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Impact of Seaport Operations on International Trade and Economic Growth in Nigeria

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Abstract
In this paper, the authors examined the impact seaport operations played on international trade and economic growth in Nigeria. The study was motivated by decrease in growth rate in 2016 and 2020 and trade deficit in 2020 when compared to 2019 and Nigeria being import dependent despite strategies geared towards revitalizing the economy. Annual time series data from 1990-2022 were used to conduct this research. Key variables such as container throughput, container traffic, logistic performance index and seaport infrastructure index served as variables of seaport operations. The variables were tested using Augmented Dicker Fuller (ADF) and Philip-Perron tests to check for unit root and Philip-Ouliaris Cointegration test was used to determine long-run relationship. The data were fully analysed using the Dynamic Ordinary Least Square (DOLS) technique. The study revealed that Seaport operations (including cargo throughput, container traffic, logistic performance and seaport infrastructure) exerted significant positive impact on international trade and economic growth in Nigeria. Therefore, this paper recommended the initiation and implementation of port-gate policies such as truck appointment systems, provision of integrated intermodal transport system and computerisation of processes for effective port operations. Also, Nigerian government should focus on investment in port infrastructure and revitalisation of other Eastern ports to full capacity utilisation.

Keywords: Cargo Throughput, Container Traffic, Economic Growth, International Trade, Seaport infrastructure Index, Seaport Operations,

1. Introduction

The Nigerian economy is one of the largest in Africa, a mixed economy and an emerging market with expansion in trade, manufacturing, services, communications, technology and entertainment sectors and a GDP of $414 billion in 2021 (IMF,2022). This economy is sustained by several pillars and a resilient economy remains a key priority for any country, thus, understanding these pillars is critical in strengthening the country's economy.

One of the identified pillars of Nigeria's economy is economic growth, which generally refers to an increase in the level of national output or income over time (Duodu & Baidoo, 2020). Economic growth is vital especially in developing economies where the unemployment rate is high and poverty is still widespread (Rahman, Rana &Barua, 2019). Sustained economic growth remains a key priority for policymakers and researchers as the achievement of the phenomenon seems elusive owing to volatility and constant changes in the business environment (Chakamera & Pisa, 2020). Resultantly, several

macroeconomic growth strategies have been pursued by both developed and developing countries with varying degrees of success. For example, the success of the East Asian tigers is attributed to export-led growth strategies (Palley, 2011), services-led growth in India (Ghani, 2010) and Pakistan (Siddiqui & Saleem, 2008). Other scholars (Deng, 2013; Cigu, Agheorghiesei, &Toader, 2019) link economic success to investment, particularly transport infrastructure investment-led growth strategies, etc. Despite macro-economic predictions of economic catch-up and steady-state economic growth for all countries, in the long run, the gap between the advanced economies and the developing countries is widening. For instance, the World Development Indicators (WDI) showed that in 2019 Sub-Saharan Africa, South Asia, least developing countries reported 2.3%, 4.14% and 4.46% annual growth rates respectively (World Bank, 2020). Similarly, in Nigeria GDP growth rate in 2017 and 2018 was 0.81% and 1.92% respectively. In 2020, the country witnessed a negative growth rate of -1.79 attributed largely to the negative impacts of Coronavirus. However, in the wake of the COVID-19 pandemic, Nigeria is projected to be amongst the countries that will be most affected.

Furthermore, another pillar of the Nigerian economy is international trade. The benefits of international trade to economies cannot be overemphasised. Trade has been upheld as one of the key drivers of diverse economies because of its effect of integrating economies across the globe, generating foreign exchange, increasing technological transfer, generating efficiency among firms due to competition, increasing employment, and alleviating poverty (Agrawal, 2015, Le Goff & Singh, 2014, Zahonogo, 2017), among several other benefits. Regardless, trade statistics in Africa for the immediate past decades have been disappointing when compared with other regions of the world and Nigeria is no exception. For instance, statistics from the National Bureau of Statistics (NBS), Nigeria recorded a trade deficit of ₦7.37 trillion(trn) in 2020 while its total trade stood at ₦32.42 trn. In Q4 2020, Nigeria's total merchandise trade stood at ₦9.12trn, an increase of 8.9% when compared to Q3 2020 but a decline of 9.9% when compared to Q4 2019. The export component of trade stood at ₦3.19trn in Q4 2020 representing an increase of 6.7% when compared to Q3 2020 but a decline of 33% when compared to Q3 2019. On the flip side, total imports stood at ₦5.92trn in Q4 2020, an increase of 10.1% when compared to Q3 2020 and an increase of 10.8% when compared to Q4 2020. Imports accounted for 65% and exports accounted for 35% of total trade in 2020. The trade data shows that the Nigerian economy is still primarily dependent on imports and is yet to deepen its value chains and diversify its export earnings away from crude oil. Analysts note that Nigeria's consistent trade deficit results and its overdependence on oil expose its economy to external factors which continuously hurt it. For example, its high dependency on imports implies that it keeps losing domestic jobs that could have been created if such products were produced locally. Also, being import-dependent has made the economy vulnerable to inflation and other external factors.

The seaport sector in Nigeria has the potential to contribute significantly to the overall economy in many ways. Seaports are seen as a vital link between the global supply chain and international trade, handling up to 90 percent of the world's freight. Such a thriving sector can help in saving foreign exchange, reduce freight costs and thus promote the country's foreign trade. The provision of seaport operations could drive economic growth and trade growth. Seaports could lead to economic growth in several ways. First, investing in seaport infrastructure itself could increase demand for goods and services. Second, seaport infrastructure improvement reduces travel time, and passenger and freight transporters gain directly from time and cost-saving (Hong, Chu & Wang, 2011). Third,

better seaport infrastructure attracts foreign direct investment (Mudronja, Jugović & Škalamera-Alilović, 2020), which is widely regarded as an important engine of economic growth in Nigeria. Lastly, lower transport and trade costs can accelerate industrial agglomeration (Hong, Chu & Wang, 2011), and the concentration of economic activities increases labour productivity (Hong, Chu & Wang, 2011).

Besides, seaport operations could contribute to the economy through trade growth. Ports play a very important role in international trade. This is so because according to the United Nations Conference on Trade and Development (2015) ports are regarded as the backbone of international trade. It is therefore not surprising that about 80% of merchandise trade (in volume) in the world is carried by ships (African Development Bank, 2015). In the case of Nigeria, Nwanosike (2014) opined that over 99% of traded goods are carried by sea. Globalization and increased competitiveness have led to ports becoming one of the key elements in international trade. Efficient ports services facilitate the mobility of products, ensuring their safety and speed as well as providing cost reductions when trading among countries (Sharipbekova & Raimbekov, 2018).

However, there is controversy on the impact of seaport operations on the economy. Several studies found a positive impact of seaport operations on the economy (Alam, Baig, Li, Ghanem & Hanif, 2020; Ke, Lin, Fu & Wang, 2020; Mudronja, Jugović and Škalamera-Alilović, 2020). Howbeit, recent studies produced opposite results. For instance, Banerjee, Duflo and Qian (2020) and Chakamera and Pisa (2020) stated that the relationship between seaport operations and the economy is not linear as their studies shows that whilst the seaport operations was expanding, the economy did not experience expansion in terms of rising economic growth and trade performance. This is in accordance with Omoke, Aturu, Nwaogbe, Ajiboye and Diugwu (2018) who found that whilst the seaport sector was declaring huge turnovers and profits, the economy was experiencing marginal performances. Against this background, this study aims to investigate the impact of seaport operations on international trade and economic growth in Nigeria.

Research QuestionsThe following research questions guided this study. (a) How has seaport operations impacted on Nigeria's trade relations? (b) What is the impact of seaport operations on Nigeria's economic growth?

2. Literature Review

2.1 Concept of Economic Growth

Economic growth is the heartbeat of economic development in any country and is measured by the growth rate of a country's national income; a higher national income should translate to higher benefits for the citizens (Agboola, Bekun, Osundina, Kirikkaleli, 2020). Economic growth, an increase in the real gross domestic product (GDP) over time, is a necessary condition for a country's overall social and economic development. It is the most powerful tool for creating jobs, reducing poverty and improving the standard of living through improved health status and educational attainment. Economic growth is vital especially in developing countries/regions where the unemployment rate is high and poverty is still widespread

Economic growth refers to the increase of potential output, that is, production at full employment, rather than aggregate demand growth (Duodu & Baidoo, 2020). This definition provided above seems to support classical tradition in which at equilibrium, full employment is achievable. Similarly, Okwu, Obiwuru, Obiakor and Oluwalaiye (2016) define economic growth as referring to the increase in the inflation-adjusted market value

of various goods and services an economy produces over time. Put differently, economic growth could be viewed as the enhancement in the basket of commodities an economy produces over some time. For this study, we adopt the definition provided by Okwu et al (2016).

The Concept of International Trade: International trade is the buying and selling of goods and services between countries (Usman, 2011). International trade is the exchange of capital, goods and services across international borders or territories because there is a need for the goods or services. In simple words, it means the export and import of goods and services. Export means selling goods and services out of the country, while import means goods and services flowing into the country. However, our study relates to Usman's (2011) conceptualization of international trade. Traders engage in economic activities for the profit maximization engendered from differentials among the international economic environment of nations (Adedeji, 2006). According to Krugman, Maurice and Melitz (2012), international trade focuses on the transactions of the international economy.

Concept of Seaport Operations: According to Park and Seo (2016), seaport operations refer to the activities related to freight handling. Similarly, to Shan, Yu and Lee (2014), seaport operations are an essential part of the logistics of the supply chain and refers to the process of moving goods across the globe. Our study relates to the definition of Park and Seo (2016). Therefore, the importance of seaports operations to the economy hinges on the ability to facilitate international trade flows as the bulk of domestic and international trade is carried by sea. Seaborne trade depends on ports for its operations, as it acts as a maritime/land transport (railways, roads or inland waterways) interface. It implies that for efficient maritime transports, ports need to perform the core role of lifting and putting down of cargo efficiently. Despite the complex and diversified nature of modern ports, they render the following services: cargo services, vessel services, infrastructure, marketing, management and security.

Indeed, seaport operations can help economies in various ways: decreasing production cost, lowering transportation cost, enticing port-related activities, promoting employment, providing domestic manufacturers access to profitable foreign markets, offering inter-modal transport networks, helping the location of distribution centres by retailers and manufacturers within the regions of the ports, among others (Jouili, 2016).
As noted by Clark, Dollar and Micco (2004), seaport operation can be proxied using cargo throughput (CAT) and container traffic (COT). Similarly, Sanchez et al (2007) also captured seaport operations using the logistics performance index (LPI) and seaport infrastructure index (SII). To ensure a robust study, we utilized all these metrics in measuring seaport operations.

2.2 Theoretical and Empirical Literature Review

This study is anchored on the gravity theory. The gravity theory which is also known as the "gravity model" was first presented in 1962 by Jan Tinbergen, who proposed that the size of bilateral trade flows between any two countries can be approximated by employing the 'gravity equation', which is derived from Newton's theory of gravitation. The gravity model suggests that relative economic sizes attract countries to trade with each other while greater distances weaken the attractiveness. Initially, the gravity model was seen as an empirical one, without any particular grounding in trade theory, but the widespread adoption of the gravity model to explain patterns of trade has been seen by economists as a significant development on previous theoretical models.

The gravity model is now seen as the workhorse of trade theory, and especially in terms of forecasting the impact of changes in trade policy on trade costs. The model is flexible in that 'distance' between countries can include a range of relevant variables, including cultural and political differences between trading nations (Baier & Standaert, 2020).

Empirically, the gravity framework initially was appealing to researchers because of the log-linear model which was a simple and intuitive empirical way to assess the relationship between bilateral trade flows, production, income, and variables that could conceivably be viewed as factors that distort bilateral trade. When applied to trade data, the coefficient estimates were typically economically and statistically significant, and the simple gravity specification seemed to account for a large share of the variations of bilateral trade flows.

This section also presents studies on the relationship between seaport operation and trade. However, the survey of the literature shows there is a scarcity of studies focusing on seaport-trade nexus, hence this section also reported studies on logistic performance and trade. For example, Hausman, Lee and Subramanian (2012) examined the impact of logistics performance on global bilateral trade. The study drew on a data set compiled by the World Bank containing specific quantitative metrics of logistics performance in terms of time, cost, and variability in time. Sampling 80 countries from diverse regions, the study reported that logistics performance is statistically significantly related to the volume of bilateral trade.

Fabling, Grimes and Sanderson (2013) investigated the impact of port infrastructure on exporter behaviour, focusing on the opening of a competing inland port within Auckland. They modeled the adoption of the new facilities among local firms, and tested the impacts of uptake on future export growth. They found that the determinants of uptake were product and firm related, rather than location specific. The study concludes that there is no significant effect of the port's introduction on firms' subsequent export performance. Similarly, Saslavsky and Shepherd (2014) investigated the effects of logistics performance on trade in parts and components within international production networks and their main conclusion is that trade in parts and components is more sensitive to logistics performance than the trade in final goods.

Martí, Puertas and Garcia (2014) examined the importance of the logistics performance index in international trade. More specifically, the gravity model was used to determine the importance of logistics in exports for the regions of Africa, South America, the Middle East, the Far East and Eastern Europe. The aggregate logistics performance index is calculated by analyzing six main components using the following indicators: customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing, and timeliness. The results obtained reveal that improvements in any of the components of the LPI can lead to significant growth in a country's trade flows. Sintoo (2015) assessed the role of Dar es Salaam port in facilitating the growth of trade in Tanzania. Applying descriptive statistics, the study found that Dar es Salaam port has brought a significant positive contribution to the growth of trade. Gani (2017) explored the effect of logistics performance on international trade. The analysis draws on overall logistics performance as well as disaggregated measures of logistics specific data for a large sample of countries. The empirical analysis involved the estimation of standard export and import equations incorporating measures of logistics performance. The findings showed that overall logistics performance is positively and statistically significantly correlated with exports and imports. Bottasso, Conti, de Sa Porto, Ferrari and Tei (2018) analyzed the

impact of port infrastructure on trade by estimating a gravity equation for exports (imports) of Brazilian states towards (from) all main Brazil's trading partners. In particular, they consider exports (imports) of the 27 Brazilian states towards (from) 30 of Brazil's most important trading partners over the period 2009-2012.In the Association of Southeast Asian Nations (ASEAN) countries, Lai, Pang, Wong, Lun and Ng (2019) found that transport logistics development generates a spillover effect to promote trade with non-members. Additionally, the findings of the study indicate that a country's transport logistics development will bolster both its regional and global trade development.

Töngür, Türkcan and Ekmen-Özçelik (2020) examined the effects of logistics infrastructure on export variety, as measured by the extensive margin. They utilized six core indicators (customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing, and timeliness) to construct the logistics performance index. Also, the authors employed finely disaggregated exports data for Turkey's trade with 174 countries over the period 2007 to 2017; they decomposed gross export flows into the extensive and intensive margins of Turkish exports utilizing the method developed by Hummels and Klenow (2005). The gravity estimates suggest that logistics infrastructure positively influences export values and has a greater impact on the extensive margin than the intensive margin. Zaninović, Zaninović and Skender (2020) examined the impact of logistics performance on the international bilateral trade of the EU15 and Central and Eastern European EU member countries (CEMS) with the rest of the world in the period 2010 to 2018. They developed and estimated a structural gravity model with Poisson pseudo-maximum probability estimator, using the logistic performance index and its sub-indices as the main independent variables of interest. They found that differences in logistic performance index values have a heterogeneous impact on bilateral trade, especially when considering a trade-in between different classes of goods and different groups of country pairs.

Bugarcic, Skvarciany and Stanisic (2020) assessed the level of the impact of logistics performance on trade volume in the Central and Eastern European countries (CEECs) and Western Balkans. To achieve the aim, the impact of the Logistic Performance Index (LPI) on international trade in 2007 and 2018 was investigated. This relationship was examined using the gravity model approach with a focus on overall LPI and its components. The research results show that there is a positive statistical significance and impact of logistics on bilateral trade between CEECs and logistics justifies the role of a trade facilitator. Wang, Kim and Kim (2020) applied Vector Autoregressive (VAR) and Vector Error Correction Model (VECM) frameworks to examine the causal relationship between logistics infrastructure and economic development in China for the period 2000 to 2017. The study documents the long-run equilibrium between the logistics infrastructure and the economic development in China and causality, in general, running from the former to the latter. The authors also reported that the infrastructure related to maritime transport plays a key role in promoting the Chinese economy and international trade.

Shan, Yu and Lee (2014) investigated the impact of the seaport on the host city's economic development. Based on data from 41 major port cities in China over the period 2003 to 2010, the estimation showed that port cargo throughput has a positive effect on the economic growth of the host city. Song and van Geenhuizen (2014) estimated the output elasticity of port infrastructure through production function, applying panel data analysis from 1999 to 2010 and calculated the model at the level of four-port regions in China as well as the port province level. The results indicated clear positive effects of port infrastructure investment in all regions, however, the strength varies considerably among

the four regions, with the Yangtze River Delta region (Shanghai) at the strongest level, followed by the Bohai Rim region (Tianjin), the Southeast region (Guangzhou) and the Central region, where the influence is the weakest. The analysis indicates that differences are related to the character of the port (land or sea), the stage of economic development of the region, international network connectivity, and the spillover effects from adjacent regions. In the Zhejiang province of China, Huang and Peng (2014) investigated the association between port logistics and economic growth using the grey correlation analysis. The authors' findings showed a strong positive correlation (0.907) between the logistics industry and economic development. Zou and Smith (2015) assessed the interactive relationship between regional logistics development and economic growth in Sichuan (located in China) using a logistic model. Total freight traffic is the proxy for the logistics development. The findings indicate a long-term and stable equilibrium relationship between logistics industrial development and economic growth. Breidenbach and Mitze (2015) analyzed the long-run effects of port facilities on regional income levels in Germany and the study found a positive correlation between port locations and gross domestic product per capita.

Jouili (2016) investigated the impact of public investments of seaports on the economic growth in Tunisia over the period 1987 to 2014 and the results show that public investments in seaports generated positive contributions to Tunisian economic growth; first, by direct contribution via its added value; and second, by indirect contributing via the development of other economic activities. Park and Seo (2016) assessed the economic impact of seaports on regions in Korea. Econometric analysis employing augmented Solow model was conducted based on the panel data covering all the regions of Korea over the period 2000 to 2013. The econometric analysis showed that cargo ports without sufficient throughput obstruct regional economic growth, whilst cargo ports contribute to regional economic growth only when they have sufficient throughput. Furthermore, the result indicates that container port activities positively affect regional economic growth, whilst port investment indirectly leads to economic growth. Similarly, Song and Mi (2016) investigated the Granger causality between port investment and economic growth in China both at the full regional level and the sub-regional level. Panel data from 1999 to 2009 was employed to test the Granger causality between port investment and economic growth. The results showed that short-term bidirectional causality exists between port investment and economic growth, and the port investment is the long-term Granger reason for economic growth; however, economic growth is not the long-term Granger reason for port investment, namely that the long-term unidirectional causality exists running from port investment to economic growth.

Yudhistira and Sofiyandi (2017) studied the impacts of access to existing port infrastructure on regional development, i.e., income per capita, productivity, and poverty at the district level in Indonesia. The estimation results show that proximity to the main ports has positive effects on GDP per capita, labour productivity, poverty rate, and poverty gap. Considering 91 countries with seaports, Munim and Schramm (2018) conducted an empirical inquiry into the broader economic contribution of seaborne trade, from a port infrastructure quality and logistics performance perspective. A structural equation model (SEM) was used to provide empirical evidence of significant economic impacts of port infrastructure quality and logistics performance. The results revealed that it is vital for developing countries to continuously improve the quality of port infrastructure as it contributes to better logistics performance, leading to higher seaborne trade, yielding higher economic growth. Sharapiyeva, Antoni and Yessenzhigitova (2019) examined how

logistics efficiency and port infrastructure in a country can influence a country's economy. They used data for 37 countries, which include some African countries (Chad, Central African Republic, Burundi, Zimbabwe, Zambia, Malawi, Burkina Faso, Uganda, South Sudan, Rwanda, Nigeria, Mali and Ethiopia).The logistics efficiency comprises six indicators (ability to track and trace consignments; competence and quality of logistics services; ease of arranging competitively priced shipment; efficiency of customs clearance process; the frequency with which shipments reach the consignee within scheduled or expected time; quality of trade and transport related infrastructure). Their findings demonstrated the significant contribution of logistics efficiency and quality of port infrastructure to economic growth. Sun and Yu (2019) considered the relationship between Shanghai port logistics and regional economic growth using the Vector Autoregressive (VAR) model from 1990 to 2017. Port logistics was measured using Shanghai port container throughput and cargo throughput and the study revealed that port logistics development is an important engine for Shanghai's economic growth. Wong and Yip (2019) utilized a structural equation model formulated to examine the effect of transportation infrastructure on the relationship between institutions and gross domestic product per capita. The study identified the different roles of transportation infrastructure in mediating the relationship between institutions and average income in these two types of economies. Institutions and transportation infrastructure positively influence gross domestic product per capita whereas institutions positively influence transportation infrastructure. Banerjee, Duflo and Qian (2020) estimated the effect of access to transportation networks on regional economic outcomes in China over twenty years of rapid income growth. Their results showed that proximity to transportation networks have a moderately sized positive causal effect on per capita GDP levels across sectors, but no effect on per capita GDP growth.

Emenyonu, Onyema, Ahmodu, Onyemechi (2016) investigated the impact of seaport development on economic growth in Nigeria. The variables utilized in the study included trade, gross domestic product, logistics performance and liner shipping connectivity. Using Analysis of variance (ANOVA) and Correlation analysis, the study found that seaport development positively influenced Nigeria's economic growth.

Omoke, Aturu, Nwaogbe, Ajiboye and Diugwu (2018) analyzed the impact of port operations on the Nigerian economy, with a focus on Apapa port. Specifically, the study determined the impact of the gross registered tonnage of vessels on Nigerian gross domestic product, ascertained the influence of cargo throughput on Nigerian gross domestic product, as well as determined whether ship traffic significantly influenced Nigeria's gross domestic product. Data sourced from Nigeria Ports Authority's operational bulletin were analyzed and they found that gross registered tonnage of vessels is significantly contributing to the Nigerian gross domestic product and that cargo throughput and vessel traffic have a positive impact on the economy but are not significantly influencing the Nigerian gross domestic product.

Osadume and Edih (2020) examined the effect of port revenue performance on Nigeria's economic growth by critically evaluating the Nigerian ports authority performance. The neoclassical growth theory was employed in the study and the Nigeria Ports Authority was chosen as its sample, covering the period from 2010 to 2019. The study used secondary time series data sourced from the Nigeria Ports Authority and the National Bureau of Statistics, the ordinary least square regression and the Engle-Granger co-integration to test the variables at the 5% level of significance. The findings showed that total revenue to gross registered tonnage had a positive and significant effect on economic growth while operating surplus to operating revenue showed a negative but significant

effect and operating surplus to cargo throughput showed an insignificant effect; there was no co-integration between the variables.

3. Methodology

Theoretical Framework

Following Anderson and Van Wincoop (2003) and Bernhofen El-Sahli and Kneller (2016), the study adopts gravity trade theory as the theoretical framework. The gravity trade theory is best suited for this study because it provides unambiguous theoretical link between seaport operations and trade relations as well as economic progress. According to Tinbergen (1962) and Bernhofen et al (2016), gravity model predicts that bilateral trade between a pair of countries should increase as their economic sizes increase and decrease as the distance between the trading economies and transaction costs increases. Seaport is an economic infrastructure that is aimed at bridging or minimizing the negative effect of distance on trade. In other words, efficient seaport services that reduce the adverse effect of distance on trade could enhance trade. Following the Newton's law of gravity, Tinbergen (1962) expressed the gravity model as follows:

$$T_{ij} = G.\frac{M_i^a M_j^a}{D_{ij}^\theta}$$

T*ij* is trade flows from origin country *i* to destination country *j*; usually it is expressed as a country's exports, imports or total trade value. M_i and M_j are the economic forces (example of economic forces could be GDP growth, economic policies, logistic performance, seaport throughput, etc) of the two countries that have a positive effect on bilateral trade flows. D_{ij} is the economic force that negatively affects trade flows between the origin country and the destination country (such as trade protection, poor seaport infrastructure etc.); it usually represents changes in transaction costs. G is a constant which maps changes in $\frac{M_i M_j}{D_{ij}}$ on T_{ij}.

Model Specification: The thrust of this study is to ascertain the impact of seaport operations on international trade and economic growth. To achieve the specific objectives of the study, two models are specified in line with the objectives of the study.

Impact of seaport operations on trade relations: As noted by Clark, Dollar and Micco (2004), seaport operation can be proxied using cargo throughput (CAT) and container traffic (COT). Sanchez et al (2003) also captured seaport operation using logistics performance index (LPI) and seaport infrastructure index (SII). Plugging the identified proxies

$$\ln T_t = \beta_0 + \alpha_1 \ln Y_t + \alpha_2 \ln CAT_t + \alpha_3 \ln COT_t + \alpha_4 \ln LPI_t + \alpha_5 \ln SII_t + \alpha_6 \ln ER_t + \alpha_7 \ln TOT_t + \alpha_8 \ln OILP_t + U_t \quad \ldots\ldots 1$$

Following Fink, Mattoo and Neagu (2005) and Clark et al (2004), we identified exchange rate (ER), terms of trade (TOT) and oil price (OILP) as trade factors that affects trade in the context of transaction cost.

Where T = Trade (N), Y= Real GDP, CAT=Cargo Throughput (TEU), COT= Container Traffic (TEU), LPI= Logistic Performance Index (%), SII= Seaport Infrastructure Index (%), ER =Exchange rate (N/$), TOT = Terms of Trade,and OILP ($) = Oil price.

Also, β_0 is the intercept, α_i refers to the i^{th} slope parameter and U is the error term.

Impact of seaport operation on economic growth: As recognized by Hargono et al (2013), trade is a critical factor in economic growth. Hargono et al (2013) also argued further that since seaport operations facilitates trade, it could equally be a critical factor in growth equations. Furthermore, Hargono et al (2013) argue that to the extent that seaport

operation affects trade transaction costs, it could be possible candidates for growth equations. And because oil price is critical for growth accounting in Nigeria, we add oil price (OILP) to the Equation.

$$ECOG_t = \alpha \ln CPL_t + \beta_1 \ln FIPS_t + \beta_2 \ln MOPS_t + \beta_3 \ln CAT_t + \beta_4 \ln COT_t + \beta_5 \ln LPI_t + \beta_6 \ln SII_t + \beta_7 \ln OILP_t + \varepsilon_t \quad \ldots\ldots 2$$

Where ECOG = economic growth (%), CPL = capital per labour (%), FIPS = fiscal policy stance(N) and MOPS = monetary policy stance (%)

The main estimation technique used for the analysis is the dynamic least square technique (DOLS). First, the time-series properties of the data were tested using the augmented Dicker-Fuller test (ADF) and Phillip-Perron test. Second, the cointegration test was estimated using Phillip Ouliaris to determine the long-run relationship before conducting DOLS regression.

4. Result Presentation and Discussions

Table4.1 SUMMARY OF DESCRIPTIVE STATISTICS

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob	Obs
ER (₦/$)	130.18	128.65	381.00	8.04	98.98	0.75	2.05	2.96	0.23	33
OILP ($)	44.51	37.66	91.480	11.91	26.50	0.46	1.81	2.92	0.23	33
Y (₦B)*	42157.55	37474.95	83428.75	19199.06	21116.84	0.41	1.71	3.01	0.22	33
T(₦B)	21,601.29	10,047.39	67,466.10	155.60	23,985.7	0.77	-1.06	3.09	0.20	33
ECOG (%)	4.79	3.78	33.74	-1.8	6.36	0.13	2.1	0.6	0.70	33
FISPS (₦B)	-1044.6	-202.72	32.05	-7908.3	1781.53	-0.42	2.2	0.7	0.81	33
MOPS(%)	13.73	13.50	26.00	6.00	3.88	0.76	2.0	0.59	0.71	33
CPL(%)	20.42	21.95	31.35	9.94	6.32	0.01	1.57	2.62	0.27	33
COT (TEU)**	624475.4	512610.	1289078.	279497.0	265695.80	0.73	2.5	3.1	0.2	33
SII	2.7	2.59	3.60	2.2	0.37	0.81	2.8	3.4	0.2	33
LPI	2.5	2.44	2.84	2.3	0.13	0.61	1.7	0.6	0.0	33
CAT (TEU)	5127086 0.	4863793 1.	81298341 .	43827586 .	9977241 .	0.51	2.8	2.9	0.2	33

Source: Researchers' estimations using E-views 10

** TEU means Twenty-foot Equivalent Unit*

*** ₦B means billion naira*

From the result shown on Table 4.1, the mean value of cargo throughput (CAT) is 51,270,860 TEU with median value of 48,637,931 TEU (TEU means twenty-foot equivalent unit). CAT is a measure of the total volume of cargo discharged and loaded at the port in twenty-foot equivalent units (TEUs), which is a standard-size container. The maximum value of 81,298,341 TEU indicates that the highest annual cargo throughput was 81, 298,34

TEU: this value was achieved in 2020. Similarly, container traffic (COT) measured as summation of both inward and outward container traffic records an annual average of 624,475.40 TEU and a median value of 512,610 TEU. COT measures flow of containers from land to sea transport modes, and *vice versa.* The minimum value of the series was 279,497 TEU while the maximum value is 1,289,078 TEU. In the same vein, the distribution for logistic performance index (LPI) is 2.5, 2.44, 2.84 and 2.3 for mean, median, maximum and minimum values respectively. LPI is an interactive benchmarking tool created by the World Bank to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. It is the weighted average of the country scores on six key dimensions: customs performance, infrastructure quality, ease of arranging shipments, logistics services quality, consignments tracking and tracing and timeliness of shipments. This measure indicates the relative ease and efficiency with which products can be moved into and inside a country. The LPI ranges from 1 (lowest) to 5 (highest). Also, the statistics for seaport infrastructure index (SII) are reported on Table 4.1. It measures the state of seaport related infrastructure with scores ranging from 1 (lowest) to 7 (highest). The mean SII was 2.7 with standard deviation of 0.37.

Table4.2: SUMMARY STATISTICS FOR UNIT ROOT TEST

		ADF Test++	Philip-Perron Test ++	
Variable	ADF statistics	Order of Integration	PP statistics	Order of Integration
Seaport Infrastructure Index (SII)	-4.929***	I(1)	-4.929***	I(1)
Exchange Rate (ER)	-5.194***	I(1)	-5.338***	I(1)
Trade (T)	-4.548***	I(1)	-4.380***	I(1)
Real GDP (Y)	-6.058***	I(1)	-6.154***	I(1)
Cargo Throughput (CAT)	-26.355***	I(1)	-25.872***	I(1)
Container Traffic (COT)	- 8.578***	I(1)	-4.554***	I(1)

Logistics Performance Index (LPI)	-5.463***	I(0)	-9.619***	I(0)
Terms of Trade (TOT)	-8.671***	I(1)	-8.452***	I(1)
Economic Growth (ECOG)	-7.428***	I(1)	-7.403***	I(1)
Fiscal Policy Stance (FIPS)	-6.837***	I(0)	-3.425**	I(0)
Monetary Policy Stance (MOPS)	-4.278***	I(1)	-16.479***	I(1)
Oil Price (OILP)	-3.976**	I(0)	-3.633**	I(0)
Capital per Labour (CPL)	-4.189***	I(0)	-4.104***	I(0)

Source: Researchers' estimations using E-views 10

, and *** implies statistical significance at 10%, 5% and 1% respectively.*

++ ADF/PP critical is -3.196 (10%), -3.53 (5%), -4.21 (1%)

From table 4.2, the result shows that seaport infrastructure index (SII), exchange rate (ER), trade (T), real GDP (Y), cargo throughput (CAT), container traffic (COT), terms of trade (TOT), economic growth (ECOG) and monetary policy stance (MOPS) are integrated of order one (I(1)). This means that they become stationary at the first difference. Other series including logistics performance index (LPI), fiscal policy stance (FIPS), oil price (OILP) and capital per labour (CPL) are integrated at levels(I(0)).

This result corroborates Martin, Hurn and Harris (2017), conclusion that financial time series are integrated processes or realization of nonstationary processes.

Cointegration Result: Philips-Ouliaris cointegration framework was utilised to investigate existence of long-run equilibrium relationship among the model variables. For the null hypothesis of no cointegration to be rejected, the Philip-Ouliaris conitegration matrix must indicate at least one cointegrated relation. A relation is said to be cointegrated if the probability of both tau-statistic and z-statistic are at least less than 0.05. In the case that either tau-statistic or z-statistic is less than 0.05, the result is said to be inconclusive.

Table4. 3 SUMMARY OF PHILIP-OULIARIS COINTEGRATION TEST

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
+**ECOG***	-16.2186	0.0088	-45.6287	0.0000
LPI	-4.6521	0.8323	-22.7421	0.8866
COT	-4.2099	0.9268	-20.1972	0.9637
CAT	-17.098	0.0032	-22.0876	0.9209
+**T***	-16.9762	0.0025	-49.0186	0.0000
FIPS	-6.0800	0.3604	-25.0330	0.7810
OILP	-3.5871	0.9865	-15.8750	0.9963
ER*	-41.5503	0.0000	-61.1289	0.0000
MOPS	-7.1364	0.1267	-34.0052	0.1247
CPL	-4.3082	0.9099	-22.5443	0.8946
TOT*	-16.0170	0.0098	-66.6775	0.000
SII	-4.4274	0.8861	-22.3362	0.9024
Y*	-41.0969	0.0000	-70.7391	0.0000

Source: Researchers' estimations using Eview 10

+ indicates the equations of the dependent variables.

** indicates the cointegrated equations*

The result shown on Table 4.3 indicates that there are five (5) cointegrated relationships including the two dependent variables. Thus, the null hypothesis of no cointegration is rejected at 5% level of significance. This indicates that there is long run relationship among the variables in all the models. This also shows that the regression of dependent variables on their explanatory variables is not spurious.

Error Correction Mechanism (ECM): Engle and Granger (1987) and Martin, Hurn and Harris (2017) note that if stochastic processes are cointegrated, then, an error correction model can be estimated to ascertain the adjustment mechanism of the model variables. In other words, since long run equilibrium exists, there must be a mechanism for correcting short run disequilibrium before attaining the long run equilibrium.

In table 4.4 below, the error correction term ECM is negative and significant for past period T and ECOG. This suggests that short run disequilibrium is corrected before converging to the steady state equilibrium in all equations. The ECM term -0.744 and -0.435 for T and ECOG respectively indicate that 74.4% and 43.5% of the deviations in T and ECOG respectively are corrected in the current period. This suggests that the speed of adjustment is fast and slower for T and ECOG respectively

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Table 4.4 SUMMARY REPORT FOR ECM

	Trade equation	Economic growth equation
D(LNCAT(-1))	0.16** (2.035)	0.32*** (5.859)
D(LNCOT(-1))	0.345*** (3.246)	0.69*** (2.671)
D(LPI(-1))	0.031*** (6.482)	0.062*** (5.334)
D(SII(-1))	0.036*** (4.401)	0.072* (1.69)
D(ER(-1))	0.487 (0.859)	
D(Y(-1))	2.766 (1.337)	
D(TOT(-1))	0.057 (0.622)	
D(OILP(-1))	0.324 (0.786)	0.649 (1.509)
D(CPL(-1))		1.01*** (4.557)

D(FIPS(-1))		-2.841*** (-6.074)
D(MOPS(-1))		0.189*** (5.998)
ECM(-1)	-0.744*** (6.023)	-0.435*** (-3.386)

Source: Researchers' estimations using E-views 10
*,** and *** indicate 10%, 5% and 1% significant level

Dynamic Ordinary Least Square (DOLS): The result of the DOLS is presented according to the first objective "Impact of seaport operations on trade relations'

Table 4.5 SUMMARY OF STATISTICS FOR IMPACT OF SEAPORT OPERATIONS ON TRADE RELATIONS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dependent Variable: LNT				
LNCAT	0.100118	0.038274	2.61582275	0.0089
LNCOT	0.215551	0.0516409	4.17403647	0.0000
LNLPI	0.019386	0.002326	8.33447979	0.0000
LNSII	0.022505	0.008523	2.64050217	0.0083
LNER	-0.304438	0.118135	-2.57703475	0.0099
LNY	0.903165	0.186672	4.83824569	0.0000
LNTOT	1.541853	0.189311	8.1445505	0.0000
OILP	0.172251	0.0990017	1.73987618	0.0815
C	1.862727	0.939329	1.98304002	0.0470
R-squared	0.899854			

Source: Researchers' estimations using E-views 10

From table 4.5, the coefficient of CAT (container throughput) is 0.1001 with standard error of 0.0383. This suggests that the container-throughput elasticity of trade is 0.10. That is, 1% increase in container throughput would engender 0.10% increase in trade volume. Similarly, the coefficients of COT, LPI and SII are 0.2156, 0.0194 and 0.0225 respectively. This suggests that 1% increase in COT, LPI and SII would lead to 0.22%, 0.02% and 0.02% percent increase in trade volume. The coefficients for control variables including ER, Y, TOT and OILP are 0.3044, 0.9032, 1.5419 and 0.1723 respectively. From the result, it could be shown that the response of international trade to changes in terms of trade is more than proportionate. This implies that international trade is highly sensitive to terms of trade.
The second objective seeks to evaluate the impact of seaport operations on economic growth.

Table 4.6 SUMMARY OF STATISTICS FOR IMPACT OF SEAPORT OPERATIONS ON ECONOMIC GROWTH

Variable	Coefficient	Marginal Effects $\left(\beta_i/\bar{x}_i\right)$	Std. Error	t-Statistic	Prob.
		Dependent Variable: ECOG			
LNCPL	1.729	0.085	0.431	4.012	0.000
LNFIPS	603.568	0.578	219.110	2.755	0.006
LNMOPS	-2.203	-0.161	0.586	-3.759	0.000
LNCAT	979572.900	0.019	98791.500	9.916	0.000
LNCOT	88877.430	0.142	8984.040	9.893	0.000
LNLPI	2.059	0.831	0.722	2.852	0.004
LNSII	1.031	0.388	0.413	2.496	0.013
OILP	2.464	0.055	1.021	2.414	0.016
C	22.334		3.160	7.068	0.000
R-squared	0.90				

Source: *Researchers' estimations using E-views 10*

Note: The marginal effect was computed using the formula: $\left(\beta_i/\bar{x}_i\right)$ *as provided by Hurn and Harris (2017) where* β_i*the coefficient of the explanatory variable, xi is, and* $\bar{x}_i$*is the mean of the* i^{th} *explanatory variable. Hurn and Harris (2017) further provided that elasticity could be computed as* $\left(\beta_i/\bar{y}\right)$*% where* $\bar{y}$ *is the mean of the dependent variable.*

Table 4.6 shows that the coefficient of CAT and COT are 979572.9 and 88877.43 with marginal effects of 0.019 and 0.142 respectively. This implies that increasing CAT and COT by 1 unit would raise ECOG by 0.019 and 0.142 units respectively. Similarly, increase in LPI and SII by one unit is expected to raise ECOG by 0.831 unit and 0.388 unit respectively. The coefficients of the control variables are 1.728 for CPL, 603.568 for FIPS, -2.203 for MOPS and 2.464 for OILP. This suggests that one unit increase in CPL, FIPS and OILP will lead to 0.085 unit, 0.578 unit and 0.388 unit increase in ECOG. In the same vein, one unit increase in MOPS will lead to 0.161 unit decrease in ECOG.

5. Summary, Conclusion and Recommendations

This paper analysed the impact of seaport operations on international trade and economic growth in Nigeria. The study adopted gravity trade theory as the theoretical framework. The gravity trade theory is best suited because it provides unambiguous theoretical link between seaport operations and trade relations as well as economic progress. The gravity model predicts that bilateral trade between a pair of countries should increase as their economic sizes increase and decrease as the distance between the trading economies and transaction costs increases. Seaport is an economic infrastructure that is aimed at bridging or minimizing the negative effect of distance on trade. The empirical evidence shows that seaport operations are critical for economic growth in Nigeria. However, evidence is scarce on seaport operations on trade. The results obtained show that seaport operations (cargo throughput, container traffic, seaport logistics and seaport infrastructure) exert significant positive impact on trade.

Similarly, the results also show that seaport operations (cargo throughput, container traffic, seaport logistics and seaport infrastructure) have significant positive impact on economic growth. Based on the findings, this paper recommended the initiation and implementation of port-gate policies such as truck appointment systems, provision of integrated intermodal transport system and computerisation of processes for effective and efficient port operations. Also, the Nigerian government should focus on investment in port infrastructure and revitalisation of other Eastern ports to full capacity utilisation.

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