OPTIMAL POLICY FOR PORT SUPPLY CHAIN ORIENTATION AS A STEP TO IMPROVE THE PERFORMANCE OF THE NIGERIAN INDUSTRIAL SECTOR

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ABSTRACT

The study evaluates Apapa and Tin Can Ports' industrial sector orientation to evaluate the food and beverage supply chain in Lagos and Ogun states, proposing solutions. The port supply chain orientation was assessed using port throughput (PT), while industrial performance was evaluated using manufacturing production value (MPV). The Nigerian Port Authority (NPA) provided data on port throughput for eight years from 2014 to 2021. The Manufacturers Association of Nigeria (MAN) provided data on manufacturing production values. Multiple regression analyses reveal a significant and direct relationship between the MPV of the food and beverage sector and the PTs of Apapa and Tin-can Island ports. The effects of PT on MPV vary across seaports, with Tin Can Port PT having a greater impact than Apapa PT. The research reveals variations in the impact of port supply chain orientation across different manufacturing clusters (Apapa, Ikeja, Ogun) at the cluster level. The cluster-specific analysis enhances the understanding of the findings and enables the development of personalized policy recommendations.

Key words: Port, supply-chain, orientation, industrial, performance
JEL code: L95; L91; L98

1. INTRODUCTION

The Nigerian manufacturing sector, as per economic statistics from 1982-2018, is not operating at its full potential, as indicated by annual GDP, and manufacturing value added. The manufacturing sector contributed 8.65% to GDP in the second quarter of 2022, a decrease from the 8.69% recorded in second quarter of 2021, according to the National Bureau of Statistics. The manufacturing contribution to Nigerian GDP in 2021 was 8.69%, lower than the 10.20% recorded in the first quarter of 2022, indicating no consistent increase over the years. The International Standard Industrial Classification (ISIC) data on Nigerian manufacturing value added between 2018 and 2022 reveals no consistent growth. The Nigerian manufacturing value added in 2022 reached $64.89B, marking a 0.75% rise from the previous year. The value for 2021 reached $64.41B, marking a 17.67% rise from the previous year. Nigerian manufacturing value added increased by 0.13% in 2020 to $54.75B. In 2019, the value added reached $54.68B, a 34.36% increase from 2018. The review indicates that manufacturing's value added has not consistently increased over the specified years.

The World Bank's (2020) national accounts report indicates that Nigerian manufacturing value added (MVA) has not experienced steady growth for nearly 40 years from 1982 to 2018 (Yusuf, 2023). In 1981, Nigerian manufacturing value added reached a total of $33.3 billion. The value experienced a sudden decrease until it reached $5.1 billion in 1993. It increased gradually till it reached $27.5 billion in 2008. The value fluctuated from $22.9 billion in 2009 to an all-time high of $54.8 billion in 2014. It dropped to $46.6 billion in 2015, and since then, it has been going down. The amount was $30.9 billion in 2018, 36 years later, which is the same as it was in 1982. The manufacturing sector's current performance may not achieve global competitiveness, improved living standards, efficient administration, safety, security, and sustainable economic growth expected from a strong industrial sector. The failure of the Nigerian manufacturing sector negatively impacts its growth, exports, and poverty reduction, necessitating measures to enhance its industrial performance.

Studies show that efficient port systems significantly enhance a location's competitiveness by offering supply chain solutions (Host et al., 2018; Seethamsetty and Ogoti, 2020; Oni et al. 2023). The competitiveness of a port is significantly influenced by its capacity to provide supply chain solutions. The National Bureau of Statistics' (NBS) international trade data suggests a potential link between Nigerian port infrastructure and its industrial sector, suggesting the port's capacity to manage Nigerian manufacturing supply chains could impact its performance. According to NBS, Nigerian firms imported raw materials worth N570.6 billion in 2020. This amount increased to N710.2 billion in the third quarter and N715.7 billion in the fourth (The Punch investigator, 2023). The Nigerian manufacturing sector is primarily dominated by the food and beverages sector which contributed 5% to GDP in 2019 and constituted 17% of the market capitalisation of the Nigerian Exchange Group.

A port-supply chains approach presupposes that the emphasis should shift from port efficiency as a standalone entity to supply chain network efficiency (Chen et al., 2009 and Norman, 1991). The emphasis on port supply chains should be evident in how the port system and enterprises match their objectives, structures, and activities. These alignments should lead to improved performance because systems and processes will ensure that the plan is successfully implemented (Norman, 1991; Chen et al., 2009). Port supply chain orientation should therefore eliminate any delays, wastes, duplication of effort, overlap of duties, lack of process standardization, and other issues that may result from stakeholder independence and conflict of interest. Sayareh and Lewarn's (2006) study demonstrates that ports offer a swift, secure, and cost-effective entry to the market when they are integrated with other logistics activities. The experiences of businesses at Nigerian seaports indicate a lack of necessary orientation for companies using these ports (Delloitte, 2017; Cotecna, 2021; Oni, Ojekunle and Adesanya, 2023). Oni, Ojekunle, and Adesanya (2023) found that customs clearance expenses alone account for over 80% of the total seaport costs incurred by manufacturers using Lagos seaports. Lagos' seaports' cargo clearance time is two to three weeks, compared to the 48 hours required by the United Nations standard. The reports suggest that further investigation may be necessary to address potential issues related to the connection between ports and supply chains.

The relationship between seaports and the supply chain for manufacturing has been studied by a number of scholars. Lee and Kim's (2009) study found that supply chain orientation has limited impact on customer satisfaction and port competitiveness, possibly due to implementation and practical issues. Han (2018) studied port supply chain integration in Busan container ports, finding customer integration significantly impacts quality performance and cost performance positively impacts ship calls and cargo throughput. Host et al (2018) examined the role of port integration in supply chains, specifically North Adriatic Ports. They hypothesized a correlation between business cycles of firms in the port supply chain, but the data showed ambiguity.

Similarly, Kim, et al (2020) examined the link between logistics integration and supply chain performance focusing only on shipping companies. The study collected data from 250 South Korean manufacturers for analysis. Study showed that building a strategic relationship for logistics services helps the manufacturing firms improve their business and operations performances in their supply chain. Parka and Dossanib (2020) studied the impact of Colombo Port on supply chain integration in the South Asian apparel industry, highlighting its transshipment hub and consolidation services, but highlighting the need for further improvements.

The literature suggests a connection between the port system and the industrial sector, but little research has been conducted on the relationship between port supply orientation and firms' supply networks using Nigerian ports. Furthermore, previous studies have primarily focused on port supply orientation's impact on terminal and corporate efficiency, neglecting industry-level public policies' impact on manufacturing growth, despite empirical evidence. The literature emphasizes the importance of considering public policy perspectives on port supply chain orientation to foster a robust, inclusive, resilient, and innovative industrial sector (Ikubor, et al., 2022). The study aims to enhance the food and beverages sector's capacity utilization through public policies focusing on port supply chain orientation. The paper is divided into five sections. Following the introduction is the second section, which evaluates studies that link port supply chain orientation to manufacturing supply chain or business performance. Section three provides a description of the methodology. Section four presents the findings and related debates. The findings and recommendations are reported in section five.

2. LITERATURE REVIEW

2.1 Port Supply Chain Orientation and industrial Performance

Seaports are considered logistics hubs and crucial components of supply chains, according to studies on supply networks. Ports facilitate global supply chains and industry networks, promoting efficient communication, reducing delays, waste, redundancies, job overlap, and operational cost reduction. Based on this idea, Sayareh and Lewarn (2006) observed that ports provide a quick, secure, and affordable entry to the market when their operations are integrated with wider logistics activities of others, such as supply chains. By functioning in this fashion, ports have evolved into hubs for overseeing the transportation of freight from point of origin to point of destination, so improving the effectiveness of freight operations. From the standpoint of port competitiveness strategy, Notteboom (2008) observed that ports have evolved beyond being a facility to handle ships to become significant connections in global supply chains.

In his paper, Woo (2010) focused on the connections between port supply chain integration (PSCI) strategies of seaport terminals along the supply chain, port supply chain orientation (PSCO) strategies, and port performance (PP). Data from 127 terminal operating firms, shipping companies, and freight forwarders in South Korea were used in the study. The results demonstrate that PSCO, PSCI, and PP as constructs were successfully validated using the elements found in the literature research and interview data. As a result, it can be inferred that the three constructs are multidimensional ideas. The study also demonstrated a substantial correlation between PSCO and PSCI. Additionally, the findings indicate that PSCI significantly and favorably affects PP.

Zhang and Lam, (2014) studied port strategy from a supply chain perspective considering the case of Hong Kong. Analysis shows that the status of Hong Kong Port as free port and world-class customs clearance offer the port a sustainable and considerable advantage to shorten transit time. These strategies (free port and world-class customs clearance) make the port strategically fit for the shipping of high value and time-sensitive cargoes. With an agile strategy, the Port will be good for a responsive supply chain. Again, Zhand et al (2015) investigates impacts of the emerging global manufacturing trends on Hong Kong Port development. The study found that relocation of manufacturing activities to Western Guangdong contributes to Hong Kong Port development, while other relocation destinations do not contribute to the port's development but rather make Hong Kong Port less attractive or even irrelevant.

Similarly, Han (2018) examined the impact of port supply chain integration on the performance of Busan Container Ports. The study that used factor analysis and regression method considered explicitly both supplier and customer of port supply chains. The results show that customer integration has a significant effect on quality performance. Furthermore, cost performance was found to have a positive impact on both ship calls and cargo throughput. The study of Kim, et al (2020) used data from 250 South Korean manufacturers (with a focus on shipping companies) to examine the link between logistics integration and supply chain performance. Study's findings showed that building a strategic relationship for logistics services helps the manufacturing firms improve their business and operations performances in their supply chain.

Furthermore, Parka and Dossani, (2020) focused on South Asian apparel industry and Colombo Port to analyzed the role of port infrastructure in supply chain integration. It was found that Colombo Port transshipment hub and its multi-country consolidation services have played a role in improving supply chain integration. Nevertheless, there is a need to improve internal logistics and to improve matching port and logistics infrastructure in the rest of South Asia.

Zhou (2013) developed a logistics value chain model for express delivery, identifying key activities from senders to receivers, thereby enhancing the logistics competitiveness of express enterprises. Carlo (2023) emphasized that a firm's competitive advantage is achieved through observing interconnected activities, and identified the value chain (logistics) model as a useful tool for identifying strategic activities and value creation.

The literature lacks research comparing multiple ports in a specific area to demonstrate potential variances in the impact of ports on Nigerian industrial cluster supply chains. The manufacturing industry in Nigeria must choose the most suitable port policy based on its industrial orientation, as seaports are public infrastructure that governments can invest in. In fact, Sebil's (2023) study suggests that Nigeria needs to implement sector-specific fiscal spending to stimulate sectorial output growth. Thus, the integration of Nigerian ports, Apapa and Tin Can, into the industrial policies of the Apapa, Ikeja, and Ogun regions could enhance industrial development in Lagos and Ogun states.

3. METHODOLOGY

3.1. Theoretical Framework Model Specification

3.1.1 The Logistics Value Chain Model.

This study utilizes the Logistics Value Chain Model, a tool utilized by business organizations to design and plan value-added activities in the logistics process (Zhou, 2013 and Chopra and Meindl, 2007). It is one part of the enterprise's value chain, which includes such external logistics activities as delivery of raw materials and finished goods, and also involves such internal logistics activities as production and selling. Logistics value chain exists in the relationship of logistics process, from upstream to downstream (Zhou, 2013). Port operations, including administrative, handling, storage, transportation, and IT logistics, are integral to the logistics value chain for marine transport. The Logistics Value Chain Model highlights cargo handling, storage, administration, and transportation at seaports as value-added activities in the import/maritime logistics process. The argument made here is that there is a meaningful connection between port-supply chain orientation and the success of manufacturing clusters, based on the perceived relationship as seen above.

3. 2. Estimation Techniques

A multiple linear regression was used to determine the effect of port throughput on the manufacturing production value of the food and beverages sub-sector and then the three industrial clusters (Apapa, Ikeja and Ogun). Following the theoretical framework, the hypothetical links between port throughput and manufacturing production values are shown in models 1a to 1d;

$$MPV_S = \beta_0 + \beta_1 PT_1 + \beta_2 PT_2 + e \quad (1a)$$
$$MPV_A = \beta_0 + \beta_1 PT_1 + \beta_2 PT_2 + e \quad (1b)$$
$$MPV_I = \beta_0 + \beta_1 PT_1 + \beta_2 PT_2 + e \quad (1c)$$
$$MPV_O = \beta_0 + \beta_1 PT_1 + \beta_2 PT_2 + e \quad (1d)$$

Where, MPVS = Manufacturing Production Value of the sub-sector

MPV_A = Manufacturing Production Value of the Apapa industrial cluster

MPV_I = Manufacturing Production Value of the Ikeja industrial cluster

MPV_O = Manufacturing Production Value of the Ogun industrial cluster

PT_1 = Port Throughput for Apapa port

PT_2 = Port Throughput for Tin-Can Island port

β_0 = constant or intercept

β_1 & β_2 = regression coefficients

e = error term

The parameters of regression models (1a, 1b, 1c & 1d) were estimated using the Ordinary Least Squares (OLS) technique, with the aid of the E-view 9 software. This is to determine the extent of (if there is) the significant relationship between the dependent and independent variables.

3.3. Data and Variable Description

This study focused on the food and beverages manufacturing sector in Lagos and Ogun states. It investigated both the sector and the three industrial clusters. These clusters include; Apapa, Ikeja and Ogun industrial clusters. These industrial clusters account for over 75 percent of manufacturing investments in Nigeria (Field Services, Manufacturer Association of Nigeria-MAN, 2020). Data from MAN show that Ogun cluster alone has over 70% share of manufacturing investments in the country between 2014 and 2017 (Manufacturer Association of Nigeria (MAN) Economic Review, 2014-2017).

Two sets of data were gathered in order to conduct a study on the connection between port-supply orientation and industrial performance. Data on port-supply orientation made up the first set of data, which is an independent variable, while data on industrial clusters made up the second set of data, which is a collection of dependent variables. Manufacturing Production Values (MPV) was used to measure the performance of industrial clusters, while Port Throughput (PT) was used to measure the orientation of port-supply chains. Port throughput, defined in Twenty Equivalent Units (TEUs), is the total number of containers handled by Lagos Seaports throughout the study period. Based on the reality that companies choose ports based on their ability to offer supply chain solutions (Host et al., 2018; Seethamsetty and Ogoti, 2020). The level of container traffic attracted by the port therefore is based on how advantageous such ports are to the manufacturers. Manufacturing Production Values define the worth of production made in a particular period based on industrial clusters.

The investigation utilized secondary data. The statistics pertain to the period from 2014 to 2021. The Nigerian Port Authority (NPA) has provided time series statistics on container port throughput, which is crucial for port administration and operations in Nigeria. The Manufacturers Association of Nigeria (MAN) was utilized to collect data on manufacturing production values. Nigerian top two seaports chosen for the study, Apapa Port and Tin Can Island, manage over 70% of all freight traffic entering or departing the country.

4. RESULTS AND DISCUSSION OF FINDINGS

4.1. Descriptive Analysis

The summary statistics of the time series data for the explanatory variables in the multiple regression models are presented in Table 1. The data for the Manufacturing Utilization Capacity (MCU) is presented in percentages, while the data for the Manufacturing Production Values (MPV_S, MPV_A, MPV_I & MPV_O) and the Port Throughput (PT_1 & PT_2) are in their log form. The statistical tools for the descriptive analysis include the mean, median, maximum value, minimum value, standard deviation, skewness, kurtosis, and the Jarque-bera.

Table 1.
Statistics of Core Variables

Statistics	MPV_S	MPV_A	MPV_I	MPV_O	PT_1	PT_2
Mean	11.87776	11.11600	11.92886	11.89780	5.741060	5.842279
Median	12.11142	11.54098	12.25183	12.02926	5.746386	5.866342
Maximum	12.55205	11.93759	12.54344	12.38917	5.839217	5.967808
Minimum	10.91676	8.534026	10.32869	10.77238	5.550000	5.619266
Std. Dev.	0.506842	1.057839	0.676926	0.444836	0.078695	0.094042
Skewness	-0.80287	-1.83909	-1.16966	-1.04442	-0.77964	-0.71323
Kurtosis	2.179266	4.931628	3.038055	3.454915	3.182541	2.964764
Jarque-Bera	2.167997	11.50684	3.649254	3.046819	1.643115	1.357333
Probability	0.338240	0.003172	0.161278	0.217967	0.439746	0.507293
Observations	16	16	16	16	16	16

Source: Outputs from E-View 9 (2022)

Table 1 shows the mean of the Manufacturing Production Value (MPV_S) for the food and beverage subsector as 11.88 (N750billions) with a standard deviation of 50.7%. This implies that the MPV_S varies slightly during the $period_s$ in consideration. Similarly, the means of the Manufacturing Production Value for the three industrial clusters (Apapa- MPV_A, Ikeja- MPV_I & Ogun- MPV_O) are respectively 11.12 (N132billions), 11.93 (N850billions) and 11.90 (N800billions). However, the standard deviations (105.8%, 67.7% & 44.5%) suggest that the values vary across the clusters, during the periods. Furthermore, the average values of the port throughput for the specified ports (Apapa-PT_1 & Tin-can Island-PT_2) are respectively 5.74 (N550,000) and 5.84 (N690,000). The standard deviations are however very low (7.9% & 9.4%) indicating that the throughputs are stable in the two ports, during the periods.

In addition, Table 1 shows the normality of the distribution of the time series data representing the core variables. The distribution of the MPV_S data is tailed to the left and approximately mesokurtic (-0.8 & 2.2 respectively); the distribution of the MPV_A data is skewed to the left and leptokurtic (-1.8 & 4.9 respectively); the distribution of the MPV_I data is skewed to the left and mesokurtic (-1.2 & 3.0 respectively); the distribution of the MPV_O data is skewed to the left and approximately mesokurtic (-1.0 & 3.5 respectively); the distribution of the PT_1 data is skewed to the left and approximately mesokurtic (-0.8 & 3.2 respectively) and the distribution of the PT_2 data is also skewed to the left and mesokurtic (-0.7 & 3.0 respectively). The summary of the result of the skewness and kurtosis for the all variables suggests normality of the respective data.

The Jarque-bera statistics further establish the normality of the time series data, with the results indicating that MPV_S (2.2), MPV_I (3.6), MPV_O (3.0), PT_1 (1.6) and PT_2 (1.4) have non-significant p-values ($p > 0.05$), at the 5% significance level. These results suggest normal distribution for the data. However, the same cannot be said of MPV_A (11.5), whose value is significant at the specified 5% level ($p = 0.003 < 0.05$).

4.2**.** Examine the impact of Port Throughput on Manufacturing Production Value.

A multiple linear regression model was used to examine the impact of port throughput on manufacturing production values at the sectorial level and across three industrial clusters (Apapa, Ikeja & Ogun). The result of the econometric analysis of the model is presented in Tables 2 to 5.

Table 2:
Parameter Estimates of Model 1a
Dependent Variable – MPV_S

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.6586	6.79778	-2.5977	0.0221
PT_1	2.735692	1.420484	1.925887	0.0076
PT_2	2.367331	1.188663	1.991591	0.0068
R-squared	0.599122	F-statistic		9.714426
Adjusted R-squared	0.537449	Prob(F-statistic)		0.002628
		Durbin-Watson stat		1.613615

Source: Outputs from E-View 9 (2022)

$$MPV_S = \beta_0 + \beta_1 PT_1 + \beta_2 PT_2 + e \quad (1a)$$

Table 2 reveals the results of the parameter estimates of the model involving the sectorial manufacturing production value (MPV_S) and the two port throughputs (PT_1 & PT_2). The result shows a positive regression coefficient ($\beta=2.73$) for PT_1. This implies a direct relationship where a unit increase in Apapa port throughput results in 2.73units increase in the sectorial manufacturing production value, with the Tin-can Island port throughput remaining constant. The t-statistic of this coefficient ($t=1.93$) is significant at the 5% level ($p<0.05$), indicating a significant relationship between the manufacturing production value of the food and beverage sector and the throughput from Apapa port.

Furthermore, there exist a positive relationship between MPV_S and PT_2 ($\beta=2.37$), where a unit increase in throughput from Tin-can Island port leads to 2.37units increase in manufacturing production value of the sub-sector. Also, the t-statistic of the coefficient ($t=1.99$) is significant at the 5% level ($p<0.05$), implying a direct and significant relationship between manufacturing production value of the food and beverage sub-sector and Tin-can Island port throughput.

In addition, Table 2 shows the model summary. The R-squared value of 0.60 indicates that the port throughput variables explain 60percent of the total variations in the manufacturing production value of the food and beverage sector. The F-statistic ($F=9.71$) is also significant at the 5% level ($p<0.05$). The Durbin-Watson statistics of 1.6 further suggests the absence of serial correlation among the variables. These results imply a good model fit.

Table 3:

Parameter Estimates of Model 1b

Dependent Variable – MPV_A

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-48.0076	14.74174	-3.25657	0.0062
PT_1	9.628361	3.080477	3.125607	0.0080
PT_2	0.658399	2.577748	0.255416	0.8024
R-squared	0.567206	F-statistic		8.518686
Adjusted R-squared	0.500622	Prob (F-statistic)		0.004323
		Durbin-Watson stat		1.475675

Source: Outputs from E-View 9 (2022)

$$MPV_A = -48.01 + 9.63PT_1 + 0.66PT_2 \quad (1b)$$

The parameter estimates of the model involving the manufacturing production value for Apapa industrial cluster (MPV_A) and the port throughputs (PT_1 & PT_2) is shown in Table 3. The result indicates a positive regression coefficient ($\beta=9.63$) for PT_1, which implies a direct relationship where a unit increase in Apapa port throughput results in 9.63units increase in the manufacturing production value for the cluster, with throughput from Tin-can Island port remaining constant. The t-statistic of the coefficient ($t=3.13$) is significant at the 5% level ($p<0.05$), indicating a direct and significant relationship between the manufacturing production value of the Apapa industrial cluster and the throughput from Apapa port.

Furthermore, there is a positive relationship between MPV_A and PT_2 ($\beta=0.66$), where a unit increase in Tin-can Island port throughput only implies 0.65units increase in manufacturing production value of the cluster. The t-statistic of the coefficient ($t=0.26$) is not significant at the 5% level ($p=0.80>0.05$). This implies that Tin-can Island port throughput does not significantly influence the manufacturing production value of the Apapa industrial cluster.

The model summary results show a R-squared value of 0.57. This suggests that the port throughput variables explain 57percent of the total variations in the manufacturing production value of the cluster. The F-statistic ($F=8.52$) is also significant at the 5% level ($p<0.05$). The Durbin-Watson statistics of 1.5 further suggests the absence of serial correlation among the variables. In all, the result of the model summary implies a good model fit.

Table 4:
Parameter Estimates of Model 1c
Dependent Variable – MPV_I

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-19.5849	9.664078	-2.02657	0.0637
PT_1	0.162569	2.019435	0.080502	0.9371
PT_2	5.234338	1.689866	3.097488	0.0085
R-squared	0.545784	F-statistic		7.810387
Adjusted R-squared	0.475905	Prob(F-statistic)		0.005918
		Durbin-Watson stat		1.637589

Source: Outputs from E-View 9 (2022)

$$MPV_I = -19.58 + 0.16PT_1 + 5.23PT_2 \qquad (1c)$$

Table 4 reveals the estimates of the model involving the manufacturing production value for Ikeja industrial cluster (MPV_I) and the port throughputs (PT_1 & PT_2). The regression coefficient for PT_1 is positive (β=0.16), which suggest a direct relationship where a unit increase in Apapa port throughput only leads to 0.16units increase in the manufacturing production value for the cluster, while Tin-can Island port throughput remains constant. The t-statistic (t=0.08) is however not significant at the 5% level (p>0.05). This implies that Apapa port throughput does not significantly influence the manufacturing production value of the Ikeja industrial cluster.

Similarly, the regression coefficient for PT_2 is a positive (β=5.23), suggesting a direct relationship where a unit increase in Tin-can Island port throughput results in 5.23units increase in manufacturing production value of the cluster. The t-statistic of this coefficient (t=3.10) is significant at the 5% level (p<0.05). This implies that Tin-can Island port throughput significantly influences the manufacturing production value of the Ikeja industrial cluster.

Furthermore, the model summary results reveal a R-squared value of 0.55, implying that the port throughput variables account for 55percent of the total variations in the manufacturing production value of the Ikeja cluster. The F-statistic (F=7.81) is also significant at the 5% level (p<0.05). The Durbin-Watson statistics of 1.6 is within the acceptable threshold of 1.5 – 2.5, indicating the absence of serial correlation among the variables. The results of the model summary imply a good model fit.

Table 5:
Parameter Estimates of Model 1d
Dependent Variable – MPV_O

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.83441	7.441608	-1.18716	0.2564
PT_1	2.15941	1.555021	1.38867	0.0188
PT_2	1.426652	1.301244	1.096376	0.0293
R-squared	0.376326	F-statistic		3.922103
Adjusted R-squared	0.280376	Prob(F-statistic)		0.046476
		Durbin-Watson stat		1.70647

Source: Outputs from E-View 9 (2022)

$$MPV_O = -8.83 + 2.16PT_1 + 1.43PT_2 \quad (1d)$$

The parameters in Table 3.5 show a positive relationship between manufacturing production value for Ogun industrial cluster (MPV_O) and the port throughputs (PT_1 & PT_2). The regression coefficient for PT_1 ($\beta=2.16$), implies that a unit increase in Apapa port throughput results in 2.16units increase in the manufacturing production value for the Ogun cluster, while Tin-can Island port throughput remains constant. The t-statistic ($t=1.39$) also significant at the 5% level ($p<0.05$). This implies that Apapa port throughput significantly influences the manufacturing production value of the Ogun industrial cluster.

Similarly, the regression coefficient for PT_2 is a positive ($\beta=1.43$), suggesting a direct relationship where a unit increase in Tin-can Island port throughput results in 1.43units increase in manufacturing production value of the Ogun cluster. The t-statistic of this coefficient ($t=1.10$) is also significant at the 5% level ($p<0.05$). This implies that Tin-can Island port throughput significantly influences the manufacturing production value of the Ogun industrial cluster.

In addition, the model summary results reveal a R-squared value of 0.38, suggesting that the port throughput variables only account for 38percent of the total variations in the manufacturing production value of the Ogun industrial cluster. The F-statistic ($F=3.92$) is also significant at the 5% level ($p<0.05$). Furthermore, the Durbin-Watson statistics of 1.7 indicates the absence of serial correlation among the variables. In all, the model summary results suggest a good model fit.

5. CONCLUSION AND POLICY RECOMMENDATIONS

The study reveals a direct and significant correlation between throughputs at Apapa and Tin-Can Island ports and the manufacturing production value of the food and beverage sub-sector. The impact of ports on manufacturing production value (MPV) varies, with Tin Can Port having a higher impact than Apapa Port. The study reveals that the throughput of Tin Can Island Port significantly impacts MPV in relation to the Ikeja Industrial Cluster. The throughputs of both ports significantly affect MPVs in the Ogun Industrial cluster. However, Apapa has a more significant impact than Tin Can Port. Port throughputs significantly influence the overall production values of manufacturing. The study uses cluster-specific analysis to improve understanding and develop policy recommendations, unlike previous studies that suggested ports' impact on regional industrial activity (Zhand et al., 2015; Parka and Dossani, 2020; and Kim *et al.* 2020).

The study reveals variations in the impact of two ports on industrial performance at the cluster level, possibly due to their industrial orientation. Variations in cluster dynamics may be influenced by factors like inter-firm partnerships, port-manufacturing cluster interdependency, and cooperation between ports and industrial clusters. The group's inter-firm collaboration within a specific cluster can potentially secure external alliances, such as those with ports. The interdependency between ports and clusters can vary due to the collaborative nature of clusters, which can influence the influence of a port on a specific cluster. Concessions and waivers may be more advantageous for industries frequently using the port than for those less frequently using the port's infrastructure. The impact of a port on an industrial cluster depends on the level of collaboration between parties, as production levels vary across clusters. Further research could explore the specific effects of each factor influencing the interaction between the port-industrial cluster in Lagos and Ogun States. In light of the study's conclusions, the following suggestions are made:

(i) Promoting effective collaboration within industrial clusters is crucial for fostering coherence and orienting the port's supply chain.
(ii) The perspective of an industrial cluster should be used to analyze port-supply chains, rather than focusing on a single enterprise.
(iii) The optimal approach to a port should consider the relationship between the port and the industrial cluster.
(iv) The two Lagos seaports will compete primarily based on their supply chain capabilities, necessitating a focus on supply chain orientation.

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