



Gravity Model Analysis of Nigeria's Bilateral Trade

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ABSTRACT

The quantum and directions of a nation's foreign trade transaction generally viewed as a major determinants of extent of growth and development of the nation in terms of the gross Domestic Product (GDP). The study analyzed the bilateral export shipping trade between Nigeria and China, Nigeria and U.S.A, and Nigeria and India using augmented Gravity Model of trade flows between nations by incorporating population of the trading partners, real exchange rate, the prevailing freight rates and spot rates into the original variables of the gravity model which explain volume of bilateral trade between two countries as a function of distance factors and the economic size. Secondary data were obtained and used in the study. The augmented Gravity Model was used to analyze the data obtained. The results of the study show that the size of the Nigerian economy measured by the GDP has significant influence on the value of Nigeria's bilateral export shipping trade with the U.S.A, China and India over the period covered in the study. The individual influences of the other distance, external and internal factors of bilateral trade between Nigeria and the selected countries were discussed in the study. The result also shows 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 influences on the value of Nigeria bilateral export shipping trade to the U.S.A, China and India.

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1. Introduction.

Maritime trade is renowned globally as a very dynamic component in the economy and fulcrum that drive economic development of most ocean economies. Nigeria as a maritime nation has huge potentials for economic development due to the very large size of her maritime trade consisting of the seaborne export and import trades, waiting to be tapped. It is important to note that, the development of the ocean trade aspect of the blue economy require empirical information on the quantum of both bilateral seaborne export trade between Nigeria and her major trading partners. The availability of such empirical information is important, if the country must proactively develop her seaborne import and export trade, by taking advantage of her bilateral trade relationships with her major trading partners.

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Recent trend in Trade and economic globalization has led to the decoupling of time and space which in the beginning constitute major barriers to bilateral trade transactions among States, resulting in the death of distance. Seaborne trade has remained a major driver of economic globalization and the impact has been most phenomenal. Developing countries have contributed the largest shares to world exports and imports, but available empirical studies indicate that their has been a decline in recent years while most developing countries in African tend to import more than they export to the global community (UNCTAD, 2017). This declining trend suggest that productive ventures in developing countries is either agrarian and lacked the rudiments and quality to enable the countries concerned to attract foreign buyers and achieve improved earnings from exports. The implications is that while earning from bilateral export trade of most developing countries in West Africa faces declining trend, the countries enjoy no favorable balance of trade or equilibrium trade in their bilateral trade relationships with developed countries, the seaport carry less vessel and trade traffic and they

suffer import dependency challenges. The consequence of this is that socioeconomic development of the affected economies is adversely affected. Reports by the Central Bank of Nigeria (CBN, 2018) reveal that, the United States of America, China, and India remain the dominant trading partners with Nigeria, given the sizes of the values of Nigeria's export and import trade with these Countries. For example, the inability of Nigeria to achieve higher volume of export trade transactions with her major trading partners such as the United States of America, China and India over the years has led to a situation where Nigeria's balance of trade with each of the identified major trade partners suffers. There exists disequilibrium in favour of each of the aforementioned bilateral trade partners who engage in trade with Nigeria. This has led to a situation where most manufactured goods and services in Nigerian markets are imported from overseas due to the lack of local production capacity. This has implications on unemployment rate, per income, purchasing power, the Gross domestic product (GDP), and the overall development of the Nigeria economy.

Following the development of Seaborne trade as aforementioned, it is possible for example, for Coal from Australia, Southern Africa, West Africa and North America to be traded and supplied to production factories in the Europe Union; Grains from North and South America and Australia to be traded and delivered to Europe and the East; Oil from the Middle East, 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. (Nwokedi et al, 2022; Stopford, 1997). The inter-dependency between two countries in the trading of commodities produced in the countries carried 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 import and export shipping trade (Nwokedi, Okoroji and Igboanusi, 2016). Nigeria's economy over the years is adjudged to depend majorly on revenue from exports of raw materials than revenue from local taxes and domestic trade. There is therefore no doubt that the participation of Nigeria in bilateral trade with her major trading partners of U.S.A., China and India over the years has contributed majorly the foreign exchange earnings, employment, development of domestic trade, and the overall extent of development of the Nigerian economy, measured by the Gross Domestic Product (GDP). Exports which contributes a greater percentage of the gross domestic product is one of the primary indicator used to gauge the health of a country's economy. Value of export trade in the context of this study thus represents the total dollar value of all goods and services produced over a specific time period.

However, available empirical studies are in agreement with public opinion in Nigeria that the Country consistently record unfavorable balance of trade with her major trade partners over the years, which implies that she benefits less from her bilateral trade engagements with her trading partners, than expected over the years. The argument is that the unfavorable balance of trade affects Nigeria's variables of economic development and that the country must seek and empirical understanding of the directions of her bilateral trade transactions with a view to

developing deep knowledge of the extent of influences of both external and internal factors of trade, in order to improve the benefits from engaging in bilateral trade with her major trading partners such as the United states of America (U.S.A), China and India. Nigeria's export trade volume and earnings are not enough to enable her achieve equilibrium in her bilateral trade relationships with the U.S.A., China and India, who are her major foreign trade partners.

There appears to be dearth of empirical information on the nature of relationship between Nigeria and her major trading partners, concerning the flow of seaborne export trade. Studies by Nwokedi, Okoroji and Igboanusi (2016) suggest that Nigeria has not benefited maximally from her bilateral trade relationships with the trading partners. According to Nwokedi, Okoroji and Igboanusi (2016), for a Country to benefit maximally from her bilateral foreign trade, it is important that she must proactively harness the internal, external and distance factors affecting her bilateral trade to her advantage; or at least ensure that all internal factors which she has control over, are positively influenced to her advantage. Harnessing the internal factors to the advantage of the country will require that she develops the potentials and capacity to achieve higher volume of export trade and export earnings, in order to achieve trade equilibrium or a favorable balance of trade. This is not the case with Nigeria. Developing an empirical relationship between the flow of Nigeria bilateral export trade and the external, internal and distance factors that influence the trade will provide the basis that will position Nigeria to maximize benefits derivable from such trades.

However, it is important to note that, such empirical information that depict relationship evidencing the interaction between Nigeria's volume cum value of bilateral shipping export trade and the distance factors, internal and external factors that effects bilateral export trade between Nigeria and U.S.A., China and India seems currently unavailable and lacking, in existing empirical literature. Most studies have only considered the economic sizes measured by the GDPs of the trading partners and the distances apart of the trading partners as proposed in the original gravity model of trade. This study therefore seek to overcome the identified problems by introducing transport cost between the ports of the trading partners as a measure of the effects of distance on the volume of export trade between the countries; the real effective exchange rates prevailing in the economies of the two countries and the populations of the two economies to augment the original gravity model which considers only distance and the size of the economy measured by the GDP as the only influencers of bilateral trade. On the above basis, the problem of inadequate empirical basis for maximizing the benefits offered by the bilateral export trade between Nigeria and her major trading partners as identified above can be addressed.

The specific objectives of the research include:

1. To establish the effect of freight rate on the value of seaborne export trade between Nigeria and her major trading partners (China, America and India).
2. To determine the impact of population size on Nigeria's

seaborne export trade with her major trading partners.

3. To ascertain the significance of the effects of distance factors on the value of seaborne trade between Nigeria and her major trading partners.
4. To establish the impact of economic size on the value of shipping export trade flow between Nigeria and her major trading partners of China, America and India.
5. To ascertain influence of bilateral real effective exchange rate on the value of seaborne export trade between Nigeria and her major trading partners namely, China, America and India.

In order to address the aforementioned objectives of the study, the following hypotheses were proposed in line with the objectives of the study:

1. There is no significant effect of freight rate on the value of bilateral export shipping trade between Nigeria and each of U.S.A, China and India.
2. There is no significant impact of population size on the value of Nigeria's bilateral export shipping trade with each of the U.S.A., China and India.
3. Distance factors do not significantly influence the value of export shipping trade between Nigeria and each of U.S.A., China and India.
4. There is no significant impact of economic size on the value of export shipping trade between Nigeria and her major trading partners of China, America and India.
5. The influence of bilateral real effective exchange rate on the value of seaborne export trade between Nigeria and her major trading partners is not significant.

2. Literature Review.

Reports by the United Nations Conference on Trade and Development (UNCTAD, 2017) note that by the year 2014, most developing economies transited from being net exporters into net importers of most traded commodities in global seaborne trade. The study also indicates that by the year 2017, most developing nations had approximately deficits of 400 million tons of commodities traded in the global markets, which they originally had competitive advantage in the production; as compared to a surplus of 190 million tons in the year 2012 (UNCTAD, 2017). These figures however vary in magnitude as we move across the countries and continents. For example, while developing economies in Asia and Oceania are gradually improving the exports to counter deficits in production that resulted to increasing the trend of import of such commodities, developing economies in America and Africa continued running significant deficits resulting to increasing trends in imports in order to close the gaps created by production deficits (UNCTAD, 2017).

The implication is that most developing economies in Africa faces a risk of import dependency which poses danger for the development of local productive capacity. It equally implies that such countries will be faced with difficulty in achieving a favorable balance of trade or trade equilibrium in their bilateral

trade transactions with their trading partners. These may consequently affect the development of the local production capacity, employment, standard of living and the over economic development of the affected countries and continents. This underscores the need for an empirical investigation into the external and internal factors that drive the trend of bilateral shipping import trade between the trading partners in order to determine the significant factors and manipulate it in favour the local economy; to achieve equilibrium in the balance of trade.

Studies by Jean-Francois, et al (2007), Baier and Bergstr (2009), and Schlaich, et al (2020) are in agreement that the basis for nations to improve their standing on bilateral trade transactions with other nations rest of the ability of such nations to develop theories based on empirical knowledge, that will help in identifying the determinant external and internal factor that influence the direction of import and export trade. This according to () is because, by manipulating the significant factors that influence the directions of foreign trade to her advantage, a nation can achieve equilibrium or favorable balance of trade in her bilateral trade engagements with her trading partners. The lack of this critical information renders developing nations vulnerable in the arms of developed and transition economies, which she engages in bilateral trade transactions. This could be disadvantageously dangerous to the developing economies in the development of local production capacity. Thus some trade theories that are form popular and dominant basis for understanding significant determinants of bilateral trade transactions include theory of absolute advantage, theory of comparative advantage, the gravity model of trade, and the labour theory of value, among others. Adam Smith's absolute advantage is geared at encouraging and increasing specialization between two nations, where a nation specializes in the production of the product of its absolute advantage and exchanging part of its output with another nation for the products of which it has absolute disadvantage model (Markusen et al., 1995).

According to Limao et al (2001) the gravity model of international trade states that the volume of trade between two countries is proportional to their economic mass and a 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 model of international trade for more than 50 years. While the initial empirical work using the gravity model lacked sound theoretical underpinnings, the theoretical developments have highlighted how a gravity-like specification can be derived from many models with varying assumptions about preferences, technology, and market structure. Along the strengthening of the theoretical roots of the gravity model, the way in which it is estimated has also evolved significantly since the start of the new millennium. Depending on the exact characteristics of regression, different estimation methods should be used to estimate the gravity model (Markusen et al., 1995; Limao, et al, 2001). It is important to note that while the gravity model view the volume of bilateral trade between two trading partners as being influenced by the distance apart between the countries and the size of their economy, on which basis it models the influences of distance and the size of the economy measured by the GDP on the bi-

lateral trade volumes between trading partners. It is observed that, the distance between the trading partners have implications on the transportation cost for shipping per ton or per TEU of trade between the ports of the trading partners; thus, 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 influences transportation cost on the volumes of bilateral import shipping trade between the trading partners for decision purposes (Nwokedi et al, 2016). In a similarly manner, the population size and the prevailing real exchange rate in an economy have implications on the GDP or output level in the economy. The implication is that incorporating the population size and the effective bilateral real exchange rate into the gravity model to modify it will provide an understanding of the directions and extent of influence of both external and internal population size and real exchange rate prevailing in the countries engaging in bilateral trade on the trend of development of bilateral export shipping trade in each partner country (Nwokedi et al, 2016).

Studies by Onyemehi et al (2017) which reassessed the Nigeria's ocean economy contribution as a strategy for opening new economic frontiers for states adjacent to the coastal region for the improvement of their position in the efficiency bilateral trade transactions found that, Nigeria continue to lag behind in the exploitation of her coastal resources and the subsequent export. The country thus continue to import most ocean resources types that she has endowment to produce, thereby failing to achieve favorable balance of trade or equilibrium in the trading of such commodities with her partners in bilateral trade (Onyemehi et al 2017). The study found that about 90% associations exist between the GDP (gross domestic product) of the West African state and her GDP. It equally found that offshore oil and gas energy sector more significantly impact on the GDP of Nigeria, while the other ocean economy business variables have no significant impacts. The study recommended for the development of empirical knowledge for improving Nigeria's output of other ocean resources 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 her local production capacity of those resources that she has endowment to produce (Onyemehi et al, (2017).

Nwokedi et al (2022) investigated the influence of the TEU container freight ocean transportation cost from Shanghai port, China to Lagos seaport in West African 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 market commodities in the economy. It employed ex-post factor research design in which time series secondary data covering a nine (9) years 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 Alaba international market in the west. The findings indicate that, cumulatively, 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, does not significantly influence levels of inflation in commodity prices in the Nigerian economy (Nwokedi et al, 2022).

Antonucci and Manzcocchi (2006) studied Turkey's bilateral trade with the European Union. The result and findings of the study revealed that economic sizes, per capita income, are crucial determinants of bilateral trade between the trading partners. Studies by Tovonjatorovo and Yinguo (2015) agree that those factors determine export alongside terms of trade. However, studies by Swenson (2004) and Azu and Nasiri (2015) justified that foreign direct investment (FDI) has a considerable Impact on bilateral trade volumes between trading partners (Azu and Nasri, 2015; Swenson, 2004).

Studies by Ajakaiye (2006) also found that the economic sizes of the trading partners, distances between the ports of the trading partner which have implications on the shipping connectivity index, trade resistance factors such as regulations and policies, have considerable influences on volumes bilateral seaborne import and export trade between two countries involved in bilateral trade. This findings are supported by studies carried out by Elawady and Abdulkheir (2015) and Hailu (2015) 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.

In view of the findings and gaps in available empirical studies aforementioned, this study is designed to bridge the gap in knowledge of the lack of empirically based information of influences of both external and internal factors such population sizes of the trading economies, bilateral real exchange rates of the trading economies freight rates per ton and per TEU for shipping between the ports of the trading economies, in conjunction with the distance apart and GDP sizes of the economies. It used the bilateral seaborne export trade transactions between Nigerian and her major trading partners which include the U.S.A., China and India for implementing the investigation.

3. Data and Methods.

The aim of the study is to analyze Nigerians bilateral export shipping trade and the factors that significantly influence the flow of bilateral export shipping trade between Nigeria and the selected major trading partners of China, United States of America and India. The study used quantitative research design methods, involving the use of time series secondary data covering a period of 10 years from 2011 to 2020. Time series data on values of bilateral export shipping trade flow between Nigeria and each of her major trading partners which include U.S.A., China and India, between 2009 and 2020 was collected from the Central Bank of Nigeria (CBN) reports, and used as the dependent variable. The study obtained from the CBN and the Nigerian shippers Council (NSC), time series data on:

(i) The Gross Domestic Product (GDP) of Nigeria and each trading partners.

(ii) The population size of Nigeria and each trading region.

(iii) The bilateral real exchange rate of Nigeria and each of the trading partners.

(iv) The distance between the regions / Countries.

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

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

These were used as explanatory variables or external and internal factors that influence bilateral trade values. The gravity model of trade was thus used to analyze the relationship between the dependent and independent variables by incorporating factors other than distance and GDP as a measure of the economic size of the trading partners. Using the gravity model approach, the relationship between the dependent and independent variables is modeled to determine the level of influences of each explanatory factor on the flow of bilateral trade between Nigeria and each of China, U.S.A, and India. According to Schlaich et al (2020), the gravity model provides evidence of the relationship between distance and the magnitude cum intensity of bilateral trade flow between two Countries, regions and/or domains. The original gravity model suggests that the magnitude of bilateral trade flow 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, Schlaich et al; (2020) posit that:

$$F_{ij} = \beta_0 \left(\frac{M_i M_j}{D_{ij}^2} \right) \quad (1)$$

Where:

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

β_0 = constant term,

M_i = GDP represent economic size of origin Country (i),

M_j = GDP representing economic size of destination Country (j).

D_{ij} = distance between the two ports location.

Evidently, distance is seen from the above equation to influence magnitude of bilateral trade flow, other factors other than distance are also known to affect bilateral trade flow, e.g: transportation cost (freight), population, exchange rate, etc.

According to Baier and Bergstrand (2009), for econometric applications, it is traditional to specify that General Linear Model (GLM) estimation involves taking natural log of both sides as shown:

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

Where: e_{ij} = error term.

Where β_0 = constant term, $\beta_1, \beta_2, \beta_3$ = 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 and the charter rates for shipping

bulk trade between the ports are incorporated into the gravity model to as the distance factors as aforementioned, while the population sizes and real exchange rates were introduced to augment the economic size of the regions measured by the GDP.

Thus the Gross domestic product (GDP), population (POP), Real bilateral exchange rate (EX_r), the distance factors of spot rate and Transportation Cost (freight rate) were used as explanatory factors of the flow of bilateral shipping export between Nigeria and each of U.S.A., China and India. The two different categories 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, U.S.A and India in Dollars per 20foot equivalent (\$/TEU), and (ii) cost of shipping per ton of Wet bulk cargo between Nigeria and each of the trading partners as identified above in Dollars per ton(\$/Ton) voyage charter rate. The value of Nigeria's bilateral shipping export (EXP_{trade}) with each of U.S.A., China, and India was used as the dependent variable in each case.

Incorporating the all the factors, we have model the export trade between Nigeria and China for example as:

$$\begin{aligned} \ln EXP_{CNtrade} = & \beta_0 + \beta_1 \ln GDP_c + \beta_2 \ln GDP_N + \beta_3 \ln P_c \\ & + \beta_4 \ln P_N + \beta_5 \ln CONT_{rate} + \beta_6 \ln SPOT_{rate} \\ & + \beta_7 \ln EX_{rc} + \beta_8 \ln EX_{rN} + e_{ij} \end{aligned} \quad (3)$$

Where:

$EXP_{CNtrade}$ = 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),

P_c and P_N = population of China and Nigeria respectively,

$CONT_{rate}$ = Container freight rate (\$/TEU),

$SPOT_{rate}$ = Transport cost of shipping per ton of wet cargo (\$/ton),

EX_r = Real Exchange rate for each Country.

$\beta_1, \beta_2, \dots, \beta_9$ = Coefficients of terms

β_0 = Constant = intercept parameter

\ln = symbol for natural log transformation.

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

$$\begin{aligned} \ln EXP_{CANtrade} = & \beta_0 + \beta_1 \ln GDP_A + \beta_2 \ln GDP_N \\ & + \beta_3 \ln POP_A + \beta_4 \ln POP_N + \beta_5 \ln CONT_{rate} \\ & + \beta_6 \ln SPOT_{rate} + \beta_7 \ln EX_{rA} + \beta_8 \ln EX_{rN} + e_{ij} \end{aligned} \quad (4)$$

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

4. Results and Discussion of Findings.

Table 1: Characteristics of Bilateral Shipping export Trade between Nigeria and China.

Variable	Export	GDP _C	Contrate	Spotrate	P _C	GDP _N	P _N	EX _{rateC}	EX _{rateN}
Mean	14022072870.0	9536775000.0	1863.7	60.8	1362078500	429795000.0	174487842.7	114.0	108.47
Std Deviation	49421500770.4	2678898109.98	341.63	24.14	21756650.7	79944578059.4	14000139.6	10.427	9.98822

Source: Authors calculation from data collected.

The Table 1 above indicates that the average/mean annual value of bilateral export flow trade from Nigeria to China within the 10 years covered in the study is 14,022,072,870.0 naira with standard deviation of 49421500770.4 naira; and a mean bilateral import trade flow from China to Nigeria of 1,845,249,880,000.0 naira with a standard deviation of 732431218764.7 naira. The mean economic size of each of China and Nigeria represented by their respective GDP are 9,536,775,000.0 USD and 429,795,000 naira. Container freight rate and spot rate were used as the transport costs of shipping per TEU and per ton of wet bulk cargo between China and Nigeria 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 USD while the spot rate for shipping per ton of wet bulk cargo between the two Countries is 60.80 USD. China and Nigeria have mean populations of 1362078500.0 and 174487842.7 persons respectively in the productive age of 18 years and above. See table2 below for presentation of data on the bilateral import and export trade values between the United States of America and Nigeria; and the external and internal factors that influence the flow of bilateral trade between the two Countries.

Table 2: Characteristics of Bilateral export Trade between Nigeria and U.S.A. and the Associated Factors that Affect the Trade.

Variable	Export	GDP _A	Contrate	Spotrate	POP _A	GDP _N	POP _N	EX _{rateA}	EX _{rateN}
Mean	1978540855141.01	17239311000.0	3215	89.3	317212455.9	429795000	174487842.7	104.5	108.5
Std Deviation	949046759257.0	1995579576.88	279.9	11.9		79944578.1	14000139.6	7.7	9.9

Source: Authors calculation from data collected.

Table 2 shows that the average/mean value of annual bilateral export trade flow trade from Nigeria to U.S.A between 2009 and 2018 is 1,978,540,855,141.04 naira with standard deviation of 949046759257.0 naira. The mean value of bilateral import trade flow from U.S.A. to Nigeria over the same period is 2,380,176,469,000.0 naira with a standard deviation of 5287812182411.7 naira. The mean GDP of U.S.A. and Nigeria, depicting the economic size of each of the Countries is 17,239,311,000.0 USD and 429,795,000 naira respectively. The transportation cost of shipping per TEU and per ton of wet bulk cargo between the two regions, represented by the Container freight rate and spot rate have means of 3215.00 / TEU and

89.30/ton respectively over the period covered in the study. The U.S.A and Nigeria have mean populations of 317,212,455.90 and 174,487,842.7 persons respectively, within the productive age of 18 years and above. See Table 3 below for presentation of data on the bilateral import and export trade values between India and Nigeria; and the external and internal factors that influence the flow of bilateral trade between the two Countries.

Table 3: Characteristics of Bilateral Export Trade between Nigeria and India and the Associated Factors that Influence the Trade.

Variable	Export	GDP _N	Contrate	Spotrate	P _N	GDP _N	P _N	EX _{rateN}	EX _{rateN}
Mean	2484415420000.0	2063956900.0	318.0	106.4	1287050718.9	429795000.0	174487842.70	57.87	108.47
Std. Deviation	1367652845698.0	379972458.3	103.6	7.76	45229082.48	79944578.05	14000139.6	8.71	9.98

Source: Author’s calculation.

Table 4: Relationship between the Value of Bilateral Export Trade and Internal, External and Distance Factors that Influence Flow of Nigeria’s Export Trade to China.

	Mean	Std. Deviation	N
InEX	25.5417	.29522	9
InGDPc	22.9071	.31468	9
InCONtrate	7.4876	.19647	9
InSPOTrate	4.1983	.18471	9
InPc	21.0297	.01473	9
InGPDn	19.859	.19338	9
InPn	18.9642	.07789	9
InEXre	4.7472	.08549	9
InEXrn	4.6913	.09364	9

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.960 ^a	.921	.370	.23441

ANOVA ^a						
Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	.642	7	.092	16.70	.0536 ^b
	Residual	.055	1	.055		
	Total	.697	8			

Coefficients ^a						
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	
	B	Std. Error	Beta			
1	(Constant)	1499.815	1686.916		.889	.537
	InGDPc	2.364	3.317	2.520	.713	.606
	InCONtrate	.421	.845	.280	.499	.706
	InSPOTrate	.024	1.331	.015	.018	.988
	InPc	-71.234	82.684	-3.555	-.862	.547
	InGPDn	-1.545	1.764	-1.012	-.876	.542
	InEXre	-1.113	5.066	-.322	-.220	.862
	InEXrn	2.773	4.276	.880	.649	.634

a. Dependent Variable: InEXP. Source: Author’s calculation

Source: Author’s calculation.

The Table 3 shows that the average/mean value of annual bilateral export trade flow from Nigeria to India between 2009 and 2018 is 2484415420000.0 naira, with standard deviation of 1367652845698.0. The mean value of bilateral import trade flow from India to Nigeria, over the same period is 537488616000 naira, with a standard deviation of 232644229966.0. The mean Gross Domestic Products (GDP) of India and Nigeria, depicting the economic size of each of the Countries is 2063956900.00 USD and 429,795,000 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 174,487,842.7 persons respectively, within the productive age of 18 years and above.

The Table 4 shows the estimated relationship between flow export trade from Nigeria to China and factors such as the GDPs of each region, Population of each Country, TEU transport cost, spot rate for transportation of per ton of wet bulk, and real effective exchange rate in both trading partners. The result shows that the mean natural log values of the Export trade flow (InEXP) from Nigeria to China as 25.54. The external factors which affects export trade flow from Nigeria to China, such as, The Chinese GDP, Population, real effective exchange rate on China, container freight rate / TEU transport cost between Nigeria and China, and transport cost / spot rate per ton of wet cargo exported from Nigeria to China, have mean natural log values of 22.9, 21.03, 4.74, 7.47 and 4.19 respectively. The internal factors that affect the flow of export seaborne trade from Nigeria to China such as the Nigerian Gross Domestic Product (GDP), the domestic population, and the real effective exchange rate in Nigeria have mean natural log (In) values of 19.86, 18.96 and 4.69 respectively.

The model, showing the quantitative relationship between the flows of bilateral export trade from Nigeria to China based on the gravity trade theory is determined from the coefficient of terms as:

$$InEXP_{tradeN-C} = 1499.815 + 2.364InGDP_c + 0.421InCont_{rate} + 0.24InSpot_{rate} - 71.23InP_c - 1.55InGDP_N - 1.1InEX_{rC} + 2.77InEX_{rN} \quad (5)$$

This implies that increasing size of the Chinese economy measured by GDP, TEU transport cost, spot rate for transportation of per ton of wet bulk cargo from Nigeria to China, and the real effective exchange rate of Nigeria leads to increasing value of export trade flow from Nigeria to China. On the other hand, a unit increase in Chinese productive population, GDP of Nigeria and the Chinese real effective exchange rate, will leads to decrease in value of bilateral export trade flow from Nigeria to China by 71.23 units, 1.55 naira and 1.11 dollars respectively. By implication, increasing transport cost does not decline the value of bilateral export trade flow from Nigeria to China. The significances of the impacts of each of the identified internal and external trade factors on the flow of bilateral export trade from Nigeria to China will be examined in subsequent session, during the test of hypotheses.

The R square coefficient showing the explanatory power of the model is 0.921. This shows that the identified explanatory factors consisting of the internal and external factors explained about 92.1% of variations in the flow of bilateral export trade from Nigeria to China, leaving only about 7.9% unexplained variations which could be as a result of other factors other than the identified external and internal factors used in this study.

Table 5: Influences of Distance, external and internal factors on Bilateral Shipping Export Trade between Nigeria and U.S.A.

	Mean	Std. Deviation	N
InEXP	26.9585	4.50048	10
InGDP _A	23.5644	.11574	10
InCONT _{rate}	8.0721	.08880	10
InSPOT _{rate}	4.4833	.14195	10
InP _A	19.5749	.02169	10
InGDP _N	19.8630	.18852	10
InP _N	18.9745	.08033	10
InEX _{rA}	4.6469	.07292	10
InEX _{rN}	4.6826	.09239	10

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.830 ^a	.688	-.402	5.32900

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	125.492	7	17.927	6.31	.729 ^b
	Residual	56.797	2	28.398		
	Total	182.289	9			

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	42579.418	33211.822		1.282	.328
	InGDP _A	543.391	435.679	13.975	1.247	.339
	InCONT _{rate}	-23.674	78.053	-.467	-.303	.790
	InSPOT _{rate}	12.106	14.031	.382	.863	.479
	InP _A	-2895.660	2246.217	-13.959	-1.289	.326
	InGDP _N	107.373	88.669	4.498	1.211	.350
	InEX _{rA}	45.454	109.373	.736	.416	.718
	InEX _{rN}	-188.385	142.930	-3.867	-1.318	.318

Source: Author’s calculation.

The result of the study shown on the table above indicates that, the mean natural log value of the bilateral export trade flow (InIEXP) from the U.S.A to Nigeria is over the period covered in the study is 26.95 naira. The size of the U.S.A 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 to the U.S.A, and transport cost/spot rate per ton of wet cargo exported to the U.S.A from Nigeria, which are all external factors affecting the flow of exports from Nigeria to the U.S.A., have mean natural log values of 23.56, 19.57, 4.64, 8.07, and 4.48 and 4.19 respectively. The internal factors that affect the value of seaborne export trade flow to U.S.A., such as the Nigerian Gross Domestic Product (GDP), the domestic population, and the 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 Nigerian seaborne export trade flows to the U.S.A., relative to the gravity model of trade, is determined from the coefficient of terms as:

$$InEXP_{tradeN-A} = 42579.42 + 543.4InGDP_A - 23.71InCont_{rate} + 12.1InSpot_{rate} - 2895.6InP_A + 35.8InGDP_N + 45.5InEX_{rA} - 188.4InEX_{rN} \quad (6)$$

The negative coefficients of container transportation, U.S.A productive population and real effective bilateral exchange rate indicate that a unit increase in the Container transport cost for export from Nigeria to U.S.A., unit increase in U.S. productive population and a unit increase in Nigeria’s bilateral real exchange rate with the U.S.A., will decrease the value of export

trade flow from Nigeria to the U.S.A. by 23.7 dollars, 2895.6 and 188.4 dollars respectively. It is important to also note the positive coefficient of the spot arte and/or transport cost for freighting per ton of wet cargo to the U.S.A. Note that while increase in container transport cost decreases the value of export trade flow to the U.S.A from Nigeria, similar increase in transportation cost per Ton of wet bulk cargo, increases the value of export trade flow to the U.S.A. by 12.1 dollars. The implication is that the impact of transportation cost on the flow of trade (export trade) from Nigeria to the United States of America is dependent on the type of trade. It is trade specific. The significances of the impacts of each of the identified internal and external trade factors on the flow of bilateral export trade from Nigeria to the U.S.A. will be examined under the test of hypotheses.

The R square coefficient which measures the explanatory power of the model is 0.69. The indication is that, the identified explanatory factors consisting of the internal and external factors explains about 70% of total variations in the value of Nigeria’s seaborne export trade flow to the United States of America.

Table 6: Relationship between Value of Nigerian’s Export Trade and Factors that influence Nigerian’s Export Trade to India.

	Mean	Std. Deviation	N
InExprade	28.4082	.54860	10
InGDPIN	21.4278	.18487	10
InCONTrade	8.0664	.03287	10
InSPOTrade	4.6647	.07542	10
InPOPIN	20.9751	.03521	10
InGDPN	19.8630	.18852	10
InPOPIN	18.9745	.08033	10
InEXrI	4.0476	.15523	10
InEXrN	4.6826	.09239	10

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.984 ^a	.968	.857	.20743

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-822.370	495.141		-1.661	.239
InGDPIN	11.514	7.199	3.880	1.599	.251
InCONTrade	17.133	34.233	1.027	.500	.666
1 InSPOTrade	7.438	10.024	1.023	.742	.535
InGDPN	-.696	2.652	-.239	-.263	.817
InPOPIN	22.527	27.009	3.299	.834	.492
InEXrI	-4.426	10.985	-1.252	-.403	.726
InEXrN	7.574	8.790	1.275	.862	.480

Source: Author’s calculation.

The result on Table 6 above indicates that, the mean natural log value of the Nigeria’s export trade (InEXp) to India, over the period covered in the study is 28.4. The size of the Indian economy, measured by the gross domestic product, the productive population of India, real effective exchange rate of India, container freight rate / TEU transport cost for shipping export to India, and transport cost/spot rate per ton of wet cargo exports to India, which are all external factors affecting the flow of exports to India from Nigeria, have mean natural log values of 21.42, 20.97, 4.04, 8.06, and 4.66 respectively. The internal factors

that affect the value of Nigeria’s seaborne export trade flow to India, which include: the Nigerian Gross Domestic Product, 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:

$$\begin{aligned} \ln EXP_{tradeN-IN} = & -822.37 + 11.51 \ln GDP_{IN} \\ & + 17.13 \ln Cont_{rate} + 7.4 \ln Spotr_{rate} + 22.5 \ln P_N \\ & - 0.69 \ln GDP_N - 4.4 \ln EX_{rIN} + 7.57 \ln EX_{rN} \end{aligned} \quad (7)$$

The negative coefficient of the constant term -822.37 is an indication that Nigeria is currently witnessing a decreasing trend in the value of seaborne export trade flow to India. Similarly, the negative coefficients of the Nigerian Gross Domestic Product component and the Indian bilateral real effective exchange rate implies that a unit increase in the values of Nigeria Gross Domestic Product and Indian real effective exchange rate will lead to 0.69 units and 7.57 units decrease in the value of Nigeria’s seaborne export trade to India.

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

The R square coefficient which measures the explanatory power of the model is 0.96. The indication is that, the identified explanatory factors consisting of the internal) and external factors explains about 96% of total variations in the value of Nigeria’s seaborne export trade flow to India.

Table 7: The Significance of the Cumulative Influences of the internal and external Factors on the Value of Nigeria’s Shipping Export Trade to China.

R-square	F-cal.	df	F-critical	Sig.: Accept if: F-cal < F-critical
0.921	16.7	8	3.07	Significant, Reject null hypothesis H _{01a}

Source: Author’s calculation.

Since the test result that F-cal > F-critical, i.e, 16.7 > 3.07, we reject the null hypothesis that the impact of the external, distance and internal variables identified in the study has no significant impact on the value of Nigeria’s bilateral export trade to China. The R square value of 0.921 supports the f-test and implies 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 carried from Nigeria to China; and the internal factors consisting of the size of the Nigerian economy measured by the GDP, the Nigerian local population, and the bilateral real effective exchange rate of Nigeria; account for about 92.1% of total variations in the flow of bilateral export trade from Nigeria to China. The individual significances of the factors on the flow of bilateral export trade

from Nigeria to China are tested using t-statistic as shown in the Table 8 below.

Table 8: Testing the significances of the impacts of each of Distance, internal and external factors on Nigeria’s seaborne export trade to China.

Factor(s)	T	df	p-value (sig.)	Significant if: p-value < 0.05
External Factors: InGDP _e	0.71	8	0.61	Non-significant
InP _e	-0.86	8	0.55	Non-significant
InEX _{rC}	-0.22	8	0.86	Non-significant
Distance Factors: InSpot _{rate}	0.02	8	0.98	Non-significant
InCon _{trate}	0.49	8	0.71	Non-significant
Internal Factors: InGDP _N	-0.87	8	0.54	Non-significant
InP _N	-0.61	8	0.51	Non-significant
InEX _{rN}	0.64	8	0.63	Non-significant

Source: Author’s calculation.

For each set of factors, the p-value is greater than 0.05. i.e. $p > 0.05$, for each set of factors. The implication is that, individually, the external factors consisting of the size of the Chinese economy, the Chinese bilateral real effective exchange rate, and the Chinese population, does not have significant influence on the value of Nigeria’s bilateral export trade to China. 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, individually have no significant influence on the value of Nigeria bilateral export trade with China. The policy implication is that, rather than focus on individually on the factors that affect the flow of exports from Nigeria to China, the ministry of trade should focus on all the factors and seek to develop trade policies that improve all the identified factors for the benefit of the local economy, particularly, internal factors which it has more direct regulatory power over.

Table 9: The significance of the cumulative influence of the internal and external factors on the value of Nigeria’s seaborne export trade to the U.S.A.

R-square	F-cal.	df	F-critical	Sig.: Accept if: F-cal < F-critical
0.688	0.631	9	3.07	Accept H _{02a}

Source: Author’s calculation.

The result on Table 9 shows that $F\text{-cal} < F\text{-critical}$; (0.631 < 3.07). Thus we accept 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 affects bilateral foreign trade between the U.S.A. and Nigeria does not significantly influence the value of Nigeria bilateral export trade from the United States of America. The R square value of 0.688 suggests that, the external, internal and

distance factors account for only about 68% of total variations in the value of Nigeria’s export trade to the U.S.A. The balances 30% of the variations are attributed to factors other than the identified external, internal and distance factors. Such unidentified factors may include export policies and restrictions that limit the flow of export from Nigeria to the United States. See the table below for an assessment of the significance of the influence of the individual variables.

Table 10: Testing the significances of the impacts of each of Distance, internal and external factors on Nigeria’s seaborne export trade to U.S.A.

Factor(s)	T	df	p-value (sig.)	Significant if: p-value < 0.05
External Factors: InGDP _A	1.25	9	0.34	Non-significant
InP _A	-1.29	9	0.33	Non-significant
InEX _{rA}	0.42	9	0.72	Not significant
Distance Factors: InCon _{trate}	-0.30	9	0.79	Non-significant
InSpot _{rate}	0.86	9	0.48	Non-significant
Internal Factors: InGDP _N	1.21	9	0.35	Non-significant
InP _N	0.86	9	0.55	Non-significant
InEX _{rN}	-1.32	9	0.32	Non-significant

Source: Author’s calculation.

For each set of factors, the p-value is greater than 0.05. i.e. $p > 0.05$, 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, does not have significant influence on the value of Nigeria’s bilateral export trade to the U.S.A. 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, individually have no significant influence on the value of Nigeria bilateral export trade to the U.S.A. The policy implication is that, rather than focus on individually on the factors that affect the flow of exports from Nigeria to 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 for the benefit of the local economy, particularly, internal factors which it has more direct regulatory power over.

Table 11: The significance of the cumulative influence of the internal and external factors on the value of Nigeria’s bilateral seaborne export trade to India.

R-square	F-cal.	df	F-critical	Significant if: F-cal. > F-critical
0.968	8.71	8	0.11	Significant, reject H _{03a}

Source: Author’s calculation.

The result on Table 11 above shows that $F\text{-cal} > F\text{-critical}$; (8.071 > 3.07). Thus we reject 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 affects bilateral foreign trade between the India and Nigeria, have no significant effects on the value of Nigeria bilateral export trade to India. The R square value of 0.968 suggests that, the internal, external and distance factors account for about 97% of total variations in the value of Nigeria's seaborne export trade to India. See the table below for an assessment of the significance of the influence of the individual variables.

Table 12: Determining the individual significances of the impacts of each internal and external factors on Nigeria's bilateral seaborne export trade to India.

Factor(s)	T	df	p-value (sig.)	Significant if: p-value < 0.05
External Factors: InGDP _N	1.56	8	0.25	Non-significant
InP _N	0.06	8	0.99	Non-significant
InEX _N	-0.40	8	0.73	Non-significant
Distance Factors: InCont _N	0.50	8	0.67	
InSpot _N	0.74	8	0.54	Non-significant
Internal Factors: InGDP _N	-0.26	8	0.82	Non-significant
InP _N	0.83	8	0.49	Non-significant
InEX _N	0.86	8	0.48	Non-significant

Source: Author's calculation.

Similarly, for each set of factors, the p-value is greater than 0.05. i.e. $p > 0.05$, for each set of factors. The implication is that, individually, the external factors consisting of the size of the India economy, the bilateral real effective exchange rate, and the Indian population, does not have significant influence on the value of Nigeria's bilateral export trade to India. 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, individually have no significant influence on the value of Nigeria bilateral export trade to India.

5. Discussion of Result and Policy Implications.

The findings of the study reveal that the size of Nigeria's economy measured by the GDP has significant influence on her bilateral shipping export trade with her major trading partners over the years covered in the study. Although the Nigeria's balance of trade with U.S.A, China and India is not favorable to her, the significant influence of the size of the Nigerian economy measured by the GDP on the direction of bilateral trade between Nigeria and India, U.S.A. and China implies that Nigeria can leverage on the findings of the study to improve the size of her economy measured by the GDP, by encouraging improvement in local productive capacity through proactive investment in productive ventures, thereby limited imports from foreign countries and improving exports to her trade partners. The findings of the study corroborates with the findings of Baier and Bergstrand (2009), that the size of the economy of a Country measured by the GDP is a core internal factor which

significantly affects her foreign trade volumes with the trading partners. Ensuring improvement in Nigeria local output will at the long run will lead to improved balance of trade in Nigeria, economic growth and development. By implication, to improve the benefits accruable to Nigeria from bilateral trade with India, 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, the result similar to the findings of Mikkelson and Tronstad, (2006), show that the bilateral trade between India and Nigeria is significantly influenced by the interaction of host of external internal and distance factors such as 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, which jointly significantly influence the direction of the bilateral export trade between the countries. This is similar to the findings of the influences of the endogenous, exogenous and distant factors on the bilateral trade between the U.S.A and Nigeria, and between Nigeria and China. The policy implication to Nigeria for the improvement of her balance of trade is that attention is to be given the host of external factors, internal factors and distance factors in order that the country achieves capacity to manipulative these identified variables of internal trade to her advantage and improve her balance of trade with her trading partners which currently is not in her favour.

Conclusions.

The results of the analysis shows that the size of the Nigerian economy measured by the GDP has significant influence on the value of Nigeria's bilateral export trade with India, U.S.A. and China over the period covered in the study. Similarly set external, distance and internal factors, each have p-value is greater than 0.05. i.e. $p > 0.05$, for each set of factors. The implication is that, individually, each of the factors with p-value greater than 0.05, do not have significant influence on the value of Nigeria's bilateral export trade to India, U.S.A. and China. The R square value of 0.898 suggests that, the external, internal and distance factors account for about 90% of total variations in the value of Nigeria's seaborne export trade to India. The identified external, internal and distance factors account for about 69% of variations in the value of Nigeria's shipping export trade to the U.S.A over the years while about 92% variations in the value of Nigeria's shipping export trade to China over the period covered in the study is explained by the external, internal and distance factors that affect foreign trade.

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