Gravity Model Analysis of Nigeria's Bilateral Seaborne Import Trade with China, India and the United States of America

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ABSTRACT

The quantum and direction of a national foreign trade transaction is generally viewed as a major determinant of the extent of growth and development of the nation in terms of Gross Domestic Product (GDP). The study analyzed the bilateral seaborne import trade between Nigeria and China, Nigeria and the United States, and Nigeria and India using a variant of the Gravity Model of trade by incorporating the population of trading partners, real exchange rate, prevailing freight rates, and spot rates into the original variables of the gravity model, which explain the volume of bilateral trade between the two countries as a function of distance factors and economic size. Secondary data were obtained and used for this study. The results of the study show that the size of the Nigerian economy measured by GDPhas a significant influence on the value of Nigeria's bilateral import shipping trade with the U.S.A., China, and India over the period covered in the study. The findings of the study indicate, among other things, a unit increase in the container TEU transport cost for importsfrom the United States and a unit increase in the U.S. GDP and a unit increase in Nigeria's bilateral real exchange rate will decrease the value of Nigeria's import trade flow from the U.S.A. by 18.8,383.4units and 10.09 units respectively. The results also show that distance factors consisting of TEU transportation cost and per ton transportation cost for wet bulk cargo, and the internal factors consisting of the size of the Nigerian economy/GDP, local population, and real effective exchange rate of Nigeria, individually have no significant influence on the value of Nigeria's bilateral shipping import trade from the United States. The results provides evidence that increasing trend in the growth of Nigeria's GDP have positive correlation with growth in the values of her bilateral shipping import trade with China, India and the U.S.A. It was recommended that Nigeria's bilateral foreign trade policy be developed to actualize the improvement in the value of Nigeria's balance of trade with bilateral trade partners in line with the rate of change of the internal and external factors that have a significant influence on the direction of trade.

Keywords: Shipping, Import-trade, Gravity-model, Bilateral-trade

1. Introduction

Seaborne trade constitutes more than 80% of global aggregate international trade. Reference [1] views Seaborne trade as the movement of merchandise by vessels between the port of origin, where merchandise is received from the exporter, and the port of destination, where merchandise is claimed bythe importer. The implication is that seaborne trade connects countries, markets, businesses, and people to buy and sell goods globally in international markets. Consignments traded in seaborne trade may comprise commodities of different types and sizes, consisting of both aggregated and disaggregated trade types. The main groups of traded trade types mostly include, but are not limited to, energy trade, agricultural products, metals, forest products, manufactured commodities, and bulk ores. [2; 3].

Shipping import and export trade is acknowledged to develop as a result of the differences in the extent, nature, and level of availability of natural resource endowments in various regions and countries. This implies that while some regions have a competitive advantage in the production of petroleum resources, others have a better competitive advantage in the production of other products, such as manufactured goods. The effect is that a dependency situation arises among countries, giving rise to shipping import and export trade transactions. Maritime transportation and shipping thus serve to eliminate distance barriers by connecting regions for trading and exchange to occur. Following the development of Seaborne trade as aforementioned, it is possible for Coal from Australia, Southern Africa, West Africa and North America to be traded and supplied to production factories in the European Union; grains from North and South America and Australia to be traded and delivered to Europe and the East; Oil from the MiddleEast, Russia, West Africa and South America to be traded and supplied to the manufacturing factories in China and Asia; manufactured Goods in Asia, Europe and China to be traded and supplied to Africa, etc. [3; 1]. The interdependency between the two countries in the trading of commodities produced in the countries by sea and exchange of values in the course of the trading is referred to in the context of this study as bilateral seaborne trade, consisting of shipping import and export trade [4].

There is no doubt that Nigeria's participation in bilateral trade with her major trading partners over the years has contributed majorly to her foreign exchange earnings, employment, volume of domestic trade, and the overall extent of economic development. The seaborne trade contributes to a greater percentage of the (GDP). This represents the total dollar value of all goods and services produced over a specific time period. Available empirical studies seem to agree with public opinion in Nigeria that the Country consistently records an unfavorable balance of trade with its major trade partners over the years. The implication is that the country benefits less from bilateral trade engagement with trading partners than expected. The argument is that an unfavorable trade balance affects Nigeria's economic development variables. Thus, the Country must seek avenues for understanding the directions of its bilateral trade transactions with its trading partners, with a view to developing deep knowledge of the extent of influence of both external and internal trade

factors on its performance. This is to improve the benefits accruable to her from engaging in bilateral trade with major trading partners such as the United States of America (U.S.A), China, and India.

The gravity model of trade offers distance and transportation cost as determinant explanatory variables of the factors that influence the flow of bilateral trade between the two countries. Literature content analysis reveals that both external and internal factors, such as populations of each of the two trading regions, real exchange rate prevailing in the countries (trading partners), and size of the GDP of each country, depicting the extent of economic development in conjunction with distance factors and freight transportation cost, have implications on the extent and direction of bilateral trade transactions between trading partners. This means that both external and internal factors influence the direction of the bilateral trade transactions between countries. This subsequently influences the trading partners' balance of trade performance.

Thus, Nigeria cannot overlook the dynamics of external and internal trade factors in the quest to achieve a favorable balance of trade. Unfortunately, available there is a seeming knowledge gap and lack of empirical information on the extent of influence of external and internal factors such population, GDP, real exchange rate, freight rate (transportation cost) and other distance factors on the shipping import trade volume traded between Nigeria her major trade partners consisting of the U.S.A., China and India. This is with a view to providing an understanding of the extent and direction of the influences of these factors and how knowledge can be used to improve Nigeria's bilateral shipping import trade standing with trading partners. These are the challenges that this study seeks to address. Thus, this study aims to analyze Nigeria's bilateral shipping import trade with the aforementioned major using the augmented gravity model. The specific objectives of this study were as follows:

1. To establish the effect of the freight rate on the volume of bilateral shipping import trade between Nigeriaand its major trading partners (China, America, and India).
2. To determine the impact of population size on Nigeria's bilateral shipping import trade with selected major trading partners.
3. To determine the effect of distance on the volume of shipping import trade between Nigeria and its major trading partners.
4. To establish the relationship showing the impact of GDP on the volume of shipping import trade flow between Nigeria and its selected major trading partners (China, America, and India).
5. To establish the impact of the bilateral real exchange rate on the volume of shipping import trade between Nigeria and its major trading partners.

In line with the objectives of the study enumerated above, the study developed the following hypotheses to guide the realization of the study objectives:

There is no significant effect of freight rate on the volume of bilateral shipping import trade between Nigeriaanditsmajor trading partners, which include China, the United States, and India.

1. Population size has no significant impact on Nigeria's bilateral shipping import trade with selected major trading partners.

2. The effect of distance on the volume of shipping import trade between Nigeria and its major trading partners was not significant.
3. GDP has no significant effect on the volume of shipping import trade flow between Nigeria and China, the United States, and India.
4. The bilateral real exchange rate has no significant impact on the volume of the shipping import trade between Nigeria and its major trading partners.

2. Literature Review

Reports by the United Nations Conference on Trade and Development [5] note that by 2014, most developing economies had transitioned from being net exporters to net importers of most traded commodities in global seaborne trade. The study also indicates that by 2017, most developing nations had approximately 400 million tons of commodities traded in global markets, which they originally had a competitive advantage in production, as compared to a surplus of 190 million tons in 2012 [5]. However, these figures vary across countries and continents. For example, while developing economies in Asia and Oceania are gradually improving exports to counter deficits in production that resulted in increasing imports of such commodities, developing economies in America and Africa continue running significant deficits, resulting in increasing trends in imports to close the gaps created by production deficits [5].

The implication is that most developing economies in Africa face the risk of import dependency. This is dangerous for the economy because it hinders the development of the local productive capacity. Consequently, such countries may face difficulties in achieving a favorable balance of trade or trade equilibrium in their bilateral trade transactions. These may affect the development of local production capacity, employment, standard of living, and overall economic development of the affected countries. This underscores the need for an empirical investigation into the external and internal factors that drive the trend of bilateral shipping import trade between trading partners to determine the significant factors and manipulate them in favor of the local economy and achieve equilibrium in the balance of trade.

Studies [6,7,8] agree that the basis for nations to improve their standing on bilateral trade transactions relies on the ability of such nations to develop theories based on empirical knowledge that will help in identifying the determinant external and internal factors that influence the direction of import and export trade. According to (jjj), by manipulating the significant factors that influence the direction of foreign trade to her advantage, a nation can achieve a favorable balance of trade. The lack of this critical information renders developing nations vulnerable to the arms of developed and transition economies that trade with. The available literature suggests that popular and dominant trade theories, such as the theory of absolute advantage, the theory of comparative advantage, the gravity model of trade, and the labor theory of value, provide the basis for understanding the significant determinants of bilateral trade transactions. Adam Smith's absolute advantage theory for example is geared at encouragingand increasing specialization between two nations, where a nation specializes in the productionof the product of its absolute advantage and exchanging part of its output with another nation forthe products of which it has absolute disadvantage model [9].

According to reference [10], the gravity model of international trade states that the volume of trade between two countries is proportional to their economic mass anda measure of their relative trade frictions, and inversely related to their distance from each other. Perhaps because of its intuitive appeal, the gravity model has been the workhorse ofinternational trade for more than 50 years. While initial empirical work using the gravitymodel lacked sound theoretical underpinnings, theoretical developments have highlightedhow a gravity-like specification can be derived from many models with varying assumptionsabout preferences, technology, and market structure. Along with the strengthening of the theoreticalroots of the gravity model, the way it is estimated has also evolved significantly since the new millennium. Depending on the exact regression characteristics, differentmethods should be used to estimate the gravity model [10, 11, 9]. It is important to note that while the gravity model views the volume of bilateral trade between two trading partners as being influenced by the distance between the countries and the size of their economy, it models the influences of distance and the size of the economy measured by the GDP on the bilateral trade volumes between trading partners. It is observed that the distance between trading partners has implications for the transportation cost for shipping per ton or per TEU of trade between the ports of the trading partners. This implies that replacing the distance factor in the gravity model with the transportation cost equivalent for shipping per ton and per TEU of trade between the ports of the trading partners provides the basis for empirically investigating the influence of transportation costs on the volumes of bilateral import shipping trade between trading partners for decision-making purposes. Similarly, the population size and prevailing real exchange rate in an economy have implications for the GDP or output level in the economy. This implies that incorporating population size and the effective bilateral real exchange rate into the gravity model to modify it will provide an understanding of the direction and extent of influence of both external and internal population size and real exchange rates prevailing in the partner countries on the trend of development of bilateral shipping import trade in each partner country.

Studies by Reference [12] reassessed Nigeria’s ocean economy contribution as a strategy for opening new economic frontiers for states adjacent to the coastal region to improve their position and efficiency bilateral trade transactions. Nigeria continues to lag behind in the exploitation of coastal resources and subsequent exports. The country thus continues to import most ocean resources types that it has endowment to produce, thereby failing to achieve a favorable balance of trade or equilibrium in the trading of such commodities with its partners in bilateral trade [12]. The study found that about 90% of the associations exist between the gross domestic product (GDP) of the West African state and GDP. It was found that the offshore oil and gas energy sector had a more significant impact on Nigeria’s GDP, while the other ocean economy business variables had no significant impact. The study recommended the development of empirical knowledge to improve Nigeria’s output of ocean resource types other than oil and gas, in order to limit the importation of those resources from other countries. This is with a view to achieving a favorable balance of trade for the country and improving the local production capacity of those resources that she has endowment to produce [12].

Reference [13] investigated the influence of the TEU container freight ocean transportation cost

from Shanghai port, China, to Lagos seaport in West Africa, and the road haulage cost of TEU container freight from Lagos ports to the hinterland markets in Nigeria on the increasing trend of inflation in the prices of imported commodities. This study employed an ex-post factor research design in which time series secondary data covering a nine (9) year period from 2010 to 2018 was obtained for the TEU container freight ocean transport cost, price inflation rates in the economy, TEU container freight road haulage cost from Lagos seaports to the regional hinterland markets in Kano in the north, Onitsha in the east, and the Alaba international market in the Lagos western region. Cumulatively, the findings indicate that the TEU container freight ocean transport cost and road haulage costs borne by shippers in transporting imports from China through the Lagos seaports to the regional hinterland markets in Nigeria, West Africa, do not significantly influence levels of inflation in commodity prices in the Nigerian economy [13].

Reference [14] studied Turkey's bilateral trade with the European Union. The results and findings of the study reveal that economic size and per capita income are crucial determinants of bilateral trade between trading partners. Studies by [15] agree that these factors determine exports alongside terms of trade. However, studies by references [16,17] justified that foreign direct investment (FDI) has a considerable impact on bilateral trade volumes between trading partners [16,17].

Studies by Reference [18] also found that the economic sizes of trading partners and the distances between trading partners' ports have implications for the shipping connectivity index. Trade resistance factors such as regulations and policies have a considerable influence on bilateral seaborne import and export trade volumes between bilateral trading partners. These findings are supported by studies carried out by [17,18] which found that there exists significant impacts of economic sizes of the trading partners measured by the GDP and the transportation cost on the volumes of bilateral seaborne trade between trading partners.

Sandhu and Kaur [19] conducted a study of India's trade potential with China using a gravity model approach. This study used secondary and regression analysis approaches. The findings of the study reveal that the GDP of both India and China have positive influences on the potential of India's trade with China. This implies that while the trend of Indian and Chinese GDPs is increasing, bilateral trade between India and China witnesses increasing expansion and growth [19].

Busari and Kehinde [20] carried out a study in title "Macro economic variables and Nigeria's agricultural trade flows: A gravity model analysis approach. This study used secondary data on the values of Nigeria's agricultural export and import trade between 1970 and 2019 to investigate the trend of Nigeria's bilateral trade with its major trading partners on agricultural products. A gravity model was used to analyze the data. The findings of the study indicate a declining trend in Nigeria's earnings from agricultural exports to trading partners, while Nigeria's expenditure on agricultural imports increased significantly, resulting in a deficit balance in agricultural trade over the period 1970–2019. In a similar but different study, Chuks, Orubu, and Ezi [21] investigated Nigeria's bilateral trade in goods and services with selected international trading partners, and found that Nigeria faces the risk of a decreasing trend in their export trade volumes with their trading partners.

Finally, Manak and Shivansh [22] conducted a study on India's bilateral trade relations using a gravity model and panel data generated from 45 Indian trading partners. This study aimed to examine the determinants of India's trade with important partners and the potential for expanding trade using the gravity model. It used panel data and 45 countries' data from 1999 to 2018. The results and findings of the study show that partner countries' economic size, as well as India's population and GDP, have a positive influence on bilateral trade, whereas distance has a negative influence [22].

This study is designed to bridge the gap in knowledge of the lack of empirically based knowledge of the influences of both external and internal factors such as trading partner population sizes, bilateral real exchange rates of trading partners, freight rates per ton, and per TEU for shipping between the ports of trading economies, in conjunction with the distance apart and GDP sizes of the economies. It used bilateral trade transactions between Nigerians and their major trading partners, including the U.S.A., China, and India, to implement the investigation.

3. Data and Methods

The analyzed Nigerian shipping import trade and the factors that influence the flow of bilateral shipping import trade between Nigeria and its major trading partners of China, the United States of America, and India. This study used quantitative research design methods. This study used time-series secondary data covering a period of 10 years from 2009 to 2018. Time series data on the values of bilateral shipping import trade between Nigeria and the U.S.A., China, and India between 2009 and 2018 were collected from the Central Bank of Nigeria (CBN) reports. The values of the shipping import trade between Nigeria and the United States, India, and China were used in each case as the dependent variable in the gravity model. The study also obtained data from the CBN and Nigerian Shippers Council (NSC) on:

(1) The Gross Domestic Product (GDP) of Nigeria and each trading partner

(2) The population size of Nigeria and each trading region

(3) The bilateral real exchange rate of Nigeria and each of the trading partner

(4) The distance between the regions/Countries

(5) The container freight rate indicating the cost of transporting per TEU across the regions

(6) The spot charter rate indicates the cost of chartering and/or transporting wet cargo per ton across trading regions.

These were used as explanatory variables in the relationship model. While Nigeria's GDP, population size, and real exchange rate constitute the internal factors that influence its bilateral trade relationship with each of the countries, the GDP, real exchange rate, population, and distance by sea to Nigeria of each of the U.S.A., China, and India, constitute the external factors that influence the value of Nigeria's shipping import trade with partners. Thus, the gravity model of trade was used to analyze the relationship between the dependent and independent variables by incorporating the aforementioned internal and external factors. Using the gravity model approach, the relationship between the dependent and independent variables was modeled to determine the extent of influence

of each explanatory factor in the flow of bilateral trade between Nigeria and China, the United States, and India.

According to Baier and Bergstrand [17], the gravity model provides evidence of the relationship between the distance and magnitude of bilateral trade flow between two countries, regions, and/or domains. The original gravity model suggests that the magnitude of bilateral trade between two trading regions and/or counties (F_{ij}) is directly proportional to the product of their economic size, measured by the Gross Domestic Product (GPD), and inversely proportional to the square of their distance apart (D_{ij}). Starting with the basic gravity model for trade [17] posits the following:

$$F_{ij} = G\, M_i M_j / D^2_{ij} \qquad (1)$$

F_{ij} = spatial interaction induced magnitude of bilateral shipping import trade flow from origin Country (i) todestination Country (j)

G = constant term, M_i = GDP represents the economic size of origin country (i)M_j = GDP representing the economic size of destination country (j).

D_{ij} = distance between two port locations.

Evidently, distance is seen in the above equation to influence the magnitude of bilateral trade flow. Other factors are also known to affect bilateral trade flow, such as transportation costs (freight), population, and the real exchange rate.

According to [19], for econometric applications, it is traditional to specify that general linear Godel (GLM) estimation involves taking the natural log of both sides as shown:

$$In(F_{ij}) = \beta_0 + \beta_1 In(M_i) + \beta_2 In(M_j) - \beta_3 In(D_{ij}) + e_{ij} \qquad (2)$$

Where: e_{ij} = error term.

Where β_0 = constant term, β_1, β_2, β_3 = coefficient of terms.

For the purposes of this study, the transportation cost (freight rate) for shipping per ton and TEU on cargo between the ports of each of the trading partners, the charter rates for shipping bulk trade between the ports are incorporated into the gravity model to augment the distance factors as aforementioned. The population sizes and real exchange rates and the GDP were introduced to augment the economic size of the countries.

Thus, gross domestic product (GDP), population (POP), real bilateral exchange rate (EX_r), distance factor (D), and transportation cost (freight rate) were used as explanatory variables for bilateral shipping trade. The two different variants of transportation cost (freight rate) used in the study are (i) container freight rate for shipping goods between Nigeria and each of the three major trading partners of China, the U.S., and India, measured in US dollars per 20 ft equivalent ($/TEU), and (ii) cost of shipping per ton of Wet bulk cargo between Nigeria and each of the trading partners as identified above measured in US dollars per ton ($/Ton) voyage charter rate. The value of Nigeria's

bilateral shipping imports (IMP_{trade}) with the United States, China, and India was used as the dependent variable in each case.

By incorporating all the factors and using the transportation cost to replace the distance factors, we model the import trade between Nigeria and China as follows:

$$InIMP_{CNtrade} = \beta_0 + \beta_1 In(GDP_C) + \beta_2 In(GDP_N) + \beta_3 In(POP_C) + \beta_4 In(POP_N) + \beta_5 In(CONT_{rate}) + \beta_6 In(SPOT_{rate}) + \beta_7 In(EX_{rc}) + \beta_8 In(EX_{rN}) + e_{ij} \quad (3)$$

Where:

$IMP_{CNtrade}$= Value of shipping import trade flow between China and Nigeria (in naira)

GDP_c = China's Gross Domestic Product ($) as an external factor influencing the trade,

GDP_N = Nigerian GDP in naira as an internal factor influencing the trade,

D_{ij} = Distance between Nigeria and China (in nautical Miles)

PoP_C *and* POP_N = populations in China and Nigeria, respectively.
CON_{Trate} = Container freight rate ($/TEU)
$SPOT_{rate}$ = Transport cost of shipping per ton of wet cargo ($/ton)
EX_r = Real Exchange rate for each country.
β_1, β_2, to $\beta 9$ = Coefficients of terms
β_0= Constant = intercept parameter
In = symbol for natural log transformation.

Similarly, the flow of bilateral import seaborne trade between Nigeria and the U.S. was modeled in line with the gravity model using the equation below:

$$InIMP_{ANtrade} = \beta_0 + \beta_1 InGDP_A + \beta_2 InGDP_N + \beta_3 InPOP_A + \beta_4 InPOP_N + \beta_5 InCONT_{rate} + \beta_6 InSPOT_{rate} + \beta_7 In(EX_{rA} + \beta_8 InEX_{rN} + \beta_3 InD_{ij} + e_{ij} \quad (4)$$

The flow of bilateral shipping import trade between India and Nigeria was modelled similarly.

4. Results and Discussion of Findings

Table1. Characteristics of Bilateral export and import Trade between Nigeria and China

Variable		Import (₦)	GDP_C ($)	$Cont_{rate}$ ($)	Spotrate	P_C (counts)	GDP_N (₦)	P_N (counts)	EX_{rateC} ($)	EX_{rateN} (₦)

Mean		1845249880000.0	9536775000.0	1863.70	60.80	1362078500.0	429795000.00	174487842.7	114.0	108.47
Std Deviation		732431218764.7	2678898109.98	341.64	24.138	21756650.71	79944578059.40	14000139.60	10.426	9.988

Source: Authors calculation from data collected

Table 1 indicates that the average annual value of bilateral import shipping trade from China to Nigeria is 1845249880000.0 naira with a standard deviation of 732431218764.7 naira. The mean economic sizes of China and Nigeria represented by their respective GDPs are 9536775000.0 USD and 429795000 nairas, respectively. The container freight rate and spot rate were used as the transport costs of shipping per TEU and ton of wet bulk cargo between China and Nigeria, respectively, and stand as proxies for the impact of distance on bilateral trade flow between the two countries.The freight rate for shipping per TEU of freight between Nigeria and China is 1863.70 USDwhile the spot rate for shipping per ton of wet bulk cargo between the two Countries is 60.80 USD. Between 2009 and 2018, China and Nigeria had mean populations of 1362078500.0 and 174487842.7, respectively, within a productive age of 18 years and above.

The table below shows the value of bilateral shipping import trade between the United States of America and Nigeria and the external and internal factors that influenced bilateral trade between the two countries between 2009 and 2018.

Table2. Characteristics of Bilateral export and import Trade between Nigeria and the U.S.A, and the Associated Factors that Affect Trade

Variable	Import (₦)	GDP_A (counts)	$Cont_{Rate}$ ($)	$Spot_{rate}$ ($)	P_A (counts)	GDP_N (₦)	P_N (counts)	EX_{rateA} ($)	EX_{rateN} (₦)
Mean	2380176469000	17239311000	3215.0	89.30	317212455.9	429795000.0	174487842.7	104.5	108.47
Std Deviation	5287812182411.7	1995579576.8	279.93	11.89		79944578.05	14000139.6	7.65	9.98

Source: Authors calculation from data collected

Table2 indicates that the average value of import shipping trade from the United States to Nigeria per annum overthe 10 years is 2380176469000.0 naira, with a standard deviation of 5287812182411.7 naira. The mean GDPs of the U.S.A. and Nigeria, depicting the economic size of each country, are 17239311000.0 USD and 429795000 naira, respectively. The transportation costof shipping per TEU and per ton of wet bulk cargo between the two countries, represented by the container freight rate and spot rate, have means of 3215.00/TEU and 89.30/ton, respectively. The U.S. and Nigeria have mean populations of 317212455.90 and 174487842.7, respectively, within the productive age of 18 years and above.

Table3 below shows the average value of the bilateral import shipping trade between India and Nigeria and the external and internal factors that influence the flow of import trade between the two

countries.

Table3: Value of Bilateral Import Trade between Nigeria and India, and the Associated Factors that Affect the Trade

Variable	Import (₦)	GDP_{IN} ($)	$ConT_{rate}$ ($)	$SpoT_{rate}$ ($)	P_{IN} (counts)	GDP_N (₦)	P_N (counts)	EX_{rateIN} ($)	EX_{rateN} (₦)
Mean	537488616000	2063956900	318.7	106.4	1287050718.9	429795000.0	174487842.70	57.87	108.47
Std. Deviation	232644229966.0	379972458.3	103.6	7.76	45229082.48	79944578.05	14000139.6	8.712	9.98

Source:

Table3 shows that the average value of import shipping trade from India to Nigeria per annum between 2009 and 2018 was 537488616000 naira, with a standard deviation of 232644229966.0. The mean gross domestic product (GDP) of India and Nigeria, depicting the economic size of each country, is 2063956900.00 USD and 429795000 naira, respectively. Twenty foot Equivalent Units (TEU) transportation cost and transportation cost per ton of wet bulk cargo between the two regions have means of 3187.0/TEU and 106.4/ton, respectively, over the period covered in the study. India and Nigeria have mean populations of 1287050718.9 and 174487842.7, respectively, within the productive age of 18 years and above between 2009 and 2018.

Figure1 shows the joint presentation and comparison of data on the flow of bilateral export and import trade between Nigeria and the three identified major trading partners: China, the U.S.A., and India.

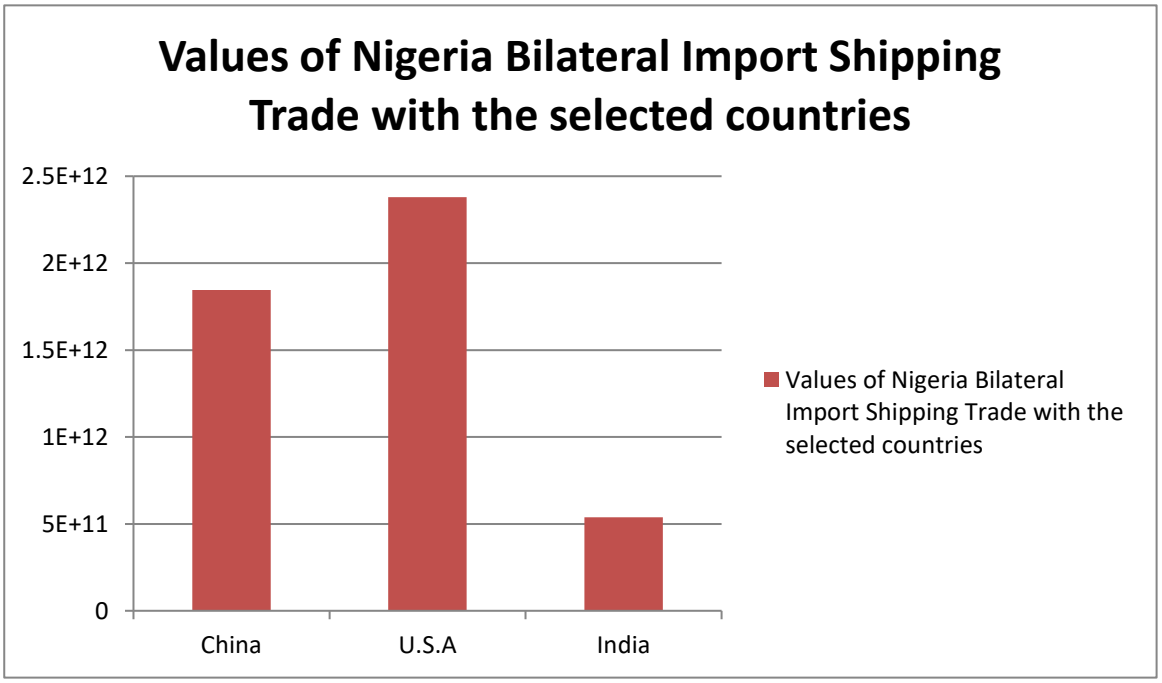

Figure1. Bar chart presentation of the mean values of imports shipping trade flow between Nigeria and the selected trading partners.

Source: Prepared by the author.

Table4. The Relationship between Value of Bilateral Import Trade and factors that influence Nigerian's Import Trade Flow from China

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1.000[a]	1.000	.998	.29142

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	333.335	7	47.619	560.707	.033[b]
	Residual	.085	1	.085		
	Total	333.420	8			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-31539.051	2097.230		-15.038	.042
	InGDPc	-33.489	4.124	-1.632	-8.121	.078
	InCONTrate	6.286	1.051	.191	5.982	.105
	InSPOTrate	4.083	1.654	.117	2.468	.245
	InPc	1475.198	102.796	3.366	14.351	.044
	InGPDn	35.834	2.193	1.073	16.339	.039
	InEXrc	84.500	6.298	1.119	13.416	.047
	InEXrn	-25.295	5.316	-.367	-4.758	.132

Source: Authors' calculations.

Table4 shows the relationship between the value of Nigeria's bilateral shipping import trade and the factors influencing foreign trade between Nigeria and China. The internal factors affecting the value of imports from China such as the Nigerian Gross Domestic Product (GDP), Nigerian population, and real effective exchange rate in Nigeria, have mean natural log (In) values of 19.86, 18.96, and 4.69, respectively.

The relationship between the value of Nigerian seaborne import shipping trade from China based on the gravity model is determined from the coefficient of terms as follows:

$$InIMP_{tradeN\text{-}C} = 31539.1 - 33.49InGDP_C + 6.3InCont_{rate} + 4.8InSpot_{rate} + 1475.2InP_C + 35.8InGDP_N + 84.5InEX_{rC} - 25.3InEX_{rN} + In132P_N \quad (5)$$

The negative coefficient of the size of the Chinese economy measured by GDP implies that a

unit increase in the value of China's GDP as an external factor influencing import trade in Nigeria decreases the flow of Nigeria's bilateral import trade from China by 33.49 dollars. Similarly, a unit increase in Nigeria's real effective exchange rate value leads to a decrease of 25.3 naira in the value of Nigeria's seaborne import trade from China. On the other hand, increasing the Chinese productive population, GDP of Nigeria, and the Chinese real effective exchange ratewill lead to an increase in the value of Nigeria's bilateral import trade flow from China. By implication, increasing transport costs do not lead to a declining value of bilateral import trade flow from China. The significance of the impacts of each of the identified internal and external trade factors on the flow of Nigeria's bilateral import trade from China will be examined in subsequent sessions during the test of the hypotheses.

The R-squared coefficient, showing the explanatory power of the model, was 1.00. The indication is that the identified explanatory factors consisting of internal and external factors explain approximately 100% of the total variations in the value of Nigeria's bilateral import trade flow from China.

Table5. Relationship between Value of Nigerian import trade and factors thatinfluence Nigerian import trade from the United States.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.899[a]	.808	-.539	1.34763

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2706.195	8446.208		-.320	.803
	InGDPA	-38.340	115.090	-4.269	-.333	.795
	InCONTrate	-18.834	21.928	-1.530	-.859	.548
	InSPOTrate	3.235	3.643	.437	.888	.538
	InPA	177.294	576.697	3.703	.307	.810
	InGDPn	13.448	23.672	2.371	.568	.671
	InEXrA	18.204	32.736	1.254	.556	.677
	InEXrN	-10.093	36.854	-.847	-.274	.830

Source: Author's calculation

Table5 indicates that the mean natural log value of Nigeria's import trade (InImp) from the United States over the period covered in this study is 27.7. The size of the U.S. economy, measured by the GDP, the productive population of the U.S.A, real effective exchange rate of the U.S.A, container freight rate/TEU transport cost for shipping from the U.S., and transport cost/spot rate per ton of wet cargo imports from the U.S., which areall external factors affecting the value of Nigeria's import trade from the U.S.A., have mean naturallog values of 23.56, 19.57, 4.64, 8.07, and 4.48 and 4.19,

respectively. The internal factors thataffect the value of Nigeria's seaborne import trade flow from the United States, such as Nigerian GDP, domestic population, and the real effective exchange rate ofthe Nigerian currency, have mean natural log (In) values of 19.86, 18.96, and 4.69, respectively. The relationship between the value of Nigeria's seaborne import trade from the U.S. and the factors that influence bilateral shipping import trade between countries:

$$InIMP_{tradeN\text{-}A} = 2706.2 - 383.4InGDP_A - 18.8InCont_{rate} + 3.24InSpot_{rate} + 177.3InP_A + 13.45InGDP_N + 18.20InEX_{rA} - 10.09InEX_{rN} \quad \textbf{(6)}$$

The negative coefficients of container (TEU) transportation cost, U.S. GDP, and Nigeria bilateral real effective exchange rate indicate that a unit increase in the container TEU transport cost for importsfrom the United States, unit increase in U.S. GDP and a unit increase in Nigeria's bilateral real exchange rate, decreases the value of Nigeria's import trade flow from the U.S.A. by 18.8units, 383.4units and 10.09 units respectively. The findings also reveal that while increase in TEU transport cost decreases the value of Nigeria's import trade flow from the U.S.A, similar increases in transportation cost per ton of wet bulk cargo, increases the value of Nigeria's import trade flow from the U.S.A. by 3.24 units. The implication is that the impact of transportation cost on the flow of import trade from the United States of America is dependenton the trade type. It is trade specific (dependent on whether it is container trade, wet bulktrade, dry bulk trade, roro trade, etc.). The significances of the impacts of each of the identified internal and external factors of trade on the value of shipping import trade from the U.S.A., to Nigeria, will beexamined under the test of hypotheses.

The R square coefficient which measures the explanatory power of the model is 0.808. The indication is that the identified external and internal factor of trade explains about 81% of total variations in the value of Nigeria's seaborne import trade flow from the United States of America.

Table6 . Relationship between Value of Nigerian's Import Trade and Factors that influence Nigerian's Import from India

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.996[a]	.993	.968	.08769

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-736.876	209.310		-3.520	.072
	InGDPIN	12.454	3.043	4.688	4.092	.055
	InCONTrade	-43.777	14.471	-2.930	-3.025	.094
	InSPOtrade	-11.483	4.237	-1.763	-2.710	.113
	InGDPN	-.214	1.121	-.082	-.191	.866
	InPOPN	42.115	11.417	6.889	3.689	.066
	InEXrI	14.992	4.644	4.738	3.228	.084

InEXrN	10.267	3.716	1.931	2.763	.110

Source: Author's calculation

The Table6 above indicates that, the mean natural log value of the Nigeria's import trade (InImp) from India, over the period covered in the study is 26.91. The size of the Indian economy, measured by the GDP, the productive population of India, real effective exchange rate of India, container freight rate/TEU transport cost for shipping imports from India, and transport cost/spot rate per ton of wet cargo imports from India, which are all external factors affecting the flow of imports from India to Nigeria, have mean natural log valuesof 21.42, 20.97, 4.04, 8.06, and 4.66 respectively. The internal factors that affect the value of Nigeria's seaborne import trade flow from India, which include: the Nigerian Gross Domestic Product (GDP), the domestic population, and the bilateral real effective exchange rate of the Nigerian currency, have mean natural log (In) values of 19.86, 18.96 and 4.69 respectively.

The relationship between the Nigeria seaborne export trade flows to India relative to the gravity model of trade is determined from the coefficient of terms as:

$$InIMPtradeN\text{-}IN = -736.88 + 12.45InGDP_{IN} - 43.77InCont_{rate} - 11.48InSpot_{rate} + 42.1InP_{N} - 0.24InGDP_{N} + 14.99InEX_{rIN} + 10.26InEX_{rN} \quad (7)$$

The negative coefficient of the constant term -736.88 also indicate that, the value of Nigeria's seaborne import trade from India, is currently witnessing a decreasing trend in flow. Similarly, the negative coefficients of the TEU transportation cost, per ton transportation cost of wet cargo, and the Nigeria GDP implies that a unit increase in the values of each of the respective variableswill induce respective of 43.7units, 11.48units and 0.24units of decline on the value of Nigeria's seaborne import trade from India. The negative coefficients of the TEU and wet cargo transport cost coefficients for imports from India also indicates that, both trade types and characteristics and regional factors, among others influence the influence of transport cost on magnitude of bilateral trade flows between trading partners.

The significances of the impacts of each of the identified internal and external trade factors on the flow of import trade from India to Nigeria will be examined under the test of hypotheses.

The R square coefficient which measures the explanatory power of the model, was 0.993. The identified explanatory factors consisting of the internal and external factors explain about 99.3% of the total variation in the value of Nigeria's seaborne import trade flow from India.

Table7. The significance of the cumulative influence of the internal and external factors on the value of Nigeria's seaborne import trade from China

R-square	F-cal.	df	F-critical	Sig.: Accept if: F-cal < F-critical
1.000	560.7	8	3.07	560.7>3.07, Reject null hypothesis H_{01b}

Source: Authors Calculation

Since 560.7 > 3.07, the study rejects the null hypothesis and accepts the alternate hypothesis that the cumulative impact of the external, distance, and internal variables identified in the study have a

significant impact on the value of Nigeria's bilateral shipping import trade from China. The R squarevalue of 1.00 supports the f-test, indicates that the external factors consisting of the size of the Chinese economy measured by the GDP, the Chinese population, the bilateral real effective exchange rate of China; the distance factors consisting of the TEU transportation cost and transportation cost per ton of wet bulk cargo between Nigeria and China; and the internal factors consisting of the size of the Nigerian economy measured by the GDP, the Nigerian localpopulation, and the bilateral real effective exchange rate of Nigeria account for about 100% of total variations in Nigeria's import trade from China. The individual significance of the factors on the flow of bilateral import trade from China to Nigeria is tested using t-statistics, as shown in the table below:

Table8. The significances of the impacts of each of Distance, internal and external factors on Nigeria's seaborne import trade from China

Factor)s)	T	df	p-value (sig.)	Significant if: p-value < 0.05
External Factors:				
$InGDP_c$	-8.12	8	0.08	Non-significant
InP_c	14.40	8	0.04	significant
$InCont_{rate}$	5.98	8	0.12	Non-significant
Distance Factors:				
$InSpot_{rate}$	2.47	8	0.25	Non-significant
$InEX_{rC}$	13.42	8	0.04	significant
Internal Factors:				significant
$InGDP_N$	16.42	8	0.04	
InP_N	10.13	8	0.03	significant
$InEX_{rN}$	-4.75	8	0.13	Non-significant

Source: Author's calculation

The results of the study shown in table8 indicates that the economic size of Nigeria measured by GDP, the Chinese bilateral real effective exchange rate, and the Nigerian and Chinese populations, each with p-values less than 0.05, have significant effects on Nigeria's bilateral import trade from China. The size of the Chinese economy, the distance factors of transportation costs, and the Nigerian real effective exchange rate have no significant effects on Nigeria's bilateral import trade from China.

Table9. Significance of the cumulative influence of internal and external factors on thevalue of Nigeria's seaborne import trade from the U.S.A.

R-square	F-cal.	df	F-critical	Sig.: Accept if: F-cal < F-critical
0.808	6.00	8	3.07	Significant, reject H_{02b}

Source: Authors Calculation

The results of the test show that F-cal > F-critical; (6.0 <3.07). The study rejected the null hypothesis that the size of the U.S.A. and Nigeria economy measured by the GDPs, the populations of the regions,

the bilateral real effective exchange rates of the Countries, the TEU, and wet bulk cargo transportation costs, constituting the external, internal, and distance factors that affect bilateral foreign trade between the United States and Nigeria, have no significant effects on the value of Nigeria bilateral import trade from the United States of America. The R square value of 0.808 suggests that the external, internal, and distance factors account for only about 81% of the total variations in the value of Nigeria's seaborne import trade from the United States. See the table below for an assessment of the significance of the influence of the individual variables.

Table10. Significances of the Impacts of the Individual Internal and External factors on Nigeria's Bilateral Import Shipping Trade with the U.S.A.

Factor)s)	t	df	p-value (sig.)	Significant if: p-value < 0.05
External Factors: InGDP$_A$	-0.33	8	0.79	Non-significant
InP$_A$	0.31	8	0.81	Non-significant
InEXr$_A$	0.56	8	0.68	Non-significant
Distance Factors: InCont$_{rate}$	-0.86	8	0.55	Non-significant
InSpotrate	0.89	8	0.54	Non-significant
Internal Factors: InGDP$_N$	0.57	8	0.67	Non-significant
InP$_N$	-	8	-	Non-significant
InEXr$_N$	-0.27	8	0.83	Non-significant

Source; author's calculation

For each set of factors, the p-value was greater than 0.05. that is, p >0.05, for each set of factors. The implication is that, individually, the external factors consisting of the size of the U.S. economy, the U.S. bilateral real effective exchange rate, and the U.S. population do not have a significant influence on the value of Nigeria's bilateral import trade from the United States. Similarly, distance factors consisting of TEU transportation cost and per ton transportation cost for wet bulk cargo, and the internal factors consisting of the size of the Nigerian economy/GDP, local population, and real effective exchange rate have no significant influence on the value of Nigerian bilateral import trade from the United States. The policy implication is that, rather than focusing individually on the factors that affect the flow of exports from Nigeria to the U.S.A., the Ministry of Trade should focus

on all the factors and seek to develop trade policies that improve all the identified factors jointly, for the benefit of the local economy, particularly internal factors that have more direct regulatory power.

Table11. Significance of the cumulative influence of the internal and externalfactors on the value of Nigeria's bilateral seaborne import trade from India

R-square	F-cal.	df	F-critical	Sig.: Accept if: F-cal < F-critical
0.898	14.15	8	3.07	Significant, reject H_{03b}

Source: author's calculation

The results of the test show that F-Cal > F-critical; (14.15<3.07). This study rejects the null hypothesis that the size of the India and Nigeria economies measured by the GDPs, the populations of the regions, the bilateral real effective exchange rates of the Countries, the TEU, and wet bulk cargo transportation costs, constituting the external, internal, and distance factors that affect bilateral foreign trade between India and Nigeria, have no significant effects on the value of Nigeria's bilateral import trade from India. The R square value of 0.898 suggests that the external, internal, and distance factors account for approximately 90% of the total variation in the valueof Nigeria's seaborne import trade from India. See the table below for an assessment of the significance of the influence of the individual variables.

Table12. The individual significances of the impacts of each internal and externalfactor on Nigeria's bilateral seaborne import trade from India

Factor)s)	t	df	p-value (sig.)	Significant if: p-value < 0.05
External Factors: $InGDP_{IN}$	1.71	8	0.19	Non-significant
InP_{IN}	-0.23	8	0.84	Non-significant
$InEX_{rIN}$	1.05	8	0.37	Non-significant
Distance Factors: $InCont_{rate}$	-0.82	8	0.47	Non-significant
$InSpot_{rate}$	-0.52	8	0.64	Non-significant
Internal Factors: $InGDP_{N}$	3.94	8	0.029	significant
InP_{N}	1.36	8	0.27	Non-significant
$InEX_{rN}$	2.70	8	0.11	Non-significant

Source; author's calculation

The test of significance of the impacts of the individual external, internal, and distance factors shows a p-value of 0.02 for the size of the Nigerian economy, as measured by GDP. The p-value was less than an alpha value of 0.05. We reject the null hypothesis and conclude that the size of the Nigerian economy, measured by GDP, has a significant influence on the value of Nigeria's import trade from India over the period covered in the study. Similarly, the remaining set of factors had a p-value greater than 0.05. that is, p >0.05, for each set of factors. The implication is that, individually, each factor with a p-value greater than 0.05, does not have a significant influence on the value of Nigeria's bilateral import trade from India.

5. Discussion of Result and Policy Implications

The findings of this study corroborate those of [16] that the size of the economy of a country measured by GDP is a core internal factor that significantly affects trade with trading partners. The findings of this study indicate that the size of the Nigerian economy measured by GDP has a significant influence on the value of Nigeria's import shipping trade from India over the study period. Similar results were obtained for bilateral trade between Nigeria and the U.S.A., Nigeria, and China. Though the balance of trade is not favorable to Nigeria, the significant influence of the size of the Nigerian economy measured by the GDP on the direction of bilateral import shipping trade between Nigeria and India, the United States, and China implies that Nigeria can leverage the findings of the study to improvethe size of its economy measured by the GDP by encouraging improvement in local productive capacity through proactive investment in productive ventures, thereby limiting imports from foreign countries and improving exports to its trade partners. In the long run, this will lead to an improved balance of trade, economic growth, and development in Nigeria. To improve the benefits accrued to Nigeria from bilateral import shipping trade with India, the U.S.A., China, etc., there is a serious need to focus on the endogenous (internal) factors that affect local production capacity for export with a view to limiting bottlenecks to local production for domestic consumption and export.

Similarly, a result similar to the findings of [23] shows that the bilateral trade between India and Nigeria is significantly influenced by the interaction of a host of external internal and distance factors such as the size of the India and Nigeria economiesmeasured by the GDPs, the populations of the regions, the bilateral real effective exchange rates of the Countries, the TEU, and wet bulk cargo transportation costs, which jointly show significant influence on the direction of the bilateral import shipping trade between the countries. This is similar to the findings of the influence of endogenous, exogenous, and distant factors on bilateral trade between the United States and Nigeria and between Nigeria and China. The policy implication to Nigeria for theimprovement of her balance of trade is that attention should be given to the host of external factors, internal factors, and distance factors so that the country achieves the capacity to manipulate these identified variables of trade to her advantage and improve her balance of trade withits trading partners, which currently is not in her favor.

5.1 Conclusion

The results of the analysis show that the size of the Nigerian economy, measured by GDP,

has a significant influence on the value of Nigeria's bilateral import shipping trade with its major trading partners over the period covered in the study. Hosts of external and internal factors jointly influence the direction of Nigeria's bilateral import shipping trade significantly and must be considered in the decision to develop strategies to achieve equilibrium in the country's bilateral import shipping trade transactions with its partners. However, while the Chinese GDP (economic size) and real effective exchange rate are significant external factors that explain Nigeria's bilateral import trade with China, the GDP and real effective exchange of both the U.S.A and India have no significant influence on the value of Nigeria's bilateral shipping import trade with each of the countries.

The findings also reveal that Nigeria's population is a significant internal factor that explains the value of bilateral shipping import trade with China. However, Nigeria's population has no significant influence on the value of bilateral shipping import trade with the United States and India. This suggests that the extent of the influence of the factors that influence bilateral trade transactions between countries is country dependent. This further suggests that the type of import trade (food, manufactured goods, machinery and tools, raw materials, etc.) that the importing country mostly transacts from the foreign partner may have implications for the volume and value of trade, and subsequently, the influences of the external and internal factors of trade will vary. Thus, the future focus of this study is to investigate how and to what extent the aforementioned external and internal factors of trade influence the values of specific types of shipping import trade from Nigeria's foreign trade partners.

6. Recommendations

It is recommended that:

Nigeria's Ministry of Trade should focus more on all factors that significantly affect the direction of bilateral trade, and develop trade policies to improve all the identified factors, for the benefit of the local economy.

The aggregate of external, internal, and distance factors has a significant influence on the bilateral import shipping trade between Nigeria and India, China, and the United States. Thus, Nigeria's bilateral foreign trade policy should be developed to ensure that it achieves a favorable balance of trade by proactively influencing the level and extent of these identified internal and distant factors that they can influence.

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