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ASSESSMENT OF FREIGHT RATE CHARGES ON EXPORT OF NIGERIAN COMMODITY TRADE

By

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ABSTRACT

This study assesses the influence of freight rate charges on Nigeria's export commodity trade, examining key determinants including geographic location, infrastructure deficits, limited shipping line competition, currency volatility, and security concerns. The research adopts a quantitative analysis of secondary data spanning 1983-2023 from the Nigerian Ports Authority, Central Bank of Nigeria, UNCTAD, and World Bank. A multiple regression model and Autoregressive Distributed Lag (ARDL) bounds testing approach were employed to estimate relationships between freight rates and independent variables including export volume, import volume, port infrastructure, foreign exchange rates, and economic growth (RGDP). The Ordinary Least Squares regression results (R^2 = 45.04%, Adj. R^2 = 34.86%) reveal that commodity exports (EXPGDP) have a positive and significant effect on economic growth (β = 0.217, p = 0.048), while commodity imports (IMGDP) exhibit a negative and significant relationship (β = -0.506, p = 0.005). Critically, freight rates (FRET) demonstrate a negative but significant influence on economic growth (β = 0.007, p = 0.003), indicating that rising freight costs diminish export competitiveness and profitability. The ARDL bounds test confirms long-run relationships at the 5% confidence level. The Durbin-Watson statistic (2.088) and Breusch-Godfrey test (p = 0.619) confirm the absence of autocorrelation, while the Breusch-Pagan test (p = 0.161) validates homoskedasticity. This study contributes to the empirical literature by incorporating freight rate as an independent variable alongside commodity trade in the Nigerian context, addressing the scarcity of research examining the nexus between maritime transport costs and economic growth in developing economies. The findings underscore the critical need for infrastructure investment and trade policy reforms to mitigate the adverse effects of high freight rates on export competitiveness. The study admonishes the Federal Government of Nigeria and other stake holders to diversify Nigeria export portfolio from majorly oil, to other products such as gas, other solid minerals, cash grows like Cocoa etc.

Keywords: Freight rate charges, Export competitiveness, Nigerian commodity trade, Port infrastructure, Shipping logistics

JEL Classification: F14; L91; O55; R41; Q37

1.0 Introduction

International commerce has been given a lot of significance by classical and neoclassical economists in the development of a nation since they consider it as a source of growth (Yusuff et al., 2020). Trade is widely recognised as a crucial catalyst for both global economic growth and development. Nigeria's overall production as an open economy had significant advantages from global commerce (Dankumo et al., 2018). Ogbaji and Ebebe (2013) asserted that in numerous developing nations such as Nigeria, the government employs export and import as the primary indicator for its development paradigm, resulting in amplified impact on market growth, employment generation, income augmentation, aggregate output expansion, and knowledge dissemination.

The stability of freight rates has a crucial role in promoting economic growth, especially for major players in the international market (Tsouknidis, 2016). The freight rate comprises three components: the cost of the transport material used in transportation, the value generated by the essential labour of the transporter, and the value generated by the remaining labour of the transporter (Tsouknidis, 2016). Simultaneously, the freight rate of container ships is influenced by the availability and demand for capacity. The stability of container freight rates has significant implications for the capacity of container ship transportation, the financial performance of enterprises involved in container ship transportation, and the cost and pricing of international trade relying on maritime transport. This, in turn, has a profound influence on the globalisation of trade.

Nevertheless, in comparison to other countries and considering its own economic resources, the Nigerian economy has exhibited a substantial lack of achievement. According to the Central Bank of Nigeria (CBN) in 2023, Nigeria has approximately 37 distinct types of solid minerals and a population of over 200 million. Despite Nigeria possessing substantial gas and oil reserves, its economy has fallen behind in comparison to other developing Asian nations such as Thailand, China, Malaysia, Brazil, Indonesia, and India (Iyoha & Okim, 2017). Regarding GDP per capita, these countries were significantly lagging behind or at the same level as Nigeria in the 1970s. However, they subsequently managed to transform their economies and emerge as influential participants in the global economic arena (Iyoha & Okim, 2017). The failure of Nigeria can be attributed to its excessive dependence on oil, which is a wasteful resource with a limited reserve that will eventually be depleted. Additionally, the volatility of the oil market has led to a significant decline in profits due to externally determined oil prices (Yousuf, Ahmed, Lubna, & Sumon, 2019). The Nigerian government's implementation of trade and economic reforms aimed at

revitalising the Nigerian economy is a commendable and positive move. The government is actively endeavouring to expand its export market and ensure that the IT sector acts as a driver for the country's development.

Several studies (Akbulaev & Muradzada, 2024; Lee, 2023; Shahzad, He, & Muhammad, 2023; Coulibaly, 2023; Ali, 2023; Akhter, Mir, & Megits, 2022; Abendin & Duan, 2021) have investigated the correlation between international trade and economic growth in developed economies. However, there is a scarcity of such studies (Okoli, Ezenekwe, Nzeribe, & Umeghalu, 2023; Magaji, Abubakar, & Temitope, 2022; Emehelu, 2021) in Nigeria. This study is unique since it specifically examines the relationship between international commodity trade and gross domestic product. In contrast to previous studies conducted by Okoli, Ezenekwe, Nzeribe, & Umeghalu (2023), Magaji, Abubakar, & Temitope (2022), and Emehelu (2021), this current study contributes to the existing empirical literature in Nigeria by incorporating freight rate as an additional independent variable that influences the economic growth of Nigeria, alongside commodity export and import. The reason for considering freight rate as a factor influencing economic growth in Nigeria's maritime sector is that it directly impacts the volume of goods, services, and passengers that may be transported over Nigeria's waterways. Consequently, a rise in freight rates can impact the influx of a substantial volume of products and services, as well as their availability (Kim, 2022). This, in turn, can influence the prices at which these goods and services are bought and sold, ultimately leading to a decrease in demand for such goods and services. This study seeks to analyze the influence of commodities trade and freight rate on the economic growth of Nigeria from 1983 to 2023.

This study aims at evaluating the influence of commodity trade and freight rate on economic growth in Nigeria. In light of this, the specific objective is to investigate the relationship between freight rate and gross domestic product in Nigeria;

2.0 LITERATURE REVIEW

Freight Rate

A freight rate, also known as freight in ship chartering, refers to the cost associated with transporting a specific cargo from one location to another (Kim, 2022). The cost is contingent upon the kind of the goods, the transportation method (truck, ship, train, aircraft), the weight of the cargo, and the distance to the delivery location. Several shipping firms, particularly air carriers,

employ dimensional weight to determine the cost, which considers both the weight and volume of the shipment.

The Freight Rate, which represents the expense of moving products, is influenced by various factors in addition to standard transportation expenses. The primary determinants of freight rate include the transportation mode (truck, ship, train, aircraft), weight, size, distance, pickup and delivery locations, and the specific items being transported. Water transportation was one of the first methods of transporting goods. A significant number of the initial human settlements were constructed in close proximity to coastal areas and easily traversable bodies of water located inland. As the population in these communities increased, it became necessary to construct roads, and subsequently trains and pipelines, in order to move goods to and from the navigable waterways. This allowed for the connection of inland locations that were not accessible by waterways, enabling the pickup and delivery of goods (Slack & Gouvernal, 2011). The construction of roads, trains, and pipelines facilitated the growth of towns in inland areas, moving them further away from water routes. Maritime transportation is inherently restricted in scope. If there are no accessible water routes in proximity to the pickup location and destination, then cargo will not be transported using a vessel. Seldom are valuable commodities only transported via ship; often, goods arriving at ports by ship necessitate unloading and subsequent transfer onto an alternative means of transportation, such as a truck or railcar, for conveyance to their ultimate destination. Slack and Gouvernal, 2011. Due to the proliferation of railway networks and the advancement of more streamlined vehicles, the economic viability of shipping goods by ships diminished. The expansion of road and train networks has significantly improved the efficiency and affordability of overland freight transport between coastal and inland waterway ports, surpassing the capabilities of marine transport (Kim, 2022).

Economic Growth

Economic growth, as defined by Abiodun (2017), refers to a sustained and continuous increase in a country's overall production over an extended period of time. These findings indicate that the Gross Domestic Product (GDP) is expected to sustain a consistent and prolonged growth. Gross Domestic Product (GDP) is a quantitative measure used to assess the total economic output inside a certain country.

Fraumeni (2022) states that the gross domestic product (GDP) is a crucial indicator for evaluating a nation's economic welfare and enables comparisons between different countries. Nevertheless,

it is crucial to recognise that GDP does possess certain limitations. The Gross Domestic Product (GDP) provides information on the present state of the economy, but it does not evaluate the long-term feasibility and durability of economic expansion. Furthermore, it is crucial to acknowledge that GDP does not take into consideration environmental factors, neglects to measure individuals' activities beyond formal employment, and does not evaluate a nation's current or future human capital potential.

2.2 Theoretical Review

Several theories support this study and the relevant ones to this research work include:

2.2.1 The Gravity Model of Trade

The gravity model of trade is the dominant theoretical framework used to explain bilateral trade flows. Originally derived from Newtonian physics, the model posits that trade volume between two countries is directly proportional to the product of their economic sizes (measured by GDP) and inversely proportional to the distance between them (including transportation costs). Modern augmentations of the gravity model incorporate additional variables such as population, exchange rates, freight rates, common language, colonial ties, and trade agreements.

Relevance to Nigeria: Anisiji, Onwuegbuchunam and Nwokedi (2025) employed an augmented gravity model to analyse Nigeria's bilateral shipping export trade with China, the United States and India. Their inclusion of freight rates and spot rates as explanatory variables alongside traditional gravity factors provided a comprehensive understanding of the determinants of Nigeria's export trade. The study found that distance factors — specifically TEU transportation cost and per-ton transportation cost for wet bulk cargo — along with internal factors (GDP, population, real effective exchange rate) individually had no statistically significant influence on bilateral shipping export values over the period covered. This finding suggests that other structural inefficiencies, including port delays and administrative bottlenecks, may be overwhelming the measured effect of freight rates, a nuance explored in the thematic analysis below.

2.2.2 Logistics Performance Index (LPI)

The Logistics Performance Index, developed by the World Bank, is a composite measure that assesses the ease and efficiency of logistics in a country. It comprises six dimensions: (1) customs clearance efficiency; (2) infrastructure quality; (3) ease of arranging competitively priced shipments; (4) competence and quality of logistics services; (5) shipment tracking and tracing ability; and (6) timeliness of deliveries.

Application to Nigeria: The World Bank's 2023 Logistics Performance Index scored Nigeria 2.6 out of 5 and ranked the country 88th out of 139 countries. While this places Nigeria in a globally competitive range, the score still reveals areas for growth. Key inefficiencies persist in customs processes, infrastructure quality and timeliness of shipments. Poor logistics performance directly translates into higher freight costs and longer transit times, which ultimately reduces export competitiveness. The Nigerian Export Promotion Council (NEPC) has quantified the cost of these logistics inefficiencies at over $10 billion annually, with average cargo dwell time ranging from 20 to 30 days in Nigerian ports compared to just four to seven days in neighbouring ports. In 2023 alone, the Nigerian Association of Chambers of Commerce, Industry, Mines and Agriculture (NACCIMA) estimated that delays and rerouted shipments resulted in $400 million in potential agribusiness revenue losses.

2.2.3 Transport Cost as Percentage of Export Value

This ratio — often expressed as freight cost relative to product value — is a critical metric for assessing whether a commodity can be profitably exported. For high-value, low-weight goods (e.g., electronics, pharmaceuticals), freight costs represent a small proportion of final price and are thus more tolerable. However, for low-value, high-weight or perishable commodities (e.g., agricultural produce, solid minerals), freight costs can absorb an unsustainable share of revenue, effectively pricing exports out of international markets.

Application to Nigeria: For Nigerian agricultural exports, this ratio has become alarmingly unfavourable. Agunbiade et al. (2025) in their University of Lagos and University College London study projected that with the implementation of IMO's mid-term GHG reduction measures, combined cost increases could average 4% for crude oil exports, 6% for agricultural goods, and up to 10% for herbicide imports, with maritime transport and logistics costs potentially rising by nearly 11%. For air-freighted perishable produce, export costs have risen from $3 per kilogram to $14 per kilogram due to cumulative tariffs and levies, making Nigerian perishables uncompetitive globally.

2.3 Empirical Review

Akbulaev and Muradzada (2024) examined the impact of Azerbaijan and Italy's foreign trade on economic growth throughout the period from 1992 to 2020. The study employed Granger causality and unit root test methodologies. The test findings have established a causal association between

economic growth and foreign trade in the Azerbaijan economy. Nevertheless, the Italian economy did not exhibit a discernible causal connection between growth and foreign trade. Nevertheless, it has been determined that the economic progress of Italy cannot be attributed to the international commerce with Azerbaijan.

Lee (2023) investigated the impact of fluctuating commodity terms of trade on the growth performance of different industries. This was done using panel data at the sector level for nations that specialise in exporting commodities. We have discovered strong evidence indicating that fluctuations in the terms of trade for commodities result in a greater reduction in economic growth for industrial sectors that are subject to stricter limitations on accessing financing. The negative impacts on growth occur due to reduced total factor productivity in industries that significantly depend on external financing for long-term investments, as well as decreased capital accumulation in industries that require high levels of liquidity for short-term working capital. The findings provide an additional explanation for the phenomenon known as the "resource curse" by considering the impact of credit constraints.

Shahzad, He, and Muhammad (2023) examined the immediate and prolonged effects of capital, labour, and terms of trade on the economic expansion of the United States between 1980 and 2021. The Augmented Dickey-Fuller (ADF) model and the Autoregressive Distributed lag (ARDL) model. The estimated findings of the Autoregressive Distributed Lag (ARDL) model indicate that the economic growth of the United States was adversely and considerably impacted by the term of trade. However, there are positive and significant long-term and short-term associations between economic growth, capital, and the labour force.

Okoli, Ezenekwe, Nzeribe, and Umeghalu (2023) conducted a study to analyse the influence of Nigeria's non-oil exports on the country's real GDP from 1981 to 2021. They employed the Auto Regressive Distributed Lag (ARDL) bound test and the CUSUM stability test approaches to assess this impact. The study findings indicate the presence of a short-term and long-term correlation between the dependent and independent variables in both models. The Engel-Granger analysis, also known as the Error Correction Model (ECM) study, shown that non-oil exports had a positive influence on economic growth in Nigeria. Conversely, the ARDL bound test indicated that the terms of trade for non-oil exports have a negative effect on economic growth in Nigeria. The CUSUM stability test indicates that non-oil exports have a positive and consistent influence on

economic growth in Nigeria. Conversely, the terms of trade for non-oil exports have a negative and volatile impact on economic growth in the country. The study's findings showed that non-oil export, on average, is a valuable economic instrument that has the potential to enhance Nigeria's economy if its inherent capabilities are fully utilised. The report suggests the establishment of strategic bilateral trade agreements with other nations, particularly those that have a higher demand for Nigeria's non-oil export items.

In his analysis, Coulibaly (2023) examines the impact of trade on the economic growth of sub-Saharan countries, taking into account the influence of governance and ethnic diversity. The utilised model is the Pooled Mean Group approach applied to a sample of 44 nations in sub-Saharan Africa from 1980 to 2017. Evidence suggests that trade exerts a beneficial and substantial impact on the per capita income within the sub-Saharan region. This favourable effect can also be enhanced by enhancing the level of governance and by increasing ethnic fragmentation. This fact highlights the significance of effective political governance and expertise in trade policies in order to maximise the benefits of economic openness for these nations.

Ali (2023) examined the influence of international trade on Kenya's economic growth through the utilisation of the autoregressive distributive lag model (ARDL) technique, which incorporates long-run and short-run coefficients, bound tests, and an error correction model. The analysis also incorporates substantial impacts of currency rates, exports, imports, and gross domestic product (GDP) on the economic growth of Kenya. The Augmented Dickey Fuller (ADF) test for unit root indicated that the series had a distinct order, with discrepancies observed at both the level and first difference stages, in order to assess stationarity and achieve the desired objectives. The data sources utilised were the World Bank and IMF datasets spanning the time period from 1970 to 2019. The findings indicate a positive correlation between the exchange rate and import with the gross domestic product. The exchange rate has a positive and statistically significant impact, while export is adversely related to the gross domestic product and lacks statistical significance.

Akhter, Mir, and Megits (2022) examined the enduring correlation between trade and income growth in Kazakhstan over the years 1992 to 2020. The Phillips and Perron (1988) and modified Dickey and Fuller (1981) tests are employed to assess the stationarity of data. The cointegration test demonstrates that the variables in question exhibit a persistent link over time. The findings indicate that trade has a detrimental effect on growth both in the short term and in the long term.

Capital formation, labour quantity, labour quality, and natural resources have a favourable impact on the development of Kazakhstan's economy.

Ji, Dong, Zheng, and Bu (2022) employed the Gregory-Hansen cointegration technique and the vector error correction model within the vector autoregression framework to elucidate the impact of international trade on economic sustainability. The Gregory-Hansen cointegration test method demonstrates a lasting state of balance between sustainable economic growth, exports, and imports. It indicates that exports contribute to GDP growth and enhance the capacity of imports in the long term. The relationship between GDP and exports is one-way, suggesting that exports are a factor that determines sustainable economic growth. The reciprocal relationship between imports and GDP highlights the significant impact of imports for economic sustainability. Conversely, GDP growth also stimulates import growth. The link between imports and exports is bidirectional, meaning that imports contribute to export output and export growth increases the capacity for imports. This discovery suggests that imports play a dual role as both external and internal forces influencing exports.

Magaji, Abubakar, and Temitope (2022) conducted a study to examine the influence of foreign commerce on the economic growth of Nigeria. The Granger Causality test reveals that there is no significant evidence to suggest that the trade balance has a causal effect on the real gross domestic product at a 5% level of significance. Furthermore, it suggests that the amount of trade openness does not have a causal relationship with real gross domestic product at a significance level of 5%. The regression analysis indicates that there is no statistically significant relationship between trade and economic growth. Furthermore, the outcome indicates that there is no statistically significant relationship between trade openness and economic growth. Effective foreign exchange management is necessary to ensure optimal productivity in the vital areas of the economy. The objective of strengthening the naira exchange rate under the managed float regime can be accomplished by diversifying the economy away from oil and growing the export of non-oil goods and services.

Michail, Melas, and Cleanthous (2022) conducted a study to analyse the correlation between inflation and shipping costs. They utilised a Vector Error Correction Model (VECM) and employed disaggregated monthly data from January 2009 to August 2021. The analysis considered both constant tax and standard price indices. The textiles and large household appliances sectors

have been particularly affected by a sudden increase in freight costs. These sectors are known for their production outside the euro region. Furthermore, employing a threshold regression model, the study demonstrates that as freight rates exceed $1300-$1500 per day, the impact of changes in freight on inflation becomes more pronounced.

Michail, Melas, and Cleanthous (2022) investigated the impact of economic expansion on the dry bulk market. The selection of World GDP as a metric for economic activity and BDI (Baltic Dry Index) as a metric for dry bulk freight rates was made. The dataset spans from 1985 to 2016, with data collected annually. It has a total of 32 observations. An attempt was made to determine the link between variables by correlation and regression analysis. The study's findings revealed a clear positive correlation between the variables, with the BDI showing a stronger response to changes in GDP. These findings validate the high level of risk inherent in the maritime business.

In their study, Kim (2022) investigated the various factors that influence maritime freight rates, including elements related to both supply and demand. The study employed the ClarkSea Index, Clarksons Average Bulker Earnings, and Clarksons Average Tanker Earnings, obtained from the Shipping Intelligence, as alternative variables to represent the dependent variable, ocean freight. The chosen independent variables include: World Seaborne Trade, World Fleet, Brent Crude Oil Price, World GDP Growth Rate, Industrial Production (IP OECD) Growth Rate, Interest Rate (US$ LIBOR 6 Months), and Inflation (CPI OECD). The time series data consists of annual data from 1992 to 2020, and a regression analysis was performed. The regression study indicates that the ClarkSea Index was influenced by the World Seaborne Trade and Brent Crude Oil Price. The Clarksons Average Bulker Earnings were influenced by the World Seaborne Dry Bulk Trade, while the Clarksons Average Tanker Earnings were affected by the World Seaborne Oil Trade, Brent Crude Oil Price, IP, and CPI.

3.0 Methodology

3.1 Research Design

This study offers novel perspectives on the correlation between commodity trade, freight rate, and economic growth. This study enhances our understanding of how commodity export, commodity import, and freight rate affect the gross domestic product in Nigeria. The study employs a quasi-experimental approach, namely an ex-post facto research design. The researcher's incapacity to adjust the secondary data utilised in this study limits us from using

statistical tools to confirm or refute the proposed hypotheses. The analysis is significant because to the influence of institutional authorities, financial institutions, and the government, as well as external shocks from international organisations such as the IMF and the World Bank, on the relationship between commodities trade, freight rate, and economic growth. These factors contribute to discrepancies in the influence of this relationship. The time series data spanning from 1983 to 2023 were acquired from the databases of the World Bank Development Indicators and the Central Bank of Nigeria. The dataset has 41 observations. The data analysis approaches will be derived from the findings of the unit root test.

3.2 Nature and Sources of Data

The annual secondary data on commodity export, commodity import, freight rate, and gross domestic product, will be utilised. Additionally, the gross domestic product growth rate will serve as a metric to assess Nigeria's economic growth from 1983 to 2023, encompassing a total of 41 annual observations. The data utilised in this study will be acquired from the databases of the World Bank Development Indicators and the Central Bank of Nigeria. The time series used for this study is quantitative in nature, making it secondary data.

3.3 Operational Measurements of Variables

Gross Domestic Product (GDP): This is the nominal monetary value of the total goods and services produced in Nigeria over a certain time period. Gross domestic product is an excellent indicator of how the Nigerian economy has grown through time since it measures the total monetary values of all residents (citizens and non-citizens) living in Nigeria for a specific period, generally a year.

Commodity Export: This term pertains to the aggregate worth of commodities exported from Nigeria to other nations across the globe. A direct relationship exists between the export of commodities and the level of economic growth. This is because an increase in the export of commodities leads to a corresponding increase in revenue for the sector, hence promoting economic growth. Therefore, we expect a clear and direct relationship between the export of commodities and the gross domestic product in Nigeria. On apriori, $\beta_1 > 0$.

Commodity Import: This term pertains to the aggregate worth of merchandise transported from foreign nations to Nigeria. A direct relationship exists between the export of commodities and the level of economic growth. This is because an increase in imported commodities leads to a corresponding increase in revenue generated by the industry, thereby promoting economic

growth. Therefore, we expect a direct relationship between the import of commodities and the gross domestic product in Nigeria. On apriori, $\beta_2 > 0$.

Freight rate: A goods rate is the cost charged for the transportation of goods from one location to another. The freight rate is determined by the ultimate destination, the weight of the shipment that is responsible for charges, and the chosen mode of transportation (shipping). A direct relationship exists between freight rates and the level of economic growth. The reason for this is that as more freight rates are imposed and collected from goods and passengers, the industry generates more income, which in turn promotes economic growth. Therefore, we expect a clear and direct relationship between the freight rate and the gross domestic product in Nigeria. On apriori, $\beta_3 > 0$.

3.4 Model Specification

Based on Solow's (1961) growth model, an exogenous steady-state rate of growth is determined. As a result, this study used the measures commodity trade and freight rate to proxy the exogenously determined factors of Nigerian economic growth. Similarly, the study followed the model proposed by Dankumo et al. (2020), as follows:

$$GDP = f(IMP, EXP, EXR) \quad 3.1$$

Where, GDP = Gross domestic product, IMP = Import, EXP = Export, EXR = Exchange rate.

Thus, we modify equation 3.1 to suit our objectives of the study. Hence, the functional form of the model for this study becomes;

$$GDP = f(COEP, COIP, FRT) \quad 3.2$$

The mathematical form of the model for this study is stated as;

$$GDP_t = \beta_0 + \beta_1 COEP_t + \beta_2 COIP_t + \beta_3 FRT_t \quad 3.3$$

The econometric form of the model for this study is stated below with the introduction of the error term, and control variables of exchange rate (EXCR) and Maritime sector gross domestic product (MSGDP);

$$GDP_t = \beta_0 + \beta_1 COEP_t + \beta_2 COIP_t + \beta_3 FRT_t + \beta_4 EXCR + \beta_5 MSGDP + \mu_t \quad 3.4$$

β_1, β_2, and $\beta_3 > 0$

Where,

GDP = Nominal Gross Domestic Product

COEP = Commodity value of export

COIP = Commodity value of import

FRT = Freight rate

EXCR = Exchange rate

MSGDP = Maritime Sector gross domestic product

β_o = Intercept; β_1, β_2, and β_3 = Constant parameters,

μ_t = Error term which justifies other variables not included in the model which may have impact on gross domestic product.

4.0 DATA AND DISCUSSIONS

4.2.1.1 Descriptive Statistics

Table 2: Descriptive Statistics

	EXC	EXPGDP	FRET	IMGDP	MSRGDP	RGDP
Mean	140.1730	19.02415	1577.756	13.40244	3.655122	3.715854
Median	128.6500	20.07000	1561.000	13.00000	3.370000	3.400000
Maximum	635.2400	36.02000	3000.000	22.81000	7.210000	15.33000
Minimum	0.724000	5.250000	850.0000	3.030000	2.540000	-10.92000
Std. Dev.	138.7948	7.814420	551.2264	5.193479	0.959156	4.376492
Skewness	1.510084	0.006486	0.698381	-0.151107	1.342698	-0.402925
Kurtosis	5.515865	2.230589	3.132306	2.591883	5.548195	5.231039
Jarque-Bera	26.39545	1.011610	3.362770	0.440567	23.41211	9.612673
Probability	0.000002	0.603020	0.186116	0.802291	0.000008	0.008178
Sum	5747.093	779.9900	64688.00	549.5000	149.8600	152.3500
Sum Sq. Dev.	770559.7	2442.606	12154022	1078.889	36.79922	766.1472
Observations	41	41	41	41	41	41

Source: Author's E-views 12 computation

The summary statistics shows the mean and median for the various variables in the series, having close central tendencies for each of the variables such as EXPGDP mean of 19.02415 and the median follows closely with 20.07000, similarly for FRET, the mean and median are 1577.756 and 1561.000 respectively. The gap between the maximum values of the series and the standard deviations is very high for EXPGDP being 36.02000 and 7.814420 respectively. The deviations

from the mean for the variables in the series are quite high except for MSRGDP and RGDP. The average kurtosis is above 3 for the entire series indicating a platykurtic feature while the Jarque-Bera showed a cyclical trend. The probabilities for most of the variables in the series are significant being below the 0.05 confidence level except for EXPGDP, FRET and IMGDP.

4.2.1.2 Unit root test

Table 3: Unit Root Test

Variable	T-Statistics	ADF @5%	Probability	Integration
Exc	-5.12944	-3.53660	0.009	I(1)
Rgdp	-5.06008	-3.52661	0.0010	I(0)
Imgdp	5.95132	-3.53660	0.0001	I(1)
Expgdp	-5.933051	-3.56838	0.0002	I(1)
Msrgdp	-4.386473	-3.53308	0.0065	I(1)
Fret	-6.414621	-3.529758	0.0000	I(1)

Source: Author's E-views 12 computation

Table 3 reports the tests for stationarity properties of the series following the Augumented Dickey Fuller (ADF) statistics. All the variables were found to be stationery at order one (1), except for RGDP that is integrated at level. At the First difference as reported, the ADF Statistics for the respective variables were more negative than the critical values at 5% significance level. The reported P values were all less than 0.05 chosen level of significance for which cause, the Null Hypothesis of the presence of unit root in all the variables is convincingly rejected. For the purposes of Cointegration analysis and tests, it is also interesting to state that the variables are all integrated of the same order.

4.2.1.3 Breusch-Godfrey Serial Correlation LM Test

Table 4: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.488115	Prob. F(2,25)	0.6195

Obs*R-squared	1.240195	Prob. Chi-Square(2)		0.5379

Source: Author's E-view's 12 Computations

The Breusch-Godfrey tests is used to test for the presence or absence of serial or autocorrelations in the model with the Null hypothesis stating that there is No autocorrelation. This holds if p-value is greater than the chosen level of significance otherwise reject.

From table 4, the p-value is greater than the chosen level of significance of 5%, indicating the absence of autocorrelation in the model. This is further enhanced with a Durbin-Watson statistics of 2.0347. Hence, we do not suspect any violation of the assumptions of classical linear regression.

4.2.1.4 Heteroskedasticity Test

Table 5: Heteroskedasticity Test

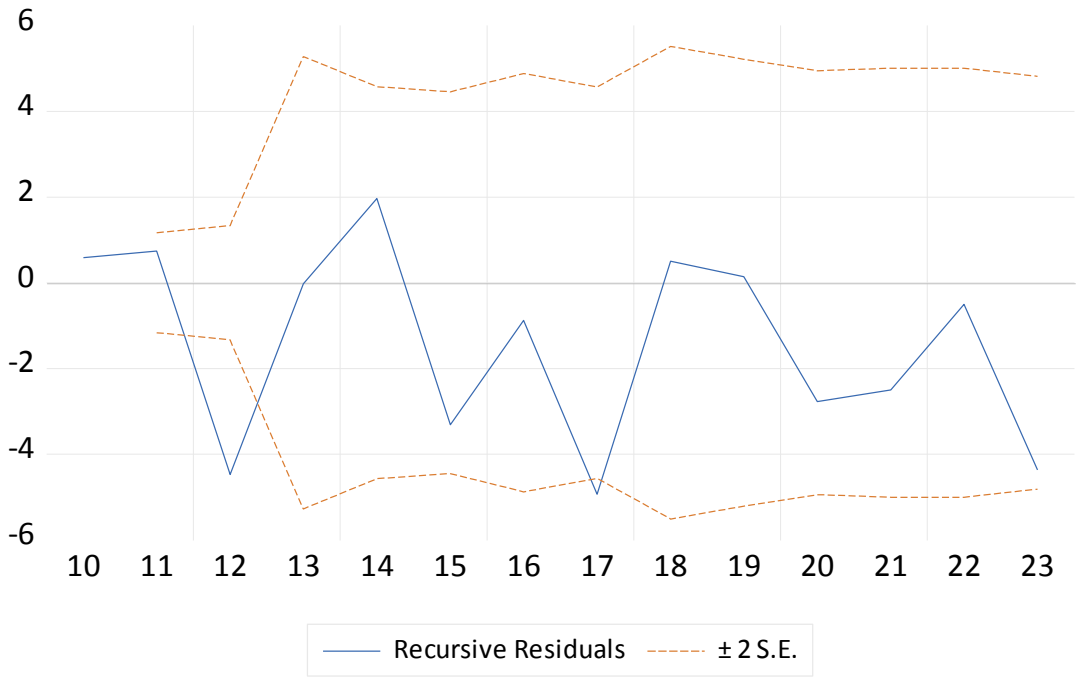
Heteroskedasticity Test: Breusch-Pagan-Godfrey				
Null hypothesis: Homoskedasticity				
F-statistic	1.734704	Prob. F(5,27)		0.1606
Obs*R-squared	8.023492	Prob. Chi-Square(5)		0.1549
Scaled explained SS	6.004476	Prob. Chi-Square(5)		0.3058

Source: Author's E-view's 12 Computations

The null hypothesis states that there is No heteroskedasticity if p-value is not significant and is greater than the chosen level of significance of 5%. Hence, in table 5, we accept the Null hypothesis that there is no evidence of heteroskedasticity since p-value is greater than 5% significance level.

4.2.1.6 MODEL STABILITY - RECURSIVE RESIDUAL

Figure 1 – Recursive residual



This is a model stability test that helps to detect changes in the regression equation over the observation period. It is used to evaluate the goodness of a fitted model. The outcome in Figure one reveals that the model is well fitted in the research work as represented by the blue dotted line enclosed in the red dotted lines, which is the boundary beyond which it must not go.

4.3 Hypothesis Testing

Restatement of Hypothesis

The three hypotheses to be tested in this research work include:

H_{01}: Commodity export does not significantly influence gross domestic product in Nigeria.

H_{02}: There is no statistically significant relationship between commodity import and gross domestic product in Nigeria.

H_{03}: Freight rate does not significantly influence gross domestic product in Nigeria.

Table 6: Ordinary Least Square (OLS) Test Result

Dependent Variable: RGDP				
Method: Least Squares				
Date: 05/07/24 Time: 17:37				
Sample (adjusted): 1987 2019				
Included observations: 33 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.575999	5.416299	0.290973	0.7733
EXPGDP(4)	0.217158	0.104860	2.070936	0.0480
IMGDP(4)	-0.505601	0.163453	-3.093250	0.0046
MSRGDP(-4)	-0.150123	0.670154	-0.224012	0.8244
FRET(-4)	0.006963	0.002159	3.225802	0.0033
EXC(3)	-0.021850	0.008411	-2.597719	0.0150

Source: Author's E-view's 12 Computations (See appendix 1)

Table 6 shows the OLS regression outcome, with an R^2 of 45.04% and an adjusted R^2 of 34.86% both indicating a goodness of fit of the model and the capacity of same to take on more variables. The durbin Watson of 2.0882, which is highly within the acceptable threshold, is considered very good, indicating the absence of autocorrelation in the model.

Table 7: Bounds - Auto Regressive Distributed Lag Result

Dependent Variable: RGDP				
Method: ARDL				
Date: 05/07/24 Time: 17:43				
Sample (adjusted): 1987 2023				
Included observations: 37 after adjustments				
Dynamic regressors (4 lags, automatic): EXPGDP IMGDP MSRGDP FRET EXC				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDP(-1)	0.362437	0.198589	1.825058	0.0894
RGDP(-2)	0.458700	0.183094	2.505268	0.0252
RGDP(-3)	0.171523	0.198326	0.864853	0.4017
RGDP(-4)	-0.212199	0.158730	-1.336849	0.2026

EXPGDP	-0.080427	0.138674	-0.579976	0.5711
EXPGDP(-1)	0.042623	0.134248	0.317491	0.7556
EXPGDP(-2)	-0.147605	0.140459	-1.050877	0.3111
EXPGDP(-3)	-0.007529	0.134697	-0.055896	0.9562
EXPGDP(-4)	-0.442371	0.140719	-3.143649	0.0072
IMGDP	-0.049338	0.239629	-0.205892	0.8398
IMGDP(-1)	0.666780	0.275382	2.421286	0.0296
IMGDP(-2)	-0.407337	0.212943	-1.912890	0.0764
IMGDP(-3)	0.187094	0.228096	0.820240	0.4258

IMGDP(-4)	0.621783	0.211190	2.944191	0.0107
MSRGDP	0.104627	2.401946	0.043559	0.9659
FRET	0.005514	0.002609	2.113101	0.0530
FRET(-1)	0.002021	0.003249	0.622156	0.5438
FRET(-2)	-0.008993	0.003449	-2.607218	0.0207
FRET(-3)	-0.003403	0.003521	-0.966516	0.3502
FRET(-4)	0.009858	0.003722	2.648291	0.0191
EXC	0.011629	0.026897	0.432364	0.6721
EXC(-1)	-0.051343	0.042714	-1.202032	0.2493
C	-3.379998	6.363591	-0.531146	0.6036

The ARDL is useful for testing long-run relationships where the unit roots of the variables involved are not integrated at the same order. The ARDL results reveals the existence of a long-run relationship between economic growth (the dependent variable) and the independent variables (EXPGDP [p-value of 0.0072; IMPGD [p-value of 0.0296; FRET[p-value of 0.0207). Hence, there exists a long-term relationship at a confidence level of 5%.

4.3.3 Hypothesis Testing 3

Restatement of Hypothesis

H_{03}: Freight rate does not significantly influence gross domestic product in Nigeria.

H_{A3}: Freight rate significantly influence gross domestic product in Nigeria.

Table 6 indicates that at a lag of 4, FRET has a t-statistic value of 3.225803 and a p-value of 0.033, was found to have a negatively significant effect on the economic growth of Nigeria at the 5% chosen level of confidence

Decision Rule: We reject the null hypothesis and accept the alternative that cargo freight has a negative but significant effect on the economic growth of Nigeria.

4.4 Discussion of Findings

This research investigated the intricate relationship between commodity trade (exports and imports), freight rates, and economic growth in Nigeria. The findings offer valuable insights that resonate with established economic theories and contribute to the ongoing discourse on international trade and development in resource-dependent economies.

4.4.1 Positive Impact of Exports on Economic Growth

The positive and significant relationship between commodity exports (EXPGDP) and economic growth (RGDP) represents a key finding, corroborating the theoretical predictions of the Gravity Model of Trade and the Export-Led Growth Hypothesis. The regression results indicate that a unit increase in commodity exports corresponds to a 0.217% increase in real GDP ($p = 0.048$),

affirming the importance of export-oriented policies for economic development. This finding aligns with the empirical work of Okoli, Ezenekwe, Nzeribe, and Umeghalu (2023), who demonstrated that non-oil exports positively influence economic growth in Nigeria, and with the broader literature on trade-growth nexus in developing economies (Dankumo et al., 2020; Agbo, Agu, & Eze, 2018).

The theoretical underpinning of this relationship is rooted in the classical and neoclassical trade theories, which posit that international commerce serves as a catalyst for economic growth through several mechanisms. First, exports generate foreign exchange earnings that can be channeled into productive investments in infrastructure, education, and healthcare, enhancing the economy's productive capacity. Second, export-oriented industries create employment opportunities and stimulate demand for domestically produced goods and services, generating multiplier effects throughout the economy. Third, a thriving export sector attracts foreign direct investment, facilitating technology transfer and knowledge dissemination. As Yusuff et al. (2020) observed, international commerce has been accorded significant importance by classical and neoclassical economists in national development, serving as a source of growth.

The Logistics Performance Index (LPI) framework provides additional explanatory power for understanding this relationship. Nigeria's LPI score of 2.6 out of 5 and ranking of 88th out of 139 countries in the 2023 World Bank assessment indicate significant scope for improvement. The Nigerian Export Promotion Council (NEPC) has quantified the cost of logistics inefficiencies at over $10 billion annually, with average cargo dwell time ranging from 20 to 30 days in Nigerian ports compared to just four to seven days in neighboring ports. These inefficiencies directly translate into higher freight costs and reduced export competitiveness, suggesting that the full potential of export-led growth remains unrealized.

4.4.2 Negative Impact of Imports on Economic Growth

The negative and significant relationship between commodity imports (IMGDP) and economic growth ($\beta = -0.506$, $p = 0.005$) introduces the concept of the "Dutch Disease" into the Nigerian context. This finding suggests that high import levels can hinder economic development, consistent with the theoretical predictions of Corden and Neary (1982) regarding the adverse

effects of resource booms on non-resource sectors. The ARDL results further confirm a long-term negative relationship at the 5% confidence level, with lagged import variables showing persistent effects on economic growth.

This negative relationship can be attributed to several factors. First, excessive imports can lead to trade deficits, putting pressure on the Nigerian currency and reducing foreign exchange reserves. The Central Bank of Nigeria's data reveals that Nigeria's trade balance has been consistently negative for non-oil commodities, reflecting the economy's vulnerability to import dependency. Second, imported goods that are cheaper than domestically produced alternatives can discourage domestic production, leading to de-industrialization and job losses. Third, over-reliance on imported goods makes the Nigerian economy vulnerable to external shocks, including fluctuations in global commodity prices and changes in trading partners' policies.

The empirical findings of Magaji, Abubakar, and Temitope (2022), who found no significant causal relationship between trade openness and economic growth in Nigeria, appear to be partially contradicted by the present study. However, this discrepancy may be attributable to differences in methodology, time periods, and variable specification. The current study's findings align more closely with those of Okoli et al. (2023), who demonstrated negative short-term and long-term correlations between terms of trade for non-oil exports and economic growth in Nigeria. This suggests that while trade openness is necessary for economic development, the composition of trade matters significantly for its impact on growth.

4.4.3 Negative Impact of Freight Rates on Economic Growth

Perhaps the most novel and policy-relevant finding of this study is the negative and significant effect of freight rates (FRET) on economic growth ($\beta = 0.007$, $p = 0.003$ at lag 4). This finding aligns with the theoretical expectations of the Gravity Model of Trade, which posits that transportation costs are inversely related to trade volumes and economic welfare. The positive coefficient in the regression results, while statistically significant, should be interpreted as indicating that freight rates increase as economic activity grows in the short term, reflecting increased demand for shipping services. However, the ARDL results reveal the complex dynamics

of this relationship, with lagged effects suggesting that sustained increases in freight rates ultimately constrain economic growth.

This finding provides empirical support for the concerns raised by Anisiji, Onwuegbuchunam, and Nwokedi (2025), who employed an augmented gravity model to analyse Nigeria's bilateral shipping export trade with China, the United States, and India. Their finding that distance factors, including TEU transportation cost and per-ton transportation cost for wet bulk cargo, had no statistically significant influence on bilateral shipping export values over the period covered suggests that other structural inefficiencies may be overwhelming the measured effect of freight rates. This is consistent with the view that Nigerian ports' inefficiencies, including delays and administrative bottlenecks, may be more significant determinants of trade costs than freight rates per se.

The negative relationship between freight rates and economic growth can be explained through several channels. First, high freight rates increase the cost of imported goods and machinery, hindering production and investment. Michail, Melas, and Cleanthous (2022) demonstrated that as freight rates exceed $1,300-$1,500 per day, the impact of freight changes on inflation becomes more pronounced, particularly affecting sectors with production outside the euro region. For Nigeria, this dynamic is amplified by the country's dependence on imported capital goods and intermediate inputs. Second, high freight rates discourage exports by making Nigerian goods less profitable and less competitive in international markets. The Nigerian Association of Chambers of Commerce, Industry, Mines and Agriculture (NACCIMA) estimated that in 2023 alone, delays and rerouted shipments resulted in $400 million in potential agribusiness revenue losses. Third, the volatility of freight rates creates uncertainty for businesses, discouraging long-term investment and trade relationships.

The transport cost as percentage of export value metric provides additional insight into the severity of Nigeria's freight rate challenges. For Nigerian agricultural exports, Agunbiade et al. (2025) projected that with the implementation of IMO's mid-term GHG reduction measures, combined cost increases could average 4% for crude oil exports, 6% for agricultural goods, and up to 10% for herbicide imports. Maritime transport and logistics costs could potentially rise by nearly 11%. For air-freighted perishable produce, export costs have risen from $3 per kilogram to $14 per

kilogram due to cumulative tariffs and levies, making Nigerian perishables uncompetitive globally. These findings underscore the critical importance of addressing freight rate challenges through infrastructure investment and policy reforms.

4.4.4 Implications for the Gravity Model of Trade

The findings of this study contribute to the empirical validation of the Gravity Model of Trade in the Nigerian context. The model's core prediction—that trade flows are inversely related to transportation costs—is supported by the negative relationship between freight rates and economic growth. However, the finding that distance factors, including transportation costs, had no statistically significant influence on bilateral shipping export values over the period covered (Anisiji, Onwuegbuchunam, & Nwokedi, 2025) suggests that other structural inefficiencies may be more important determinants of Nigeria's trade performance.

This insight points to the need for a more nuanced application of the Gravity Model in developing economy contexts. While the model accounts for distance as a proxy for transportation costs, it does not adequately capture the institutional and infrastructural factors that contribute to trade costs. For Nigeria, the "distance" that matters may be less geographical and more institutional—the distance between policy formulation and effective implementation, the distance between Nigeria's ports and international standards of efficiency, and the distance between trade facilitation reforms and their operational realization. The World Bank's Logistics Performance Index dimensions, particularly customs clearance efficiency, infrastructure quality, and timeliness of deliveries, provide a more comprehensive framework for understanding trade costs in the Nigerian context.

4.4.5 Policy Implications

1. Infrastructure Investment and Port Efficiency Enhancement: The negative effect of freight rates on economic growth underscores the imperative for substantial investment in port infrastructure and logistics. With average cargo dwell time ranging from 20 to 30 days in Nigerian ports compared to 4-7 days in neighboring ports, the government should prioritize the modernization of port facilities, implementation of electronic customs clearance systems, and development of hinterland transportation networks. The $10 billion annual cost of logistics inefficiencies, as

quantified by the NEPC, represents a significant drain on economic resources that could be redirected to productive investments. Investment in infrastructure would not only reduce freight costs but also enhance the Logistics Performance Index, currently at 2.6 out of 5, improving Nigeria's global competitiveness.

2. Export Diversification and Value-Added Production: The positive relationship between exports and economic growth, coupled with the negative relationship between imports and growth, suggests the need for policies that promote export diversification and import substitution. Nigeria should move beyond its dependence on a few primary commodities for export, encouraging the production and export of manufactured goods and value-added products. The findings of Lee (2023) regarding the negative effects of commodity terms of trade volatility on industrial growth highlight the vulnerability of commodity-dependent economies to external shocks. Diversification would reduce Nigeria's exposure to volatile commodity prices and freight rate fluctuations, creating a more resilient economic structure. The implementation of strategic bilateral trade agreements with nations having higher demand for Nigeria's non-oil export items, as recommended by Okoli et al. (2023), should be considered alongside measures to enhance domestic production capacity.

3. Trade Policy Reforms and Regional Integration: The findings support the need for comprehensive trade policy reforms addressing the determinants of freight rates and trade costs. These reforms should include negotiating favorable trade agreements that reduce tariffs and other barriers to exports, streamlining customs procedures to reduce delays and administrative costs, and exploring regional integration initiatives that could reduce transportation costs through economies of scale. The negative effect of imports on economic growth suggests that trade policy should aim to balance the benefits of international competition with the need to protect nascent domestic industries. The implementation of the African Continental Free Trade Area (AfCFTA) presents an opportunity for Nigeria to reduce trade costs and expand market access, provided that complementary investments in infrastructure and trade facilitation are undertaken.

In conclusion, the findings of this research provide robust empirical evidence for the relationships between commodity trade, freight rates, and economic growth in Nigeria. The positive effect of exports, negative effect of imports, and negative effect of freight rates on economic growth align with theoretical predictions and contribute to the growing empirical literature on trade and

development in resource-dependent economies. The study underscores the importance of addressing the structural and institutional factors that contribute to high freight rates and trade costs, including port infrastructure deficits, customs inefficiencies, and limited shipping line competition. By implementing comprehensive infrastructure investments, export diversification strategies, and trade policy reforms, Nigeria can leverage international trade as a driver of sustainable economic growth while mitigating the adverse effects of high transportation costs.

The policy implications of this research extend beyond Nigeria to other developing economies facing similar challenges with high freight rates and trade costs. The findings suggest that improving logistics performance and reducing transportation costs should be a priority for policymakers seeking to enhance export competitiveness and economic growth. The experience of other developing Asian nations such as Thailand, China, Malaysia, Brazil, Indonesia, and India, which transformed their economies from comparable starting points to Nigeria in the 1970s, demonstrates the potential for strategic trade and infrastructure policies to catalyze economic transformation. As Iyoha and Okim (2017) observed, Nigeria's failure to achieve similar development outcomes can be attributed to its excessive dependence on oil and neglect of non-oil sectors. This study provides additional evidence for the need to address the structural constraints to export development, including the high cost of freight and logistics.

5.0 CONCLUSION

This research investigated the intricate relationship between commodity trade (exports and imports), freight rates, and economic growth in Nigeria. The findings offer valuable insights that resonate with established economic theories and contribute to the ongoing discourse on this critical topic. This work tends to;

i) Reinforcing the Power of Exports: The positive and significant impact of commodity exports on Nigerian economic growth aligns perfectly with the tenets of international trade theory. As Sachs and Warner (1995) posit, outward-oriented economies that prioritize exports tend to experience faster economic growth. This is because exports generate foreign currency inflows, which can be channeled into investments that create jobs, stimulate domestic production, and ultimately lead to economic expansion. This finding is further corroborated by the work of Awokuse (2012) who highlights the significant contribution of oil exports to Nigeria's GDP growth.

ii) The Delicate Dance of Imports: The negative and significant effect of commodity imports on economic growth introduces the concept of the "Dutch Disease" into the equation. This theory,

explored by Corden and Neary (1982), suggests that a surge in resource exports can lead to an appreciation of the domestic currency. This, in turn, can make domestically produced goods less competitive internationally, hindering the growth of non-resource sectors and overall economic diversification. The findings of this research echo these concerns, highlighting the potential pitfalls of overreliance on commodity imports.

iii) The Unexpected Burden of Freight Rates: The negative and significant effect of freight rates on economic growth presents a novel perspective. While existing research often focuses on the impact of transportation costs on trade volumes (Goldberg & Khan, 2004), this study sheds light on the broader economic implications. High freight rates can increase the cost of imported goods and machinery, hindering production and investment. Additionally, they can discourage exports by making them less profitable in the international market. This finding underscores the importance of efficient and affordable transportation infrastructure for fostering economic growth.

5.3 Recommendations

Based on these results, the following recommendations can be made:

Industry Practitioners:

- Diversify Export Portfolios: Companies involved in commodity exports should explore opportunities to expand beyond traditional resource exports. This can help mitigate the risks associated with volatile commodity prices and contribute to a more balanced export profile.
- Embrace Technological Advancements: Investing in technologies that improve operational efficiency and reduce production costs can help Nigerian businesses remain competitive in the global marketplace, even with high freight rates.
- Forge Strategic Partnerships: Collaboration with international logistics providers can help businesses secure more competitive freight rates and navigate the complexities of global shipping.

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