

ORIGINAL ARTICLE

Open Access



# Effect of shipping trade on economic growth in Nigeria: the Vector Error Correction Model (VECM) approach

Adedotun Joseph Adenigbo<sup>1\*</sup> , Joash Mageto<sup>1</sup> and Rose Luke<sup>1</sup>

\*Correspondence:  
ajadenigbo@uj.ac.za

<sup>1</sup> Department of Transport and Supply Chain Management, University of Johannesburg, Auckland Park, Johannesburg 2006, South Africa

## Abstract

The maritime industry is significant to the growth and development of nations. The relationship between shipping trade and economic growth in Nigeria is acknowledged in the literature. Still, the need to emphasise the role of shipping import and export volume and exchange rate volatility in Nigeria's economic growth remains. The economic growth and development level that a maritime nation will derive from its ocean depends on its import and export volumes in the face of exchange rate volatility. Using the Vector Error Correction Model, this study analyses the effect of shipping trade on economic growth in Nigeria from 1970 to 2020. The study examines the effect of seaport imports, exports, and real exchange rates on GDP to determine if Nigeria's economic growth is sustainable, that is if the current pattern of shipping imports and exports for economic growth will not hamper future economic development. The cointegration test established a short- and long-term causality from import, export and exchange rates to GDP. The result showed that Nigeria's economic growth is import-dependent and that, in the long run, import and exchange rates significantly affect GDP. The study further indicates that the present export volume does not significantly contribute to GDP growth. The results imply that building an economic system on an import-dominated trade system is not sustainable for future development. The study recommended strategic initiatives to maintain the economic growth rate while promoting export through local production.

**Keywords:** Shipping trade, Export volume, Import volume, Exchange rate, Economic growth

## Introduction

The maritime industry's role in nations' economic development is essential for research consideration. The shipping operations support global trade with their capacity to facilitate the exchange of enormous volumes of goods across countries of the world. The maritime industry encompasses diverse components of shipping operations that ensure the successful handling and transshipment of goods from the sea to the hinterlands and vice versa. The roles of the shipping industry in global trade are huge, having the capacity to influence product sales and price shocks (Kalouptsidi 2021). Global shipping operations have been recording substantial growth over the

years due to the symbiotic relationship between globalisation and shipping (Corbett and Winebrake 2008; Mishra 2018).

The shipping trade represents the global exchange of goods within the maritime industry, which is expected to grow by 2.4% from 2022 to 2026 (UNCTAD 2021). CISION PR Newswire (2022) reported that the value of global shipping containers reached US\$9.5 billion in 2021 and projected a value of US\$15.3 billion by 2027. The predictions about the growth in international shipping trade will be subject to the influence of different factors such as protectionism, digitalisation, e-commerce, consolidation, and climate change (UNCTAD 2018a, b). The United Nations (2016) stated that maritime transport, through shipping operations, is the backbone of global trade and economy. International Chambers of Shipping (2020) also asserted that the shipping trade is at the centre of the world economy, with a total value of US\$14 trillion in 2019. Matekenya and Ncwadi (2022) established that shipping operations significantly positively impact total trade.

The ocean is a natural endowment with abundant resources to facilitate the sustainable economic growth of nations. It means that a country with abundant seas and a favourable trade balance where export dominates over import is expected to flourish economically. However, the level of growth and development that a maritime nation will derive from the ocean depends on the trade volume with the balance between export and import cargoes and the currency valuation (Akatsuka and Leggate 2001; Kang 2016; Apanisile and Oloba 2020). So, the characteristic problem with the shipping trade imbalance (Kalouptsidi 2021), exchange rate volatility and their effect on economic growth (Bittencourt and Agudelo 2021) is the concern for this study. This follows the result of Bittencourt and Agudelo (2021) that exchange rate volatility is harmful to trade relationships in Colombia. Then, this study argues that a nation with a massive ocean, unfavourable shipping trade balance and exchange rate volatility may not record sustainable economic growth.

The effort to efficiently manage the shipping trade imbalance is complex due to the volatility in a country's macroeconomic variables (Tsouknidis 2016; Lim et al. 2019; Sakyi and Immurana 2021). It means that even with a favourable balance of shipping trade, a question about the effect of exchange rate volatility on sustainable economic growth remains (Siddique et al. 2020). This study addresses the problem of achieving sustainable economic growth from maritime activities in the face of dominating imbalanced shipping volumes and volatile exchange rates. This study is motivated by the need to achieve sustainable economic growth with effective exchange rate management and a favourable shipping trade imbalance of export over import in Nigeria.

So, the export and import pattern at a country's seaports and its relationship to currency volatility requires critical examination for sustainable economic growth policy. The analysis of economic development resulting from the contribution of cargo imports, exports and exchange rates is the focus of this study to determine whether Nigeria's economic growth can be accounted as sustainable for its massive maritime operations. Thus, how Nigeria's shipping imports and exports interact with the exchange rate for economic growth is the question that this study answers. To this end, the research examines the effect of seaborne cargo import, export and exchange rates on the economic growth in Nigeria from 1970 to 2020. Thus, this paper examines the relationship

between maritime imports, exports and exchange rates to determine the sustainability of the economic growth in Nigeria over the years.

The contributions of this study to literature are (1) determination of the short-run and long-run effect of import and export shipping on the economic growth of Nigeria; (2) determination of the short and long-run effect of the exchange rate on the economic growth of Nigeria; (3) provide insight for sustainable economic growth policy decisions in Nigeria. To examine the relationship between shipping trade and economic growth in Nigeria, this study employs shipping traffic volume, which reflects shipping trade, and exchange rate, to determine their effects on economic growth (proxied by GDP) in Nigeria. The study's scope from 1970 to 2020 yields 51 observations. The shipping import and export volumes are used in this study because it represents the volumes of trade through the maritime industry. The exchange rate is important for this study because it represents the currency value for exchanging the goods transported by sea.

Similar to Michail (2020), a search for literature on shipping trade and economic growth in Nigeria revealed few studies on this aspect of the maritime industry. Osadume and Okuoyibo (2020), Owoputi and Owolabi (2020), and Ekpo (2012) employed a descriptive technique to discuss maritime shipping trade and economic growth in Nigeria. Njoku et al. (2020) and Elias et al. (2018) applied a non-time series regression technique to examine external debt, external reserve, and export and import values and their effects on economic growth in Nigeria. However, Osadume and Uzoma (2020) applied the Autoregressive Distribution Lag (ARDL) to study economic development proxied by the HDI—human development index and the effect of trade, exchange rate and inflation rate. This study differs from the few studies in terms of analytical technique, choice of variables and data scope with a focus on the effect of shipping import, export volume and exchange rate on economic growth in Nigeria. Although few attempts have been made to examine the relationship between shipping trade and economic growth in Nigeria, the literature is yet to determine the short and long-run effect of import traffic, export traffic and exchange rate on economic growth in Nigeria. This study, therefore, examines the short and long-run effect of seaport import traffic, export traffic and exchange rate on economic growth in Nigeria using the Vector Error Correction Model (VECM) with the capacity to account for time effects in data with larger temporal scope. The goal is to address the problem of shipping trade imbalance and exchange rate volatility on economic growth.

The remaining sections of this paper are as follows. Section “Literature” presents the summary of the literature reviewed, Section “The Nigeria Shipping industry” provides information on the Nigeria's shipping industry, Section “Data and method” describes the data and methods adopted for the conduct of the study, Section “Results” shows the results of the data analysis, Section “Discussion of results” discusses the results of the research, and Section “Conclusion and Policy recommendations” concludes the paper with relevant policy recommendations.

## Literature

The import and export cargo traffic represents the total volume of the shipping trade of a country. However, the volumes of import and export cargoes that make up the shipping trade are characterised by fluctuations with a similar pattern of effect on economic

growth (Tsouknidis 2016; Matekenya and Ncwadi 2022). The global shipping trade has recorded growth in the volume of imports and export over the years due to increasing population and other global forces of demand and supply and protectionism (UNCTAD 2018a, b). Despite the growth in shipping activities in Nigeria, researchers have given little attention to shipping trade and economic growth, specifically in the country. This implies a level of understudy of this critical area of development. This follows the statement of Michail (2020) that global researchers are yet to provide an elaborate analysis of the effect of the shipping trade on the economy. However, studies on maritime trade and economic growth focussed on port infrastructures and logistics activities (Munim and Schramm 2018; Lai et al. 2019); global economy (Michail 2020); freight rate and export shipping (Jiang et al. 2018); shipping trade and climate change (Walsh et al. 2019); trade and containerisation (Cosar and Demir 2018; Prokopowicz and Berg-Andreassen 2016); and shipping trade and port performance (Banerjee and Gupta 2013).

Meanwhile, issues regarding the effect of the volatility in shipping trade and the macroeconomic variables of nations are important for research consideration to achieve sustainable development. So, this paper makes an important contribution to the literature by analysing the effect of shipping imports, exports and exchange rates on economic growth in Nigeria. Even with the focus of the studies above, the existing studies that serve as the empirical framework for this study are presented under two sub-sections as follows; (1) trend in shipping trade and economic growth, and (2) exchange rate volatility and shipping volumes.

#### **Shipping trade and economic growth**

Previous studies on shipping trade and economic growth have been carried out extensively by researchers. The study by Lane and Pretes (2020) found a significant relationship between maritime dependency, which is characteristic of coastal nations, and Gross Domestic Product (GDP) per capita, which depicts that most countries that have access to the ocean benefit from shipping. The finding suggests the importance of import and export shipping to the economic growth of maritime nations. In line with this, Jiang et al. (2018) in China found that export has a negative significant impact on the trade index along the Persian Gulf and European routes, while the freight index has a negative significant effect on exports in the Southeast Asian and Taiwanese shipping routes. In addition, the relationship between shipping connectivity and trade has been established by scholars such as Lun and Hoffmann (2016), Fugazza and Hoffmann (2017) and Hoffmann et al. (2017). The studies concluded that shipping operations influence trade. This study adds to the existing literature by examining the effect of shipping imports, export and exchange rates on GDP growth in Nigeria.

#### **Exchange rate volatility and shipping volumes**

Several studies have indicated the effect of exchange rate volatility on shipping export and import volumes. For example, Kemal and Qadir (2005) found that the real exchange rate has a positive relationship with imports but a negative relationship with export. Subiyakto and Algifari (2016) found that the foreign exchange rate significantly affects export and imports at a 10% significance level. Also, Chaudharya et al. (2016) study found that the exchange rate has a significant relationship with imports in certain

countries. In Kenya, Gachunga (2018) found that real exchange rate volatility affects the imports and export of the country. In Pakistan, Siddique et al. (2020) found that the increasing real exchange rate has a significant adverse effect on exports. The study by Gupta and Varshney (2021) on India—US trade established the importance of imports in a time series analysis of countries' trade and economic growth. The study of Nguyen et al. (2021) on Vietnam and the US supports that the real exchange rate affects imports and exports volumes.

The studies on the relationship between shipping volumes and exchange rates serve as another framework for this study on Nigeria. The existing need for more research on the exchange rates and shipping export and import volumes in Nigeria justifies the contribution of this study to the literature.

### **The Nigeria Shipping industry**

Nigeria is blessed with an abundant ocean for foreign and territorial transportation of goods. The maritime resources available to Nigeria are enormous for the well-being of its over 200 million population (Onuoha 2021). Atakpa (2021) reported that Nigeria has about 852 km of coastline water with a maritime space of about 315,240 sqkm and stated that the maritime space represents 34.1% of Nigeria's landmass. Also, Okoye (2021a, b) stated that Nigeria has access to 12 Nautical miles of territorial waters, 24 Nautical miles of the contiguous zone and 200 Nautical miles of international coastal waters. The country presently has nine (9) seaports with massive shipping operations.

The eminence of the Nigerian maritime industry was pronounced by the United Nations Conference on Trade and Development (UNCTAD) by ranking Nigeria highest out of the top 35 flags of registration regarding the increase in the shares of the world merchant fleet value in 2021 (Dentons 2022). Also, the International Maritime Organisation (IMO), referring to the maritime industry, stated that Nigeria is important to Africa and the global maritime economy (Egole 2022). Onyenucheya (2022) reported that approximately 80% of shipping business on the West African coast occurs in Nigeria. Atoyebi (2022) attributed the Nigerian maritime industry's transition to a global status in the international market because its trade accounted for over 50% of the country.

With the recognition of UNCTAD and IMO, it is evident that Nigeria's shipping industry has the capacity to determine the trade volume of countries in and outside the African continent. Nigeria's shipping industry plays a significant role in the economic emancipation of nations by influencing the pace of growth in other industries. The shipping industry in Nigeria has great potential to generate huge revenue, being a goldmine with the capacity to drive economic growth (Onyenucheya 2022). The import and export volume of the shipping industry represents a country's trade value that most researchers have used in their studies.

This study, specifically on Nigeria, is relevant to other African and developing nations. This is because Nigeria has the largest economy and population in Africa. Globally, Nigeria accounts for a large market for trade opportunities. This study also focuses on Nigeria because of the massive nature of its shipping industry in relation to global trade. It calls for research attention because shipping activities in Nigeria affect trade in other African countries and globally. This study, therefore, examines the short and long-run effect of seaport import traffic, export traffic and exchange rate on economic growth in

Nigeria. The goal is to reveal the importance of seaport cargo volume and exchange rate fluctuations to economic growth.

### Data and method

The research is inferential and based on a quantitative analysis of secondary data. The study employs the Vector Error Correction Model (VECM) to analyse data for policy implications. Authors such as Michail (2020), Kim (2017), and Tsioumas et al. (2017) applied VECM to examine the shipping trade in their studies. Following the previous studies, the VEC Model is adopted in this study to explore the effect of shipping trade and exchange rates on economic growth in Nigeria. The utility of VECM in this paper is because of its ability to provide interpretation with long and short-term equations.

This study used time series data of Real Gross Domestic Product (RGDP) per capita, cargo import and export volume, and real exchange rate from 1970 to 2020. The data makes 51 time-dependent observations for analysis. The RGDP was chosen as a proxy for economic growth. Cargo imports and export volumes were taken as a proxy for shipping trade because they represent the volume of goods exchanged in a country. The study also employs export and import volumes to highlight the importance of shipping operations to economic growth. The real exchange rate was taken as the value of goods in a domestic country that can be exchanged for the same good in a foreign country. The study's import and export data were collected from the Nigerian Ports Authority (NPA) records. The data on RGDP and exchange rate were collected from the records of the Central Bank of Nigeria (CBN). The data were obtained from the statistics department of each organisation. For NPA, data were extracted from the organisation's annual statistics book. For CBN, data were extracted from the organisation's website in the statistical bulletin folder.

The data collected were subjected to multivariate time series analysis with the Vector Error Correction Model (VECM) cointegration because of its ability to address time variations in data. The analysis aims to determine the short and long-run effects of the maritime shipping trade on economic growth in Nigeria. The conditions for conducting the VECM analysis require that the data in their original state are non-stationary while they become stationary at their first difference ( $L_{(1)}$ ) level. Also, the data must have at least one cointegrating equation to facilitate building the VEC model. If the data meet the conditions, the procedure for building the model follows;

1. the determination of stationarity in data,
2. determination of optimal lag length ( $p$ ),
3. perform the Johansen cointegration test with ( $p$ ) lag,
4. specify VEC with ( $p$ ) -1 lag, and
5. perform diagnostic tests—autocorrelation, normality, and stability tests.

The specification for the model follows the general form;

$$A_t = f(B_t, C_t, D_t) \quad (1)$$

where A represents real GDP per capita, B represents import cargo volume, C represents export cargo volume, and D represents the real exchange rate

The transformation of the series into natural logarithmic form to attain direct elasticities takes the form;

$$\text{Ln GDP}_t = \alpha_0 + \alpha_{\text{Imp}} \text{Ln Imp}_t + \alpha_{\text{Exp}} \text{Ln Exp}_t + \alpha_{\text{Exc}} \text{Ln Exc}_t + \mu_i \quad (2)$$

where Ln is the natural logarithm; the real GDP was used as a proxy for economic growth, Imp and Exp represent shipping trade, Exc is the real exchange rate, and  $\mu$  is the error term. The model presumes that a rise in shipping trade will increase economic growth and  $\alpha_{\text{Exc}} > 0$ . When  $\alpha_{\text{Exp}} > 0$ , an increase in export rate is linked with high GDP, otherwise  $\alpha_{\text{Exp}} < 0$ . The import and export volumes were used in this study to express Nigeria's maritime activities by cargo throughput, which measures the operational performance of seaports.

After the identification of at least two (2) cointegrating equations between the variables, the VECM will be built on the general form;

$$\Delta Y_t = a_0 + \lambda e_{t-1} + a \Delta X_{t-1} + a_4 \Delta Y_{t-1} + a_4 \Delta Z_{t-1} + \epsilon_t \quad (3)$$

where  $\Delta$  is the difference operator;  $\lambda$  is the speed of adjustment parameter of EC; EC is the error correction term;  $a$  is the short-run coefficient for long-run equilibrium; X, Y, and Z represent the variables;  $\epsilon_t$  is the residuals; and  $a_0$  is the constant.

Specifically, the VEC model for this study that adjusts to the changes in the short and long-run equilibrium of the cointegrating equations for this takes;

$$\Delta \text{LnGDP}_t = \alpha_0 + \lambda_1 e_{t-1} + a_1 \Delta \text{LnGDP}_{t-1} + a_2 \Delta \text{LnImp}_{t-1} + a_3 \Delta \text{LnExp}_{t-1} + a_4 \Delta \text{LnExc}_{t-1} + \epsilon_{t1} \quad (4)$$

$$\Delta \text{LnImp}_t = \beta_0 + \lambda_2 e_{t-1} + a_1 \Delta \text{LnGDP}_{t-1} + a_2 \Delta \text{LnImp}_{t-1} + a_3 \Delta \text{LnExp}_{t-1} + a_4 \Delta \text{LnExc}_{t-1} + \epsilon_{t2} \quad (5)$$

$$\Delta \text{LnExc}_t = \Omega_0 + \lambda_3 e_{t-1} + a_1 \Delta \text{LnGDP}_{t-1} + a_2 \Delta \text{LnImp}_{t-1} + a_3 \Delta \text{LnExp}_{t-1} + a_4 \Delta \text{LnExc}_{t-1} + \epsilon_{t3} \quad (6)$$

The variables for this research are defined and measured as follows;

**Real Gross Domestic Product (Real GDP)**—the value of goods produced in a country in a given year subject to the index in the prices of goods and services.

**Export cargo**—the volume of goods exported from Nigeria through the seaports. It is measured in metric tons.

**Import cargo**—the volume of goods imported into Nigeria through the seaports. It is measured in metric tons.

**Real exchange rate**—the volume of domestic goods exchanged for the same volume of foreign goods. It is measured in Naira/USD.

## Results

The output of the descriptive statistics of the data, as presented in Table 1, indicates that the variables are normally distributed. The output of the descriptive statistics supports further analysis.

The VEC model testing approach examines the short and long-run relationship between shipping trade, exchange rate and economic growth in Nigeria. The model test

**Table 1** Descriptive statistics of data. *Source:* STATA Computation, 2022

Variable	Obs	Mean	Std. Dev	Min	Max	Skewness	Kurtosis
LnGDP	51	7.526603	3.135751	2.217027	11.95	-.130952	1.625489
LnImp	51	.8222437	14.79714	17.80029	.8222437	-.2538515	2.232892
LnExp	51	1.002307	14.22627	17.28538	1.002307	.2732986	1.53314
LnExc	51	2.938039	2.089145	.11	5.88	-.087595	1.347567

allows the flexibility of the integration order of the series. The study adopted the Augmented Dickey–Fuller (ADF) unit root test to determine the level of stationarity in the data. Table 2 shows that data are stationary at the first difference ( $L_{(1)}$ ). ADF unit root tests show that the series LnGDP, LnImp, LnExp and LnExc are stationary at 1%, 5% and 10% critical values and  $p = 0.000$ . The variables are integrated at the same level and fit for the cointegration test to establish the short and long-run relationships among them.

The result in Table 3 presents the lag determination criteria for the analysis. The study chose the Akaike Information Criteria (AIC), which indicates three (3) lags for building the VEC model. However, LR and FPE also indicate 3 lags for the model. The lag criteria were all significant at  $p = 0.000$ .

**Table 2** Augmented Dickey–Fuller Unit Root test. *Source:* STATA Computation, 2022

dfuller D.LnGDP, lags(0)	Dickey–Fuller test for unit root		Number of obs = 49	
	Test statistics	1% Critical value	5% Critical value	10% Critical value
Z(t)	-6.586	-3.587	-2.933	-2.601
MacKinnon approximate $p$ value for Z(t) = 0.0000				
dfuller D.LnImp, lags(0)	Dickey–Fuller test for unit root		Number of obs = 49	
	Test statistics	1% Critical value	5% Critical Value	10% Critical value
Z(t)	-10.810	-3.587	-2.933	-2.601
MacKinnon approximate $p$ value for Z(t) = 0.0000				
. dfuller D.LnExp, lags(0)	Dickey–Fuller test for unit root		Number of obs = 49	
	Test statistics	1% Critical value	5% Critical value	10% Critical value
Z(t)	-7.212	-3.587	-2.933	-2.601
MacKinnon approximate $p$ value for Z(t) = 0.0000				
. dfuller D.LnExc, lags(0)	Dickey–Fuller test for unit root		Number of obs = 49	
	Test statistics	1% Critical value	5% Critical value	10% Critical value
Z(t)	-6.024	-3.587	-2.933	-2.601
MacKinnon approximate $p$ value for Z(t) = 0.0000				

**Table 3** Lag determination for VECM. *Source:* STATA Computation, 2022

Lag	Sample: 1973–2020				Number of obs = 48			
	LL	LR	Df	$p$	FPE	AIC	HQIC	SBIC
0	-187.739				.034654	7.98914	8.04806	8.14507
1	31.5202	438.52	16	0.000	7.3e-06	-48001	-.185373*	.299657*
2	46.7586	30.477	16	0.016	7.6e-06	-.448273	.082074	.955128
3	71.3497	49.182*	16	0.000	5.5e-06*	-.806236*	-.040179	1.2209

\*Lag position; Endogenous: LnGDP LnImp LnExp LnExc; Exogenous: \_cons

**Table 4** Johansen tests for cointegration among LnGDP, LnImp, LnExp and LnExc. *Source:* STATA Computation, 2022

Trend: constant			Number of obs = 48		
Sample: 1973–2020			Lags = 3		
Maximum rank	Parms	LL	Eigenvalue	Trace statistics	5% critical value
0	36	39.275466		64.1484	47.21
1	43	54.513586	0.47002	33.6721	29.68
2	48	65.450046	0.36599	11.7992*	15.41
3	51	70.313068	0.18342	2.0732	3.76
4	52	71.349655	0.04227		

\*At least two cointegrating equations in the model

**Table 5** Vector error-correction model. *Source:* STATA Computation, 2022

Sample: 1973–2020			Number of obs = 48		
Log-likelihood = 65.45005			AIC = -.7270853		
Det(Sigma_ml) = 7.69e-07			HQIC = -.0199557		
			SBIC = 1.144116		
Equation	Parms	RMSE	R-sq	chi2	p > chi2
D_LnGDP	11	.128788	0.7886	134.2588	0.0000
D_LnImp	11	.293872	0.6852	78.34248	0.0000
D_LnExp	11	.175378	0.2554	12.34801	0.3381
D_LnExc	11	.24203	0.4616	30.87066	0.0012

The study used the Johansen tests for cointegration to determine the number of cointegrating equation(s) in the model. Table 4 shows two (2) cointegrating equations in the model expressing the relationships between shipping trade and economic growth in Nigeria. The result indicates that there is both short and long-run effect of shipping trade on economic growth in Nigeria. Table 4 shows that the Trace Statistics 11.7992 is less than 5% Critical Value of 15.41 at rank 2 to confirm that, at most, there are two (2) cointegrating equations in the model.

The result in Table 4 established at least two (2) cointegrating equations in the system, implying that the series is appropriate for the VEC model to examine the short and long-run causality between shipping trade and economic growth in Nigeria. Table 5 shows a significant correlation between the variables with R-square values of .7886 for LnGDP, .6852 for LnImp, .2554 for LnExp, and .4616 for LnExc. It implies strong positive relationships between economic growth and shipping trade in Nigeria.

The results in Table 6 indicate a positive significant long-run effect of shipping trade on economic growth in Nigeria. The coefficient of the cointegrating Eq. 1 ( $\_ce1$ ) having  $-.1071365$ , which is significant at  $p < 0.005$ , indicates an asymmetric long-run relationship of the equations running from cargo import and export and exchange rate to GDP in Nigeria. The coefficient of the cointegrating equation ( $\_ce1$ ), which is also the error term, is the speed of adjustment towards the equilibrium point of the model with an asymmetric relationship. It implies that, in the long run, import, export and exchange rate will positively affect Nigeria’s GDP growth. The Lag of cointegrating

**Table 6** VECM specification for long and short-run causality. *Source:* STATA Computation, 2022

	Coef	Std. Err	Z	$p > z$	[95% Conf. Interval]	
D_LnGDP						
_ce1	-.1071365	.0437136	-2.45	0.014	-.1928137	-.0214594
L1						
_ce2	.0879136	.0697728	1.26	0.208	-.0488386	.2246658
L1						
LnGDP						
LD	.2293239	.1453278	1.58	0.115	-.0555133	.5141611
L2D	.1277691	.1221171	1.05	0.295	-.1115761	.3671143
LnImp						
LD	-.1437443	.0655169	-2.19	0.028	-.2721551	-.0153334
L2D	-.0425921	.0555144	-0.77	0.443	-.1513983	.0662141
LnExp						
LD	-.2696409	.1253988	-2.15	0.032	-.515418	-.0238638
L2D	.092927	.1143132	0.81	0.416	-.1311228	.3169768
LnExc						
LD	.0708821	.0756523	0.94	0.349	-.0773936	.2191579
L2D	.0572609	.0819141	0.70	0.485	-.1032878	.2178096
_cons	.1485877	.0476464	3.12	0.002	.0552025	.2419729

Eq. 2 (\_ce2) of the model with a positive coefficient and  $p = 0.208$  is not significant for discussion.

However, in the short run, the results show that import and export shipping volume positively affect GDP with  $p = 0.028$  and  $0.032$  at lag order 1. It implies that, in the short run, import and export shipping volumes significantly impact Nigeria's economic growth. However, the exchange rate shows an insignificant effect on GDP in the short run, with  $p = 0.349$ , which is greater than  $0.05$ . The result implies that a unit change in the exchange rate has a negligible effect on GDP growth in the short run but a severe impact over an extended period.

The study further tested whether the Lags of LnImp, LnExp and LnExc can jointly cause GDP growth in the short run. The results in Table 7 show that the overall effect of import, export and exchange rate on GDP growth is significant in the short run, with Chi-square = 13.45 and a probability of 0.0364. It implies that the null hypothesis that the Lags of LnImp, LnExp and LnExc do not jointly affect GDP growth be rejected. In addition, the significant effect of Lag 1 of each independent variable on the dependent variable was tested. The results show that LnImp and LnExp were significant for rejecting the null hypothesis and that of LnExc was insignificant. The overall test result indicates a short-run causality from shipping import, export and exchange rates to economic growth in Nigeria.

The VECM specification derived from the analysis quantifies the shipping trade's long-run effect on Nigeria's economic growth. The study indicated two cointegrating equations for the model. Table 8 shows that the two cointegrating equations in the model are significant at  $p = 0.000$  with chi-square values of 762.4285 for Eq. 1 and 59.91376 for Eq. 2.

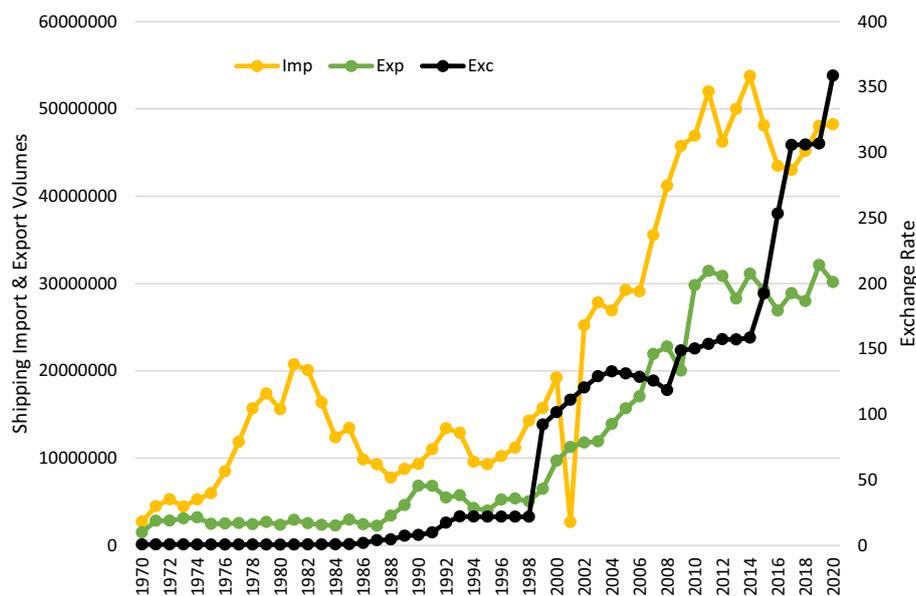
Table 8 further reveals the specifications for the two cointegrating equations. The Johansen identification technique placed four (4) constraints on the model, with ce1

**Table 7** Short-run test of causality. Source: STATA Computation, 2022

	[D_LnGDP]LD.LnImp=0	[D_LnGDP]LD.LnExp=0	[D_LnGDP]LD.LnExc=0
chi2(1)	4.81	4.62	0.08
Prob > chi2	0.0282	0.0315	0.3488
Decision	Reject Null Hypothesis	Reject Null Hypothesis	Accept Null Hypothesis

Test	Equations
(1)	[D_LnGDP]LD.LnImp=0
(2)	[D_LnGDP]LD.LnExp=0
(3)	[D_LnGDP]LD.LnExc=0
(4)	[D_LnGDP]L2D.LnImp=0
(5)	[D_LnGDP]L2D.LnExp=0
(6)	[D_LnGDP]L2D.LnExc=0
chi2(6)=	13.45
Prob > chi2=	0.0364 (Reject Null Hypothesis)



**Fig. 1** Trend of cargo import and export and exchange rates in Nigeria from 1970 to 2020. Source: NPA & CBN

having  $\text{LnGDP}=1$  and  $\text{LnImp}=0$ , while  $\text{ce2}$  has  $\text{LnGDP}=0$  and  $\text{LnImp}=1$ . Equation 1 indicates that there is the existence of an equilibrium relationship between economic growth ( $\text{LnGDP}$ ) and export shipping and exchange rates. It implies causality from export and exchange rates to GDP growth in Nigeria. However, it is noted in Table 8 that the effect of  $\text{LnExp}$  is not significant, with  $p=0.323$ . The result depicts the economic reality of trade in Nigeria, which is import-dependent (See Fig. 1).

The model restricted the import coefficient to unity in the cointegrating Eq. 2. The restriction on both equations was simply for model identification. So, further fitting of the model will yield the same maximised log-likelihood. Cointegrating Eq. 2 ( $\text{ce2}$ ) indicates that there is the existence of a cointegrating equilibrium between import ( $\text{LnImp}$ ) and export ( $\text{LnExp}$ ) and exchange rate ( $\text{LnExc}$ ). It suggests a causality

**Table 8** VECM specification for the effect of Shipping trade on economic growth. *Source:* STATA Computation, 2022

Equation	Parms		chi2		$p > \text{chi2}$	
_ce1	2		762.4285		0.0000	
_ce2	2		59.91376		0.0000	
Beta	Coef	Std. Err	Z	$p > z$	[95% Conf	Interval]
<i>Johansen normalization restrictions imposed</i>						
<i>_ce1</i>						
LnGDP	1	–	–	–	–	–
LnImp	0	(omitted)				
LnExp	–.389369	.3943516	–0.99	0.323	–1.162284	.3835459
LnExc	–1.278738	.1848304	–6.92	0.000	–1.640999	–.9164776
_cons	2.132706	–	–	–	–	–
<i>_ce2</i>						
LnGDP	0	(omitted)				
LnImp	1					
LnExp	–.6335096	.2909506	–2.18	0.029	–1.203762	–.0632569
LnExc	–.0040889	.1363669	–0.03	0.976	–.2713632	.2631854
_cons	–7.09272					

Identification: beta is exactly identified

**Table 9** VECM constrained to one cointegrating equation. *Source:* STATA Computation, 2022

Beta	Coef	Std. Err	Z	$p > z$	[95% Conf	Interval]
<i>Johansen normalization restrictions imposed</i>						
<i>_ce1</i>						
LnGDP	1	–	–	–	–	–
LnImp	–.4970651	.2361458	–2.10	0.035	–.9599023	–.0342278
LnExp	–.0744735	.3793735	–0.20	0.844	–.8180318	.6690848
LnExc	–1.276706	.1505305	–8.48	0.000	–1.57174	–.9816717
_cons	5.48324	–	–	–	–	–

Identification: beta is exactly identified

running from export and exchange rate to import. Likewise, it is to be noted that the exchange rate is not significant in the equation with  $p = 0.976$ , while export is significant at  $p = 0.029$ . The result implies the significance of shipping export on Nigeria's economic growth.

To make the model specification appear simple for presentation and discussion, the study constrained the number of the cointegrating equation to one. The result in Table 9 is the VEC model for one cointegrating equation that shows the relationship between shipping trade and economic growth in Nigeria. The results indicate bidirectional causality running from import (LnImp) and real exchange rate (LnExc) to economic growth (LnGDP) in Nigeria.

The coefficients of LnImp and LnExc are positively significant at  $p < 0.05$ . Nevertheless, that of LnExp is positive but not significant, with  $p = 0.844$ . The result has three implications; 1. Nigeria's economic growth is dictated by import shipping trade at the expense of export. 2. Nigeria's current maritime export volume is not substantial enough

to ensure future economic growth. So, implicitly, it is apparent that present Nigeria’s economic reality of building GDP on imports is not sustainable for the desired future growth and development. 3. The positive significance of the exchange rate in the model established that the import and export trade of a country is affected by the volatilities in the exchange rates.

The study concluded the analysis with diagnostic tests of the model for the reliability and validity of the results. The serial correlation with Lagrange-multiplier LM), normality with Jarque–Bera test, and stability with eigenvalue stability condition. Table 10 shows no autocorrelation in the mode; the data variables are normally distributed and confirm the stability of the model with 2-unit moduli to establish the effect of shipping trade on economic growth in Nigeria.

**Table 10** Tests of model reliability. *Source:* STATA Computation, 2022

<b>1. Lagrange-multiplier test</b>			
<b>Lag</b>	<b>chi2</b>	<b>Df</b>	<b>Prob &gt; chi2</b>
1	22.8769	16	0.11707
2	15.1440	16	0.51412
3	19.8668	16	0.22628
H0: no autocorrelation at lag order			
<b>2. Jarque–Bera test</b>			
<b>Equation</b>	<b>chi2</b>	<b>Df</b>	<b>Prob &gt; chi2</b>
D_LnGDP	18.403	2	0.00010
D_LnImp	0.755	2	0.68551
D_LnExp	0.035	2	0.98250
D_LnExc	188.728		0.00000
ALL	207.9228		0.00000
<b>3. Eigenvalue stability condition</b>			
<b>Eigenvalue</b>	<b>Modulus</b>		
1	1		
1	1		
.8680318 + .2828535i	.912954		
.8680318 - .2828535i	.912954		
.2273012 + .625078i	.665123		
.2273012 - .625078i	.665123		
-.5103092 + .3787514i	.635506		
-.5103092 - .3787514i	.635506		
-.1956455 + .2143349i	.290201		
-.1956455 - .2143349i	.290201		
.2189128 + .1381575i	.258863		
.2189128 - .1381575i	.258863		
The VECM specification imposes 2 unit moduli			

## Discussion of results

The major finding of this study implies that maritime trade in Nigeria is dominated by import shipping volume over export. Figure 1 shows the trend of shipping import, export and exchange rates over the study period. A note from Fig. 1 is that the margin between export and import gets wider as the real exchange rate increases. The trend pattern in Fig. 1 confirms the finding of this study that Nigeria's maritime trade is dictated by import shipping volume over export. It implies that trade and exchange in Nigeria are import-dependent. The study also presents the economic reality regarding domination of import over export volumes at seaports in Nigeria. The situation accounts for the reason export volume is insignificant in the results in Tables 8 and 9. This implies that the ascribed economic growth in Nigeria over the years is built on import trade. Also, the fact that the coefficient of 0.07 (see Table 9) is attributed to export indicates that the contribution of export shipping is minimal and not significant to overturn the economic fortune of Nigeria in the long run if the country continues to run its trade on import dependence. This is because a healthy economy that will support future development will have both export and import growth systematically (Kramer 2022). It implies from Table 9 and Fig. 1 that the economic reality of the import-dependent trade system in Nigeria cannot be said to guarantee economic growth that is sustainable in the future since export growth is insignificant compared to import volumes. The result of the insignificant volume of export in Nigeria supports the finding of Carrasco and Tovar-Garcia (2021) that export composition and diversification of developing countries such as Nigeria are insignificant to their imports of high-tech and capital goods.

In addition, the result of this study reflects the influence of the real exchange rate on economic growth in Nigeria. The result supports previous studies that the real exchange rate affects the relative price of goods in the domestic markets (Babangida et al. 2021) and that exchange rate volatility has a significant negative effect on economic growth (Morina et al. 2020). In such a situation, domestic consumption will grow with higher imports than export as the pass-through effect of the exchange rate declines (Bada et al. 2016). In addition, finding from the analysis imply that a continuous trade imbalance with import domination will reflect the significant effect of exchange rate volatility on domestic currency devaluation. This aligns with the studies of Kemal and Qadir (2005) and others presented in Section "Exchange rate volatility and shipping volumes".

Furthermore, the study finds that the real exchange rate and imports largely influence GDP growth in Nigeria. It strongly indicates that Nigeria is a large consumption nation which is not producing what it consumes. Also, the result implies that continuous domination of import over export with its resultant devaluation of the local currency, will have significant negative effect on economic growth in the long-run. It implies that the current import-dominated economic system in Nigeria is unsustainable for real development in the long run. The consequence is that future economic buoyancy is not guaranteed for Nigeria despite its massive ocean for shipping trade. The conclusion aligns with the study of Fountas and Aristotelous (2005) that there is an insignificant short-run effect of exchange rate volatility on the export volume of intra-European countries and that the European Monetary System of exchange rate volatility led to a decline intra-EU export in Belgium, Denmark and Germany. Also, Genc and Artar (2014) found a significant long-term effect of exchange rate on export in Nigeria and other selected developing countries. The result also supports Habanabakize (2020), who stated that imports,

exports and exchange rates influence economic growth, while economic growth also affects them. Dumre (2019) also established a significant relationship between Nepal's GDP, exchange rate, export and import. Importantly, the local currency of an import-dominated country will depreciate and in the long run, makes economic growth unsustainable for the future. In support of this, the study of Toraganlia and Yalcin (2016) found that the Turkish lira depreciation impacts export volumes.

### **Conclusion and policy recommendations**

As much as countries will continue to interact in the face of globalisation, shipping trade will continue unabated. This study examines the effect of the shipping trade on economic growth in Nigeria. Econometric analysis involving cointegration and the Vector Error Correction Model showed significant short and long-run effects of shipping trade on economic growth in Nigeria. This study finds that the present economic system of dominating shipping imports over export is unsustainable for the future development of Nigeria. Also, the findings imply that there will be a continuous devaluation of Nigeria's currency because of its import-oriented shipping trade. So, despite Nigeria's massive ocean, the study establishes that sustainable economic growth is not guaranteed in the face of its import-dominated shipping volume and volatile exchange rate. It indicates that effective policies must guide shipping operations in the country.

In line with the major findings of this study, recommendations are made as follows; first, there is a need for Nigeria to reverse growing her economy on import trade to achieve the development that will support the future aspirations of the country. This should be done with strategic initiatives such as the increase in local production and export promotion. This is relevant to other developing countries because it aligns with SDG 17.11, which aims to increase developing countries' exports by 2020. Nevertheless, UNCTAD (2021) found that most developing countries' export volume amounted to 1% in 2021. Jawaid et al. (2020) also recommended export production policy for developing countries to balance their terms of trade. The initiatives should be strategic to maximise the country's comparative advantage in some specific manufacturing products for exports. It calls for improved policy decisions for proper export promotion and trade monitoring that will outrun imports for developing countries to gain from global trade liberalisation. The goal of export promotion can also be achieved with strategies that promote liner shipping connectivity through bilateral trade agreements. Considering and implementing initiatives for local production and export promotion will address most developing countries' current problem with the import-dependent trade system.

Second, the government may implement an exchange rate policy favourable to local manufacturing and exporters through the Central Bank. Though the market dictates the exchange rate values, the government will need to intervene to control fluctuations to promote exports such that increased export will assist in reducing the level of currency depreciation in the country. The recommendation aligns with Fang et al. (2006) study about export promotion with exchange rate depreciation or stabilisation. The policy's goal is to improve the value of the local currency.

Third, the goal of Nigeria's economic policy decisions should be focused on meeting the present economic needs without jeopardising the future needs of the country.

The process for arriving at the policy decisions should involve all stakeholders. Attention must be given to local production activities such that citizens consume more of the country's produce.

In conclusion, the findings from the study make a significant contribution to existing knowledge by addressing the complexity of building a sustainable economy with shipping trade volume and exchange rate control. The results suggest Nigeria must redirect its economic policy to favour local production and export. The recommendations are significant for all developing economies and import-dependent countries worldwide.

### Limitations and further study

The research is limited to determining if Nigeria's economic growth is sustainable in the face of a volatile exchange rate and unbalanced shipping trade. Further studies may use other developing countries as case studies and employ other macroeconomic variables that this study did not consider.

#### Acknowledgements

The authors acknowledge the reviewers' comments.

#### Author contributions

AJA conceptualised, analysed and prepared the draft of the manuscript. JM and RL reviewed the manuscript. All authors read and approved the final manuscript.

#### Funding

The authors declare that there is no public funding for the research.

#### Availability of data and materials

The datasets used and analysed for this study are available from the corresponding author upon reasonable request.

### Declarations

#### Competing interests

The authors declare that they have no competing interests arising from this article.

Received: 23 December 2022 Revised: 25 April 2023 Accepted: 9 May 2023

Published online: 16 May 2023

### References

- Akatsuka K, Leggate K (2001) Perceptions of foreign exchange rate risk in the shipping industry. *Marit Policy Manag* 28(3):235–249. <https://doi.org/10.1080/03088830110055684>
- Apanisile OT, Oloba OM (2020) Asymmetric effect of exchange rate changes on cross-border trade in Nigeria. *Future Bus J* 6(8):1–9. <https://doi.org/10.1186/s43093-020-00013-0>
- Atakpa SD (2021) Marine protected areas and Nigeria's blue economy. *Ships and Ports*. <https://shipsandports.com.ng/marine-protected-areas-and-nigerias-blue-economy/>. Accessed 10 March 2023
- Atoyebi OM (2022) A comprehensive analysis of the challenges and prospects in the Nigerian Maritime/Shipping Industry viz-a-viz its implications for foreign investment. [https://drive.google.com/file/d/1G4oz3NOZOgIN63O3vZO5CUz55D\\_YGxH/view](https://drive.google.com/file/d/1G4oz3NOZOgIN63O3vZO5CUz55D_YGxH/view). Accessed 10 March 2023
- Babangida JS, Sanusi AR, Yusuf IM (2021) Relationship between real exchange rate and consumption in Nigeria: a nonlinear approach. *CBN J Appl Stat* 12(2):125–148
- Bada AS, Olufemi AI, Tata IA, Peters I, Bawa S, Onwubiko AJ, Onyowo UC (2016) Exchange rate pass-through to inflation in Nigeria. *CBN J Appl Stat* 7(1a):49–70
- Banerjee A, Gupta S (2013) Overseas trade vis-a-vis overseas shipping: growth and performance in India (1999–2009). *Res Transp Econ* 38(1):101–109. <https://doi.org/10.1016/j.retrec.2012.05.012>
- Bittencourt MVL, Agudelo PAM (2021) The impacts of the exchange rate volatility on Colombian trade with its main trade partners. *EconoQuantum* 18(2):57–81. <https://doi.org/10.18381/eq.v18i2.7209>
- Carrasco CA, Tovar-García ED (2021) Trade and growth in developing countries: the role of export composition, import composition and export diversification. *Econ Change Restruct* 54:919–941. <https://doi.org/10.1007/s10644-020-09291-8>
- Chaudharya GM, Hashmib SH, Khan MA (2016) Exchange rate and foreign trade: a comparative study of major South Asian and South-East Asian Countries. *Procedia Soc Behav Sci* 230:85–93
- CISION PR Newswire (2022) Global Shipping Container Market (2022 to 2027) - Industry Trends, Share, Size, Growth, Opportunity and Forecasts. *ResearchAndMarkets*. <https://www.prnewswire.com/news-releases/global-shipp>

- ing-container-market-2022-to-2027---industry-trends-share-size-growth-opportunity-and-forecasts-301552030.html
- Corbett JJ, Winebrake J (2008) The impacts of globalisation on international maritime transport activity: past trend and future perspectives. Global Forum on Transport and Environment in a Globalising World, 10–12 November 2008, Guadalajara, Mexico. <https://www.oecd.org/greengrowth/greening-transport/41380820.pdf>
- Coşar AK, Demir B (2018) Shipping inside the box: containerization and trade. *J Int Econ* 114:331–345. <https://doi.org/10.1016/j.jinteco.2018.07.008>
- Dentons (2022) Highlights of key developments in Nigeria's maritime industry in 2021. <https://www.jdsupra.com/legal-news/highlights-of-key-developments-in-7752689/>. Accessed 10 March 2023
- Dumre DP (2019) Role of exchange rate, import, and export in economic development of Nepal. *SSRG Int J Econ Manag Stud* 6(8):136–144. <https://doi.org/10.14445/23939125/IJEMS-V6I8P115>
- Egole A (2022) Nigerian maritime sector vital to global economy – IMO. <https://punchng.com/nigerian-maritime-sector-vital-to-global-economy-imo/>. Accessed 10 March 2023
- Ekpo IE (2012) Impact of shipping on Nigerian economy: implications for sustainable development. *J Educ Soc Res* 2(7):107–117. <https://doi.org/10.5901/jesr.2012.v3n7p107>
- Elias IA, Agu RE, Eze LO (2018) Impact of international trade on the economic growth of Nigeria. *Eur J Bus Manag* 10(18):22–30
- Fang WS, Lai YH, Miller SM (2006) Export promotion through exchange rate changes: exchange rate depreciation or stabilization? *South Econ J* 72(3):611–626. <https://doi.org/10.2307/20111836>
- Fountas S, Aristotelous K (2005) The impact of the exchange rate regime on exports: evidence from the European monetary system. *J Econ Integr* 20(3):567–589
- Fugazza M, Hoffmann J (2017) Liner shipping connectivity as determinant of trade. *J Shipping Trade* 2:1. <https://doi.org/10.1186/s41072-017-0019-5>
- Gachunga MJ (2018) Effect of exchange rates volatility on imports and exports. *Mediterr J Basic Appl Sci* 2(4):102–108
- Genc EG, Artar OK (2014) The effect of exchange rates on exports and imports of emerging countries. *Eur Sci J* 10(13):128–141. <https://doi.org/10.19044/esj.2014.v10n13p%25p>
- Gupta M, Varshney S (2021) Exchange rate volatility and import trade flow evidence from India-U.S. at industry level. *Int J Asian Bus Inf Manag (IJABIM)* 12(3):1–21. <https://doi.org/10.4018/IJABIM.20210701.aa25>
- Habanabakize T (2020) The effect of economic growth and exchange rate on imports and exports: the South African Post-2008 financial crisis case. *Int J Econ Finance Stud* 12(1):223–238. <https://doi.org/10.34109/ijefs.202012114>
- Hoffmann J, Wilmsmeier G, Lun YHV (2017) Connecting the world through global shipping networks. *J Shipping Trade* 2:2. <https://doi.org/10.1186/s41072-017-0020-z>
- International Chambers of Shipping (2020) Shipping and world trade: driving prosperity. <https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-driving-prosperity/>
- Jawaid ST, Waheed A, Siddiqui AH (2020) Terms of trade and economic growth in developing country: evidence from bilateral and commodity level analysis. *J Chin Econ Foreign Trade Stud* 13(1):1–19. <https://doi.org/10.1108/JCEFTS-07-2019-0035>
- Jiang B, Li J, Gong C (2018) Maritime shipping and export trade on “maritime silk road.” *Asian J Shipping Log* 34(2):083–090. <https://doi.org/10.1016/j.ajsl.2018.06.005>
- Kalouptsi M (2021) The role of shipping in world trade. *ECONOFACT*. <https://econofact.org/the-role-of-shipping-in-world-trade>
- Kang JW (2016) International trade and exchange rate. ADB Economics Working Paper Series 498. Asian Development Bank. <https://www.adb.org/sites/default/files/publication/202841/ewp-498.pdf>
- Kemal AM, Qadir U (2005) Real exchange rate, exports, and imports movements: a trivariate analysis. *Pak Dev Rev* 44(2):177–195
- Kim CB (2017) Does exchange rate volatility affect Korea's seaborne import volume? *Asian J Shipping Log* 33(19):43–50. <https://doi.org/10.1016/j.ajsl.2017.03.006>
- Kramer L (2022) How Importing and Exporting Impacts the Economy. *Investopedia*. <https://www.investopedia.com/articles/investing/100813/interesting-facts-about-imports-and-exports.asp>
- Lai KH, Pang Y, Wong CWY, Lun YHV, Ng YNE (2019) Are trade and transport logistics activities mutually reinforcing? Some empirical evidences from ASEAN countries. *J Shipping Trade*. <https://doi.org/10.1186/s41072-019-0041-x>
- Lane JM, Pretes M (2020) Maritime dependency and economic prosperity: why access to oceanic trade matters. *Mar Policy* 121:104180. <https://doi.org/10.1016/j.marpol.2020.104180>
- Lim KG, Nomikos NK, Yap N (2019) Understanding the fundamentals of freight markets volatility. *Transp Res Part E Log Transp Rev* 130:1–15. <https://doi.org/10.1016/j.tre.2019.08.003>
- Lun YHV, Hoffmann J (2016) Connectivity and trade relativity: the case of ASEAN. *J Shipping Trade* 1:11. <https://doi.org/10.1186/s41072-016-0015-1>
- Matekenya W, Ncwadi R (2022) The impact of maritime transport financing on total trade in South Africa. *J Shipping Trade*. <https://doi.org/10.1186/s41072-022-00106-9>
- Michail NA (2020) World economic growth and seaborne trade volume: Quantifying the relationship. *Transp Res Interdiscip Perspect* 4:100108. <https://doi.org/10.1016/j.trip.2020.100108>
- Mishra B (2018) Impact of globalisation on shipping and maritime industry. *Sea News*. <https://www.seanews.co.uk/environment/impact-of-globalisation-on-shipping-and-maritime-industry/#:~:text=Shipping%20Connects%20Cost%20Effective%20Labour,where%20manufacturing%20costs%20were%20lower.>
- Morina F, Hysa E, Ergün U, Panait M, Voica MC (2020) The effect of exchange rate volatility on economic growth: case of the CEE countries. *J Risk Financ Manag* 13(8):177. <https://doi.org/10.3390/jrfm13080177>
- Munim ZH, Schramm H-J (2018) The impacts of port infrastructure and logistics performance on economic growth: the mediating role of seaborne trade. *J Shipping Trade* 3:1. <https://doi.org/10.1186/s41072-018-0027-0>
- Nguyen NH, Nguyen HD, Vo LTK, Tran CQK (2021) The impact of exchange rate on exports and imports: empirical evidence from Vietnam. *J Asian Finance Econ Bus* 8(5):61–68. <https://doi.org/10.13106/jafeb.2021.vol8.no5.0061>

- Njoku I, Olowolagba LY, Olisa BS (2020) Appraisal of shipping trade influence on economic growth in Nigeria. *Civil Environ Res* 12(1):29–38
- Okoye A (2021a) The International Maritime Boundaries of Nigeria—Revisiting Joint Development of Natural Resources. *Afronomicslaw*. [https://www.afronomicslaw.org/category/analysis/international-maritime-boundaries-nigeria-revisiting-joint-development-natural#:~:text=As%20a%20result%2C%20Nigeria%20as,is%20measured%20\(Article%2057\)](https://www.afronomicslaw.org/category/analysis/international-maritime-boundaries-nigeria-revisiting-joint-development-natural#:~:text=As%20a%20result%2C%20Nigeria%20as,is%20measured%20(Article%2057)).
- Okoye A (2021b) The International Maritime Boundaries of Nigeria—Revisiting Joint Development of Natural Resources. *Afronomicslaw*. [https://www.afronomicslaw.org/category/analysis/international-maritime-boundaries-nigeria-revisiting-joint-development-natural#:~:text=As%20a%20result%2C%20Nigeria%20as,is%20measured%20\(Article%2057\)](https://www.afronomicslaw.org/category/analysis/international-maritime-boundaries-nigeria-revisiting-joint-development-natural#:~:text=As%20a%20result%2C%20Nigeria%20as,is%20measured%20(Article%2057)). Accessed 10 March 2023
- Onuoha C (2021) Nigeria endowed with enormous maritime resources that can cater for wellbeing of its population. *Vanguard*. <https://www.vanguardngr.com/2021/04/nigeria-endowed-with-enormous-maritime-resources-that-can-cater-for-wellbeing-of-its-population>. Accessed 10 March 2023.
- Onyenucheya A (2022) Maritime grossly under-explored in Nigeria, stakeholders lament. *The Guardian*. <https://guardian.ng/business-services/maritime/maritime-grossly-under-explored-in-nigeria-stakeholders-lament/>. Accessed 10 March 2023
- Osadume R, Okuoyibo AM (2020) Determinants of maritime trade in Nigeria: a theoretical underpinning. *Afr J Econ Sustain Dev* 3(2):38–51
- Osadume R, Uzoma B (2020) Maritime trade and economic development: a granger causality and bound test approach. *LOGI Sci J Transp Log* 11(2):23–32. <https://doi.org/10.2478/logi-2020-0012>
- Owoputi AE, Owolabi OO (2020) Seaport development as an agent for economic growth and international transportation. *Eur J Logist Purchasing Supply Chain Manag* 8(1):19–34
- Prokopowicz AK, Berg-Andreassen J (2016) An evaluation of current trends in the container Shipping Industry, Very Large Container Ships (VLCSS), and Port Capacities to Accommodate TTIP Increased Trade. *Transp Res Procedia* 14:2910–2919. <https://doi.org/10.1016/j.trpro.2016.05.409>
- Sakyi D, Immurana M (2021) Seaport efficiency and the trade balance in Africa. *Maritime Transp Res* 2:100026. <https://doi.org/10.1016/j.martra.2021.100026>
- Siddique M, Anwar A, Quddus MA (2020) The impact of real effective exchange rate on revealed comparative advantage and trade balance of Pakistan. *Econ J Emerging Mark* 12(2):193–207. <https://doi.org/10.20885/ejem.vol12.iss2.art6>
- Subiyakto H, Algifari A (2016) Cointegration and causality test among export, import, and foreign exchange. *JEJAK Jurnal Ekonomi Dan Kebijakan* 9(1):82–96. <https://doi.org/10.15294/jejak.v9i1.7188>
- Toraganlia N, Yalçın C (2016) Exports, real exchange rates and external exposures: empirical evidence from turkish manufacturing firms. IFC-ECCBSO-CBRT Conference on “Uses of Central Balance Sheet Data Offices’ information” Co-organised by the IFC, the European Committee of Central Balance Sheet Data Offices (ECCBSO) and the Central Bank of the Republic of Turkey (CBRT) Özdere-İzmir, Turkey, 26 September 2016
- Tsioumas V, Papadimitriou S, Smirlis Y, Zahran SZ (2017) A novel approach to forecasting the bulk freight market. *Asian J Shipping Logist* 33(1):33–41. <https://doi.org/10.1016/j.ajsl.2017.03.005>
- Tsouknidis DA (2016) Dynamic volatility spillovers across shipping freight markets. *Transp Res Part E Log Transp Review* 91:90–111. <https://doi.org/10.1016/j.tre.2016.04.001>
- UNCTAD (2018a) Seven key trends shaping maritime transport. <https://unctad.org/press-material/seven-key-trends-shaping-maritime-transport>
- UNCTAD (2018b) Seven key trends shaping maritime. UNCTAD’s Review of Maritime Transport 2018. <https://unctad.org/press-material/seven-key-trends-shaping-maritime-transport>
- UNCTAD (2021) Review of Maritime Transport 2021. [https://unctad.org/system/files/official-document/rmt2021\\_en\\_0.pdf](https://unctad.org/system/files/official-document/rmt2021_en_0.pdf)
- United Nations (2016) Maritime Transport Is Backbone of Global Trade and the Global Economy. SG/SM/18129-OBV/1663-SAG/486 <https://www.un.org/press/en/2016/sgsm18129.doc.htm>
- Walsh C, Lazarou N-J, Traut M, Price J, Raucci C, Sharmina M, Agnolucci P, Mander S, Gilbert P, Anderson K, Larkin A, Smith T (2019) Trade and trade-offs: shipping in changing climates. *Mar Policy* 106:103537. <https://doi.org/10.1016/j.marpol.2019.103537>

## Publisher’s Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**Submit your manuscript to a SpringerOpen® journal and benefit from:**

- Convenient online submission
- Rigorous peer review
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

---

Submit your next manuscript at ► [springeropen.com](https://www.springeropen.com)

---