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Effect of Gross Domestic Product and Exchange Rate on Rice Export Promotion and Competitiveness in Nigeria: 2000-2023

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Abstract

This study investigated the effects of Gross Domestic Product (GDP) and exchange rate on rice export promotion in Nigeria from 2000 to 2023. The study employed time series data. The Ordinary Least Squares (OLS) and Autoregressive Distributed Lag methods (ADLM) were used for the estimation of the models. The variables are stationary at level. The result of the trend estimation shows positive and significant trend at (P<1%) for exchange rate and rice export. Furthermore, the result of the trend estimation shows negative and significant trend at (P<1%) for Gross Domestic Product.The estimated Ordinary Least Square result shows that the coefficient of exchange rate (EXR) is negative but not statistically significant at (P

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=10%). The result also shows that the coefficient of Gross Domestic Product (GDP) is positive and significant at (P<10%). The estimated Autoregressive distributed lag result shows that the coefficient of exchange rate (EXR) and GDP (-1) are negative and statistically significant at (P<5%). The result further shows that the coefficient of GDP, GDP(-2) and rice export(-2) are positive and significant at (P<5%). The result shows that there is causality from exchange rate to gross domestic product. It also shows that there is no causality from exchange rate and GDP to rice export implying that rice export is not competitive. Therefore this study recommends that the Government develops export-friendly policies, negotiate trade agreements, and explore partnerships to gain access to international markets for Nigerian rice. Also, attract private sector investments in the rice value chain, from production to processing and marketing, so as to enhance competitiveness.

Keywords: Rice Export, Trends, Rice production, OLS model, ADL model, Nigeria

Introduction

The movement of products, services, and money across national borders between nations is referred to as international trade, often known as foreign trade. It deals with both imports and exports, whereby a nation purchases goods and services from another nation (imports) or sells goods and services to another nation (exports). The country that manufactures goods for export receives foreign exchange from those sales, which fuels the country's economic growth (Stojanov et al., 2024). Nigeria's export industry is the backbone of the country's economy, generating foreign exchange, job creation, and economic progress. Nigeria's oil and non-oil export industries are included in this category. Examples of non-oil exports include labor, textiles, solid minerals, agricultural products, and so on. It consists of everything else we export from Nigeria, excluding petroleum goods (Aminu, 2018). Nigeria has always relied on oil export revenue to support its development objectives and economic expansion (Oyeyinka & Oyelaran, 2022).

The importance of agricultural products in Nigeria's export industry is a reflection of both the country's potential economically and of its rich cultural legacy. Nigeria has made progress in utilizing its non-oil exports, such as cocoa, oil palm, cashew nuts, and groundnuts, to promote diversification, create new sources of income, raise GDP, and provide economic stability. Over the years, the Nigerian government has implemented several policies to boost domestic rice production, aiming to reduce import dependency, enhance self-sufficiency and export. Although Nigeria primarily focuses on meeting domestic demand, rice exports, albeit limited, have potential implications for its economy (Otsuka and Larson 2012). Rice is a significant crop in Nigeria,

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serving as a staple food for the majority of its population. Nigeria leads Africa in rice production, contributing over 70% to the continental supply. Nigeria does export rice to some African countries like the Niger Republic, Chad, Benin Republic (USDA, 2023).

These differences suggest that Nigeria's agricultural export policies on rice are ineffective and that they could have far-reaching economic repercussions. Some of the issues this industry faces are post-harvest losses, insufficient value addition and processing facilities, inadequate infrastructure, currency volatility, hurdles to market access, poor productivity levels and policy gaps (Kaur et al., 2022). Currency fluctuations have a substantial impact on the profitability and competitiveness of Nigerian exports of rice due to a number of factors such as interest rates, recession, speculative activity, political unrest, current account deficits, terms of change, government debt, and inflation. (Segal, 2021) Exchange rate variations lead to pricing issues, impacting global consumer purchasing power and altering the cost dynamics for exporters. This affects regular financial growth, enterprise sustainability and funding decisions. Uncertainty over export revenue is brought about by fluctuations in the value of the Naira relative to the most significant currencies, such as the US dollar. Research has demonstrated that elevated fluctuations in exchange rates impede economic expansion by increasing domestic expenses, weakening productivity, and reducing competitiveness. It is in this regard that this study seeks to assess the effect of gross domestic product and exchange rate on rice export promotion and competitiveness in Nigeria from 2000 to 2023, with the following specific objectives: to examine the trends of rice export, exchange rate, and GDP, determine the causal relationship of Rice Export, and examine the policy strategies for rice export competitiveness.

Literature Review

Movable products produced inside a nation's borders and traded with another nation are referred to as exports. The nation that produces these items gains foreign exchange revenue from their sales, which further propels economic expansion in that nation (Focus Economics, 2023). The entire monetary or market value of all finished goods and services produced inside a nation's boundaries over a given time period is known as the gross domestic product, or GDP. It serves as a thorough assessment of the state of the economy in a particular nation by serving as a wide gauge of total domestic production (Chappelow, 2023). The relative cost of one currency represented in terms of another currency (or collection of currencies) is known as an exchange rate (Research Bank of Australia, 1983). It is used to determine the value of various currencies in relation to each other and is important in determining trade and capital flow dynamics. The terms of trade refer to the rate at which the goods of one country are exchanged for the goods of another

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country (Jhingan, 2012). It is a measure of the purchasing power of exports of a country in terms of its imports, and is expressed as the relation between export prices and import prices of goods. Nigeria remains a leading rice producer in Africa, with production in 2024 estimated at about 5.23 million metric tons. However, insecurity in agricultural regions, high input costs, and unfavorable climatic conditions have led to concerns about declining yields. Despite these challenges, local rice production efforts are supported by investments in irrigation and mechanized farming (USDA, 2024). Ricardo (1817), in his famed theory of comparative advantage, showed that countries benefit by specializing in the production of those goods with the lowest opportunity cost and trading the surplus of production over domestic demand, taking as given appropriate exchange-rate regimes. Under this model, a country will quickly specialize in sectors in which it has a comparative advantage. The classical theory is easily couched in terms of comparative cost specifically; the theory states that a country will tend to export the commodity whose comparative cost is higher in pre-trade isolation. Given the assumption of constant cost, a country will specialize completely in the production of a commodity in which it has a comparative advantage. Countries that have a comparative advantage in producing rice are those that can produce it at a lower opportunity cost than other goods, relative to other countries. The neoclassical (modern) theory of international trade evolved in an attempt to modify some unsatisfactory aspects of the classical theory. The neoclassical theory, therefore, advanced a more satisfactory explanation for the existence of comparative cost differences between countries: it introduced capital as a second factor of production and allowed for international differences in the pattern of demand. The Heckscher-Ohlin theory (also known as the H-O model) is a model in international economics that explains how countries engage in trade based on their relative factor endowments, essentially the amounts of labor, land, and capital they possess. Developed by Swedish economists Eli Heckscher (1919) and Bertil Ohlin (1933), the theory suggests that countries will export goods that intensively use the factors of production they have in abundance, and import goods that require factors that are relatively scarce. used. On the global perspective, Sanjuán-López and Dawson (2010) determine the connection between GDP and agricultural and non-agricultural exports in 42 countries using panel co-integration methods. Their findings indicate that a long-run relationship exists between the variables in the model. The results further show that agricultural exports Granger-cause economic growth. Thus, confirm the export- led growth hypothesis for the 42 countries under study. Similarly, Henneberry and Curry (2018) examine the relationship between agricultural exports and economic growth in Pakistan. Using three simultaneous equations representing GDP, agricultural exports, and imports, they find a favourable relationship between agricultural exports

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and economic growth in the country. Kang (2015) investigates the evidence of the export- led growth in major rice exporting countries using some econometric approaches. The results confirm that agricultural export- led growth in the major rice exporting countries such as Pakistan, Vietnam and Thailand.

Methodology

The study was carried out in Nigeria. Nigeria is a prominent country in West Africa, known for its large population and significant economic influence. Nigeria occupies an area of about 923,769 square kilometers, making it one of the largest countries on the continent. It is a federal republic comprising 36 states and the Federal Capital Territory, where the capital city, Abuja, is located. (Federal Republic of Nigeria, 2024). Time series data were used for this research. Secondary data was utilized for rice production, export trends, currency exchange rates, and Gross Domestic Product indicators in Nigeria from 2000 to 2023 from the Food and Agriculture Organization (FAO), Central Bank of Nigeria, the National Bureau of Statistics, international trade organizations, and scholarly databases. Descriptive statistics were used to summarize and describe the main features of the data related to the value of rice exports, exchange rates, and GDP over the study period.

Ordinary Least Squares (OLS) regression, Autoregressive Distributed Lag (ARDL) model, and Trend Analysis were used to carry out the study. ARDL technique offers a specific approach to understanding the policy effect in economic relationships.

Trends Model:

To examine the trends in the value of rice export, exchange rate, and GDP, a simple trend analysis was conducted. The model specification for this is written as:

$$R_t = \alpha + \beta_t + \varepsilon_t$$

Where:

R_t = the variables (rice export value, exchange rate, GDP)
t = time trend (2000-2023)
α = constant term
β = coefficient of the time trend
ε_t = error term
Apriori expectation: $\beta>0$

Ordinary Least Square (OLS) Regression Analysis:

To estimate the determinants of rice export in Nigeria, the following multiple regression model was used:

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$$RE_t = \beta_0 + \beta_1 EXR_t + \beta_2 GDP_t + \varepsilon_t$$

Where:

RE_t = Rice export value
EXR_t = exchange rate
GDP_t = Gross Domestic Product rate
ε_t = stochastic error term
Apriori expectation: $\beta_1 > 0$; $\beta_2 > 0$

Autoregressive Distributed Lag (ARDL)

Impact of Rice Export on GDP: To assess the impact of rice export on Nigeria's GDP, this study employed Autoregressive Distributed Lag (ARDL)

$$RE_t = \alpha_0 + \alpha_1 RE_{t-1} + \alpha_2 EXR_t + \alpha_3 GDP_t + \varepsilon_t$$

Where:

RE_{t-1} = Lag of rice export
EXR_t = Exchange Rate
GDP_t = Gross Domestic Product of Nigeria
t= time (2000 to 2023)
ε_t = Stochastic error term
Apriori expectation: $\alpha_1 > 0$; $\alpha_2 > 0$; $\alpha_3 > 0$

Results and Discussion

Summary Statistics for all the variables

Table 1 presents the summary statistics for inflation (INF), exchange rate (EXR), GDP and rice export (RICE) from 2000 to 2023. The result shows that the value of Skewness for the exchange rate, and rice export are greater than 1, and GDP is less than 1. The result also reveals that the values of Kurtosis for all the variables are greater than 1. The result reveals further that the values for Jarque-Bera for all the variables are greater than 1. Hence, ordinary least squares and autoregressive distributed lag methods were employed.

Table 1: Summary Statistics for all the variables

	EXR	GDP	RICE
Mean	198.9996	5.050559	337.5417
Median	153.8625	5.612804	0.000000
Maximum	425.9792	15.32916	5196.000
Minimum	101.6973	-1.794253	0.000000
Std. Dev.	100.3166	3.630260	1158.649
Skewness	1.062442	0.430121	3.565803
Kurtosis	2.699514	4.287476	14.64698
Jarque-Bera	4.413531	2.397611	186.5120
Probability	0.110056	0.301554	0.000000
Sum	4576.991	121.2134	8101.000
Sum Sq. Dev.	221395.4	303.1120	30876760
Observations	23	24	24

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Unit Root Test of the variables

Table 2 shows the unit root test results of the variables used in the study. The results show that all three variables, exchange rate (EXR), GDP and rice export (RE) are stationary at level I(0)

Table 2: Unit Root Test of the variables

Variables	Level	First difference	Second difference	Order of Integration
EXR	**-0.184638*** **	_____	_____	**I(0)**
GDP	**-4.382761** **	_____	_____	**I(0)**
RE	**-4.910133*** **	_____	_____	**I(0)**

*** Significant at 1%, ** Significant at 5%, * Significant at 10% Probability Levels
Where EXR= Exchange Rate, GDP= Gross Domestic Product, RE= Rice Export

Trend Analysis of the variables

Table 3 shows the trend equation of the exchange rate. The result shows that the coefficient of the time variable is positive and significant at 1 percentage level of probability. This implies that it has a positive trend. Figure 1 below shows the trend of growth in the Exchange Rate (EXR) from 2000 to 2023. From the graph, the exchange rate shows a sharp rise around 2016, likely due to the economic recession and reduced oil revenues, which pressured the Naira. This period also saw the introduction of the Central Bank's flexible exchange rate policy in an attempt to stabilize the currency. Additionally, this continuous increase can be influenced by government policies like the removal of fuel subsidies and exchange rate adjustments, which contributed to the Naira's depreciation during this period.

Table 3: Trend equation of the Exchange Rate

Variable	Coefficient	t-Statistic	Probability
YEAR	13.16819	8.958935	0.0000
R-squared	0.792618		
Adjusted R-squared	0.782743		
F-statistic	80.26252		
Durbin-Watson stat	0.201957		

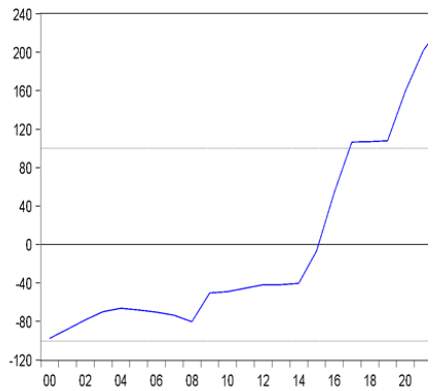

Figure 1: Graphical trend of Exchange rate: 2000 - 2023

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Trend equation of Gross Domestic Product

Table 4 shows the trend equation of Gross Domestic Product. The result shows that the coefficient of the time variable is negative and significant at 1 percentage level of probability. This implies that ia t has negative trend. Figure 2 below shows the trend of growth in the Gross Domestic Product (GDP) from 2000 to 2023. From the graph shows a general growth trend up to 2014, likely due to increased government spending and favorable oil prices. However, a sharp decline around 2016 reflects the recession and effects of reduced oil exports.

Table 4: Trend equation of Gross Domestic Product: 2000 – 2023

Variable	Coefficient	t-Statistic	Probability
YEAR	-0.357142	-4.541952	0.0002
R-squared	0.483923		
Adjusted R-squared	0.460465		
F-statistic	20.62933		
Durbin-Watson stat	1.709233		

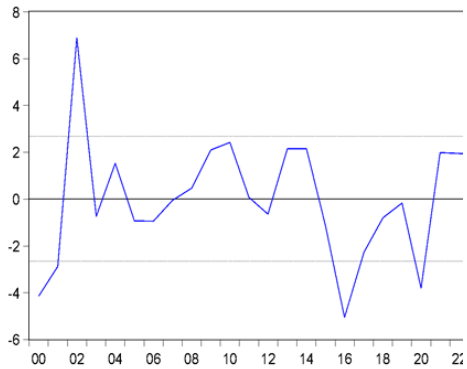

Figure 2: Graphical trend of Gross Domestic Product: 2000 - 2023

Trend equation of Rice Export

Table 5 shows the trend equation of Rice Export. The result shows that the coefficient of the time variable is positive and significant at < 1 percentage level of probability. This implies that it has a positive trend. Figure 3 below shows the trend of growth in Rice Export (RE) from 2000 to 2023. The graph shows that Nigeria's rice exports were minimal from 2000 to 2012 due to low production and reliance on imports. Exports increased between 2010 and 2014 with government efforts to boost local production, but faced a decline due to production challenges before rising again as self-sufficiency efforts improved.

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Table 5: Trend equation of Rice Export

Variable	Coeffiecient	t-Statistic	Probability
YEAR	8.182174	0.234507	0.8168
R-squared	0.002493		
Adjusted R-squared	0.042848		
F-statistic	0.054993		
Durbin-Watson stat	2.182572		

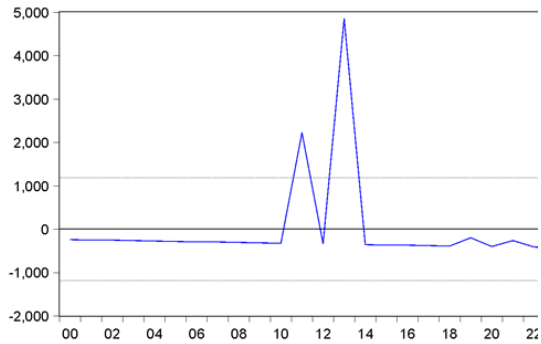

Figure 3: Graphical trend of Rice Export: 2000 - 2023

Estimated result of the relationship between (RICE Export) and the Independent variables (EXR and GDP)

Table 6 shows the estimated result of the dependent variable (RICE export) with the independent variables (EXR and GDP). The R-Square shows that the explanatory variable explained the variations in the dependent variable by 19.4 percent, while the error term explained 81.6 percent. The F-Statistics is 1.5212 and Durbin-Watson statistics is 2.7864.The coefficient (-16.8558) of EXR is negative and not statistically significant at a five percent level of probability. This implies that a unit increase in EXR led to about 16.86 units decrease in Rice Export. The result again shows that the coefficient (2.83E-11) of GDP is positive and not statistically significant at ten percent, implying that a unit increase in GDP led to about 2.8 units increase in Rice Export. The result shows that the variable (EXR and GDP) was significant and had an impact on rice export.

Table 6: The estimated result of the relationship between (RICE export) and the independent variables (EXR and GDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	-16.85586*	9.426053	-1.788220	0.0897
GDP	2.83E-11	1.73E-11	1.632056	0.1191
C	1676.209*	808.3992	2.073492	0.0520
R-squared	0.193671			
Adjusted R-squared	0.066356			
F-statistic	1.521197			
Durbin-Watson stat	2.786359			

***Significant at 1%, ** Significant at 5%, * Significant at 10% Probability Levels
where RICE = (Rice Export) EXR = (Exchange Rate) and GDP = (Gross Domestic Product)

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Autoregressive Distributed Lag (ARDL) co-integration technique of the relationship between (RICE export) and the independent variables (EXR and GDP)

The R-Square is 0.3642, showing that the explanatory variable explained the variations in the dependent variable by 36.4 percentage, while the error term explained 63.6 percent. The F-Statistics is 2.4342 and Durbin-Watson statistics is 1.9799. Table 7 shows the estimated result of the dependent variable (RICE export) with the independent variables (EXR and GDP). The coefficient of EXR (-28.9760) is negative and significant at the 5% level. This implies that a unit increase in the exchange rate leads to a decrease of about 28.98 units in rice export. The result further shows that the coefficient of GDP (4.9511) is positive and significant at 5 percentage level of probability. This implies that 1-unit increase in GDP will lead to about 4.95 units increase in rice export. The lagged value of GDP (-1) shows a negative coefficient of -4.4712, significant at the 5% level. This implies that a unit increase in the previous year's GDP results in a 4.47 unit decrease in rice export. On the other hand, the second lag (GDP(-2)) shows a positive effect, with a coefficient of 5.6512, also significant at the 5% level. This implies a 5.65 unit increase in rice export for a unit increase in GDP from two years ago.

Table 7: Autoregressive Distributed Lag (ARDL) co-integration technique of the relationship between (RICE export) and the independent variables (EXR and GDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RICE (-1)	-0.507924**	0.235554	-2.156295	0.0457
EXR	-28.97596**	10.47396	-2.766477	0.0132
GDP	4.95E-11**	1.90E-11	2.608083	0.0184
GDP(-1)	-4.47E-12**	1.71E-12	-2.610271	0.0228
GDP(-2)	5.65E-12**	1.97E-12	2.869491	0.0141
C	2608.587	872.8448	2.988603	0.0083
R-squared	0.364172			
Adjusted R-squared	0.214566			
F-statistic	2.434202			
Durbin-Watson stat	1.979899			

***Significant at 1%, ** Significant at 5%, * Significant at 10% Probability Levels where RICE = (Rice Export) EXR = (Exchange Rate) and GDP = (Gross Domestic Product).

All coefficients marked ** in Table7 are statically significant at $p < 5$ %, providing sufficient evidence of an effect.

Pairwise Granger Causality Tests

The result from Table 8 indicates that from the time frame study, rice export is not competitive.

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Table 8: Pairwise Granger Causality Tests

Sample: 2000 2023			
Lags: 2			
Null Hypothesis:	Obs.	F-Statistic	Prob.
GDP does not Granger Cause EXR	22	0.67628	0.5217
EXR does not Granger Cause GDP		3.25582	0.0635
RICE export does not Granger Cause EXR	22	1.66761	0.2181
EXR does not Granger Cause RICE export		0.45197	0.6438
RICE export does not Granger Cause GDP	22	0.17455	0.8413
GDP does not Granger Cause RICE export		0.02078	0.9795

Given that most *OLS* coefficients were not significant at P < 5%,
the causal interpretation is weak and should be treated with caution.

Conclusion

The study investigated the Effects of Rice Export on Nigeria's Gross Domestic Product from 2000 to 2023. Based on the findings of the study, Rice export plays a significant role in influencing Nigeria's Gross Domestic Product (GDP). As one of the most consumed staple foods globally, rice has become a strategic agricultural commodity with the potential to boost Nigeria's economy. By increasing rice exports, the country can diversify its revenue sources, reduce over-reliance on oil and promote economic growth. However, challenges such as inadequate infrastructure, low mechanization, poor-quality seeds and limited access to international markets have hindered the full realization of this potential. Addressing these barriers is crucial for maximizing the economic benefits of rice exports to Nigeria's GDP. The government should allocate more resources to developing irrigation systems, road networks, and storage facilities to improve rice production and export logistics. Provide subsidies and incentives for farmers to access modern farming equipment and adopt advanced Agricultural technologies to increase productivity. Also, the government should develop export-friendly policies, negotiate trade agreements, and explore partnerships to gain access to international markets for Nigerian rice.

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