from Professor Gale Boyd. Were it not for him I might never have known anything about the topic of my paper. I'm also extremely thankful to my Independent study advisor Alison Hagy for patiently helping me to refine and polish my thesis. Finally I would like to thank my friends and family for lending me their support throughout the entirety of process.

Abstract

Nigeria's heavy dependence on oil makes it a prime target for the resource curse. The occurance of this phenomenon in Nigeria could mean that there is capital flight from the agricultural sectors of the economy when the oil sector increases in profitability. This would disproportionately hurt the poor of Nigeria who depend on agriculture for their livelihood. This work investigates whether or not the Nigerian government, the largest investor into the Agricultural sector, tends to increase or decrease its investment in the agricultural sector as global oil prices rise. Using data from the years 1978-2014, the results of this paper show that as oil prices increase so too does the Nigerian government's investment in its agricultural sector.

JEL: I28, O13, Q43

Keywords: Government Policy, Agriculture, Energy

I. Introduction

In the West African country of Nigeria oil accounts for 94.9% of the country's exports as of 2014. This overwhelming majority, held by oil in terms of exports, has been the status quo in the country nearly since the first major spike in global oil prices in the 1970's (Olajide, O.T., Akinlabi, B. H, Tijani, A.A. 2012). At that time, agriculture made up approximately 60% of Nigeria's gross domestic product and the agricultural sector was growing rapidly. Between 1960 and 1965, agriculture in Nigeria grew an average of 7.4% a year. After the oil boom however, this growth turned to deterioration. Between 1970 and 1975, the agricultural output declined by an average of 17.3%, while oil revenue quadrupled from 2 billion Naira to 8 billion Naira. (Ojide et al 2014). While agriculture previously held the prime spot among Nigerian exports, the spike in oil prices in the 70's shifted the economy drastically towards the production and exportation of oil.

The primary issue caused by the creation of such a mono-product economy is one of non-inclusive growth. As a country, Nigeria is growing rapidly. Over the past ten years, Nigeria's GDP has grown at an average rate of ~7%, and the share of millionaires has increased by over 40% (Kay 2014). However, the percentage of the population in absolute poverty also increased, from 54.7% to 61% between 2004 and 2010. The issue with growth which stems from a sector controlled by relatively few is that the gains in welfare are accrued accordingly ("Nigerians living in poverty rise to nearly 61%", 2012).

Fortunately, Nigeria's previous primary export may hold the answer to this problem. Investing in Agriculture, which employs many more Nigerians than oil, is a viable solution to the issue of non-inclusive growth. While oil and gas make up approximately 15% of Nigeria's GDP,

the sector employs less than one percent of the population (Nigeria's oil sector contribution to GDP, 2014). Whereas agriculture, which has traditionally made up over 30% of the country's GDP, employs nearly 40% of the population. Ideally, this would make it a prime target for government investment. However, this may not be what is occurring due to the prevalence in Nigeria of a phenomenon called the resource curse.

The resource curse is a phenomenon commonly associated with resource rich countries and is primarily characterized by factors such as an appreciation in currency due to the surplus of foreign reserves, undermined domestic industries due to the appreciation of the local currencies relative to other currencies, decreased government investment in non- major export sectors, decreased sensitivity of government to the needs of its citizens, and the movement of resources such as human capital and private investment away from other sectors and towards the sector of the major export. These characteristics undermine economic diversification and, ultimately, economic growth. In Nigeria, the diversion of capital away from other sectors and to the primary resource sector, the oil sector, could mean a missed opportunity for increased inclusive growth.

Due to the central role agriculture plays in the Nigerian economy as a promoter of greater economic equality in the country, it is important to ensure that the resource curse is not causing the flight of capital away from the sector. And, if it is, it is important to make efforts to turn the tide. This paper seeks to determine the effect of fluctuations in the global price of oil on the level of government investment in agriculture.

No research currently exists which directly addresses dynamics of the relationship between oil and agriculture in Nigeria in the way that this paper is attempting to. However, current literature does discuss the resource curse, agriculture, and macroeconomic policy in Nigeria.

Some of the papers currently in the field seek to prove the existence of the resource curse in Nigeria. For instance, Oriavwote and Oyovwi (2012) show that oil price level, capital flow, and nominal effective exchange rate play key roles in determining the real naira to dollar exchange rate, the key takeaway being that that oil, in no small way, affects the real exchange rate of the naira. By identifying its characteristic, the manipulation of a country's exchange rate via changes in the exportation of one primary resource, the authors illustrate the existence of Dutch Disease in Nigeria, a well-known symptom of the resource curse. This particular aspect of the resource curse will not be emphasized in my paper, however, Oriavwote and Oyovwi's demonstration of proof for the existence of the resource curse in Nigeria mirrors, in part, what this paper hopes accomplish.

Many papers currently exist which emphasize the prudence and importance of agricultural investment and growth in the Nigerian economy. Ojide, and Ogbodo (2012) provided evidence for the hypothesis of export led growth, which claims that, despite oil's integral role in the Nigerian economy, sustainable growth in the economy can be derived from growth in non-oil sectors. Though this is not specific to agriculture, agriculture makes up the vast majority of non-oil exports in Nigeria; thus, the implication is that growth in agriculture grows the economy. Similarly, Olajide et al (2014) demonstrated a strong positive correlation directly between agriculture output and national gross domestic product. The authors also gave insight as to the magnitude of the effect of agriculture on GDP, the proportion of the GDP derived from agriculture as of 2011, and the extent of the neglect suffered by the agriculture industry in the oil boom of the 70's. And, finally, the investment opportunities inherent in the agriculture industry were presented by Ehui and Tsigas (2009). Their paper suggests that, though banks have traditionally been hesitant to invest in agriculture, in part due to perceived risk, certain sectors of

agriculture, such as fruit, vegetables and cattle, actually offer better returns on investment than some oil and manufacturing sectors. And, additionally, no sector outperforms agriculture in terms of returns on investment for technological improvements related to unskilled labor. All of these works, those of Ojide and Ogbodo (2012), Olajide et al (2014), and Ehui and Tsigas et al (2009), are distinct from this one in that they do not discuss the influence of oil in their discussion of agriculture and economic growth.

Though many papers are relevant to this one, the paper that comes closest to studying what is being studied here was written by Akinleye and Ekpo (2012). The authors analyze oil price shocks and macroeconomic performance in Nigeria. Their paper suggests that positive price shocks in oil lead to expansionary fiscal policy, increased imports, and higher long term economic growth, whereas negative oil price shocks do nearly exactly the opposite. However, it is still distinct from this work because it does not endeavor to examine the effects of oil price shocks on agriculture specifically.

The results of my paper show that ultimately, increases in oil prices lead to increases in agricultural investment. How I came to that conclusion is demonstrated in the following sections. The subsequent sections are as follows: II Literature Review, III Theoretical Framework, IV Data, V Methods, VI Results, and VII Conclusion.

II. Literature Review

While no study in the literature directly addresses the hypothesis of this paper, there are many works in the field which address the topics it concerns, such as the resource curse, agriculture in Nigeria, and macroeconomic policy in Nigeria. The works in the field address one or two of these topics in isolation, but not the relationship among all three as this paper intends.

To begin with, the case for the existence of the resource curse in Nigeria is fairly well established. This is exemplified by Oriavwote and Oyovwi (2012). The authors used a multiple variable regression using an autoregressive distributive lag model to reveal that terms of trade, the ratio of export prices to import prices, has a significant and positive effect on the exchange rate of Naira to dollars. Seeing as oil makes up almost 95% of Nigeria's exports, this is a relatively good indicator of how shocks in oil prices affect the exchange rate. Although my paper is steeped in a different aspect of the resource curse, concerning the flow of capital from the non-main export sector to the main export sector over time, Oriavwote and Oyovwi (2012) suggest that the resource curse exists, to an extent, in Nigeria and, thus, warrant further study of the topic.

Various papers in the literature demonstrate that not investing in agriculture may have a negative effect on GDP. For example, in their paper concerning the hypothesis of export-led growth in Nigeria, Ojide and Ogbodo (2014) confirmed that non-oil export levels are positively and significantly associated with GDP, which is defined in terms of consumption, investment, government spending, and foreign trade. This correlation was established through an autoregressive distributional lag regression in which a variable for non-oil exports was regressed on a GDP variable. Because agriculture makes up over 67% of non-oil exports as of 2011, the

papers strongly suggests a positive correlation between agriculture export growth and GDP growth. (Victor E. Oriavwote and Dickson O. Oyovwi 2012).

The research of Ojide and Ogbodo (2014) is buttressed by a similar paper by Olajide et al (2012) which showed a definitive correlation between agricultural growth and economic growth using a multivariable OLS regression method. Both of these papers indicate that agriculture is essential for growth. However, neither one tracks the Nigerian government's investment in the sector, which is a prerequisite for that growth. If government investment comes up at all, it is in reference to the divestment from agriculture that occurred during the oil boom in the 70's.

Substantial research has also been done on the effects of agriculture-based investments on the Nigerian economy. Ehui and Tsigas (2009) show how preferably investing in oil over agriculture may be economically inefficient in their paper, which found that investments in certain sectors of agriculture actually yield better returns than investment in the oil sector. They used a tool termed the global trade analysis project, GTAP, which assumes perfect competition, no change in the economy-wide employment of resources, and constant returns to scale. Additionally, it assumes cost minimizing behavior and utility maximizing behavior for producers and consumers respectively. Ehui and Tsigas found that, on a purely size-based analysis, a 1% technological improvement in oil is by far the leader in terms of increased welfare generated for the Nigerian economy. More concretely, a 1% increase in technology in the oil sector increases welfare by 1% of the total oil sector output, which, given the comparatively large output of the oil sector, is a very sizable amount. However, a similar increase in technology in their respective sectors increases welfare by 1.23% of total cattle output, by 1.23% of total other livestock output, by 1.04% of total fruits and vegetable output, and by 1.02% in total nuts output. Despite the large amount of welfare generated by investment in oil, these agricultural sectors clearly

demonstrate better returns on investment. Unlike this paper, however, the authors do not consider the factors that might influence investment.

The study that most closely approaches the topic of this paper was written by Akinleye and Ekpo (2012). Their study reiterates the findings of other studies in the field by showing that Nigeria exhibits classic signs of the resource curse, such as an appreciation of currency, an increase in imports, and an increase in inflation when there are positive oil shocks, all of which confirm my assumption that Nigeria is affected by the disease. Even more pertinent to this study, the authors examine the effects of positive and negative shocks in the global price of oil as it pertains to macroeconomic policy in Nigeria, incorporating data from 1970-2010. They found that positive and negative oil price shocks have no significant effect on real government spending in the short run, but they do have a significant effect on government spending in the long run, a positive and a negative effect respectively. While Akinleye and Ekpo study the effects of oil price shocks on total government spending, this paper will observe its effects specifically on government spending in the agriculture sector.

Though many works have been done concerning agriculture and economic growth in Nigeria and the relationship between the two, none attempt to discern how the resource curse and global oil prices play into that equation, as this paper intends. The goal of this study is to determine whether the resource curse is causing the Nigerian government to disinvest in agriculture and, thus, forgo potential gains in economic growth and income equality. This paper intends to fill the gap in the field and, if possible, to encourage better management of Nigerian governmental resources.

III. Theoretical Framework

The theories which inform the hypothesis of this paper are many. However, primary among them are those of the resource curse, specifically with respect to shifting investment and currency appreciation. Largely, they predict that if Nigeria is affected by the resource curse then increasing oil prices will cause de-investment in agriculture. The hypothesis of this paper is also informed, though to a lesser extent, by the notion that as governments earn more they also tend to spend more. This is a notion that is supported by research in the literature, that of Akinleye and Ekpo (2013), which shows that increased oil prices increase the implementation of expansionary fiscal policy in Nigeria. This notion seems to imply that government agricultural investment will increase in response to a rise in oil price. Ultimately it is unclear which of these forces will prevail, that of the increased budget or that of the resource curse.

The resource curse theory stipulates that countries affected by the "disease" will be characterized by increased economic focus on the high income industry to the detriment of other industries (Collier 2007). In the case of Nigeria, the high income industry is oil. The theory suggests that upon the discovery of oil in Nigeria in the 70's, resources should have flown from other sectors of the economy into the oil sector, expanding it. This is precisely what happened. The oil industry grew rapidly, quadrupling between 1970 and 1975, as it received a greatly increased allocation of government funds that might have been spent in other sectors. At the same time, the agricultural sector, the largest sector of the economy at the time, was greatly diminished, declining an average of 17.3% between the years of 1970 and 1975. Though this was likely due to a combination of decreased investment and a stronger Naira; stronger currency made importing from Nigeria more relatively expensive. This paper aims to determine whether

the shift in investment allocation that accompanied the first major oil price shock has repeated itself with lesser oil price shocks in recent decades.

As alluded to earlier, another central tenant of the resource curse is that a positive price shock in one of the primary exports of a country will result in the appreciation of the currency of that country, hurting all other industries that produce goods for export. This appreciation is due to the increased inflows of foreign currency that result from the price increase. For example, if, even after the price increase, a foreign country is still buying the same amount of the resource which increased in price, due to inelasticity of demand, then an "X" fold increase in the price of the resource would result in an "X" fold increase in the inflow of foreign currency. This is demonstrated graphically in figure 1.

Foreign Currency Supply and Demand

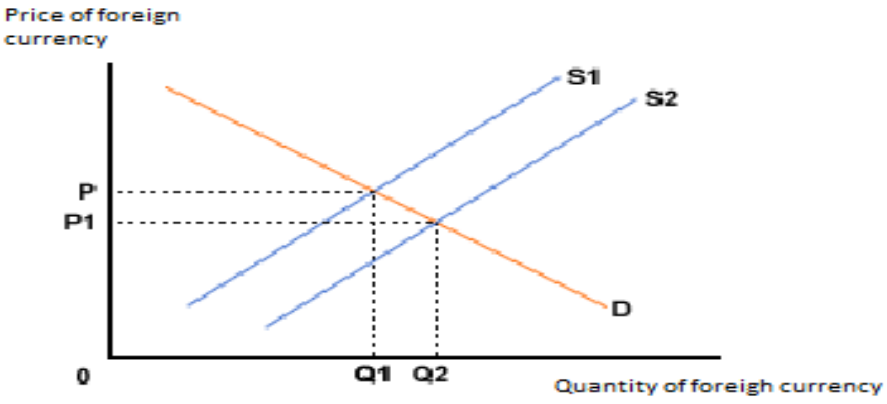


Figure 1

The increased inflow of foreign currency would lead to a considerable increase in supply of foreign currency. However, the demand for foreign currency has supposedly not increased. The result is a decrease in the value of foreign currency relative to the local currency, which is

also an appreciation of the local currency relative to the foreign country. The appreciation of the Naira in the 1970s during the great oil price shock, as depicted below, is demonstrative of the fact that this theory does indeed apply to Nigeria.

Naira Per Dollar

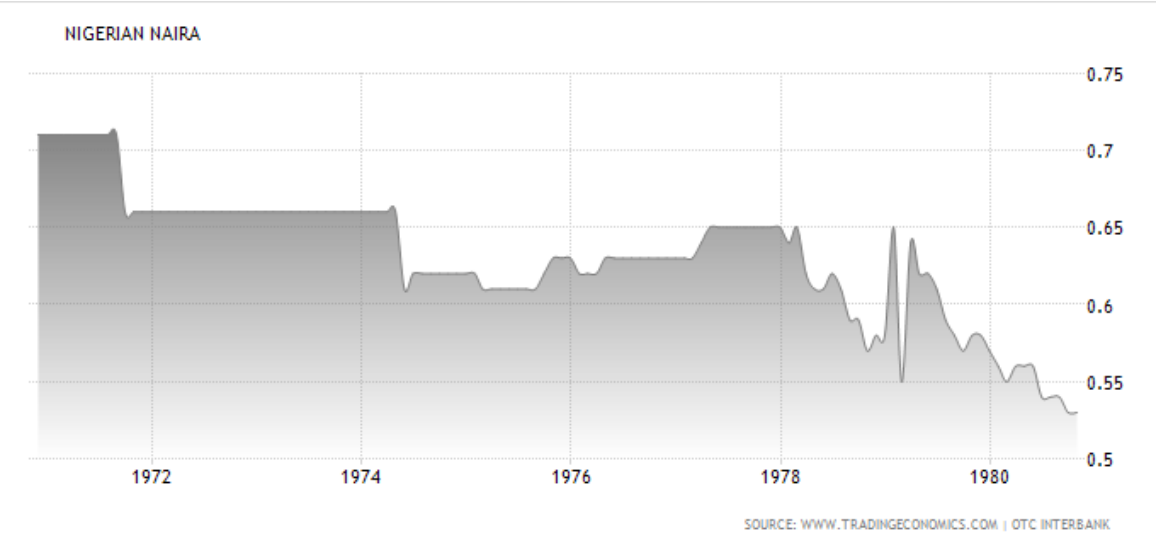


Figure 2

The rapid decline in the agricultural sector that occurred between 1970 and 1975 likely had a great deal to do with what is shown in figure 2. In the chart, the naira appreciates such that the number of naira which equal one dollar is considerably reduced and, consequently, each dollar can buy less naira. What this meant for the agriculture industry at the time is that its exports were less attractive to foreign countries, because the price of Nigerian goods had increased; it would now cost more dollars, for example, to purchase the same amount of food. This lead to considerably decreased sales and a less profitable industry. This also likely contributed to a decrease in government investment, as governments often prefer to invest in the industries that bring in the most revenue. Similar principles may still be at work in Nigeria today, which would mean that increases in the profitability of oil relative to that agriculture, as a result

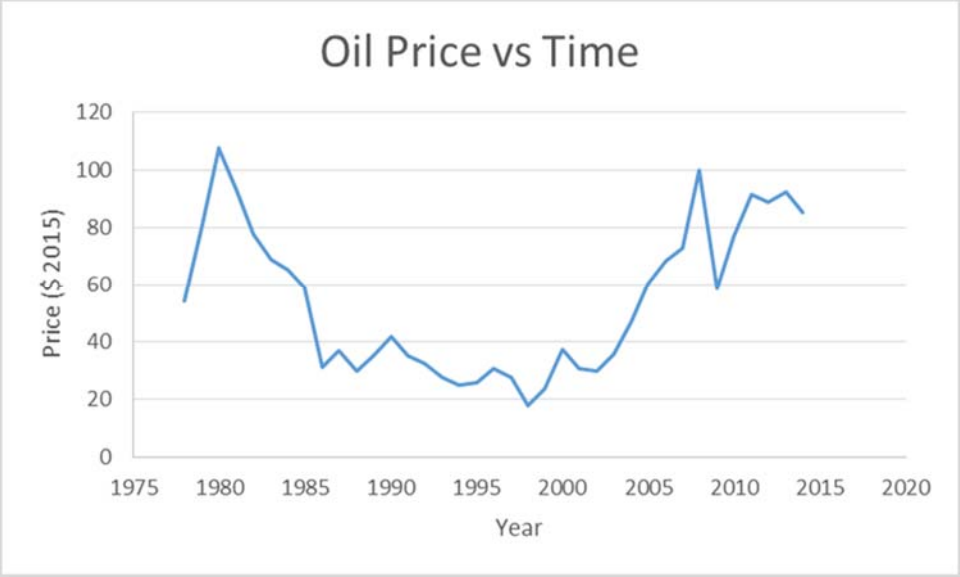
of increased oil prices and a stronger naira, is causing disinvestment in agriculture in the long term.

The principles of the resource curse imply that increased oil prices will lead to decreased agricultural investment in Nigeria, however, the tendency of governments to spend more as they earn more seems to imply a positive relationship between oil prices and agriculture spending may exist in the country. This is because the Nigerian government gets the bulk of its earnings, ~70%, from oil. The research done by Akinleye and Ekpo (2013) seem to support this notion. Their study demonstrates that the Nigerian government tends to respond to increased oil prices with increased expansionary fiscal policy in the long run, which implies greater government investment in agriculture. The resource curse theory and the results of the Akinleye and Ekpo study seem to offer contradictory results without a clear way to determine which is more correct. However, these two views can in fact co-exist. Resource curse theory maintains that, in a country influenced by the resource curse, non-local, export-oriented industries are negatively impacted. However, local industries such as construction and public works, residential rent, and government services can actually receive boosts in growth (Collier 2007). Therefore, because the vast majority of the Nigerian economy is not comprised of agriculture, it is entirely possible for the government to spend more on the economy while neglecting the relatively less profitable agriculture industry. So the two forces working against each other are resource curse effects, which theory predicts will be negative, and the effects of increased budget, which theory predicts will be positive. Whether there is ultimately a net positive or net negative effect is determined by the strength of each effect as it pertains to the agricultural sector in Nigeria, and this can only be determined empirically.

IV.Data

The data which are used in this work come almost entirely from the Central Bank of Nigeria.[1] The primary data are the selling price of Nigerian crude oil from 1978 to 2014, the amount Naira which the Nigerian Federal government spent on the Agricultural sector over the same period, and the yearly federal budget over that period. The primary advantage of these data sources is that they are consistent, meaning they have values for every year of the given time span. The primary disadvantage of this data set is that agriculture expenditure is not broken down by industry and also that there are not even more data points. Statistics for the data are shown below. These include graphs of oil price per barrel over time and agricultural expenditure over time, as well as the mean and standard deviation for both variables.

Oil Price vs Time



[1] C. (2014). Statistics Database of Central Bank of Nigeria. Retrieved January 15, 2016, from http://statistics.cbn.gov.ng/cbn-onlinestats/

Fig. 3

In the graph of figure 3, considerable variation can be seen in oil price over time. This is reflected well in the considerable standard deviation of the variable, which is displayed in table 1 below.

Oil Price Mean and Variation

Average Price (2015 dollar)	54.12
Standard Deviation	26.2

Table 1

Agricultural Expenditure

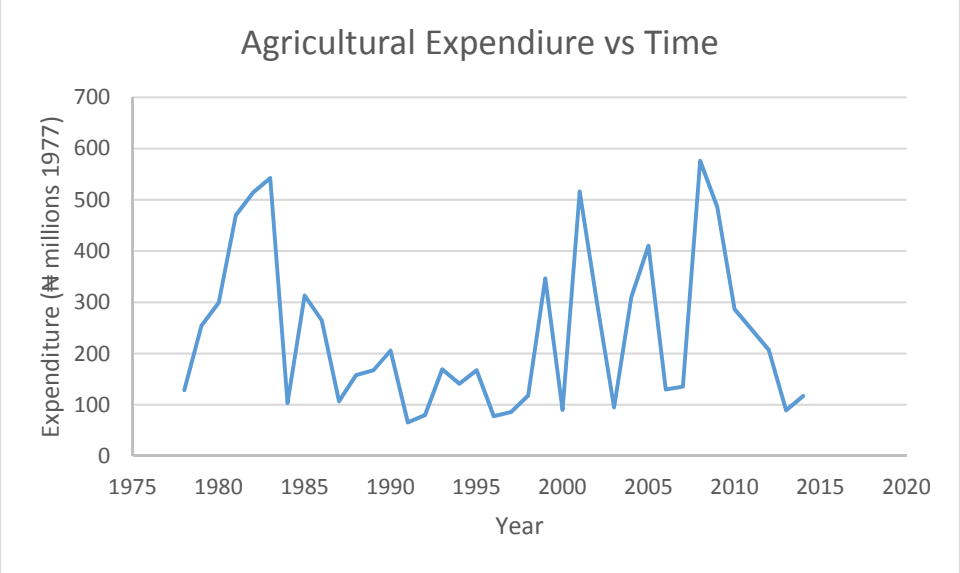


Fig. 4

Figure four reveals even larger amounts of variation in agricultural expenditure over time. This too is reflected in the table below, as the standard deviation is over 60% of the mean expenditure.

Agricultural Expenditure Mean and Variation

Average Expenditure (Million 1977 Naira)	237.26
Standard Deviation	152.61

Table 2

At a glance, the two variables seem to move together. However, their extreme variations, demonstrated by the large standard deviations in the tables and the fluctuations in the graphs, may prove problematic for determining a significant relationship between the two if the peaks and troughs are out of sync.

The Central Bank of Nigeria was the best source for what oil prices that the Nigerian government responded to over the allotted time span. Other sources were found which listed global fuel prices over long periods, however, using prices as they were observed by the Nigerian government allows for better predictions of government behavior than does using average world prices. Thus, for oil prices which allowed for the best ability to draw conclusions the CBN was the best source of data.

For the expenditure of the Nigerian federal government in the agricultural sector, CBN data was also used. The data set provided by the Central Bank of Nigeria was not the only set available, but it was by far the lengthiest and most consistent. Other data sets, containing information on federal expenditure in agriculture, were available at both the World Bank and the International Monetary Fund. World Bank data was actually considerably more detailed than that provided by the CBN. It contained a detailed breakdown of the various sectors within the agricultural sector to which the federal money was allocated, whereas the only specificity the

CBN data has is its distinction between capital expenditure and recurrent expenditure in the sector. Unfortunately, the World Bank data only spanned five years, from 2001 to 2005. This was not nearly a long enough span to allow for any meaningful analysis. The International Monetary Fund Data was also more descriptive than that provided by the CBN, because it contained an industry by industry breakdown of where the money was spent. However, this data set was extremely patchy, missing various periods of three or more years. This too is not ideal for analysis. So, while the CBN data is less descriptive than the World Bank and IMF data, its length and its consistency made it the superior choice.

Other variables which were necessary for this study were the population of Nigeria and the inflation rate of the Naira over the given timespan. These data came from the World Bank. This was an ideal source due to its reputability and the consistency of the data.[2]

Regrettably, the data does have its draw backs. The drawbacks for the CBN data are primarily the lack of specificity about the agricultural expenditure, alluded to earlier, and the substantial but still limited length of the data. The lack of an industry by industry breakdown of agriculture spending limits the conclusions that can be drawn by limiting their specificity. It cannot be determined which industries tend to be most affected by oil prices. Rather, the whole sector must be examined in aggregate. The only drawback of the World Bank data is that, like the CBN data, it could be longer. While the data sets are a sufficient length for descriptive macroeconomic analysis, increased length would mean more data points, which would mean a more robust analysis could be conducted. But, despite minor drawbacks impactful conclusions can still be drawn about how oil prices affect investment in the agricultural sector.

[2] W. (2014). World Bank Open data. Retrieved February 1, 2016, from http://data.worldbank.org/

V. Methods

The methods of data analysis used in this study are primarily univariate and multivariate OLS regression. I initially run a univariate OLS regression of change in oil price on change in aggregate agricultural expenditure and I follow that up with a multivariate regression of both change in federal budget and change in oil price on change in agricultural expenditure. This will enable me to determine if there are any effects of oil price on expenditure that are not related to oil prices effect on the federal budget. I will then run the same two regressions on the capital component of agricultural expenditure and the recurrent components of agricultural expenditure separately in order to determine whether or not the different components of expenditure are affected differently. All of the Naira prices will be converted into 1977 Naira to account for inflation.

In this analysis, the dependent variables are total agricultural expenditure, capital agricultural expenditure, and recurrent agricultural expenditure, which will be represented in Naira. Agricultural capital expenditure is comprised of physical agricultural equipment while recurrent capital expenditure takes the form of payment to government officials working in agriculture and payments for crucial fertilizer subsidies.[3] The independent variables are the oil price from one year to the next and the federal budget. Oil price is the global price of a barrel of oil in 2015 dollars. The federal budget is simply the total amount of money set aside by the Nigerian government for its spending that year and it will be represented in Naira.

[3] Central Bank, Ibid.

Different lag lengths were experimented with before it was ultimately decided that zero lag was most appropriate. Oil price for a given year is paired directly with budget and agricultural expenditure for that same year, the reason for this decision being that, after running regressions with 0, 1, 2, and 3 periods of lag, 0 lag provided the most significant results. It is likely, based on these findings, that the government forecasts future oil prices when determining spending for future years.

Controls

Possible factors that could have affected the results of the regressions if not controlled for were population size and changes in the regimes which are in power over the time span being studied. The population was controlled for by adding a population variable. As for changes in government, there have been five major shifts in the leadership of Nigeria between 1977 and 2014, cycling between military rule and democratically elected officials.[4] Accordingly, five dummy variables were created to account for this. However, the dummies all proved very insignificant, perhaps because all governments determined that the model adopted after Nigerian independence was sufficiently good and or not worth revision. As such, the dummy variables were removed so that they didn't affect the p-values of the significant variables, which is a risk when there is a limited number of observations.

[4] N. (2015, March 28). Nigerian presidents and military rulers since independence. Retrieved February 02, 2016

VI .Results

The results are primarily divided into two sections, that which addresses the first set of regressions and that which addresses the second set. Each section is accompanied by one table which shows the regression results when total agricultural expenditure is the dependent variable, when recurrent agricultural expenditure is the dependent variable, and when capital agricultural expenditure is the dependent variable. As was stated earlier, the two sections of regression are delineated by their inclusion of the federal budget as a regressor on expenditure. Regression set 1 does not include it while regression set 2 does. Including federal budget in regression 2 should separate out the changes in expenditure due to oil's effect on the federal budget from those due directly changing oil prices. The two primary sections are preceded by the key below, which establishes the units of each of the variables, and also by a univariate regression of oil price on federal budget, which justifies the need for two main sets of regressions by demonstrating the great impact oil price has on federal budget.

Variable Units Key

Variable Name	Units
Total Agricultural. Expenditure	(₦ millions)
Recurrent Expenditure	(₦ millions)
Capital Agricultural Expenditure	(₦ millions)
Population	Millions of people
Oil Price	($)
Federal Budget	(₦ millions)

Table 3

The regression in Table 4 below demonstrates the relationship between oil price and federal budget, which is significant almost at the 1% level. This is to be expected because 70% of federal revenue is derived from the sale of oil, so oil price levels should track the federal budget very closely. This regression helps to establish the need for a set of regressions which separates out those effects of changing oil price that are due to a changing budget. It was observed in the regression that a $1 increase in global oil prices lead to a ₦34.2 million increase in federal budget.

Federal Budget vs Oil Price

(Federal B.)	**Coef.**	**Std. Err.**	**t**	**P> | t |**	**95% Conf.**
Oil Price	34.2	12.9	2.66	0.012	8.1-60.3
Constant	5407.3	771.4	7.01	0.00	3841-6973

Table 4

Regression 1

Regressor	Total Expenditure(1)	Recurrent Expenditure(2)	Capital Expenditure(3)
Oil Price	2.28**	-0.067	2.344***
Population	-0.585	0.781***	-01.37*
Constant	181.4	-38.1	219.5
R-squared	0.144	0.194	0.213

Table 5

Contained in the table above are the results of the first set of regressions. Each of the columns represents a separate regression. Oil price and population are regressed on total agriculture expenditure, recurrent agricultural expenditure, and capital agricultural expenditure respectively. The first regression on total agricultural expenditure implies the answer to the question of "how does oil price affect agricultural expenditure?" is that it oil price has a statistically significant positive relationship with agricultural expenditure. The coefficient for oil price is significant at the 5% level. Its value is 2.278, meaning that every dollar increase in the price of a barrel of oil, in 2015 dollars, leads to a ₦ 2.34 million increase in agricultural investment, in 1977 Naira. The R-squared for the regression is 0.144, indicating that 14.4 % of the variation in agricultural spending is accounted for by the regressors. Given that population was not found to be a significant variable in this regression, the vast majority of the R-squared can be attributed to oil price. This R-squared value demonstrates that, while oil price is a significant determinant of agricultural expenditure, there are clearly other factors at play as well.

The next column, which focuses only on the recurrent component of agricultural expenditure, has marked differences from the first. Here the oil price is no longer significant at any level. However, as opposed to the previous regression, population is very significant with significance at the 1% level. It should also be noted that the coefficient is positive, which means that the government tends to spend more on recurrent items like fertilizer subsidies and federal salaries as population rises. This makes sense as the more people there are the more need there is for such services. The R- squared value of this regression is a notable 0.1938. Population seems to be a relatively large factor in determining how much is spent on the recurrent factors of agriculture expenditure such as federal employee wages and fertilizer subsidies.

The final column shows the effect of oil price and population on capital agricultural expenditure alone. Here the result is distinct from that in the previous two columns because both oil price and population are significant. Oil price is very significant, even more so than in column 1, with significance at the 1% level, and population is significant at the 10% level. It would appear that both variables are factors which affect federal spending on capital agricultural goods such as farming equipment and facilities. It is also worth noting that the coefficient on population is negative for this regression, implying that increasing population decreases the amount spent on capital expenditure. Logically this doesn't make much sense, however it could be the case that population is just a confounding variable which is correlated with other significant variables. The coefficient of oil price is positive and largely similar to that found in column 1. The R-squared value is largely unchanged from the previous table, with the similar implication that the variables explain a significant portion of the variation, but certainly not all of it.

When examined in aggregate, the first set of regressions reveal a significant positive effect of oil price on expenditure. It would seem that the increase in federal budget caused by oil price rises overcomes any resource curse effects, if any such effects existed at all in Nigeria after the brief 70's oil boom. It would also appear that the results of the regression on capital expenditure, column 2, are more similar to the regression on total expenditure than are those of the regression on recurrent expenditure. This makes sense because the average capital expenditure over the allotted time span, 1978-2014, is ₦ 182.17 million whereas the average recurrent expenditure is ₦ 47.83 million over the same period, a 4 to 1 ratio. It stands to reason that the effects of the regressors on capital expenditure seem to better predict their effects on total agricultural expenditure.

Regression 2

Regressor	**Total Expenditure(1)**	**Recurrent Expenditure(2)**	**Capital Expenditure(3)**
Oil Price	1.93*	-0.312	2.24**
Federal Budget	0.015	0.011**	0.005
Population	-1.19	0.351	-1.54*
Constant	157.6	33.1	212.6
R-squared	0.170	0.292	0.215

Table 6

In this second set of regressions, federal budget is included as a regressor. As stated before, this allows us to observe any effects of oil price on agricultural investment which are not

due to the government having more money. This makes it possible to determine whether the resource curse is in effect here. The resource curse is associated with decreases in investment in non-primary resource exports, like agriculture, in response to primary export, oil, price increases. Ordinarily this effect would be able to hide behind the increases in budget and spending that also tend to accompany primary export increases, but that is no longer possible in regression 2. .

In the regression on total agricultural expenditure, seen in column 1, there are already marked changes between this set and the first set of regressions. Now that federal budget level has been accounted for, oil price is only significant at the 10% level. However, these results are notable because, despite changes in federal government budget being accounted for, the effect of oil price is still positive and significant. This demonstrates a reverse resource curse effect, a sort of "oil optimism effect" where increased profitability of the primary export sector improves investment in the relatively less profitable sector. Based on these results, the resource curse does not appear to be a significant factor affecting agricultural expenditure in Nigeria. In fact, increasing oil prices increase government investment in agriculture ₦ 1.93 million for every dollar increase in the price of a barrel of oil.

Population does not appear to be a significant regressor. And, more curiously, neither does federal budget level. However, this may be because the variables are more correlated with recurrent expenditure, and thus are drowned out when expenditure is looked at in aggregate. Overall, the R-squared for this regression is larger than for the regression on total expenditure in the first set of regressions, .170 compared to .144 this suggests that a greater percentage of the variation has been explained now that federal budget is accounted for.

In column 2, now that recurrent expenditure is isolated, it can be observed that federal budget level is in fact a significant regressor. For each increase of ₦ 1 million to the federal budget, there is an increase of ₦ 11,010. Stated differently, approximately 1% of new federal spending goes to recurrent agricultural expenditure. Population is no longer significant as it was for the equivalent regression in the first set. It would seem that population was simply correlated with federal budget level, which makes sense given that budget levels tend to rise when there are more people to tax. Though there is only one significant variable, the R-squared value for this regression is much higher than that of the equivalent regression from the previous set. With a value of .292 this regression has the highest R-squared of all of the regressions in this study. The total level of federal spending appears to be a very significant factor in determining how much is spent on recurrent agricultural expenditure. Though, as always, there are clearly other factors involved.

In the third and final columns in the first set of regressions, oil price is significant when regressed on capital expenditure and so is population. The significant oil price variable mimics what was found in the first column, likely because capital expenditure is 4/5 of total expenditure. Given that federal budget is now accounted for, the positive coefficient of oil price now means that there is some direct effect of oil price which drives this behavior. The data shows that capital expenditure tends to occur primarily in large spurts of spending every two, three or four years; this is demonstrated in Figure 5 below. Higher oil prices may help determine when and or how much should be spent on these large bursts of expenditure. This could be a result of the

government being flush with cash when oil prices rise or perhaps due to optimism about future investments that is felt in the governing body when oil prices rise.[5]

Capital Expenditure Variation

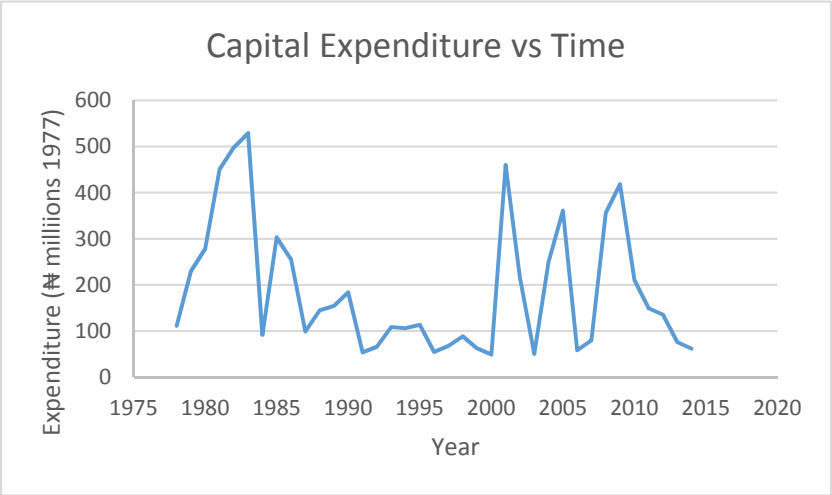


Fig. 5

This set of second set of regressions allows us to dismiss the possibility of the resource curse playing a significant role in this sector of government spending. Even when the effects on budget are accounted for, there is still a positive effect of rising oil prices on total agricultural spending. There is a net positive effect of oil price on agricultural expenditure because the effect which I expected to be positive, that of increased federal budget, was in fact positive, but the effect which was expected to be negative, the ideological response to rising oil prices, was also positive due to the "oil optimism effect". The sum of these two positive effects lead unambiguously to a positive net effect. Both the ideological factors and the material factors linked to rising oil prices cause them to increase total agricultural investment.

[5] A regression of oil price on percent of federal budget devoted to agricultural expenditure was performed in an attempt to better understand the results but was found to be insignificant.

Of the papers in the literature, the findings of my paper can be reasonably compared with those of Oludiran and Ekpo (2013) and Oriavwote and Oyovwi (2012). My results appear to corroborate the findings of Oludiran and Ekpo because the authors indicated in their paper that positive oil price shocks have a positive effect on macroeconomic spending in Nigeria, and my study has demonstrated a positive correlation between oil prices and agricultural expenditure, a form of macroeconomic spending, in Nigeria. Additionally, the authors never break down the effects of oil on spending by sector, the results of this study lend specificity to their own because these results addresses agriculture specifically.

As for Oriavwote and Oyovwi (2012), who demonstrated evidence for the resource curse by finding that the naira strengthens with rising oil prices and weakens with falling oil prices, it is worth noting that my findings do not contradict their own. The movement of currency strength with oil prices and the shift of capital from non-oil sectors of the economy are two different factors of the resource curse. While I have demonstrated that the latter is not occurring in the agricultural sector of Nigeria, the former still is. Thus, the sector is not completely unaffected by the disease. In light of Oriavwote and Oyovwi's findings, my findings indicate that some of the damage that is done to the sector when the naira grows in strength, in response to increasing oil prices, is being mitigated by the increase in government investment which also accompanies increasing oil prices.

VII. Conclusion

In conclusion, the effects of oil price shocks on Nigeria's agricultural expenditure are positive and significant. There appears to be both a direct positive effect of rising oil prices on

agricultural expenditure which has nothing to do with revenue as well as an indirect effect which occurs due to oil prices' positive impact on the federal budget. A more specific analysis would have been desirable, perhaps one which examined how oil prices specifically affect the most profitable sectors of agriculture or those sectors which most impact the poor, however the data that is available either has insufficient specificity or has too small a time span to allow for that level of analysis. In a future study, the relationship between agricultural spending and inequality in Nigeria might be examined quantitatively, so that impact of government investment in agriculture on the people might be better understood. The implication of this study is that the shift of capital away from non-local resource sectors, one of the major factors of the resource curse, is not present in the agricultural sector of Nigeria, and also that the Nigerian government is taking advantage of oil windfalls to invest in the sector which supports the most people in the country.

Works cited

Akinleye, S. O., & Ekpo, S. (2013). Oil Price Shocks and Macroeconomic Performance in Nigeria. Economia Mexicana, Nueva Epoca, 565-624.

Asekunowo, V. O. and Olaiya, S. A. (2012), Crude oil revenue and economic development in Nigeria (1974–2008). OPEC Energy Review, 36: 138–169. doi: 10.1111/j.1753-0237.2011.00205.x

Boyd, G. (2015). Resource Curse [Powerpoint Slideshow]. Rerieved from https://sakai.duke.edu/access/content/group/0e1f96a9-2e88-42e6-bc47-28dfd880238d/Oil%20Markets%20-%20Resource%20Curse.pptx

Ehui, Simeon K., Tsigas, Marinos E. (2009).The Role of Agriculture in Nigeria's Economic Growth: A General Equilibrium Analysis. 2009 Conference, August 16-22, 2009, Beijing, China, 51784

C. (2014). Statistics Database of Central Bank of Nigeria. Retrieved January 15, 2016, from http://statistics.cbn.gov.ng/cbn-onlinestats/

Collier, P., and B. Goderis (2007). "Commodity Prices, Growth, and the Natural Resource Curse: Reconciling a Conundrum," CSAE Working Paper Series, WPS/2007-15

Kay, C. (2014, March 4). Nigerian Millionaires to Soar 47% in Next Four Years, Study Says. Retrieved September 28, 2015.

N. (2015, March 28). Nigerian presidents and military rulers since independence. Retrieved February 02, 2016, from http://www.news24.com.ng/Elections/News/Nigerian-presidents-and-military-rulers-since-independence-20150328

Nigerian Naira | 1960-2015 | Data | Chart | Calendar | Forecast | News. Retrieved. (2015). November 2, 2015.

Nigerians living in poverty rise to nearly 61% - BBC News. (2012, February 13). Retrieved September 29, 2015.

Nigeria's oil sector contribution to GDP lowest in OPEC - Blueprint. (2014). Retrieved from http://www.nationalplanning.gov.ng/index.php/news-media/news/news-summary/333-nigeria-s-oil-sector-contribution-to-gdp-lowest-in-opec-blueprint

Olajide, O.T., Akinlabi, B. H, Tijani, A.A. (2012). Agriculture Resource and Economic growth in Nigeria. European scientific journal, vol 8, No 22, 103-115

Victor E. Oriavwote and Dickson O. Oyovwi (2012).The Determinants of Real Exchange Rate in Nigeria. International Journal of Economics and Finance; Vol. 4, No. 8

Workman, D. (2015, March 16). Nigeria's Top 10 Exports - World's Top Exports. Retrieved September 14, 2015.

W. (2014). World Bank Open data. Retrieved February 1, 2016, from http://data.worldbank.org/