International Journal of Maritime and Interdisciplinary Research
©2025 IJMIR/Volume 7(3) SE (1) | ISSN: 2734-3286.
Journal homepage: www.ijmir.edu.ng

A COMPARATIVE ANALYSIS OF CARGO THROUGHPUT AND REVENUE PERFORMANCE AT NIGERIAN SEAPORTS: NAVIGATING THE PERFORMANCE NEXUS

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ABSTRACT

Efficient seaport operations are crucial for national economic growth, and understanding the dynamics between cargo volume and revenue is essential for optimizing port management. This study investigates the relationship between cargo throughput and revenue performance at two major Nigerian seaports: Port Harcourt and Apapa. This research employs a comparative analysis, utilizing time-series data from 1981 to 2022, to examine how cargo throughput influences revenue generation at each port, considering their distinct operational contexts. The study analyzes factors such as cargo types, tariffs, and operational costs to understand the cargo throughput-revenue nexus. A simple linear regression model is used to quantify the impact of cargo throughput on port revenue. The findings reveal a statistically significant positive relationship between cargo throughput and port revenue at both locations, but with varying magnitudes. Specifically, a 1% increase in cargo throughput is associated with a 154.09% increase in revenue at Port Harcourt and a 1.45005% increase at Apapa. The stark difference in impact underscores the importance of port-specific factors, including infrastructure, logistics, and management practices. The study concludes that increasing cargo throughput is essential for boosting port revenue. Based on this finding, a key recommendation is for the Nigerian government to prioritize targeted investments

in infrastructure and equipment at both ports, focusing on modernization and expansion to handle larger cargo volumes efficiently. In addition, the government should adopt a single-window customs clearance system for container clearing from the seaports.

Keywords: Cargo Throughput; Nigerian Seaports; Revenue Performance; Gross Registered Tonnage.

1.0 INTRODUCTION

Seaports are critical nodes in global trade networks, serving as vital gateways for the import and export of goods. The efficiency and performance of these ports are intrinsically linked to national economic growth and development (Osadume and Edih, 2020; Crown, 2017). As the volume of global trade transported by sea exceeds 90%, the effective functioning of maritime transport is paramount for any nation's participation in the international market (International Chamber of Shipping, 2020). This paper examines the intricate relationship between cargo throughput and revenue performance at two major Nigerian seaports: Port Harcourt and Apapa. By comparing these two ports, this study aims to provide insights into the factors influencing revenue generation and operational efficiency within the Nigerian maritime sector. The study acknowledges the existing debate surrounding the correlation between revenue performance and overall port performance, with some studies suggesting a strong positive relationship (Ehbenine, 2018; Smith, 2012) while others propose a more nuanced perspective, highlighting the influence of factors beyond revenue collection (Johnson, 2020). This research seeks to contribute to this ongoing discourse by focusing specifically on the impact of cargo throughput on revenue performance.

1.1 STATEMENT OF THE PROBLEM

The Nigerian maritime sector plays a crucial role in the nation's economy, facilitating international trade and contributing significantly to GDP. Efficient and profitable seaport operations are essential for maximizing the benefits of maritime transport. However, congestion, infrastructure limitations, and bureaucratic bottlenecks, hinder revenue performance at Nigerian seaports. While increased cargo throughput is often assumed to drive revenue growth, the relationship is not always straightforward. Factors such as pricing strategies, cost structures, and the types of cargo handled can also significantly influence revenue. Furthermore, the specific context of each port, including

its location, infrastructure, and management practices, can play a crucial role in shaping the relationship between cargo throughput and revenue. Existing research offers varying perspectives on this relationship, with some studies suggesting a strong positive link while others emphasize the importance of other factors. This study seeks to address this gap by conducting a comparative analysis of Port Harcourt and Apapa seaports, examining how cargo throughput translates into revenue performance in each port's unique context. Understanding these dynamics is critical for policymakers and port authorities seeking to optimize operations, enhance competitiveness, and maximize revenue generation within the Nigerian maritime sector.

1.2 SPECIFIC OBJECTIVES

i. To compare the relationship between cargo throughput and total revenue at Port Harcourt and Apapa seaports. This involves quantifying the impact of cargo throughput on revenue for each port, considering factors such as cargo types, tariffs, and operational costs.
ii. To formulate policy recommendations for improving revenue performance at Nigerian seaports based on the findings of the comparative analysis. These recommendations will focus on strategies for optimizing cargo handling processes, enhancing infrastructure, and improving the regulatory framework.

1.3 SIGNIFICANCE OF THE STUDY

This study holds significant value for a range of stakeholders:

i. Policymakers: The findings will provide policymakers with evidence-based insights to inform the development of policies aimed at optimizing port operations and maximizing revenue generation. A clear understanding of cargo throughput and revenue relationships at different ports enables targeted interventions.
ii. Port Authorities: The study provides port authorities with practical strategies to improve cargo handling efficiency, attracting more cargo, and enhance revenue. The comparative analysis will highlight best practices and areas for improvement.

iii. Shipping Lines and Businesses: By understanding the factors influencing port efficiency and revenue, shipping lines and businesses can make more informed decisions about port selection and logistics planning. This can lead to cost savings and improved supply chain management.

iv. Researchers and Academics: The study contributes to port economics and management by providing an empirical analysis of the cargo throughput-revenue relationship in developing economies. It will also open avenues for future research.

v. Local Communities: Efficient and profitable ports contribute to local economic development through job creation and increased economic activity. The study's findings can indirectly benefit local communities by promoting sustainable port growth.

2.0 LITERATURE REVIEW

The maritime sector plays a crucial role in the Nigerian economy, facilitating the movement of goods and people via waterways (Akaso et al., 2011). Maritime transport is fundamental to international trade, facilitating the exchange of global goods (Afolabi, 2015). Efficient port operations are essential for maximizing the benefits of maritime transport, including job creation, economic diversification, and increased foreign exchange earnings (UNCTAD, 2020). However, the maritime sector also faces challenges, including environmental concerns (EPA, 2020). Nigerian seaports, like Port Harcourt and Apapa, are vital to the country's trade patterns, which are largely outward-looking (Olukoju, 2006; Badejo, 2012; Badejo and Solaja, 2014). Port Harcourt seaport, located in Rivers State, plays a significant role in supporting the oil and gas industry (Nigerian Ports Authority, 2023). Apapa seaport, situated in Lagos State, stands as Nigeria's largest and busiest port, handling a substantial volume of cargo, including containers, bulk goods, and petroleum products (Nigerian Ports Authority, 2023; Osadume et al., 2023). Seaport performance is a multifaceted concept, encompassing both financial and operational indicators (Brunet, 2003; Kaplan & Norton, 1992; Singh et al. 2016). Cargo throughput, the total volume of cargo handled by a port, is a key performance indicator (Oyeduntan, 2022; Nwokedi et al., 2019; Tongzon, 2011). Efficient cargo handling reduces vessel turnaround times and boost revenue generation. This study focuses on the relationship between cargo throughput and port revenue performance, examining how the volume of cargo passing through a port influences its financial performance. Revenue generated at Nigerian seaports comes from various sources, including

shipping haulage fees, berthing tariffs, custom duties, and clearing and forwarding fees (Akaso, et al., 2011; Chizea, 2015; Ekpo, 2012). Analyzing the impact of cargo throughput on these revenue streams is crucial for understanding the overall financial health and sustainability of Nigerian seaports. The conceptual framework for this study draws upon the extensive literature on port economics, maritime transport, and revenue management. Key concepts include:

Port Performance: This multifaceted concept encompasses various aspects of port operations, including efficiency, productivity, service quality, and financial performance (UNCTAD, various years). This study focuses specifically on the financial dimension, examining revenue generation.

Cargo Throughput: This refers to the total volume of cargo handled by a port, measured in tons or TEUs (Twenty-foot Equivalent Units). It is a crucial indicator of port activity and a potential driver of revenue (Tongzon, 2011).

Revenue Performance: This refers to the financial performance of a port, measured by its total revenue from various sources, including cargo handling fees, storage charges, and other related levies.

Port Efficiency: This relates to the optimal utilization of port resources, including infrastructure, equipment, and labor, to maximize output (cargo throughput) and minimize costs. Efficient port operations are crucial for translating cargo throughput into revenue.

2.1 THEORETICAL REVIEW

This study is based on Performance Theory (Elger, 2007), which highlights the interconnectedness of various factors affecting performance. In the context of this study, the theory suggests that cargo throughput is not the sole determinant of revenue performance. Other factors, such as port infrastructure, logistics efficiency, and management practices, also play a crucial role. The theory provides a framework for understanding how these factors interact to influence the cargo throughput-revenue nexus. Furthermore, the study draws upon New Institutional Economics (North, 1990), which emphasizes the importance of institutional frameworks, including regulations, policies, and governance structures, in shaping economic outcomes. This perspective highlights the role of the regulatory environment and port governance in influencing revenue

performance. The Resource-Based View (Barney, 1991) also informs the study, suggesting that a port's resources and capabilities, such as its infrastructure, technology, and skilled workforce, are critical for achieving competitive advantage and generating revenue. The empirical literature on port performance and revenue generation is extensive. Numerous studies have examined the relationship between cargo throughput and port revenue, often using econometric models and data from various ports around the world. Some studies have found a strong positive correlation between cargo throughput and revenue (e.g., Onyema et al., 2019), while others have emphasized the importance of other factors, such as port efficiency, pricing strategies, and the composition of cargo (e.g., Cullinane et al., 2004). Research on Nigerian ports has highlighted the challenges of congestion, infrastructure deficits, and bureaucratic bottlenecks (e.g., Osadume and Edih, 2020; Dere et al., 2021). Studies comparing different ports have often found significant variations in their performance and revenue generation (e.g., Sanchez-González et al., 2019). This study builds upon this existing literature by conducting a comparative analysis of Port Harcourt and Apapa seaports, focusing specifically on the mediating factors influencing the cargo throughput-revenue relationship in each port's unique context. The study will also consider the impact of policy reforms and port concessions on revenue performance. This theory posits that performance, both individual and collective, involves integrating skills and knowledge to achieve meaningful outcome. It emphasizes that performance is a journey, not a destination, and that different levels of performance can be identified along this journey. Elger (2007) outlines six key components influencing performance: context, knowledge level, skill level, identity level, personal factors, and fixed factors. The theory suggests that improvements in performance lead to increased quality, reduced costs, and enhanced capabilities. In the context of this study, the Performance Theory provides a framework for understanding how improvements in cargo throughput (a key performance indicator) can translate into enhanced revenue performance at seaports. The theory's emphasis on the interconnectedness of various factors influencing performance is particularly relevant, as it acknowledges that revenue performance is not solely determined by cargo throughput but also by other operational and contextual factors. Additionally, the study will draw upon theories of economic growth, which emphasize the importance of factors like GDP, balance of trade, and foreign reserves (Mascelluti, 2021; Weil, 2003). These theories provide a broader context for understanding the role of seaport performance in national economic development.

2.2 EMPIRICAL REVIEWS

Several studies have explored the relationship between port operations and economic outcomes. Ekpo (2012) highlighted the impact of shipping on the Nigerian economy, emphasizing the need for upgraded port facilities. Igberi (2013) found a negative relationship between the maritime transport sector and economic growth in Nigeria, suggesting the need for policy reforms. Okoroji (2013) stressed the importance of strong institutional frameworks for enhancing the contribution of the maritime sector. Onyema et al, (2019) empirically examined factors influencing port performance in Rivers State, finding a positive relationship between turnaround time, cargo throughput, and ship traffic volume and revenue performance. Eniola et al. (2014) analyzed port performance pre- and post-concession, finding a significant increase in cargo movement post-concession. Onyema et al., (2016) highlighted the importance of short-sea shipping for cost-efficient transport. Omoke et al., (2018) found that gross registered tonnage, cargo throughput, and vessel traffic have a positive impact on Nigeria's GDP. Osadume and Edih (2020) examined the relationship between port revenue performance and economic growth, finding a positive short-run effect. Dere et al., (2021) assessed port efficiency using Data Envelopment Analysis, finding varying levels of efficiency across Nigerian seaports.

2.3 RESEARCH GAPS

While existing research has explored various aspects of port performance and revenue generation, several gaps remain. First, there is a lack of consensus on the precise relationship between cargo throughput and revenue performance, with some studies suggesting a strong positive correlation while others highlight the influence of other factors. Second, many studies utilize complex quantitative models that are not easily interpretable, making it difficult to translate research findings into actionable policy recommendations. Third, there is a need for more recent studies focusing specifically on the comparative performance of Nigerian seaports, particularly Port Harcourt and Apapa, considering the evolving dynamics of the maritime sector in Nigeria. This study addresses these gaps by using a simpler, more interpretable model to analyze the relationship between cargo throughput and revenue performance at the selected ports, offering a clearer understanding of the factors driving revenue generation in Nigeria's maritime sector.

3.0 MATERIALS AND METHODS

3.1 RESEARCH DESIGN

This study employs an ex-post facto research design, as it analyzes existing data without manipulating variables (Nachmias & Nachmias, 2019). This design is appropriate for examining the relationship between cargo throughput and port revenue using historical data.

3.2 POPULATION OF THE STUDY

The study focuses on Port Harcourt and Apapa seaports in Nigeria, covering the period from 1981 to 2022. This timeframe allows for an analysis of port performance across different economic and policy contexts.

3.3 METHOD AND SOURCES OF DATA COLLECTION

The study utilizes secondary data collected from the Nigerian Ports Authority (NPA) annual reports, the National Bureau of Statistics (NBS) databases, and relevant publications from the Central Bank of Nigeria (CBN). These sources provide data on cargo throughput, port revenue, and other relevant economic indicators.

3.4 OPERATIONAL MEASURES OF VARIABLES

Port Revenue (PTR): The total revenue generated by the port from various sources, including cargo handling fees, storage charges, and other related levies.

Cargo Throughput (CTP): The total volume of cargo (in tons or TEUs) handled by the port within a specific period.

3.5 MODEL SPECIFICATION

The study employs a simple linear regression model developed from the work of Osadume and Edih (2020), to examine the relationship between cargo throughput and port revenue:

$PTR = \beta 0 + \beta 1CTP + \mu$ (Osadume & Edih, 2020)

Where:

PTR = Port Revenue

CTP = Cargo Throughput

$\beta 0$ = Intercept

$\beta 1$ = Coefficient representing the effect of cargo throughput on port revenue

μ = Error term

3.6 METHOD OF DATA ANALYSIS

The collected data will be analyzed using E-Views 12 software. The analysis will include:

Descriptive Statistics: To summarize the characteristics of the variables (mean, median, standard deviation, etc.).

Stationarity Tests (e.g., Augmented Dickey-Fuller test): To check for the stationarity of the time series data.

Regression Analysis: To estimate the coefficients of the model and assess the statistical significance of the relationship between cargo throughput and port revenue.

Diagnostic Tests: To check for potential issues such as heteroscedasticity and autocorrelation.

3.7 APRIORI EXPECTATION

The study expects a positive and statistically significant relationship between cargo throughput and port revenue, suggesting that higher cargo throughput leads to increased revenue generation.

3.8 LIMITATIONS OF THE STUDY

i. Data Availability and Reliability: Challenges related to data availability and reliability, particularly for historical data, may limit the scope and depth of the analysis. Inconsistencies in data collection methods or missing data points may introduce some degree of uncertainty.
ii. Model Simplicity: The model used in the study may not capture all the complex factors influencing port revenue. Other variables, such as port infrastructure, regulatory environment, and global economic conditions, could also play a role.
iii. Generalizability: The findings of the study may not be directly generalizable to other ports in Nigeria or other countries, as the specific context of Port Harcourt and Apapa seaports may be unique.
iv. Causality: While the study can establish a correlation between cargo throughput and revenue, it may be difficult to definitively prove causality due to the observational nature of the data.

3.9 EXPECTED CONTRIBUTIONS

This study is expected to make several key contributions:

i. Empirical Evidence: It will provide robust empirical evidence on the relationship between cargo throughput and revenue performance at two major Nigerian seaports.
ii. Comparative Insights: The comparative analysis will highlight the differences and similarities in the performance of Port Harcourt and Apapa seaports, offering valuable insights for port authorities and policymakers.
iii. Policy Recommendations: The study will generate practical policy recommendations for improving port efficiency and maximizing revenue generation.
iv. Theoretical Contribution: The study will contribute to the theoretical understanding of the factors influencing port performance and revenue generation in developing economies.
v. Methodological Contribution: The study's methodology can be applied to other ports and contexts, providing a valuable framework for future research.

4.0 RESULTS AND DISCUSSIONS

Data were sourced as enumerated in section 3.0 (from the Nigerian Ports Authorities at both Apapa and Port Harcourt and are available on requests)

4.1 Diagnostic Treatments

The preliminary tests carried out to determine the suitability of the variables in the series for this research work are Descriptive Statistics, Stationarity test, Johansen Co-integration test.

4.1.1 Descriptive Statistics

The descriptive statistics reveals the basic information about measure of central tendency, measure of dispersion and measure of normality of the dependent and independent variables.

Table 1a: Descriptive Statistics – Rivers Port

	CTP	EXCR	GRT	PTR
Mean	68.54259	171.2270	5.541111	82156.10
Median	65.23000	148.8800	5.560000	44285.56
Maximum	160.7000	423.9000	34.05000	515267.7
Minimum	12.62000	21.89000	-74.34000	3779.130
Std. Dev.	40.15944	106.4934	19.97850	114921.4
Skewness	0.376220	0.920348	-2.256670	2.593803
Kurtosis	2.295640	3.181084	10.57279	9.614423
Jarque-Bera	1.195076	3.848571	87.43207	79.49458
Probability	0.550165	0.145980	0.000000	0.000000
Sum	1850.650	4623.130	149.6100	2218215.
Sum Sq. Dev.	41932.31	294862.2	10377.66	3.43045
Observations	27	27	27	27

Source: Author's Eviews 12 Computation

The summary statistics shows the mean and median for the various variables in the series, having close central tendencies for each of the variables such as CTP mean of 68.54259 and the median follows closely with 65.23000, similarly for GRT, the mean and median are 5.541111 and 5.560000 respectively. The gap between the maximum values of the series and the standard deviations is very high for CTP being 160.7000 and 40.15944 respectively. The deviations from the mean for the variables in the series are quite high except for GRT and PTR. The average kurtosis is above 3 for the entire series indicating a platykurtic feature while the Jarque-Bera showed a cyclical trend. The probabilities for most of the variables in the series are significant being below the 0.05 confidence level except for CTP, EXCR and STT.

Table 1b: Descriptive statistics - Apapa Seaport Analysis

	CTP	EXCR	GRT	PTR
Mean	1222416	163.0413	29694074	192.8652
Median	20645269	148.8800	29258335	163.2000
Maximum	26987241	325.8000	37046879	518.0000
Minimum	17986998	21.89000	23303555	38.10000
Std. Dev.	2295774.	76.86780	3874279.	150.1406
Skewness	0.918261	0.945093	0.196622	0.630934
Kurtosis	3.358195	3.281192	2.066218	2.187085
Jarque-Bera	3.355240	3.499708	0.983815	2.159262
Probability	0.186818	0.173799	0.611459	0.339721
Sum	4.8808	3749.950	6.8308	4435.900
Sum Sq. Dev.	1.1614	129990.5	3.3014	495928.6
Observations	23	23	23	23

Source: Author's E-views 12 computation

The summary statistics shows the mean and median for the various variables in the series, having close central tendencies for each of the variables such as CTP mean of 21222416 and the median follows closely with 20645269, similarly for GRT, the mean and median are 29694074 and 29258335 respectively. The gap between the maximum values of the series and the standard deviations is very high for CTP being 2122416 and 2295774 respectively. The deviations from the mean for the variables in the series are quite high except for GRT and PTR. The average kurtosis is 3 for the entire series indicating a mesokurtic feature while the Jarque-Bera showed a cyclical trend. The probabilities for all the variables in the series are insignificant being above the 0.05 confidence level.

4.2 UNIT ROOT TEST

Table 2a reports the tests for stationarity properties of the series following the Augumented Dickey Fuller (ADF) statistics. All the variables were found to be stationery at order one (1). At the First difference as reported, the ADF Statistics for the respective variables were more negative than the critical values at 5% significance level. The reported P values were all less than 0.05 chosen level

of significance for which cause, the Null Hypothesis of the presence of unit root in all the variables is convincingly rejected. For the purposes of Cointegration analysis and tests, it is also interesting to state that the variables are all integrated of the same order.

Table 2a: Unit Root Output – Rivers Port

Variable	t-statistics	ADF @ 5%	Probability	Integration
CTP	-6.15868	-1.95502	0.0000	I(1)
EXCR	-4.68511	-3.60320	0.0050	I(1)
GRT	-3.41635	-3.62203	0.00242	I(1)
PTR	-3.4736	-3.62203	0.0042	I(1)

Source: Author's Eviews 12 Computation

The unit root or stationarity tests is used to ascertain the stationarity level of the series in a given model when their probabilities are less than chosen level of significance. In table 2b, while four of the variables were stationary at first difference level (CTP, EXCR and GRT their probabilities being statistically significant at p-values below the 5% confidence level.

Table 2b: Unit root test - Apapa Seaport Performance

Variable	t-statistics	ADF @ 5%	Probability	Integration
CTP	-4.90619	-3.60320	0.0031	I(1)
EXCR	-4.68511	-3.60320	0.0050	I(1)
GRT	-5.27545	-3.60320	0.0013	I(1)
PTR	-4.04719	-1.95568	0.0003	I(2)

Source: Author's Eviews 12 Computation

4.3 BREUSCH-GODFREY SERIAL CORRELATION TEST

The Breusch-Godfrey tests is used to test for the presence or absence of serial or autocorrelations in the model with the Null hypothesis stating that there is No autocorrelation. This holds if p-value is greater than the chosen level of significance otherwise reject. From table 3a, the p-value is greater than the chosen level of significance of 5%, indicating the absence of autocorrelation in the model. This is further enhanced with a Durbin-Watson statistics of 2.0347. Hence, we do not suspect any violation of the assumptions of classical linear regression.

Table 3a: Breusch-Godfrey Serial Correlation Test – Rivers Port

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	1.991583	Prob. F(2,16)	0.1689
Obs*R-squared	4.584499	Prob. Chi-Square(2)	0.1010

Source: Author's Eviews 12 Computation

From table 3b, the p-value is greater than the chosen level of significance of 5%, indicating the absence of autocorrelation in the model. This is further enhanced with a Durbin-Watson statistics of 1.8861. Hence, we do not suspect any violation of the assumptions of classical linear regression.

Table 3b: Breusch-Godfrey Serial Correlation LN Test – Apapa Seaport

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 4 lags			
F-statistic	2.031897	Prob. F(4,14)	0.1449
Obs*R-squared	8.448031	Prob. Chi-Square(4)	0.0765

Source: Author's Eviews 12 Computation

4.4 HETEROSKEDASTICITY TEST

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

Table 4a: Heteroskedasticity Test – Rivers Port

Heteroskedasticity Test: ARCH			
F-statistic	2.132653	Prob. F(1,24)	0.1572
Obs*R-squared	2.121827	Prob. Chi- Square(1)	0.1452

Source: Author's Eviews 12 Computation

Again, we accept the Null hypothesis that there is no evidence of heteroskedasticity since p-value is greater than 5% significance level.

Table 4b: Heteroskedasticity Tests – Apapa Seaport

Heteroskedasticity Test: ARCH			
F-statistic	1.357086	Prob. F(1,20)	0.2578
Obs*R-squared	1.397939	Prob. Chi- Square(1)	0.2371

Source: Author's Eviews 12 Computation

4.5 RECURSIVE RESIDUAL

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

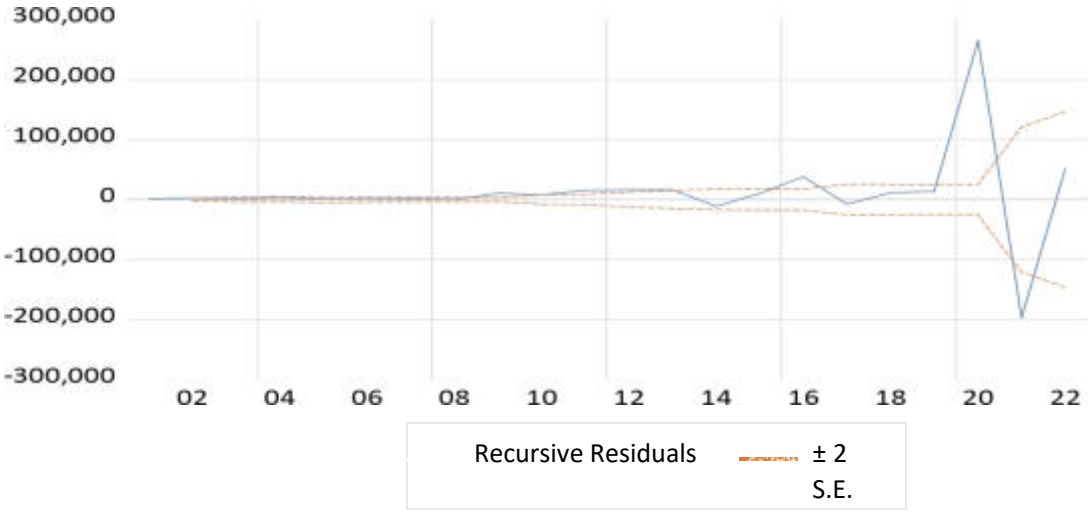


Figure 1: Recursive residuals – Rivers Port (Source: Author's Eviews 12 Computation)

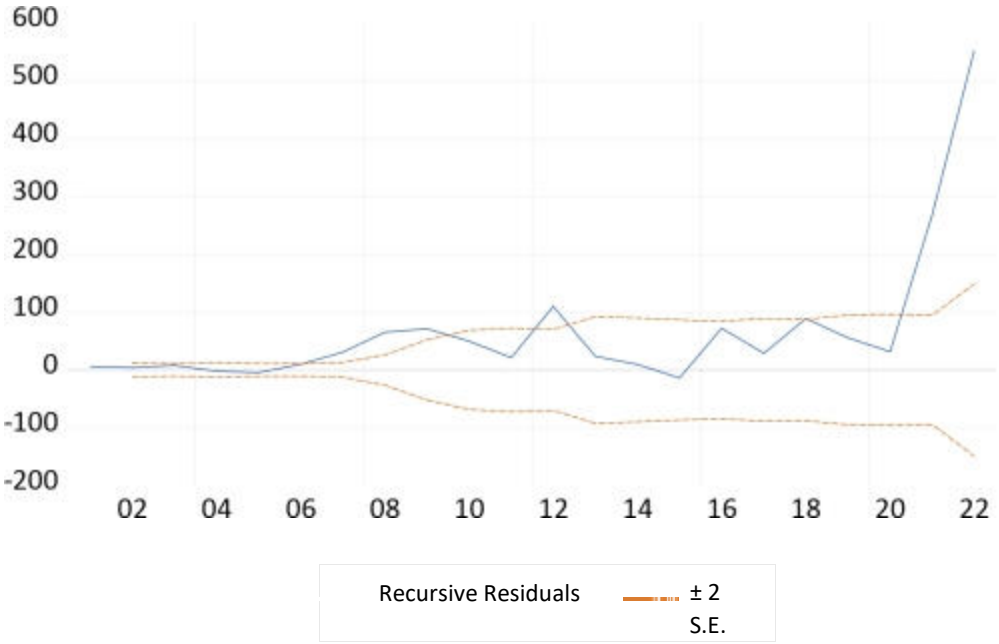


Figure 2 -Apapa Seaport Recursive Residual (Source: Author's Eviews 12 computation)

4.5 HYPOTHESIS TESTING

4.5.1 Restatement of Hypothesis

The hypotheses to be tested in this study are:

$H0_1$: There is no significant effect of cargo throughput on Port revenue performance of Port-Harcourt and Apapa seaports.

HA_1: There is significant effect of cargo throughput on Port revenue performance of Port-Harcourt and Apapa seaports.

4.5.2 Hypothesis Testing – Cargo Throughput Performance Parameter of Rivers Port, Port Harcourt

4.5.1.1 Ordinary Least Square Regression Result

From table 5a, CTP (2) at led 2, has a t-statistic value of 3.48650 and a p-value of 0.0026, and was found to have a positive effect on the value of cargo throughput and this effect is statistically significant at 5% level since its p-value is well below 0.05. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted.

Table 5a: Ordinary Least Square Result – Rivers Port – Port Harcourt Seaport

Dependent Variable: PTR				
Method: Least Squares				
Sample (adjusted): 1998 2020				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-31311.33	39929.76	-0.784160	0.4431
CTP(2)	153.8091	441.3918	3.486502	0.0026
GRT(2)	543.1925	511.2371	1.062506	0.3021
EXCR(1)	876.7738	128.6798	6.813609	0.0000

Source: Author's E-views 12 computation (See appendix 1)

Similarly, a cointegration test to ascertain the nature of relationship in the long-run, using co-integration trace and maximum eigenvalue tests revealed as below;

Table 6a: Trace Co-integration Rank Tests

Sample (adjusted): 1998 2022

Series: CTP EXCR GRT PTR

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.876360	108.3109	69.81889	0.0000
At most 1 *	0.699499	56.05130	47.85613	0.0070
At most 2	0.487808	25.99370	29.79707	0.1289
At most 3	0.291246	9.267307	15.49471	0.3412
At most 4	0.026100	0.661154	3.841465	0.4162

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

Source: Author's E-views 12 computation

The trace test in table 6a, indicates the existence of two co-integrating vectors, showing a long-run relationship between port revenue at the river's seaport and other performance parameters such as cargo throughput, gross registered tonnage and ship turnaround time (p-value = 0.0000 and 0.0070).

Also, table 7a, the maximum eigenvalue test indicates the existence of two co-integrating vectors, showing a long-run relationship between port revenue at the river's seaport and other performance parameters such as cargo throughput, gross registered tonnage and ship turnaround time (p-value = 0.0001 and 0.0236).

Table 7a: Maximum Eigenvalue Co-integration Rank Tests

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.876360	52.25959	33.87687	0.0001
At most 1 *	0.699499	30.05760	27.58434	0.0236
At most 2	0.487808	16.72639	21.13162	0.1853
At most 3	0.291246	8.606153	14.26460	0.3204
At most 4	0.026100	0.661154	3.841465	0.4162

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

Source: Author's E-views 12 computation

Decision Rule: For each of the hypothesis testing carried out on rivers port, Port Harcourt, we reject the null hypothesis and accept the alternative that there is a significant relationship between cargo throughput and port revenue performance of rivers port.

4.5.1.2 Hypothesis Testing for Apapa Port, Apapa.

For the Apapa seaport, from table 5b, CTP (2) at led 2, has a t-statistic value of 2.311853 and a p-value of 0.0328, was found to have a positive effect on port revenue and this effect is statistically significant at 5% level since its p-value is well below 0.05. Therefore, we reject null hypothesis to accept the alternative.

Table 5b: Least Square Regression Output – Apapa Seaport

Dependent Variable: PTR				
Method: Least Squares				
Date: 05/07/24 Time: 17:17				
Sample (adjusted): 1998 2020				
Included observations: 23 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-908.0170	222.8510	-4.074547	0.0007
CTP(2)	1.45005	6.2506	2.311853	0.0328
EXCR(-2)	1.505739	0.251556	5.985691	0.0000
GRT(-2)	1.67605	4.40406	3.785976	0.0014

Source: Author's E-views 12 computation (See appendix 2)

A review of the long-term relationship between these variables, is further undertaken in order to validate the nature of relationship;

Table 6b: Trace Co-integration Rank Test

Sample (adjusted): 2000 2020				
Included observations: 21 after adjustments				
Series: CTP EXCR GRT PTR				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. Of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.985656	172.9347	95.75366	0.0000
At most 1 *	0.864142	83.80168	69.81889	0.0026
At most 2	0.585524	41.88263	47.85613	0.1620
At most 3	0.380016	23.38707	29.79707	0.2275
At most 4	0.313080	13.34779	15.49471	0.1027
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				

Source: Author's E-view 12 computation

The trace test indicators the existence of two co-integrating vectors, showing a long-run relationship between port revenue at the Apapa seaport and other performance parameters such as cargo throughput, gross registered tonnage and ship turnaround time (p-value = 0.0000 and 0.0026).

Table 7b: Least Square Regression Output – Apapa Seaport

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. Of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.985656	89.13301	40.07757	0.0000
At most 1 *	0.864142	41.91905	33.87687	0.0044
At most 2	0.585524	18.49556	27.58434	0.4544
At most 3	0.380016	10.03929	21.13162	0.7410
At most 4	0.313080	7.886285	14.26460	0.3903
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				

Source: Author's E-view 12 computation

The maximum eigenvalue test indicators the existence of two co-integrating vectors, showing a long-run relationship between port revenue at the Apapa seaport and other performance parameters such as cargo throughput, gross registered tonnage and ship turnaround time (p-value = 0.0000 and 0.0044)

Decision Rule: Based on the results from these investigations, we reject the null hypothesis and accept the alternative that there is a significant relationship between cargo throughput and port revenue performance of Apapa seaport complex.

5.0 DISCUSSION

This study examined the Comparative Analysis of Seaport Performance, using selected seaports in Nigeria, namely – Rivers port and Apapa port. The motive of such a study was to affirm or refute established seaport performance standards and ascertain the better performing seaport from chosen study area. Following a detail theoretical review and empirical analyses, findings were made in line with the research questions as well as set and tested hypotheses. The result of the study revealed that for Rivers seaport, the cargo throughput had a positively significant effect on Port revenue with a p-value of 0.0026 while, Apapa Port's cargo throughput, also had a positively significant effect on Port revenue of the seaport with a p-value of 0.0328. These results align with existing literature emphasizing the positive correlation between these variables (Onyema et al., 2019; Osadume and Edih, 2020). The stark difference in the magnitude of the impact between the two ports underscores the importance of port-specific factors, such as infrastructure, operational efficiency, and the types of cargo handled, in shaping this relationship. This study's findings resonate with Elgar's Performance Theory (2007), which posits that performance is influenced by various interconnected components, including context and skill level. The distinct contexts of Port Harcourt and Apapa, along with their respective operational skills and efficiencies, likely contribute to the observed differences in the cargo throughput-revenue relationship. The implication of such an outcome is that a 1% increase in cargo throughput will result to a 154.09% rise in Port revenue at River's port while it will result to 1.45% rise at Apapa seaport.

5.1 CONCLUSION

This study investigated the impact of cargo throughput on port revenue performance at two key Nigerian seaports: Port Harcourt (Rivers) and Apapa. Our analysis revealed a statistically significant positive relationship between cargo throughput and port revenue at both locations. Specifically, our findings indicate that a 1% increase in cargo throughput at Port Harcourt is associated with a substantial 154.09% increase in port revenue. While Apapa also showed a positive relationship, the magnitude was considerably smaller, with a 1% increase in cargo throughput linked to a 1.45% rise in revenue. Our comparative analysis highlights the need for tailored strategies to enhance cargo throughput and, consequently, revenue performance at each port. The study reinforces the understanding that cargo throughput, ship turnaround time, and

gross registered tonnage are key performance indicators that require close monitoring and strategic management by port authorities to ensure optimal revenue generation.

5.2 RECOMMENDATIONS

Based on the findings of this study, the following specific and actionable recommendations are proposed for immediate implementation by the Nigerian government to enhance cargo throughput at Port Harcourt and Apapa seaports:

i. Targeted Infrastructure Investment and Modernization: The government should prioritize targeted investments in infrastructure and equipment at both ports, with a particular focus on addressing the specific needs of each location. For Port Harcourt, this could involve dredging the port's channels to accommodate larger vessels, expanding warehousing facilities, and upgrading cargo handling equipment. For Apapa Port, given its higher traffic volume, the focus should be on streamlining logistics, improving traffic management in and around the port, and expanding container terminal capacity. Modernization efforts should include the adoption of digital technologies for cargo tracking, customs processing, and port management to improve efficiency and reduce turnaround time. This targeted approach will allow both ports to handle larger volumes of cargo efficiently, which will lead to increased revenue.

ii. Enhancement of Inter-Agency Collaboration, Streamlining of Regulatory Processes and adoption of Single-window Customs Clearance System: The government should foster greater collaboration among the various agencies operating within the port environment, including customs, immigration, and security agencies. Streamlining regulatory processes, reducing bureaucratic bottlenecks, and implementing a single window clearance system will significantly reduce delays and improve cargo clearance efficiency. This includes simplifying documentation requirements, automating customs procedures, and minimizing physical inspections where possible. Enhanced inter-agency coordination will foster a more efficient, business-friendly environment, boosting cargo throughput and attracting more shipping lines.

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