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An Economic Analysis of Dutch Disease in Nigeria

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ABSTRACT

This study is an economic analysis of Dutch disease in Nigeria from 1981-2014 adopting the co-integration regression of fully modified ordinary least squares (FM-OLS) and canonical co-integration regression (CCR) as the modeling approach. To establish the long-run convergence of the variables in the model even though they diverge in the short-run, we apply the bounds test of co-integration which reveals a co-integrating relationship among the variable. The results of the study establish the existence of Dutch disease in Nigeria within the study period. The study recommends both vertical and horizontal linkages of the oil and gas sector for effective and efficient application of oil revenue that will reverse the current Dutch disease trend in the economy. These recommendations arise from the need to efficiently utilize the available oil proceeds, given the exhaustible nature of oil resource.

Keywords: Dutch Disease, Economic Analysis, co-integration, fully modified ordinary least squares. JEL Classification: Q43, Q41,

INTRODUCTION

The economic term "Dutch Disease" was first stated in the magazine The Economist published in November, 26, 1977. Nagasaka, the professor at Takushoku University mentioned the Dutch Disease in his paper. The paper was written for a seminar held on June in 2001 organized by the Policy Research Institute in the Ministry of Finance Japan.

Dutch disease in this case explains the relationship between the exploitation of a natural resource and decline in the other sectors. Corden and Neary (1982) modeled the idea and explained Dutch disease as adverse effect on non-booming sector(s) due to booming sector. In

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their model, there are non-traded (services sector, e.g. transport, financial services, etc.) sector and two traded goods sectors (booming and non-booming sectors). The booming sector means the natural resource (mining sector), where as non-booming sector is agriculture and manufacturing sectors.

Accordingly, (Bature, 2013) explained that the discovery of any tradable goods truly becomes a blessing by helping a nation to face her constitutional obligations to the people. The Dutch disease theory therefore, refers to the situation in which a boom in an export sector leads to a shift of production factors towards the booming sector and an increase in the prices of non-tradable goods and services, thus, hurting the rest of the tradable goods sector. Daniel, (1986) explains that resource curse has two main areas of active research: Political economy of mineral rent generation and distribution and general equilibrium effects of a minerals boom, including the spending effects of the mineral rents.

The above means that there occurs a blockage to diversification in a country as a result of sudden rise in revenue of such country whose riches from natural resources or otherwise it's abundance, rather takes the country several years backward by killing its economy. In place of diversification, leaders are rather induced into corruption and wasteful spending, thereby, creating a decline in economic activities, weak investments, and nonchalant attitude towards reinvesting the excess income from their booming single sector. According to the Daily Graphic (2009), "no country is going to create wealth if its leaders exploit the economy to enrich themselves-or if the police can be bought off by drug traffickers" In the case of Nigeria for instance, Obasanjo (1992:2) explained that:

While Indonesia had oil in part to finance its investment in agricultural development and to use it as jump of leverage, Malaysia was not

blessed with the same gift of nature. Yet the story has been told so often of how Malaysia came in the sixties to collect palm oil seedlings from Nigeria. The irony of it is that while Malaysia is currently an exporter of palm oil, Nigeria is now an importer of palm oil and importing from Malaysia.

This explains the story of declining agriculture and even manufacturing in Nigeria as a result of concentration on a single sector (oil) for everything. The situation became more and more difficult, when rising bills from imported food and industrial machines made Nigeria to become more and more dependent on oil. The danger of depending on a single sector began to manifest glaringly when Nigeria began to produce less than 1 million barrels of petrol daily and sold it for about $30 per barrel as against an earlier 2.5 million barrels per day in 1979 and at a tagged price of $40 per barrel(FGN1983). Many countries of the world have suffered from similar situation due to dependence on single growing sectors".

The Dutch disease (DD) theory is therefore, a situation in which the discovery of primary mineral resource anywhere in the world instead of boosting exploitation and harmonious development of the economy, rather leads to decline or total collapse of economic activities in other sectors of their economies. This was the situation in the Netherland where the discovery of a large natural gas reserve led to a decline in its industrial base owing to inflationary pressure on the guilder.

The purpose of this paper is to analyze the Dutch Disease in terms of economics and econometrics. The Dutch Disease discussed in this paper is what happened in the Netherlands from 1970s to 1980s as a result of the natural gas discovery in the North Sea and its production. There has been the biggest and long-lasted boom of primary commodities in 1970s, which accelerated the Dutch natural gas industry to produce and export it. This natural gas discovery sounds positive for the Dutch economy

but it has been said, in line with economics, that the other sectors and the country's economy itself were seriously damaged due to the fact that the natural gas export had dramatically increased and the exchange rate became extremely high.

LITERATURE REVIEW

Several writers or schools of thought believe that the discovery of natural resources such as petrol in Nigeria, gas in Netherland or forestry resource in any part of the world can be considered as a blessing and a curse. Petrol has rather impoverished so many oil exporting countries in the world today, due to the fact that harmonious exploitation and development of the various sectors of the economy would no longer be guaranteed. Amongst such writers or schools of thought are Xavier and Arvind (2003:13), Utomi, (2003:1) Satish, (2001).

Stijns (2003) employed a gravity trade model to empirically test the Dutch Disease hypothesis on a number of countries. The study found strong evidence of the DD, with energy price led booms systematically tending to hurt manufacturing exports of the energy exporters.

In his study, Makochekanwa (2013) studied the effect of Dutch disease on Botswana. He found out that although the Dutch Disease (DD) model clearly predicts that a resource boom always hurt a country's manufacturing exports, the case of Botswana however defies this predicted resource curse. According to him, whilst qualitative literature describes how the country has managed to avoid the resource curse hook, his study econometrically tested the DD hypothesis on the country's main export products from the manufacturing, mining and agriculture sectors. He employed the gravity model for his study and concluded that diamond exports, instead of hurting the country's exports, it rather boosted exports from manufacturing, mining and agricultural sectors.

Investigating the Dutch disease hypothesis by analising its impact of foreign inflows on appreciating real exchange rate, Javaid (2011) studied contraction in the tradable sector in selected South-East Asian countries over 1981-2007. Using static and dynamic panel data techniques, he estimated real exchange appreciation due to surge in foreign inflows and then estimated contraction in the tradable and expansion in the non-tradable sector. He found evidence of the existence of the Dutch disease hypothesis in the countries studied.

Karlygash, Ali, and Wyzan(2001:4, 8) maintained that, Kazakhstan has a lot of natural resources. The exportation of this resources and natural gas enabled her to earn rising revenue between 1995 and 2000. During this period, "the exportation of petrol rose from 23% to 52.8%., while ferrous metallurgy experienced a fall from 19% in 1995 to 12.9% in 2000." By implication, such an economy can be vulnerable to the DD. This is so because, based on the theory of the model of hollandaise syndrome, countries exporting petrol in the world increase their goods due to the rise in revenue accruing from the petroleum sector. The discoveries of a primary resource or even a progress in technology help to develop the energy sector particularly during the petroleum shock of the 1970s in some countries like Japan. Hence, we cannot explain the DD in terms of petrol or gas alone. We know that all the countries that have experienced situations of fall in certain producer sectors due to the discovery of primary material, fall into a DD automatically.

Comparing developments in Croatia and Slovenia, Broz and Dubravčić (2011) tested the proposition that the Dutch disease results from excessive total foreign exchange inflows from various sources – exports of natural resources not necessarily being one of them. They found that the sum of foreign exchange inflows from foreign tourism, workers' remittances and net capital inflows (the sum of direct and portfolio investment and changes in the foreign debt position) in Croatia were almost three times as high as those in Slovenia. The consequences were

an appreciation of the domestic currency (Kuna) in Croatia, while the Slovenian Tolar exhibited a constant tendency to depreciation. In contrast to Slovenia, Croatia appears to suffer from strong symptoms of deindustrialization. The steeper rise of real wages in Croatia, as the consequence of the overflow of foreign exchange windfall, is seen as the decisive reason for the deteriorating competitive position of producers of tradable in Croatia.

Although the core model of the Dutch Disease makes unambiguous predictions regarding the negative effect of a resource boom on a country's manufacturing exports, the empirical literature that has followed has not clearly identified this effect. Stijns (2003) attributed this to the failure of the existing literature to combine enough data to produce a sufficiently powerful and exogenous test. He used the World Trade Database to systematically test this hypothesis in a gravity model of trade. World energy prices were used to bypass issues of endogeneity regarding primary exports. A one percent increase in world energy price was estimated to decrease a net energy exporter's real manufacturing exports by almost half a percent. Similarly, after instrumentation, a one percent increase in an energy exporting country's net energy exports was found to decrease the country's real manufacturing exports by 8 percent. The corresponding confidence intervals were tight and these results were shown to be quite robust.

Imo (2012) traced the problem of Nigeria to the inherent contradictions, anomalies, and problems associated with countries that depend on oil as their primary export commodity. The revenue it generates when prices are high tends to cause "Dutch-Diseases", high oil revenue raises exchange rates, promotes an adverse balance of payments when prices fall, reduce the incentive to risk investment in non-oil sectors like agriculture and manufacturing. Just one example is Nigeria, which, since initiating the export of oil has seen its agricultural sector collapsing and now it is entirely dependent on imported food. He drew

attention to the political imperative strengthening governance to address these anomalies.

According to Gould and Kapadia the oil boom of the 1970s led the country to neglect its other industries causing the country to suffer from DD. The dominance of the oil industry still holds in more recent times with oil exports accounting for 90% of total exports and 70-80% of government revenue. Nigeria has faced a number of challenges, including a heavy reliance upon the oil industry at the expense of other sectors, an aging infrastructure, and regional conflict. These factors threaten to undermine the potential growth of the Nigerian economy and could fuel a second outbreak of Dutch disease.

DATA AND METHODOLOGY

This study uses time series data from 1981 to 2014,on real gross domestic product, crude oil export, and price of crude oil, real effective exchange rate and labor force from the World Development Indicators and OPEC annual statistical bulletins.

The study adopts the fully modified least squares (Phillips and Hansen, 1990) and canonical co integration models (Park, 1992). This is because these methods are robust to serial correlation and endogeneity problems. In other words, these methods can correct for endogeneity and serial correlation problems that could emerge as a result of the co integrating relations. Though these methods differ in their correction approach, the two techniques are known to be asymptotically equivalent. The fully modified least square is a semi-parametric instrumental variable estimate designed to eliminate the second order bias problem (see Phillips and Hansen, 1990). The approach is known to be robust to stationary and non-stationary series and provides consistent and efficient estimates even in the absence of level relationship (Phillips, 1995). The fully modified least squares first modify the variables and then estimates directly to eliminate the nuisance parameters.

In other words, a fully modified least square uses the transformation of both the data and the estimates. If we let (y_t, x_t) be an $n+1$dimensional (1) process, then we can represent the co integrating system in its triangular form as Eq. (1) and Eq. (2);

$y_t = x_t'\beta + D_{1t}'\gamma + V_{1t}$.....(1)

$\Delta y_{2t} = \varepsilon_{2t}$.....(2)

Where $\varepsilon_t = (V_{1\,t,}\varepsilon_{2\,t}')$ are assumed to be strictly stationary with zero mean and infinite covariance matrix $\Sigma and \Sigma$ is block diagonal and ε_t is weakly dependent. The ordinary least square estimate of beta is consistent but not efficient. The approach by FMOLS and canonical co integration techniques is to use a transformation process to produce a consistent and efficient estimate of beta. If we let $D_t = (D_{1\,t,}D_{2\,t}')$ represent deterministic trends, then the x_t regressors are governed by:

$x_t = \Gamma_{21}'D_{1t} + \Gamma_{22}'D_{2t} + \varepsilon_{2t}$.....(3)

$\Delta\varepsilon_{2t} = v_{2t}$.....(4)

If we let $\hat{v}_{1t}$ be the residual obtained from eq. (1), then we can obtain $\hat{v}_{2t}$ directly from the difference eq. (5) or from eq. (6).

$\Delta x_t = \Gamma_{21}'\Delta D_{1t} + \Gamma_{22}'\Delta D_{2t} + \hat{v}_{2t}$.....(5)

$\hat{v}_{2t} = \Delta\hat{\varepsilon}_{2t}$.....(6)

Now if we let $\hat{\Omega}$ and $\hat{\Lambda}$ to be the long-run covariance matrices computed using the residuals $\hat{v}_t = (\hat{v}_{1t,}\hat{v}_{2t})'$, then the modified data can be expressed as eq. (7) and (8).

$y_t^+ = y_t - \bar{\omega}_{12}\bar{\Omega}_{22}^{-1}\hat{v}_2$.....(7)

$\hat{\lambda}_{12}^+ = \hat{\lambda}_{12} - \hat{\omega}_{12}\bar{\Omega}_{22}^{-1}\hat{\Lambda}_{22}$.....(8)

$y_t^+ and \hat{\lambda}_{12}^+$ are the correction terms for endogeneity and serial correlation, respectively. The resulting FMOLS estimator is then given as eq. (9).

$\hat{\theta}_{FME} = \{(\sum_{t-1}^{T} Z_t Z_t')^{-1}(\sum_{t=1}^{T} z_t y_t^+ - [\hat{\lambda}_{12}^{+\prime}_{0}])\}$.....(9)

The canonical co integration requires a consistent estimate of the contemporaneous covariance matrix Σ. Contrary to the FMOLS, the

CCR only transforms the data then selects a canonical regression from the class of models representing the same co integration relationship. The first step is to obtain estimates of the innovations $\hat{v}_t = (\hat{v}_{1t,}\hat{v}_{2t})'$ and the long-run covariance matrices $\hat{\Omega} and \hat{\Lambda}$. The method then uses the transformation (i.e. transformation of $(y_{t,}x_t')$) below to obtain consistent and efficient estimates of beta.

$$x_t^+ = x_t - (\sum^{-1}\hat{\Lambda}_2)'\hat{v}_t \quad \text{.....(10)}$$

$$y_t^+ = y_t - (\sum^{-1}\hat{\Lambda}_2\tilde{\beta} + [{}^{0}_{\hat{\Omega}_{22}^{-1}\hat{\omega}_{21}}])'\hat{v}_t \quad \text{.....(11)}$$

The CCR estimator is given as

$$\hat{\theta}_{CCR} = (\sum_{t=1}^{T} z_t^* z_t^{*1})^{-1}\sum_{t=1}^{T} z_t^* y_t^* \quad \text{.....(12)}$$

EMPIRICAL MODEL

This study follows the empirical specifications from Corden and Neary (1982) with some modifications. This study account for the impact of oil price and labour factor as key modifications in the empirical model. The model is presented thus:

$$GDP = XQOIL + POIL + INF + EXCH + LAB \quad \text{.....(13)}$$

Where

XQOIL is the quantity of oil exported in barrels, POIL is the price per barrel of oil, INF is inflation rate, EXCH is the exchange rate and LAB is the economy labour force.

RESULTS AND DISCUSSION

This section presents the main findings of the study; the section begins with a preliminary analysis of data persistence, long-run equilibrium (co integration) and test for breakpoints in the data set.

Unit Root Test

Contrary to cross-section data, time series data is known to exhibit data persistence. Hence, the moment condition is often violated. As a requirement for the use of time series data, data must be check for

persistence. This study uses the Phillip–Perron and Augmented Dickey Fuller unit root tests to test for data persistence. Table 1 shows the result for unit root test. First, the author includes deterministic component and all the series in levels exhibit unit root with exception of crude export for both PP and ADF. However, at first difference, all the series do not exhibit unit root. Thus, the series are integrated of order one.

Table 1: Unit root test result.

Null hypothesis: there is no unit root in series						
	Philip-Peron			Augmented Dickey-Fuller		
	Test Statistic			Test Statistic		
Variable	Constant	cons& trend	None	Constant	cons& trend	None
RGDP	2.191711	0.514018	2.821298	2.813274	-0.487059	1.742589
D(RGDP)	-2.642831	-3.128433	-2.310786**	-2.710164	-3.204613	-2.328376**
CRUDE EXPORT	-1.107465	-3.214797	1.115010	-1.322941	-3.309150***	0.470688
D(CRUDE EXPORT)	-9.399322*	-14.20552*	-6.513072*	-6.511517*	-6.508097*	-6.360122*
CRUDE PRICE	-1.308123	-2.184446	-0.603257	-1.279754	-2.144018	-0.598982
D(CRUDE PRICE)	-4.475705*	-4.271327**	-4.567602*	-4.477474*	-4.273313*	-4.567620*
LABOR	5.618849	3.970458	25.56199	2.146095	0.921832	2.069248
D(LABOR)	-5.489182*	-5.728078*	-5.157670	-5.484911*	-5.728078*	-5.137324*
EXCH	-0.202049	-2.190526	1.183538	-0.202049	-2.145050	1.303245
D(EXCH)	-5.377029*	-5.316857*	-4.875459*	-5.377029*	-5.316857*	-4.853704*
INFLATION	-0.547899	-2.590838	0.679783	-0.661578	-2.598841	0.547876
D(INFLATION)	-6.475055*	-6.380747*	-6.136168*	-6.455367*	-6.363448*	-6.136943*

, **, * indicates 1%, 5% and 10% significance level*

Test for Co-integration

The study proceeds to examine whether there exist a long-run relationship among the variable i.e. if there is a co-integrating relationship. This is achieved by the use of Bounds testing approach to co-integration by Pesaran and Shin (1999). The result of the bound test is presented in table 2. The results indicate the presence of long-run relationship (Co-integrating relationship) among the variables at 5% level of significance where the value of the F-statistic (4.832643) is higher than the I(1) bound value of (4.57) at 5% level of significance. By implication, the short-term path of these variables may diverge, but in the long run there is convergence. In other words, there is a common

deterministic trend among these variables. Thus, crude oil export, crude oil price, exchange rate and labour force can be treated as the 'longrun forcing' variables for economic growth in Nigeria.

Table 2: ARDL Bound Test Results

Test Statistics	Value	K
F-statistics	4.832643	4
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	3.03	4.06
5%	3.47	4.57
2.5%	3.89	5.07
1%	4.04	5.72

Source: E-views extract.

The Empirical Result

This section examines the presence or otherwise of Dutch disease in Nigeria. For robustness purpose, this section compares the result based on the fully modified least squares and the canonical co-integration regression. The result is shown in Table 3.

The result of the study indicate that, the impact of crude oil export on the Nigeria's economy is negative i.e. an inverse relationship with gross domestic product; specifically, the result indicate that a unit increase in crude oil export within the sample period lead to -313.8824 units decrease in the gross domestic product at 1% level of statistical significance. This finding depicts the existence of Dutch disease in the Nigeria, which is line with the findings of Imo (2012), Gould and Kapadial (1970). The implication of this finding confirmed the structural economic imbalances that has riddled the Nigerian economy, given huge crude oil export that transmute in to enormous revenue for governance. The result further assert a positive but insignificant relationship between oil price and gross domestic product, indicating that a unit increase in the price of oil

will result to a 528.7358 units increase in gross domestic product in Nigeria. This result conforms to a priori. Theoretically a unit increase in crude oil price given a fixed quantity for export will lead to increase in available revenue for capital expenditure that could create enabling environment for improved or increased production, hence, economic growth. Equally an inverse relationship is shown between exchange rate and economic growth, indicating that, a unit increase in foreign exchange will result in -37.1971 decreases in gross domestic product. This implies as foreign exchange appreciate leading to increase in export cost from the domestic economy will lead to reduction in revenue from export sales primarily due to lack of international market price competitiveness, resulting in reduction in output. In another vein, the study reveal a positive relationship between labor force and economic growth, indicating that, a unit increase in labor force will lead to a 0.0605 unit increase in gross domestic, which is in line with a priori expectation. In a similar vein, a unit increase in inflation will lead to 36.56443 increase in gross domestic product implying that a given level of inflation (single digit) is acceptable for economic growth to thrive effectively.

Table 3: Results of the model

Fully Modified Ordinary Least Squares			Canonical CointegrationRegression		
Regressor	Coefficient	P-Value	Regressor	Coefficient	P-value
XQOIL	-313.8824	0.0001	XQOIL	-329.5023	0.0046
POIL	528.7358	0.4317	POIL	481.1219	0.5759
EXCH	-37.1971	0.0000	EXCH	-37.1459	0.0000
LABOR	0.060593	0.0000	LABOR	0.061263	0.0000
INFL	36.56443	0.9474	INFL	87.82964	0.8912
C	-952880.7	0.0000	C	-951303.4	0.0000

R-square adjusted: 0.887483, Long-run variance: 0.0642, Normality: JB-0.961340 (0.618369)

CONCLUSION AND RECOMMENDATIONS

This study is an attempt to test the presence on otherwise of Dutch disease in Nigeria within the study period (1981-2014), empirical findings indicate the presence of Dutch disease in Nigeria. The result is obtained

through the application of co-integration regression methods of fully modified ordinary least squares (FM-OLS) and canonical co-integration regression (CCR). The empirical evidence of this study confirms the economic reality of Nigeria, where oil export and by extension oil revenue has been on the increase within the study period yet, the economic standard of living has been on the decline. This has been describing in literature as poverty in the midst of abundance, which is a common thread with oil rich nations afflicted by Dutch disease. This is as a result of lack of vertical and horizontal linkages of the oil and gas sector of the Nigerian economy. The study recommends, first, the articulation of vertical linkages within the oil and gas industry by way of creating industry value-chain that accompany crude explorations, in terms of refining the crude, establishment of viable petrochemical industries for the production of agricultural fertilizers, industrial chemicals that are by-products of crude refining. This will in effect creates multiplier ripples in terms of employment creation, technological local content development, thereby stimulating economic growth. Second, the articulation of horizontal sectoral linkages with key sectors and industries that are growth spinners or stimulants such as the use of gas for adequate energy generation which is the sustainer of industrial production of any nation both at the small and large scale level.

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