



CONTRIBUTION OF TIMBER EXPORTS TO ECONOMIC GROWTH IN NIGERIA: AN ECONOMETRIC ANALYSIS

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ABSTRACT

The paper examined the contribution of timber exports to the economic growth in Nigeria, using an econometric approach. Augmented Dickey-Fuller (ADF) and Johansen Co-integration techniques were respectively used to test for unit root and examine the relationship between the variables used. In addition, Granger causality approach was used to determine the direction of causality between variables. Regression analysis was conducted to determine the significance of timber exports to the Nigerian economy. The results of the unit root test indicate that the variables were non-stationary at their level form, but after first differencing, they became stationary. Johansen co-integration test shows that there is at least one co-integrating equation among the variables, while the regression analysis shows that timber export makes significant contribution to the gross domestic product of Nigeria. It is therefore recommended that policies aimed at effectively and appropriately financing forestry sector that produces timber for export should be adequately formulated and implemented by government in order to increase timber output as well as timber for sustainable timber export.

Keywords: Timber, unit root, Nigeria, Johansen co-integration, gross domestic product, Granger Causality

INTRODUCTION

Natural resources play an important role in the economic growth process of most economies in the World (Cronin and Pandya, 2009). Most importantly, no developing economy in the World has the prospect to sustain growth in the absence of natural resources, since they serve as sources of foreign earnings especially oil and timber. It is therefore expected that countries rich in natural resources should perform better than those poor in natural resources. This is, because, it is believed that economies which are rich in natural resources can accumulate economic infrastructure and human capital easily. However, empirical studies on the natural resource endowment-economic growth relationship reveal that while many countries rich in natural resources have performed poorly while countries poor in natural resources have performed better (Njimanted and Aquilas, 2015). Among the countries which have fallen victim of a resource-curse are Nigeria, Angola, Congo, Bolivia, Sierra Leone and Venezuela (Arezki and Ploeg, 2010). From 1965 to 1998, the rate of growth of Gross National Product (GNP) per capita in Iran and

Venezuela was on average -1% per year, -2% in Libya, -3% in Iraq and Kuwait. For Qatar, between 1970 and 1995, it was -6% (World Bank, 2000 in Gylfason (2001). Gross National Product per capita fell by an average of 1.3% during 1965-1998 for all OPEC, relative to the 2.2% average per capita growth in all the lower- and middle-income countries. The only countries which are rich in natural resources with long-term investment above 25% of Gross Domestic Product (GDP) on average from 1970-1998, which is equal that of successful industrial countries that are poor in natural resources were Botswana, Indonesia, Malaysia, and Thailand (Gylfason, 2001). On average, GDP per capita growth rates for Nigeria, Venezuela and Indonesia from 1998 to 2002 were -0.59%, -3.64%, and -1.38% respectively (Iimi and Ojima, 2005). Some studies in China have also supported the resource-curse hypothesis at provincial levels. These include studies carried out by Zhang *et al.* (2008); Shao and Qi (2009) in Jiet *et al.* (2013). The hypothesis of a resource-curse is equally supported by the studies of Papyrakakis and Gerlagh (2007) cited in Jiet *et al.* (2013)

using data from 49 states in the United States of America. Most of these countries have depended on oil revenue for their growth, but since economic growth based on oil is unsustainable due to the exhaustible nature of oil resources, much emphasis is now placed on the role played by the export of renewable natural resources in the economic growth process of countries. One important sector that has the potential to transform the economy of most developing countries especially in Sub-Saharan Africa is the forestry sector.

Forestry sector provides employment opportunities for thousands of Nigerians. In addition to this, it plays a variety of vital roles in rural development through provision of food and fodder, medicine, fuel wood, timber, game and wildlife and raw materials for industries (Emeghara, 2012). Nigeria has benefitted immensely from forest, especially in terms of trade in timber products before the commercial exploitation of petroleum (Kalu and Okojie, 2009).

Timber trade accounts for a large proportion of total agricultural share of international economics which contributes to socio-economic development (Toledo, 2006). This has important implications for economic growth and development, since it favourably affects the term of trade. The GDP of forestry compares favourably with other aspects of agriculture like fisheries (Onyekwelu and Ayodele, 1997). Well managed forests contribute to poverty alleviation, the protection of environment service and sustainable economic growth in developing and transition countries (Edo, 2004). The most striking development in recent years is growing share of the world trade export of forestry and agriculture. The export value earnings from timber are usually obtained from products like log, sawn wood, veneer and pulp wood. However, the forestry sector experienced a gradual set back in recent times. This is partly because of over exploitation of the best timber species in the previous decades and partly because of the industry is still largely oriented towards exporting raw materials (Geist and Lambin, 2002; Rudel, 2005; Laurence, 2005).

Exports of timber, as a renewable natural resource, have contributed to the growth of most economies in the World. In France for instance, round wood exports contributed on average about \$252 million to the country's yearly total export revenue between

1970 and 2012. Similarly, in Japan and United Kingdom, average annual contributions of total round wood to export revenue were approximately \$4.5 million and \$252 million respectively (Estimate from the Food and Agricultural Organization (FAO, 2014). The contribution of timber to the economic growth of Malaysia has been significant. In 2010, it contributed 3.7 of the GDP and 3.2% of the country's total merchandize exports. Timber contributed an estimated \$7.4 billion to Malaysia's total export and between 1% and 2% to GDP in 2011 (Harun, 2012). In Gabon and Democratic Republic of Congo, round wood contributed an annual average of about \$193 million and \$27 million to total export revenue and consequently GDP between 1970 and 2012 respectively (estimates from FAO, 2014). Gabon's forestry sector contributed 0.3% in GDP in 2011 (African Economic Outlook, 2012). Timber production makes up approximately 6% of Ghana's GDP. It provides around 12% of foreign exchange between 1990 and 2000 (Lebedys, 2004).

Contribution of the Forestry subsector to the Nigerian Economy

Before the discovery of oil in the late 50s and early 60s, agriculture sector (forestry inclusive) was the mainstay of the Nigerian economy contributing over 80 percent of the GDP. Over the years, the level of contribution has dwindled due to the undue reliance on oil. Forestry is the smallest sub-sector in Nigerian agriculture contributing only 3.0% to the GDP (between 1960 & 2011); however, the subsector plays a major role in providing industrial raw materials (timber), providing incomes as well as preserving biodiversity (Odetola and Etumnu, 2013). In analyzing the contribution of the forestry subsector to the economy therefore, one is constrained to employ the only measuring rod, that is, its monetary value contribution to the GDP (see Fig.1).

In Nigeria, the export revenue from forestry grew at 4.1, 8.0 and 28.8% from 1950-60, 1960-70 and 1970-80 respectively (Aribisala, 1993), although African sawn wood prices were under downward slide in late 2006 due to stable demand from India and China (Castano, 2006). However, from 2011-2015, Nigeria exported \$400.2 million worth of timber, behind Cameroun and Gabon who exported \$745.9 million and \$474.7 million worth of timber respectively (Eno-Abasi, 2017).

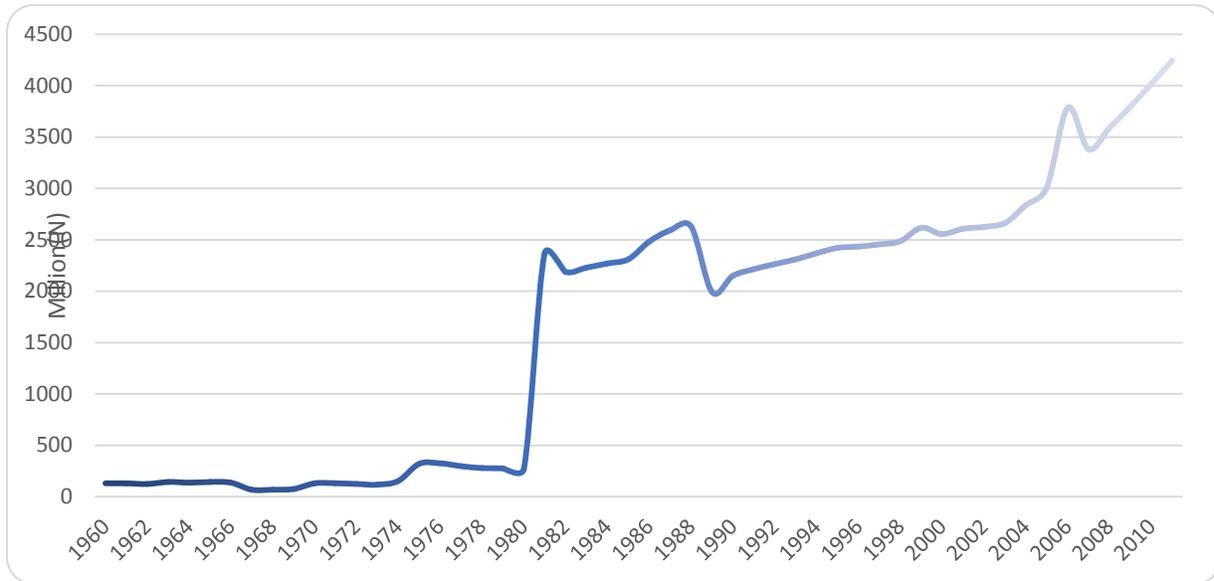


Figure1: Contribution of the Forestry Subsector to GDP (1960-2011)

Growth of the Forestry subsector

The growth of the forestry subsector is far from being impressive when compared with other subsectors within the agriculture sector. From Figure 2 below, the growth pattern had been a fluctuating one from

negative value in the 1960s, rising a little thereafter only to drop again. Although the growth rate seemed to have stabilized from the 1980s, there were occasional fluctuations probably due to decrease in volume of export, exchange rate and prices.

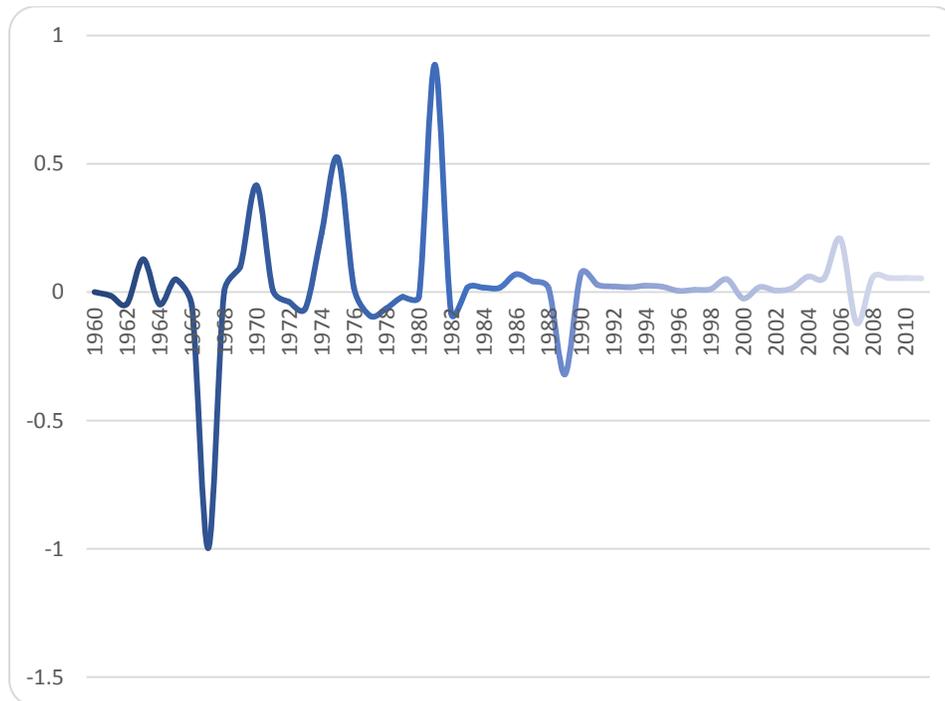


Figure2: Growth Rate of Forestry Subsector(1960-2011)

The link between primary export growth and economic growth has received a lot of attention in the export-led growth literature, with many findings supporting the fact that growth in export results to

economic growth. Some of these studies include those of Levin and Raut (1997); Boame (1998); Ekanayake (1999); Chemedda (2001); Abou-Stait (2005); Dawson (2005); Aurangzeb (2006) and Kalu

and Okojie (2009) and Sanjuan-Lopez and Dawson (2010). Gilbert *et al.* (2013) also supported the export-led growth phenomenon for some agricultural commodities. However, the study by Faridi (2012) refutes the export-led growth strategy.

Scientific studies on primary exports and growth have concentrated on cocoa, coffee, banana, rubber and other exports like oil, with the neglect of timber exports. Studies which concentrate on the link between timber exports and economic growth are relatively absent in the literature, probably because timber is considered more as a natural resource than an agricultural commodity. This study, therefore, attempts to bridge an important gap in empirical literature by examining the relationship between timber exports and economic growth in Nigeria using the co-integration and error correction modeling approach to estimate the long run implications of timber export on economic growth of Nigeria. The advantage of this methodological framework is that it allows us to test for bidirectional causality relationship from timber exports to economic growth (GDP) and vice versa.

METHODOLOGY

Sources of Data

Data for this study were obtained from secondary sources and covered 1962 to 2014. This period is considered long enough to capture the effects of any policy reforms within the export sector in general and timber exports in particular on economic growth. The data were sourced from the Central Bank of Nigeria (CBN) Annual Statistical Bulletin (2007-2011, and 2014), Food and Agriculture Organization (FAO, 2014), National Bureau of Statistics (NBS 2011-2013) and some other sources. Data were collected on real exchange rate, Gross Domestic Product (GDP), which was used as proxy for economic growth, agricultural exports as well as timber exports.

Analytical Technique

This study adopted co-integration analysis approach. Co-integration, in recent times, has gained increasing popularity and importance in analysis that describes long run or equilibrium relationships (Tambi, 1998). An equilibrium relationship is said to exist between variables in a model when those variables are co-integrated. Two or more variables are said to be co-integrated when they co-move or move together at the same 'wavelength'. In other words, for co-

integration to occur, the data series for each variable involved must exhibit similar statistical properties, that is, be integrated of the same order with evidence of some linear combination of the integrated series. A variable is integrated of the order (0) when it is stationary in level form. Time series is stationary if the mean, variance and auto-correlation are constant over time. Fuller (1976) defined a stationary series as one that has its mean and variance constant over time and the value of the covariance between two time periods and not on the actual time at which the covariance is captured. Thus, the applications of the co-integration paradigm will guard against the loss of information from long term relationships in the first differences.

The analytical procedure for this study involved three categories. The first involved the conventional regression analysis to capture the effect of timber exports on economic growth (GDP). This would only analyze one direction of a possible bidirectional relationship and unable to uncover the causation of timber exports and GDP growth. This therefore led us to the second category, which involved the use of Granger Causality based tests on timber exports and economic growth variable, which is the GDP. The third category was the use of the concept of co-integration and error correction to explore the short-run and long-run dynamics between export of timber and economic growth.

Model Specification

$$LGDP = f(LTEXP, LRER, LAgExp) \quad (1)$$

Stochastic form as:

$$LGDP = b_0 + b_1LTEXP + b_2LRER + b_3LAgExp + U_i \quad (2)$$

Where,

LGDP = Log of Gross Domestic Product (Growth rate), which is the proxy for economic growth. GDP is one of the indicators used to determine the 'health' of a country's economy. According to export-led growth hypothesis, increased export can perform the role of 'engine of economic growth' because it can increase employment, create profit, trigger greater productivity and lead to rise in accumulation of reserves, allowing a country to balance their finances (Goldstein and Pevehouse, 2008).

LTEXP = total timber export, which is sum of round wood and sawn wood;

LRER = real exchange rate. This is the nominal exchange rate that takes the inflation differentials among the countries into account. It can be used as an indicator of competitiveness in the foreign trade of a country.

LAgExp = total agricultural export;

b_0 = constant intercept; b_1 - b_3 = slope of coefficients of the explanatory variables captured in the model, and U_i = stochastic disturbance term.

RESULTS AND DISCUSSION

Unit Root Test

The unit root or stationarity test was conducted using the Augmented Dickey Fuller (ADF) unit root test approach. This was used to determine whether each time series is stationary or not. The null hypothesis is

that the variable observed has a unit root, against the alternative that it does not. Table 1 shows the results of test of the series (in logarithms) for unit roots using ADF Test (Dickey and Fuller 1979, Fuller 1976). The test results indicate that all series are non-stationary at their level form but stationary after first differencing. Therefore, the order of integration is one and the variables are said to be integrated of the first order. That is I (1). This therefore is in line with earlier studies by Okoh (1999), Mafimisebi (2002), Adeoti and Owoyemi (2006) and Ghafoor et al (2009) that time series data are usually integrated of order one and are often stationary after first differencing (Hussain, 2010; Mehmood, 2010). The results therefore allow to proceed for co-integration tests for examining long-run equilibrium relationship.

Table 1: Augmented Dickey Fuller (ADF) Unit Root Test

Variable	Coefficient(At Level Form)	Decision	Coefficient(At First Difference)	Decision
LAgExp	-3.341297	Non Stationary	-9.886785	Stationary
LTimExp	-3.344245	Non Stationary	-9.887392	Stationary
LRER	-0.257810	Non Stationary	-7.209031	Stationary
LGDP	-3.141412	Non Stationary	-6.008972	Stationary

Eviews 9.5 Statistical Package Output; Critical Value at 1% is -3.560019

Johansen Co-Integration Test

Johansen test of co-integration is used to test for co-integration among more than two time series variables, as against the Engle-Granger method which is applicable when there are only two variables. From Table 2 and Table 3, both the Trace test and the Maximum Eigenvalue test show that there is at least

one co-integrating equation among the variables. This implies that the variables are co-integrated. In other words, there is a long term equilibrium relationship among the variables. That is, in the event of any shock, the variables may drift apart in the short run, but may return to equilibrium position in the long run.

Table 2: Trace Test for Co-integration

Hypothesized No of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Probability
None*	0.569663	66.47465	47.85613	0.004
At Most 1	0.231819	22.62899	29.79707	0.2648
At Most 2	0.128229	8.915013	15.49471	0.3733
At Most 3	0.033635	1.779121	3.841466	0.1823

Eviews 9.5 Statistical Package Output

Table 3: Maximum Eigenvalue Co-integration Test

Hypothesized No of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Probability
None*	0.569663	43.84566	27.58434	0.002
At Most1	0.231819	13.71398	21.13162	0.389
At Most2	0.128229	7.135892	14.26460	0.4732
At Most 3	0.033635	1.779121	3.841466	0.1823

Eviews 9.5 Statistical Package Output

Table4 contains the regression result showing the relationship between economic growth and timber export in Nigeria. The result implies that the coefficients of agricultural exports, timber export as well as real exchange rate are statistically significant at 0.05 level of significance. This shows that a percentage change in timber export, agricultural export as well as real exchange rate will cause GDP to increase by 3.234, 6.089 and 1602.995 respectively. This implies that timber export plays a significant role in the economic growth of Nigeria. That is, timber export makes significant contribution to the Nigerian economy despite the neglect of the

forestry sector which timber belongs. This result corroborates the works of Yusuf and Edom (2007) and FVTC (1996) in which round wood and sawn wood exports are said to have contributed immensely to the foreign exchange earnings in Nigeria and have been a significant source of revenue for Nigeria.

In addition, the R^2 value of 0.7301 implies that at least 73% of the total variation in GDP is explained by the regression equation. The Durbin-Watson statistic of 2.2874 is also higher than R^2 of 0.7301 which is indicative that the model is not a spurious regression and therefore the results are meaningful.

Table4: Regression Analysis Result

Variable	Coefficient	t-statistics	Probability
RER	1602.995	6.115	0.0000
TIMBER_EXP	3.234	2.342	0.0013
AGREXP	6.089	3.066	0.0035

Eviews 9.5 Statistical Package Output $R^2 = 0.7301$ Adjusted $R^2 = 0.7139$ Durbin-Watson Statistic =2.2874

Table 5 depicts the Granger causality test result. This shows that there is a uni-directional relationship between agricultural export and GDP, timber export and agricultural export, real exchange rate and GDP, timber export and GDP, as well as real exchange rate and timber exports. This implies that agricultural export granger causes gross domestic product, timber export granger causes agricultural export, real exchange rate granger causes GDP, timber export

granger causes GDP and real exchange rate granger causes timber export. In other words, timber export can influence what happens to GDP. This implies that export of timber can significantly influence economic growth of Nigeria. Any change that occurs to timber export will therefore cause a change in the value of the gross domestic product, and by implication, it will affect the economic growth.

Table 5: Granger Causality Test Result

Null Hypothesis	F-statistics	Probability
GDP \longrightarrow AGREXP	1.12248	0.3650
AGREXP \longrightarrow GDP	2.25468	0.0231
RER \longrightarrow AGREXP	1.35415	0.2632
AGREXP \longrightarrow RER	0.47401	0.7933
TIMBER_EXP \longrightarrow AGREXP	4.63310	0.0021
AGREXP \longrightarrow TIMBER_EXP	0.09700	0.9921
RER \longrightarrow GDP	2.23556	0.0017
GDP \longrightarrow RER	0.27128	0.9260
TIMBER_EXP \longrightarrow GDP	3.70112	0.0079
GDP \longrightarrow TIMBER_EXP	1.61326	0.1800
TIMBER_EXP \longrightarrow RER	0.34251	0.8838
RER \longrightarrow TIMBER_EXP	2.75809	0.0320

Table 6 shows the result of the Error Correction Model (ECM). Co-integration analysis only considers the long-run property of a model. It does not deal with the short-run dynamics explicitly. However, error correction model has been specified for this purpose. The ECM is probably the most useful tool in this regards, as it provides a stylized picture of the relationship between two variables. The ECM takes into consideration the adjustment of short-run and long-run disequilibrium and time to remove disequilibrium in each period. Table 6 shows that about 90% disequilibrium between Gross Domestic

Product (GDP) and timber export is removed each year within the Nigerian economy. This implies that whenever there is a distortion in the equilibrium position between export of timber products from Nigeria and the resultant effect on the economic growth of the country, it will take less than two (2) years to restore the export of timber products and the GDP (which is the proxy for economic growth) to their equilibrium position. This is because at least 90% of the distortion in the equilibrium position will be corrected within a year.

Table 6: Error Correction Model Result

Variable	Coefficient	t- statistics	Probability
CONSTANT	39624.5	0.82564	0.4129
TIMBER_EXP	2.7770	6.42835	0.0000
ECM	-0.9019	-13.56483	0.0000

Eviews 9.5 Statistical Package Output

CONCLUSION AND RECOMMENDATION

This paper investigates the contribution of timber exports to economic growth (GDP) in Nigeria. The study employed Augmented Dickey-Fuller (ADF) technique in testing the unit root property of the series and Johansen Co-integration test to examine the relationship between the variables used. The results of the unit root test suggest that all the variables were non-stationary at level form, but became stationary after first differencing. Both the Trace and the Maximum Eigen-value tests of the Johansen co-integration test show that there is at least one co-integrating equation among the variables.

This, therefore, implies that the variables are co-integrated. In other words, there appears to be a long term relationship among the variables. The regression results also reveal that timber export plays significant role in the economic growth of Nigeria, as it contributes significantly to the gross domestic product of the country.

In view of this, it is recommended that policies aimed at adequately financing the forestry sector, which produces the timber for export, must be adequately formulated and implemented by the government of Nigeria so as to increase timber output, availability

and quality for sustainable timber export. In addition, policies towards diversifying the economy of the country as well as improving the performance of the non-oil sector of the economy, especially, the forestry

sub-sector must be sincerely implemented by the government so as to save the country from the current economic challenges resulting from over dependence on oil.

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