

## Trade Openness and Transport Sector Output Growth in Nigeria (1986-2016)

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### Abstract

This study investigated the relationship between trade openness and performance of the transportation sub-sector in Nigeria from 1986 to 2016. Specifically, the impacts of trade openness, exchange rate, foreign direct investments (FDI) and export-import ratio on transportation GDP was examined. The data required were collected from Central bank of Nigeria Statistical Bulletin and World Bank World Development Indicators. The Ordinary Least Squares (OLS), Augmented Dickey-Fuller test, Johansen test and error correction model were applied in analyzing the data. The unit root test results show that all the variables are first difference stationary. Thus, they are considered to be integrated of order one [I(1)]. The outcome of the Johansen cointegration test results show evidence of three cointegrating equations for the trace statistics and two cointegrating equations for the Max-Eigen statistics, indicating that the series have long run relationship. The OLS regression result indicates that the performance of the transportation sub-sector is negatively influenced by the degree of openness, but significantly enhanced by changes in exchange rate and export-import ratio. The dynamic parsimonious ECM reveal that the current and one period lag of trade openness are negatively related to transportation GDP. A unit increase in the degree of openness contracts transportation GDP by 2.14 units. The result also reveals that performance of the transport sub-sector is adversely affected by exchange rate volatility. Increase in exchange rate (lagged for one period), on the average, reduced transportation GDP by 2.79 units. However, the results further revealed that FDI and export-import ratio are statistically insignificant in influencing Transportation GDP. The model also shows evidence of a convergence speed to the tune of 30.52 percent, indicating that in the long period, the short run disequilibrium positions in the system can be reconciled. Owing to the findings, policy makers should ensure that the policy of trade openness offers opportunities required for the turnaround of the transportation sub-sector.

**Keywords:** *Trade openness, Transportation GDP, Exchange rate, FDI*

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### **Background to the Study**

Trade openness is a process of reducing or removing restrictions on international trade. This may take the form of removal or reduction of tariffs, abolition or enlargement of import quotas, abolition of multiple exchange rates and removal of requirements for administrative permits for imports or allocation of foreign exchange. In recent years, liberalization of transportation has not only attracted growing attention but is being viewed as the vehicle for growth and equity in the economy. By expanding markets and removing distortions caused by high levels of protection in transportation, global trade will not only facilitate competition but spur growth in an area that is directly linked to poverty and hunger.

World Bank estimated that more rapid growth associated with a global reduction in trade protection could reduce the number of people living in poverty by as much as 13% in 2015. In simple words, 300 million persons could be pulled out of poverty (Bhaskar, 2005).

According to Oni and Okanlanwon (2006) transport is the cornerstone of civilization. As the society and economic organizations become complex, the relevance of transport grows. Due to trade liberalization, there has been a massive expansion in the growth of world trade relative to world output. While world output (GDP) has expanded five folds, the volume of world trade has grown 16 times at average compound rate just over 7% per annum. More so, it is difficult to understand the growth and development process of countries without references to their trading performance (Third wall, 2000).

Furthermore, countries with high trade performance have recorded higher rates of GDP growth than others. In view of the above, it is obvious that trade is very essential in promoting and sustaining the growth and development of an economy. No country can isolate itself from trading with the rest of the world because trade act as a catalyst of growth. Hence Nigeria, being part of the world, is no exception. This is why we need to examine the nature of the relationship between trade openness and Transport output growth in Nigeria.

### **Statement of the Problem**

The contribution of transportation to the Nigerian economic growth is low with a Gross domestic product share of 3% (NBS, 2010). Nigerian Transport is classified into four basic categories, namely, Rail, Roads, Water and Air transport. Economic transformation and indeed, the development of any country are hardly possible without an efficient transport system (Salim, 2003; Linguitiene; 2006). An anatomy of the Nigerian transport system shows that the system is bedeviled by inefficiencies and lack of good transport network and low rate of economic growth (GDP), in addition to this, the poor government policy on transportation have succeeded in trimming down the transport system in Nigeria which have a negative effect on the economic growth.

With the adoption of the IMF/World Bank structural adjustment programme (SAP) in 1986, there was a shift from inward-oriented trade policies to outward-oriented trade policies in Nigeria. The primary aim of the programme was to restructure and diversify the productive base of the economy. In addition SAP was also designed to establish a realistic and sustainable

exchange rate for the naira through trade and payment liberalization, tariff reforms, commercialization and privatization of public enterprises etc. (Oyejide, 1990).

Today, in order to flow with the trend of globalization and trade liberalization in global economic system, Nigeria is a member of and signatory to many international and regional trade agreements such as International Monetary Fund (IMF), World Trade Organization (WTO), Economic Community of West African States (ECOWAS), and so many others. The policy response of such economic partnership on trade has been to remove trade barriers, reduce tariffs and embark on outward – oriented trade policies. Despite all her efforts to meet up with the demands of those economic partnerships in terms of opening up her border, The economy has struggled vigorously to stimulate growth through openness to trade. In fact, it appears that as the country makes conscious effort to boast her economic growth by opening up to trade with the global economy the more she becomes worse-off relative to her trading partners in terms of country output growth. Based on the above challenges, the study answers the following research questions: What are the effects of degree of openness on Transport sector output in Nigeria? Has exchange rate impacted the Transport sector output as a result of trade openness in Nigeria? What is the impact of foreign direct investment on Transport sector as a result of Trade openness in Nigeria? What is the impact of Export-Import ratio on Transport sector as a result of Trade openness?.

### **Objective of the Study**

The broad objective of this study is to ascertain the effects of Trade openness on Transport sector output growth in Nigeria.

### **Literature Review**

#### **Theoretical Framework**

The doctrine that trade enhances welfare and growth dates back to Adam Smith (1723-90). In his famous book, an inquiry into the nature and causes of the wealth of nations (1776), Smith stressed the importance of trade as a vent for surplus production and as a means of widening the market thereby improving the division of labor and the level of productivity. We may summarize the absolute advantage trade theory of Adam Smith, thus, countries should specialize in and export those commodities in which they had an absolute advantage and should import those commodities in which the trading partner had an absolute advantage. That is to say, each country should export those commodities it produced more efficiently because the absolute labour required per unit was less than that of the prospective trading partners. (Appleyard and Field, 1998).

The Smithian trade theory generated a lot of arguments. This led David Ricardo (1772-1823) to develop the theory of comparative advantage and showed rigorously in his principles of political economy and taxation (1817) that on the assumptions of perfect competition and the full employment of resources, countries can reap welfare gains by specializing in the production of those goods with the lowest opportunity cost over domestic demand, provided that the international rate of exchange between commodities lies between the domestic opportunity cost ratios. These are essentially static gains that arise from the reallocation of resources from

one sector to another as increased specialization, based on comparative advantage, takes place. The static gains from trade stem from the basic fact that countries are differently endowed with resources and because of this the opportunity cost of producing products varies from country to country. The law of comparative advantage states that countries will benefit if they specialize in the production of those goods for which the opportunity cost is low and exchange those goods for other goods, the opportunity cost of which is higher.

Heckscher-Ohlin theory seeks to explain the pattern of international trade as determined by the relative factor of production existing in countries. This theory postulates that, trade arises from differences in comparative costs which in turn arise from inter-country differences in relative factor endowments means that countries should make use of locally abundant factors to produce export goods and import goods that are locally scarce. By implication the emphasis of this theory is that countries should rely on factor endowment. This links international trade to the international movement of labour and capital. The theory is based on the following assumptions (i) there are no transport costs and impediment to trade. (ii) there is also perfect competition in commodity and factor market, (iii) all production function are homogeneous of the first degree. (iv) The production function differ between commodities but are the same in both countries. It is the belief of many economists that Heckscher-Ohlin model is an improvement on the Ricardian theory of comparative advantage (Jhingnn, 2006).

The Ricardian and Heckscher-Ohlin theories are based on the assumption that technology is the same in all trading countries, as such, they do not analyse the effect of technological change on trade. According to (Posner, 1961) the effect of technology on trade is manifested in the continuous process by which technological changes influences the pattern of international trade. A technological innovation in the form of production of a new good in one country leads to the imitation gap and the demand gap in the other country. The extent to which trade will take place between the two countries depends on the net effect of the demand lag and the imitation gap. The imitation gap theory explains the sequence of innovation and imitation but as it affects the pattern of trade when a firm innovates in the form of a new product which becomes profitable in the domestic market, it enjoys a temporary monopoly. As it exports the product to foreign market and has an absolute advantage in this product. After some time, the profit of the innovating firm encourages imitation in the other country. But it will continue to export the product and have a comparative advantage in its production till the importing country learns the new process, change plant, equipment, etc in order to produce it, this is the imitation gap.

According to (Posner, 1961) the imitation gap has three components. The first is the “foreign reactions lag” which is the time taken by the innovating firm to start the production of the new product. The second is the “domestic reaction lag” which is the time taken by other domestic producers to follow suit and establish a hold on the domestic market. The third is the “learning period” which is the time taken by domestic producers to master the technique of producing the new product and selling it in the domestic market. These three components together form the imitation lag. Therefore, in this study we adopted as our theoretical framework the Smithian theory of Absolute advantage, the Ricardian theory of Comparative advantage and the

Heckscher-Ohlin trade theory. These provided explanations as to the patterns of international trade and how countries benefit from trade.

### **Conceptual Literature**

#### **Concept of Trade Openness**

“Openness” refers to the degree of dependence of an economy on international trade and financial flows. Trade openness measures the international competitiveness of a country in the global market. Thus, we may talk of trade openness and financial openness. Trade openness is often measured by the ratio of import to GDP or alternatively, the ratio of trade to GDP. It is now generally accepted that an increase in openness with respect to both trade and capital flows will be beneficial to a country. Increased openness facilitates greater integration into global markets. Integration and globalization are beneficial to developing countries although there are also some potential risks. (Iyoha and Oriakhi, 2002). Trade openness is interpreted to include import and export taxes, as well as explicit non tariff distortions of trade or in varying degrees of broadness to cover such matters as exchange-rate policies, domestic taxes and subsidies, competition and other regulatory policies, education policies, the nature of the legal system, the form of government, and the general nature of institution and culture (Baldwin, 2002).

Trade liberalization according to the protagonists is economic integration for global output expansion, in that, with market liberalization, investment funds can move unimpeded from industrialized countries to developing countries where they are most needed. Consumers can also benefit from cheaper products because reduced tariffs make goods produced from hi-tech industrialized countries cheaper to buy. In the same vein, producers of goods gain by selling to a wider market, while countries will benefit by gaining access to modern technology, negotiate for multilateral and/or bilateral trade (Ayodamola, 1997). While antagonists argue that trade liberalization is a conscious effort by the western world to deliberately force some of their economic policies that may not be favorable to the receiving economy with the aim of perpetually contributing to the under-development of the less developed countries. It is seen as another form of post-colonialism strategy which does not promote self-reliance, self-determination and indigenization (Ojoh, 2005).

They also argued that the success of most developed nations is through protectionism and subsidies and not because of free trade (Ha-Joon, 2007). It is on this point of view that trade liberalization is defined as integration toward unified economic system dominated by supra-national countries and institutions that are not accountable to democratic processes or national governments (Richard, 2000). In addition, further reasons for the changing perception of liberalization are thus, the lack of tangible benefits to most developing countries from opening their economies, despite the well publicized claims of export and income gains which antagonists argue that it is even lesser than economic losses and social disorder rapid trade liberalization has caused many developing countries; they also argue that trade liberalization has led to growing inequalities of wealth, technology, decreasing opportunities both in home and the international community, and the perception that environmental, social and cultural problems have been worsened by the workings of free trade economy (Aja, 1998).

### **Overview of the Transport Sector in Nigeria**

Transport system is classified into four basic categories, namely, Rail, Road, Water and Air transport. The share of transport in the gross domestic product (GDP) is in the neighborhood of 3 percent. . Economic transformation and indeed, the development of any country are hardly possible without an efficient transport system Salim (2003) and Linguitiene (2006). Transportation is an essential part of economic development. It is one of the indices for measuring the development of a country. Nigeria's rural transport structure has been identified as a crucial component for the economic development of the country by linking the rural communities to the urban areas FGN (2007).

One of the key factors that play a pivotal role in a countries economic growth is the presence of a reliable and efficient transportation system and this is because a well-developed transportation system provides adequate access to the country which in turn is a necessary condition for the efficient operation of manufacturing, agriculture, retailing etc. An anatomy of the Nigerian transport system shows that the system is bedeviled by inefficiencies and lack of good transport network and low rate of economic growth (GDP), in addition to this, the poor government policy on transportation (lack of regulation of fees charged by private transporters, inadequate fuel, lack of spare parts, and above all the prevalence of bad roads and lack of security) have succeeded in trimming down the transport system in Nigeria which have a negative effect on the economic growth.

According to Oni and Okanlanwon transport is the cornerstone of civilization. As the society and economic organizations become complex, the relevance of transport grows. Thus, a good transport system is essential to support economic growth and development. Since the attainment of independence in 1960, the problems of Nigerian transport system include bad roads, inadequate fleets of buses or trucks, irregular, inadequate and overcrowded trains and airplanes and congested ports.

### **Empirical Literature**

Calderon, Loayza, and Schmidt –Hebbel (2004) interact in their panel growth regressions a measure of openness (volume of trade /GDP) with linear and quadratic terms of GDP per capita, which they regard as proxy for overall development. They find that the growth effect of trade opening is nearly zero for low levels of per capita GDP, increases at a decreasing rate as income rises, and reaches a maximum at high levels of income.

Chang, Kaltani and Loayza (2005) study how the effect of trade openness on economic growth depends on complementary reforms that help a country take advantage of international competition. They presented some panel evidence on how the growth effect of openness depends on a variety of structural characteristics. They use non-linear growth regression specification that interacts a proxy of trade openness with proxies of educational investment, financial depth, inflation, stabilization, public infrastructure, governance, labour-market flexibility, ease of firm entry, and ease of firm exit. They find that the growth effects of openness are positive and economically significant if certain complementary reforms are undertaken.

Giles and Stroomer (2005) developed flexible techniques for measuring the speed of output convergence between countries when such convergence may be of an unknown non-linear form. They then calculate these convergence speeds for various countries, in terms of half-lives, using a time-series data-set for 88 countries. These calculations are based on both non parametric kernel regression and 'fuzzy' regression and the results are compared with more restrictive estimates based on the assumption of linear convergence. The calculated half-lives are regressed, again in various flexible ways, on cross-section data for the degree of openness to trade. They find evidence that favors the hypothesis that increased trade openness is associated with a faster rate of convergence in output between countries.

Joffrey (2003) in his work, tries to clarify a number of issues related to the “trade openness and growth debate”. He considers a number of sector specialization indicators and examine whether they indeed affect the link between openness and growth. Using both cross-section and panel data techniques, he finds that both its pattern are likely to affect significantly the link between openness and growth.

On research studies that relate to Africa and Nigeria in specific, Sarkar (2007) examines the relationship between openness (trade-GDP ratio) and growth. The cross-country panel data analysis of a sample 51 countries of the South during 1981-2002 shows that for only 11 rich and highly trade-dependent countries a higher real growth is associated with a higher trade share. Time series study of individual country experiences shows that the majority of the countries covered in the sample including the East Asian countries experienced no positive long-term relationship between openness and growth during 1961-2002. He finds that the experience of various regions and groups shows that only the middle income group exhibited a positive long-term relationship.

Also, Baliamoune-Lutz and Ndikumana (2007) explore the argument that one of the causes of the limited growth effects of trade openness in Africa maybe the weakness of institutions. They also control for several major factors and, in particular, for export diversification, using a newly developed data set on Africa. Results from Arellano-Bond GMM estimations on panel data from African countries show that institutions play an important role in enhancing the growth effects of trade. They find that the joint effect of institutions and trade has U-shape, suggesting that as openness to trade reaches high levels, institution play a critical role in harnessing the trade-led engine of growth. The results from this paper are informative about the missing link between trade liberalization and growth in the case of African countries. Likewise, Ogujiuba, Oji and Adenuga (2004) test the validity of trade openness for Nigeria's long-run growth using a co-integration approach. They used the VAR approach and their econometric results show that there is no significant relationship between openness and economic growth, and that unbridled openness could have deleterious implications for growth of local industries, the real sector and government revenue.

Kandiero and Chitiga (2003) investigate the impact of openness to trade on the FDI inflow to Africa. Specifically, in addition to economy wide trade openness, they analyze the impact on FDI of openness and manufactured goods, primary commodities and services. The empirical

work is conducted using cross-country data comprising of African countries observed over four periods: 1980-1985, 1985-1990, 1990-1995, and 1995-2001, they find that FDI to GDP ratio responds well to increased openness in the whole economy and in the services sector in particular.

Adubi, and Okunmadewa, (1999) researched on Price, exchange rate volatility and Nigeria's agricultural trade flows using EVAR. The study was able to establish that exchange rate volatility has a negative effect on agricultural exports, while price volatility has a positive effect. Thus, the more volatile the exchange rate changes, the lower the income earnings of farmers, which subsequently also leads to a decline in output production and a reduction in export trade. However, price volatility exerts a positive effect on the level of exports. Also an appreciation of the local currency decreases export earnings, while an increase in export price influences the level of exports positively. The implication is that if the exchange rate change is more volatile, it tends to increase the prices of export crops, but the general effect leads to a decline in export production. Furthermore, the study also established the efficacy of price increase as a tool for increasing output of export crops. For import trade, the appreciation of the exchange rate reduces imports, while its volatility has a positive effect. If the exchange rate and import prices are volatile, they tend to increase the level of imports. The study has also shown that the SAP era, though beneficial in terms of price increases of agricultural exports, has also resulted in a high level of price and exchange rate fluctuations.

### **Research Methodology**

The study which is time series based adopted the quasi experimental research design. Data from central bank and National bureau of statistics were utilized. The data covered the period from 1986-2016. The data includes those on Transport sector output, degree of openness (measured as trade – GDP ratio i.e (import +export)/GDP), Exchange Rate, Foreign Direct Investment and Export-Import Ratio.

The study adopted the analytical method of ordinary least squares (OLS) of multiple regression. In applying this method, we quantified the relationship and assumptions that show the interrelationship of the economic variables in the model. Other methods employed included; Unit root test, co-integration tests and error correction model.

### **Description of Variables in the Model**

1. **Transport Sector Gross Domestic Product:** This is the total value of services rendered by the Transport sector in a country in a particular year. It is a dependent variable in the model.
2. **Degree of Openness:** This is the measure of the extent to which an economy depends on trade with other Countries or regions that is the ratio of the sum of imports and exports to gross domestic product. It measures the international competitiveness of the economy in the global market it is an internal shock to the economy. It is expected to be positive. It is an independent variable
3. **Exchange Rate:** This is the rate at which a domestic currency is being exchanged with the currency of another country. It is an external shock to the economy. It is expected to be negative. It is an independent variable.



4. **Foreign Direct Investment:** This is an investment in the form of a controlling ownership in a business in one country by foreign nationals and companies/entities based in another country. It is expected to be positive. It is an independent variable
5. **Export - Import Ratio:** This is the ratio of export to import in the Economy. It is expected to be positive. It is an independent variable.

**Model Specification**

The model is specified thus:

$$TGDP = F(DOP, EXR, FDI, EIR).....(1)$$

The mathematical form of the model can be expressed as:

$$TGDP = B_0 + B_1DOP, B_2EXR, B_3FDI, B_4 EIR.....(2)$$

But equation (iic) above is exact or deterministic in nature. In order to allow for the inexact relationship among the variables as in the case of most variables stochastic error term “U” is added to the equation. Thus we can express the econometric form of the model as:

$$TGDP = B_0 + B_1DOP, + B_2EXR + B_3FDI, + B_4 EIR + U_i.....(3)$$

Where

TGDP =Transportation sector gross domestic product which will be used as a proxy or Transport sector output,

DOP = Degree of openness measured as Trade-GDP ratio i.e (import + export-Trade/GDP),

EXR = Exchange rate, FDI = Foreign direct investment,

EIR = Export-import ratio proxied by terms of trade

In equation (3) Bo stands for constant of the equation, B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub> and B<sub>4</sub> coefficients of: DOP, EXR, FDI and EIR while U<sub>i</sub> is the stochastic or random or error term.

**Results and Discussion**

**Descriptive Statistics of the Series**

The summary statistics comprising the mean, minimum and maximum values and standard deviations of the series are reported in Table 1

**Table 1: Descriptive statistics of the series**

	TGDP	DOP	EXR	FDI	EIR
Mean	370.6668	53.27323	96.15968	3.267370	123.2235
Median	189.9700	57.69000	121.0000	2.801490	92.30000
Maximum	1361.070	81.81000	197.0000	10.83260	225.8800
Minimum	8.170000	21.15000	2.020000	0.650350	43.88000
Std. Dev.	412.2118	15.92639	62.03263	2.281257	64.78630
Observations	31	31	31	31	31

**Source:** Author's computation

A cursory look at the results in Table 4.1 reveals that the transportation GDP averaged ₦370.67 billion during 1986-2016. The result also shows that the averaged values of degree of openness, exchange rate and FDI are 53.27 %, ₦96.15 per dollar and 3.27 % (as a share of GDP). The mean value of import-export ratio is 123.22. As observed from Table 4.1, transportation GDP fluctuated over the sample period from a minimum value of ₦8.17 billion to a maximum value of ₦1,361.07 billion. Similarly, the degree of openness has minimum value of 21.15% and a maximum value of 81.81%. More importantly, the standard deviation of each of the series shows that the observations for the degree of openness, exchange rate, FDI and export-import ratio clustered around their mean values while that of transportation GDP are divergent from their mean values.

### Stationarity Test

In view of the common problem of time series data as they tend to depict a unit root process, the ADF unit root test process is applied in this study. The results are summarized in Table 4.2

**Table 2: ADF unit root test Results**

S/N	Series	T-stat. at levels	P-value	T-stat. at 1st diff.	P-value	O/I
1	TGDP	2.175	1.000	-5.307	0.012	I(1)
2	DOP	0.516	0.999	-4.411	0.010	I(1)
3	EXR	-2.138	0.5049	-5.839	0.0002	I(1)
4	FDI	-3.521	0.0606	-5.603	0.0005	I(1)
5	EIR	-2.422	0.3613	-6.268	0.0001	I(1)

**Source:** Author's computation

NB: O/I denotes order of integration

The results in Table 2 show that all the variables including transportation GDP have a unit root. In this regard, the null hypothesis of non-stationarity cannot be rejected at levels. Although, these results are not surprising given the common characteristics of time series variables, they suggest that the estimation of the model using Ordinary Least Squares may produce a spurious result. The differencing of the series shows that they are first difference stationary. Thus, the variables are integrated of order one [I (1)] and in accordance with this, the Johansen system of cointegration was applied.

### Cointegration Test

The Johansen system of cointegration was applied in this study and the results are reported at 5 percent level.

**Table 3: Cointegration test Results**

Series: TGDP DOP EXR FDI EIR				
Hypothesized		Trace	0.05	Prob.**
No. of CE(s)	Eigenvalue	Statistic	Critical Value	
None *	0.996926	260.8666	88.80380	0.0000
At most 1 *	0.885994	104.6763	63.87610	0.0000
At most 2 *	0.586697	46.04562	42.91525	0.0235
At most 3	0.473267	22.18914	25.87211	0.1344
At most 4	0.165363	4.880472	12.51798	0.6136
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.996926	156.1904	38.33101	0.0000
At most 1 *	0.885994	58.63064	32.11832	0.0000
At most 2	0.586697	23.85648	25.82321	0.0890
At most 3	0.473267	17.30867	19.38704	0.0977
At most 4	0.165363	4.880472	12.51798	0.6136

**Source:** Estimated by the researcher using E-views 9.

**Note:** r represents number of cointegrating vectors, k shows the number of lags in unrestricted cointegration test while \* denotes rejection of null hypothesis at 5 percent level.

As observed from Table 3, the Trace statistics indicate that three cointegrating equations exist in the model while Max-Eigen statistics show evidence of two cointegrating equations. These results are promising as they indicate that the series have long run relationship and can be expressed as an ECM in line with the Engel and Granger proposition.

### Static Regression Model

The static regression model was estimated using the OLS technique following its characteristics of best linear unbiased estimator. The results are showed in Table 4

**Table 4: Static regression results**

Dependent Variable: TGDP				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DOP	-7.984292	1.604207	-4.977094	0.0000
EXR	3.148762	0.623274	5.051975	0.0000
FDI	2.256235	10.60301	0.212792	0.8331
EIR	2.697143	0.627176	4.300454	0.0002
C	153.5082	111.3442	1.378682	0.1797
R-squared	0.933170	Mean dependent var		370.6668
Adjusted R-squared	0.922889	S.D. dependent var		412.2118
Log likelihood	-188.2096	Hannan-Quinn criter.		12.54053
F-statistic	90.76179	Durbin-Watson stat		1.050896
Prob(F-statistic)	0.000000			

**Source:** Author's computation

Table 4 shows the static regression results. It was observed that the performance of the transportation sub-sector is negatively influenced by the degree of openness, but significant enhanced by changes in exchange rate and export-import ratio. It was also found from the F-statistic (90.76) that the regressors are collectively important in explaining the systematic variables in transportation GDP. Although the model shows evidence of high explanatory power, the Durbin-Watson statistics indicates that it is serially correlated at 5 percent level and as such may not be reliable for forecast.

### Error Correction Model

The ECM was estimated based on the general-to-specific framework. The results are expressed in the parsimonious form in Table 5.

**Table 5: Parsimonious ECM**

Dependent Variable: D(TGDP)				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TGDP(-1))	0.523456	0.239574	2.184943	0.0432
D(DOP)	-2.148074	0.983761	-2.183532	0.0433
D(DOP(-1))	0.941326	1.032688	0.911530	0.3748
D(DOP(-2))	-0.964735	0.880668	-1.095458	0.2886
D(EXR)	1.406789	0.935507	1.503772	0.1510
D(EXR(-1))	-2.797847	0.875742	-3.194829	0.0053
D(FDI)	3.145001	4.299717	0.731444	0.4745
D(FDI(-1))	-8.028483	4.262786	-1.883389	0.0769
D(EIR(-1))	-0.626173	0.571057	-1.096516	0.2881
ECM(-1)	-0.305234	0.130924	-2.331386	0.0323
C	31.02073	16.84123	1.841951	0.0830
R-squared	0.645264	Mean dependent var		42.66464
Adjusted R-squared	0.436596	S.D. dependent var		60.91594
F-statistic	3.092302	Durbin-Watson stat		1.494385
Prob(F-statistic)	0.019668			

**Source:** Author's computation

The dynamic short run behaviors of the variables indicate that the contemporaneous values of trade openness is negatively related to transportation GDP. A unit increase in the degree of openness contracts transportation GDP by 2.14 units. This finding agrees with the long run behavior observed from the static model and suggests that the inflows of automobiles associated with openness to trade has somewhat harmful effect on the home grown automobile and transportation services. The result also reveals that performance of manufacturing sub-sector is adversely affected by exchange rate volatility. Increase in exchange rate (lagged for one period), on the average, reduced transportation GDP by 2.79 units. However, the results further revealed that FDI and export-import ratio are statistically insignificant in influencing Transportation GDP. The probability value (0.0196) of the F-statistic reveals that the regressors are jointly significant. The model also shows evidence of a convergence speed to the tune of 30.52 percent, indicating that in the long period, the short run disequilibrium positions

in the system can be reconciled. It is also clear from the R-squared (0.64) that the observations clustered round the regression line at 64 percent. Hence, the model is well fitted.

### Model Diagnostics Tests

The diagnostics tests for the parsimonious ECM are summarized in Table 6

**Table 6: Diagnostics test results**

Test type	Test stat.	P-value
Serial correlation test (Breush-Godfrey LM test)	X <sup>2</sup> -statistics	0.643
Heteroscedasticity test (Breusch-Pagan-Godfrey test)	X <sup>2</sup> -statistics	0.073
Normality test	Jarque-Bera stat	0.091

**Source:** Author's computation

The results reveal that model is residuals are normally distributed, uncorrelated and homoscedastic. These findings are promising and suggest that forecasts and policy prescriptions based on the findings are reliable.

### Conclusion and Recommendation

This study explored the effectiveness of trade openness on the performance of the transportation sub-sector in Nigeria. The result showed those trade openness and exchange rates are negatively related to transportation GDP while FDI and export-import ratio exert insignificant influence on transportation GDP. It is therefore, concluded that the transportation sub-sector has not benefit from the trade integration associated with the globalization of the Nigerian economy. Owing to the findings, policy makers should ensure that the policy of trade openness offers opportunities required for the turnaround of the transportation sub-sector.

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