Oil and Economic Growth: An Econometric Analysis

BY

C.A. OGBOKOR

Department of Economics

Polytechnic of Namibia

Namibia

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ABSTRACT

The study focuses specifically on the effect of oil exports, non-oil exports and foreign capital inflow on Nigeria's economic growth performance. Using the OLSQ regression technique, we generated the relationship between the variables identified above. Relying on selected macroeconomic data for the period 1980 – 2000, the results of the study provides empirical evidence to reinforce the claim that oil exports have contributed more significantly to the growth of the Nigerian economy vis-à-vis other variables that were analysed. The paper recommends, as part of Nigeria's strategy for achieving rapid and sustainable economic 'miracle' the aggressive pursuit of an export-led industrialisation policy.

1. INTRODUCTION

Over the years, the oil sector of the Nigerian economy has been the main propeller of developmental activities in the economy. Indeed, oil has to continue to flow all the times for the economy to survive (Tam David West 1986). Over seventy percent of the revenue of the government of Nigeria is obtained from this sector.

In the same vain, the position of the government's foreign reserve depends crucially on the volume of exported oil, not to mention, generation of employment opportunities and the multiplier effects which the industry has made on the entire economy.

Most of the writings concerning the relationship between oil and the Nigerian economy have been descriptive. Accordingly, the objectives of the study can be presented selectively as follows:

Firstly, to establish a behavioural relation between oil exports, non-oil exports, foreign capital inflow and economic growth with the aid of OLSQ technique.

Secondly, to determine the sensitivity of economic growth to changes in oil exports, non-oil exports as well as foreign capital inflow. The period under study is 1980 – 2000.

The rest of the paper is arranged in the following fashion. In section II, we present the methodology and model specification. This is followed by an analysis and interpretation of the OLSQ regression results. The final part focuses on the policy implications of the study as well as concluding remarks.

II. METHODOLOGY AND MODEL SPECIFICATION

METHODOLOGY

The study utilises time series data from 1980 – 2000. The behavioural equations used are linearized to facilitate econometric analysis. Using the OLSQ regression technique the equations as well as their respective double log transformation forms were estimated. The beauty of the double log transformation regression equations lies in the fact that, it enables us to carry out sensitivity analysis on the estimated coefficients. More specifically, it makes it possible for the researcher to determine the quantitative responsiveness of the regressand to changes in the regressors.

MODEL SPECIFICATION

The general model relating real GDP to regressors such as oil exports, non-oil exports and foreign capital inflow is of the form.

$GDP_t = F(Y_t, F_t, X_t)$. We also expect a positive relationship between real GDP and each of the explanatory variables, i.e.

$$\frac{dGDP}{dY} > 0; \qquad \frac{dGDP}{dF} > 0; \qquad \frac{dGDP}{dX} > 0;$$

Where:

GDP	=	Real gross domestic product. It is serving as a proxy to economic growth.
Y	=	Oil exports
F	=	Foreign capital inflow
X	=	Non-oil exports
t	=	Time period

The implicit nature of the above model does not permit direct approach estimation. Consequently, the explicit models to be estimated are thus derived as follows:

1. $GDP_t = K_0 + K_1 Y_t + Ut$
2. $GDP_t = K_0 + K_1 X_t + Ut$
3. $GDP_t = K_0 + K_1 F_t + Ut$
4. $GDP_t = K_0 + K_1 Y_t + K_2 F_t + Ut$
5. $GDP_t = K_0 + K_1 Y_t + K_2 X_t + Ut$
6. $GDP_t = K_0 + K_1 Y_t + K_2 X_t + K_3 F_t + Ut$

The respective double log transformation forms of the above regression equations are:

7. $LOGGDP_t = K_0 + K_1 LogY_t + Ut$
8. $LOGGDP_t = K_0 + K_1 LogX_t + Ut$
9. $LOGGDP_t = K_0 + K_1 LogF_t + Ut$
10. $LOGGDP_t = K_0 + K_1 LogY_t + K_2 LogF_t + Ut$
11. $LOGGDP_t = K_0 + K_1 LogY_t + K_2 LogX_t + Ut$
12. $LOGGDP_t = K_0 + K_1 LogY_t + K_2 LogX_t + K_3 LogF_t + Ut$

All variables used are deflated to take care of price disturbances i.e. inflation.

III. ANALYSIS OF REGRESSION RESULTS

The estimated regression results of equations one to six are reported in appendix I while their double log linear transformation forms are reported in appendix II. However, for the purpose of analysis and interpretation, we shall utilise the results displayed in appendix II in view of the following reasoning:

It allows us to directly carry out sensitivity analysis on the regressand with respect to the various explanatory variables contained in the estimated equations.

It is therefore apparent that the results generated in appendix II are technically superior to those contained in appendix I. The discussions and analyses relating to equations seven to twelve shown in appendix II are now presented selectively as follows:

- An examination of equation 7 shows the coefficient of the Y term to be positively signed as expected. The fit of this equation is fairly high. The independent variable Y is able to explain over 61 percent of the variance in real GDP. The regressor is also highly significant at both levels of 10 percent and 5 percent. A ten percent increase in oil exports will, ceteris paribus, leads to a 5.2 percent jump in real GDP. There is strong ground to suspect that oil exports and economic performance are positively related.

- Equation 8 shows the coefficient of the X term to be correctly signed. The X term is significant at both levels of 10 percent and 5 percent. The value of the R^2 allows us to infer that non-oil exports are able to account for about 50 percent of the systematic variation in economic growth. In the same vain, a 10 percent increase in non-oil exports will, ceteris paribus, trigger approximately 11 percent increase in economic growth. Non-oil exports, thus, has a positive influence on economic performance.

- In equation 9, the coefficient of the F term does not conform to theoretical expectations. Also the F term fails the significant test at both levels of 10 percent and 5 percent. The equation is poorly fitted in view of the low value of the R^2. We equally expect a ten percent increase in foreign capital inflow, ceteris paribus, to lead to a 0.5 percent decrease in real GDP. Foreign capital inflow does not appear to be a critical variable in the process of economic growth.

- On inspection, the coefficients of Y and F terms were found to conform to a priori expectations in equation 10. While the Y term passes the significance test at both levels of 10 percent and 5 percent, the F term surprisingly did not pass the significance test at both levels. The fit of the equation is reasonably high. The explanatory variables, namely, oil exports and foreign capital inflow jointly account for about 60 percent of the variation in economic growth activities. We equally expect a 10 percent increase in Y and F variables lead to a 5.5 percent and a 0.4 percent jump in real GDP respectively. Oil exports, thus, seems to be playing a more critical role in the process of economic growth vis-à-vis foreign capital inflow.

- In equation 11, the coefficients of the Y and X terms are positive as expected. Apart from the Y term that was reasonably significant at both levels of 10 percent and 5 percent, the other term i.e. X did not pass at both levels. The R^{-2} value of 0.596 suggests that approximately 60 percent of the variance in the model is accounted for by the explanatory variables i.e. oil exports and non-oil exports. Elasticity results generated shows that a 10 percent increase in Y will increase economic growth to the tune of 4 percent. Similarly, a 10 percent rise in X will boost economic activities to the tune of 3.3 percent. We can infer from this result that oil exports contributions to the economy of Nigeria are superior to that of non-oil exports.

- All the coefficients in equation 12 conform to a priori knowledge. The three regressors passed the significance test at various levels. In particular the X term was found to be significant at both levels of 10 percent and 5 percent. The reasonably high value of the adjusted co-efficient of determination suggests that over 65 percent of the variation in the dependent variable is explained by the estimated regression equation. A 10 percent rise in Y will lead to an increase of 3 percent in economic growth activities. Also, a 10 percent jump in X is associated with a 9 percent rise in real GDP. Similarly, a 10 percent increase in F will generate only a 1.1 percent rise in economic growth activities.

Three main observations are apparent from the econometric results reported in appendix II in view of the above discussions. These are:

- The contribution of oil to the economic growth of the Nigerian economy is quite enormous. This goes to reinforce our initial position that the oil sector of the Nigerian economy has remained consistently the main propeller of developmental activities over the years.

- Secondly, we equally observed that non-oil exports and economic performance are positively related. However, oil exports were found to be playing a leading role vis-à-vis non-oil exports.

- Finally, foreign capital inflow did not feature as a critical variable in the process of economic growth as shown in the analysis above. Other previous studies reviewed, for example, Fajana and Oyejide shared similar opinion.

IV RECOMMENDATIONS AND CONCLUDING REMARKS

Recommendations emanating from the study are thus, presented selectively as follows:

The government of Nigeria should be more aggressive in her diversification policy so as to reduce the dangers associated with the heavy dependence on the oil sector. In this regard, the ongoing federal government programmes such as the Export Processing Zones scheme and the Liquified Natural Gas project should be given a more practical expression.

It is also recommended that Nigeria should pursue outward-oriented strategies aimed at export diversification. Apart from promoting economic growth, export diversification can also reduce the dependence of the economy on foreign capital inflow. In this regard, the agricultural as well as the manufacturing sectors cannot be ignored.

While one cannot deny the desirability of foreign capital inflow in addressing the gap created by shortages of domestic resources, most developing countries including Nigeria fails to successfully use them to attain sustainable economic growth. One of the findings of this study is that foreign capital inflow does not have significant effect on economic growth for Nigeria. To reverse this trend, it is recommended that Nigeria should be selective in her choice of foreign capital inflow and foreign investment ventures. This should be accompanied by a simultaneous mobilization of domestic resources needed for the promotion of economic growth.

Furthermore, the need to design trade policies targetted at achieving and maintaining a healthy balance of payments position cannot be over-emphasized. For instance, tariffs should be used to stimulate the local production of key products in order to reduce importation.

Finally, it is hoped that the outcome of this study will serve as food for thought to policy-makers and provoke my professional colleagues to carry out more research on the role of exports and foreign capital in other developing countries of the world.

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APPENDIX I

OLSQ REGRESSION RESULTS

DEPENDENT VARIABLE	EXPLANATORY VARIABLES						
	K_0	Y_t	X_t	F_t	R^2	R^{-2}	D - W
1. GDP_t	47119** (4.06)	0.032878** (5.04)			0.559	0.537	0.92
2. GDP_t	3588 (0.24)		57.84** (5.53)		0.605	0.585	2.74
3. GDP_t	83531** (3.12)			-4.412 (-1.11)	0.058	0.011	1.16
4. GDP_t	51950** (2.60)	0.0323** (4.67)		-0.87 (-0.30)	0.561	0.515	0.93
5. GDP_t	13124 (1.10)	0.0207** (3.62)	39.6** (4.10)		0.766	0.742	2.24
6. GDP_t	-16205 (-0.81)	0.0206** (3.81)	48.1** (4.65)	3.98* (1.77)	0.801	0.768	2.64

KEY TO APPENDIX 1

( ) = t – statistic

* = significant at the 10 percent level

** = significant at both levels of 10 percent and 5 percent

GDP_t = real gross domestic product in t period

Y_t = Oil exports in t period

X_t = Non-oil exports in t period

F_t = Foreign capital inflow in t period

K_0 = Numerical constant or constant term

R^2 = Unadjusted coefficient of determination

R^{-2} = Adjusted coefficient of determination

D – W = Durbin-Watson statistic

APPENDIX II

OLSQ REGRESSION RESULTS (DOUBLE LOG FORMS)

DEPENDENT VARIABLE	EXPLANATORY VARIABLES						
	K_0	Y_t	X_t	F_t	R^2	R^{-2}	D - W
7. $LOGGDP_t$	2.40** (6.44)	0.517** (5.68)			0.618	0.599	0.72
8. $LOGGDP_t$	1.40* (2.00)		1.09** (4.44)		0.497	0.472	0.90
9. $LOGGDP_t$	4.62** (20.13)			-0.0484 (-0.75)	0.27	0.0	0.54
10. $LOGGDP_t$	2.16** (4.66)	0.548** (5.60)		0.0389 (0.89)	0.633	0.594	0.79
11. $LOGGDP_t$	1.91** (2.99)	0.404** (2.68)	0.333 (0.94)		0.635	0.596	0.76
12. $LOGGDP_t$	0.403 (0.43)	0.300** (2.03)	0.902** (2.12)	0.109* (2.10)	0.706	0.657	1.19

KEY TO APPENDIX II

( ) = t – statistic

* = significant at the 10 percent level

** = significant at both levels of 10 percent and 5 percent

GDP_t = real gross domestic product in t period

Y_t = Oil exports in t period

X_t = Non-oil exports in t period

F_t = Foreign capital inflow in t period

K_0 = Numerical constant or constant term

R^2 = Unadjusted coefficient of determination

R^{-2} = Adjusted coefficient of determination

D – W = Durbin-Watson statistic