

Strengthening Port-Supply Chain Relationships to Maximize AfCFTA Benefits in Nigeria

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Abstract

Logistics infrastructure deficiencies in Nigeria result in costs for traders ranging from 40-60% of product value, with transportation from seaports to inland areas making up 40 to 80% of total container shipping expenses. This situation detrimentally affects trade competitiveness and undermines the effectiveness of the African Continental Free Trade Agreement (AfCFTA). Strengthening relationships in the port-supply chain by linking hinterland transportation to the port system at Lagos seaports is vital for improving regionalization efforts. This study explores the relationship between hinterland logistics and port clearance processes in Nigeria and their impact on the effectiveness of the African Continental Free Trade Agreement (AfCFTA). The study utilized a survey research design involving 43 import-dependent businesses listed on the Nigeria Exchange Group that transport goods via seaport and land. Pearson correlation analysis was used to examine the relationship between transportation costs and port clearance costs. The results indicate a negligible correlation ($r = 0.056$), with only 0.3% of the variation in clearing costs attributed to transportation expenses. Transportation costs have minimal impact, suggesting that efforts should be focused on other factor including tariffs and documentation.

Keywords: Logistics costs, port-supply chain integration, operations, port clearance, trade competitiveness.

1. Introduction

With a number of programs and policies, Nigeria has actively encouraged cross-border trade and increased its participation in international trade. For example, the New Trade Policy of Nigeria (TPN) 2023-2027 seeks to increase economic growth, diversify the economy, and

increase Nigeria's involvement in international trade. This initiative has a strong emphasis on encouraging development that benefits the poor, regional integration, private sector participation, and sustainable economic practices. African Continental Free Trade Agreement (AfCFTA), signed in July 2019 and ratified in December 2020, aims to establish a single market for goods and services among 54 African countries. Nigerian companies now have unrestricted access to regional markets according to the ECOWAS Trade Liberalization Scheme, a scheme designed to foster economic integration among West African nations. While bilateral investment agreements with 31 nations encourage international commerce and investment, the African Growth and Opportunity Act (AGOA) grants qualifying African nations duty-free access to the US market.

The African Continental Free Trade Agreement (AfCFTA) offers Nigeria a crucial chance to boost trade competitiveness and economic growth. The African Development Bank estimates that AfCFTA could lift 30 million individuals out of extreme poverty and enhance Africa's income by 3% to 4%. A World Bank analysis anticipates that full implementation of AfCFTA may result in a real income increase of approximately \$450 billion by 2035, representing a 7% gain (World bank, 2020). In the study by Oni et al. (2025), it was found that AfCFTA could benefit Nigeria by increasing intra-African trade by 15%–50%, contributing to GDP growth of about 10%–15%, creating 1.4 million new jobs, and promoting economic diversification. Additionally, Nigeria may enjoy greater access to cheaper goods and services from other African nations, given its current low level of intra-African trade. In 2018, Nigeria's imports from the African region accounted for 3.2% of its total imports, while its exports to the region made for 13.2% of its total exports. According to the Brookings Institute (2021), a recent survey of 1,804 Nigerian manufacturing companies revealed that six out of ten companies anticipate the AfCFTA to lower labor and material costs, boost production capacity, increase market share and consumer size, and lower prices. Therefore, it is vital to create an environment that will allow Nigeria to fully benefit from the African Continental Free Trade Agreement (AfCFTA).

Ogunlesi (2023) emphasized the importance of logistics infrastructure for the efficient movement of goods. Gaps in Nigeria's road, rail, and port facilities significantly increase logistics costs for traders, comprising 40-60% of product value. Inland transport contributes 40 to 80% of total container shipping expenses, which negatively impacts trade competitiveness. For instance, transporting goods from Apapa Port to Nigeria's hinterland may cost over one million naira, compared to just 600,000 naira from Lome Port in Togo to Lagos (Beresford et al., 2012; Behdani, 2020). Port clearance charges for a 40-foot container in Nigeria range from 18 million to 26 million naira, significantly higher than 5.6 million in Togo and 7.2 million in Ghana. These elevated costs of port operations and transportation make locally manufactured goods less competitive and more expensive in both domestic and international markets. In short, Nigeria's unstable ports result in an annual cost of approximately \$86 million, as businesses opt for more efficient ports in other countries.

Studies show that efficient transportation between ports and business locations, along with managing port clearance costs, is essential for promoting trade and enhancing competitiveness. Nazarczuk et al. (2020) highlighted the significant influence of seaports on the geographical decisions of exporters. Munim and Schramm (2018) investigated and reported that ports function as key hubs in waterborne transportation networks, linking hinterlands to global trade. Ports are essential for cost-effective transportation and distribution, playing a crucial role in international trade and global economic growth. Ports should function as vital components in a broader supply-chain network, not merely as isolated gateways. Enhancing the efficiency of ports and their surrounding areas is crucial for smooth operations, promoting trade, and maximizing the benefits of AfCFTA.

Port-supply chain integration in Nigeria is essential for enhancing economic growth and trade competitiveness. Strategically placed ports are essential entry points for regional companies aiming to access international markets and enhance deep supply-chain connections. Such a strategy enhances the logistics ecosystem by attracting new companies to the hinterland, fostering industrial clustering, and facilitating infrastructure upgrades such as rail connections and dry ports. Collaboration among inland distributors, shipping lines, freight forwarders, and port operators enhances operational efficiency.

Moreover, better coordination increases the dependability and speed of information flow by providing real-time updates on vessel arrivals, berth availability, and cargo status. This reduces waiting time when scheduling trucks, trains, or barges, which leads to shorter stay times, cheaper inventory holding costs, and less traffic at the quay and on hinterland roads. Strong relationships foster cooperative investments in delivery and warehousing, thereby reducing capital expenditure. By aligning capacity with demand, the network minimizes over-investment and logistics costs. Improved integration of port-supply-chain systems enhances service reliability, enabling shippers to optimize production schedules and mitigate the "bullwhip" effect, ultimately boosting on-time delivery performance.

Research on the port-hinterland system indicates a literature gap regarding the interaction between hinterland logistics and port clearance processes, suggesting a need for further exploration in port-supply chain relationships (Paflioti et al., 2014; Chen et al., 2016; Wang et al., 2017; Ticiana, 2019; Zgonc et al., 2019; and Mueller, Wiegmansand, and Duin, 2020). Hinterland logistics encompass transportation, material handling, and warehousing, linking businesses to the port, while cargo administrative clearance ensures protection against prohibited materials. Together, these logistics aspects are crucial to the port-supply chain relationship. Nigeria must strengthen port-supply chain relationships to achieve the goals of trade policies such as the African Continental Trade Agreement (AfCFTA). This study explores the connection between hinterland logistics and port administrative clearance processes in Nigeria and their influence on the efficacy of AfCFTA.

This study consists of five sections: an introduction outlining the background and purpose, a literature review analyzing the link between port-hinterland and port clearance, a methodology section, results and findings discussion, and a conclusion with recommendations. The next section critically assesses existing literature, outlining the article's background and objectives. It examines key findings, theoretical frameworks, and methodologies concerning port-supply chain logistics and port clearance's impact on Nigeria's trade performance, setting the stage for subsequent discussions and analysis.

2.Literature Review

2.1. Hinterland, Supply Chain and Interconnections

Muller et al. (2020) describe the hinterland as the region surrounding a major port that is accessed by clients, linked through transportation corridors. It encompasses the port, transportation modes (truck, rail, and waterways), inland ports, and consumer locations, with its configuration being influenced by the transportation network. Research indicates that hinterland transit represents 60 to 80 percent of the costs associated with international container transportation (Beresford et al., 2012; Behdani, 2020).

Muller et al. (2020) classified port hinterlands into three types: main/basic, competing, and non-competing. The main hinterland handles the majority of cargo due to advantages like proximity and established transit routes. Competing hinterlands involve competition with other ports for freight, while non-competitive hinterlands struggle due to factors like high transportation costs. This suggests that port competitiveness decreases with the distance from

the port, indicating the need for research to focus on specific hinterland types. According to the study by Notteboom and Jean-Paul (2017), the hinterland is categorized into three main divisions: logistical, physical, and macroeconomic. The macroeconomic hinterland highlights factors affecting transportation demand globally, while the physical hinterland details the scale and type of transportation supply, both modally and intermodally. Lastly, the logistical hinterland pertains to the flow structure that harmonizes transportation and supply. By implication, port development strategies should be tailored to the type of hinterland, with investments focused on efficiency and capacity for basic hinterlands, while prioritizing competitiveness and differentiation for competing hinterlands. Again, understanding logistical factors such as transport infrastructure and connectivity is crucial for ports to enhance their services and effectively capture market opportunities.

Ports play a crucial role in the supply chain as they serve as hubs facilitating the movement of goods between maritime and land transport. The hinterland, which refers to the area surrounding a port, is equally important as it dictates the efficiency of cargo distribution to and from the port. Efficient connectivity between ports and their hinterland enhances the overall supply chain performance by reducing transit times and transportation costs. Factors such as infrastructure quality, transport modes, and logistics services in the hinterland significantly impact supply chain operations linked to port activities.

To assess the seaport-hinterland relationship, various indicators have been used in studies focusing on port-hinterland operations and port clearance, as indicated by several researchers (Marquez-ramos et al., 2011; Paflioti et al., 2014; Chen et al., 2016; Wang et al., 2017; Ticiana, 2019; Zgonc et al., 2019; and Mueller, Wiegmansand, and Duin, 2020).

For example, Chen et al. (2016) contended that the hinterland connections of seaports may depend on the amount of inland transportation infrastructure. The hinterland connections of seaports may also be determined by the availability of key manufacturing and logistics hubs, the variety of modal options available to transportation providers, the carrying capacity of the main corridors, and the reliability of shipment delivery across the hinterland. Additionally, Wang et al. (2017) delved into how distance influenced the choice between unimodal car transportation and intermodal railroad transportation, indicating that distance may influence seaport hinterland links. In a similar vein, Zgonc et al. (2019) examined the impact of a port's distance from its hinterland on the movement of import goods. In order to illustrate how containerized exports might adapt to changes in port hinterland approaches, Mueller, Wiegmansand, and Duin (2020) presented a novel model. Five crucial port selection criteria—the cost of land transportation, the cost of marine transportation, the length of land transportation, the frequency of port visits, and an adverse replacement variable for rail transportation—achieved the best model fit out of the eleven components.

Alamouh (2016) investigated the impact of hinterland transport on seaport efficiency, focusing on the regulated vehicle system's effects. The study compared vehicle turnaround times with four performance indicators at a dry goods terminal: vessel turnaround time, berth occupancy rate, total berth output, and average vessel size. Data was collected from 120 observations at the Jordanian port of Aqaba. The analysis, using unit root tests, T-tests, correlation tests, and simple regression, revealed a positive correlation between port efficiency and hinterland transports.

The study by Ashakah, Okeudo, and Onyema (2025) examined the effect of hinterland transport connectivity on the operational performance of ports in Nigeria. Improved integration of the land transport system was found to boost the logistics performance index, reduce vessels' turnaround time, and enhance overall port performance. Hypotheses were tested using

regression and ANOVA, revealing that the Logistics Performance Index, domestic logistics costs, and liner connectivity index significantly influence the integration of various transport modes, thereby improving port performance in Nigeria.

In conclusion, the physical characteristics of the hinterland and seaports are key for assessing the port-supply chain interaction, focusing on transportation connections, modal options, and inland infrastructures. Indicators such as the regularity of transportation between seaports and hinterland facilities serve as measures of location and reliability, alongside considerations of time, money, and distance.

Research on the relationship between ports and their hinterlands overlooks supply chain perspectives that highlight the importance of integration, specifically the connection between hinterland transport logistics and port clearance. This study examines the link between hinterland logistics and port clearance processes in Nigeria, addressing a gap in the literature related to supply chain strategies to enhance the effectiveness of the African Continental Free Trade Agreement (AfCFTA).

2. 2 Theoretical Framework

2.2.1. The Port Regionalization Theory

The port regionalization theory (PRT), propounded by Notteboom and Rodrigue in 2005, explains the relationship between logistics costs and trade competitiveness in the context of seaports. According to the theory, ports are evolving beyond their traditional boundaries to become critical nodes in global supply chains, influencing trade competitiveness. Key concepts in PRT include hinterland development which focuses on expansion of ports' hinterland reach to attract additional cargo, leading to increased competition and cooperation among ports. Corridor development which has to do with establishment of intermodal corridors to enable ports have access to distant markets, reducing transportation costs and enhancing trade competitiveness. Integration with inland freight system which emphasizes seamless integration with inland freight systems to facilitate the smooth movement of goods, improving trade competitiveness.

The application of Port Regionalization Theory to the study of relationship between logistics costs and trade competitiveness in Nigeria implies that developing intermodal corridors and implementing hinterland connectivity can help reduce logistics costs and enhance trade competitiveness (Notteboom and Rodrigue, 2005). Furthermore, upgrading port infrastructure and equipment can improve efficiency and reduce congestion, enhancing trade competitiveness. Moreover, providing efficient logistics services, including customs clearance and inland transportation, can improve supply chain efficiency and reduce logistics costs.

Nigeria's port regionalization, notably through the Lekki Port, has enhanced its maritime transport position in West Africa, enabling the accommodation of large cargo vessels and establishing it as a competitive hub. Additionally, the creation of an Inland Container Depot in northern Nigeria supports this strategy, aimed at making Nigeria a regional hub for landlocked countries and facilitating effective port regionalization practices. However, Nigeria's ports, crucial for over 90% of international trade, are plagued by significant inefficiencies, especially at Apapa and Tin Can Island Ports, which handle 1.5 million and 1.3 million TEUs annually. These ports experience challenges in cargo evacuation and have long dwelling times of 18 to 20 days, contributing to severe congestion issues impacting the economy.

PRT strategies such as hinterland development, corridor development, and integration with inland freight systems can address port challenges by attracting more cargo, reducing transportation costs, and enhancing trade competitiveness. Hinterland development expands

port reach, while corridor development establishes intermodal access to distant markets. Integration with inland freight systems improves supply chain relationships, facilitating smoother goods movement and logistics frameworks for imported cargo. These potential solutions can help achieve AfCFTA goals by increasing cargo attraction, lowering transportation costs, and improving trade competitiveness.

3. Methodology

3.1. Data and Sources

The study employed a survey design involving 43 import-dependent companies listed on the Nigerian Exchange Group. Companies submitting at least 20 annual customs declarations demonstrating reliance on imported machinery and raw materials were selected. Out of the participants, 23 organizations completed and returned the structured questionnaires. Data analysis included percentage frequency distribution and Pearson Correlation analysis using SPSS. The structured questionnaire includes four sections: demographics (age, education, area of operation, work experience), container transport costs, clearance information (steps, agencies, documents, mode of operation), and additional data (clearance duration, delays, annual imports, total costs). To ensure validity, specialists evaluated the instrument before distribution, and pilot tests were conducted to assess questionnaire quality based on Nwankwo's (2016) recommendations. Frequency distribution analysis of these items is presented in Table 4.1.

4. Relationship between cost of transportation and cost of clearance

In this section, the estimation results of the relationship between transportation costs and clearance costs at Lagos seaports are presented. Frequency distribution analysis is shown in Table 4.1, and Pearson Correlation analysis conducted with SPSS is shown in Table 4.2.

4.1 Frequency Distribution of items in the questionnaire

This subsection analyzes 23 firms, revealing that 52.2% of managers have a degree or Higher National Diploma and 47.8% have postgraduate degrees, indicating a highly skilled respondent pool. The analysis of respondent demographics indicates a highly skilled pool of managers, with 52.2% holding a degree or HND and 47.8% having postgraduate degrees. This composition suggests high expertise among respondents, ensuring their understanding of the survey questions and the provision of informed responses. Additionally, the skills of the respondents enhance the credibility of the data collected and indicate a diverse range of perspectives due to varying educational backgrounds.

Additionally, 95.7% of respondents are logistics experts, while only 4.3% are managers, indicating the reliability of the reported data based on the respondents' expertise. The high proportion of logistics experts (95.7%) among respondents enhances data reliability, ensuring credible insights and reducing bias. Their expertise strengthens the validity of research findings and recommendations, suggesting that results are rooted in practical knowledge, which may inform targeted interventions or policies.

Table 4.1 indicates that the respondents' manufacturing sectors are comprised of 31.8% consumer goods, 18.2% industrial, 45.5% healthcare, and 4.5% from other sectors. The study represents Nigeria's major manufacturing sectors. The distribution of respondents across Nigerian manufacturing sectors significantly enhances the study's representativeness and generalizability. It provides sector-specific insights into logistics and supply chain management challenges and opportunities, enabling comparative analysis among sectors such as healthcare and consumer goods. The findings aim to inform targeted strategies and policies for improving logistics practices within these sectors.

Furthermore, most sampled companies are located in Ogun State, comprising 56.5%, while 43.5% are based in Lagos State. The geographical distribution of sampled companies' centers on Ogun and Lagos States, underscoring their significance as Nigeria's industrial hubs. This focus permits comparative analysis between Ogun's manufacturing and Lagos's commercial activities. However, the findings may be limited in their generalizability to the wider Nigerian context. The research emphasizes the potential implications for logistics and supply chain strategies specific to these states and highlights regional business operational differences, urging caution in applying results to other regions of Nigeria.

Majority of the firms surveyed, 81.8%, clear their containers at Apapa Port, while 18.2% use Tin Can Island Port. The study reveals a significant reliance on Apapa Port, which accounts for 81.8% usage, emphasizing its critical role in Nigeria's imports. The operational insights may indicate the port's efficiency and challenges. However, the limited data from Tin Can Island could lead to underrepresentation of those firms' experiences. The research highlights the need for improved port management and policy, suggesting comparative studies on port efficiency and logistics that may influence firms' port selection strategies in Nigeria.

The study highlights that Nigeria's dependency on Apapa Port poses risks to trade facilitation under the AfCFTA, necessitating efficiency enhancements to leverage AfCFTA opportunities. It suggests that developing Tin Can Island Port and other ports could alleviate congestion and bolster trade resilience, as port efficiency is pivotal for Nigeria's competitiveness in regional trade. AfCFTA aims to streamline trade procedures, reduce costs, enhance regional trade and economic integration, and promote industrialization and economic diversification. Recommendations include investing in Apapa Port infrastructure, optimizing port utilization, and fostering competition among Nigerian ports to improve services.

Additionally, 88.9% of containers from Lagos seaports are transported by truck, while 11.1% use barges, demonstrating that trucks are the primary mode of transport. The dominance of truck transport (88.9%) raises concerns about infrastructure strain, with implications for road congestion and wear. Additionally, trucks may influence logistics costs and efficiency negatively compared to barges, while presenting higher emissions. This situation underlines the necessity for improved truck management and infrastructure investment, as well as the exploration of alternative transport modes like barges and rail, to optimize logistics and inform sustainable transport policies in Nigeria. The dominance of truck transport in Nigeria's logistics poses challenges for the implementation of the African Continental Free Trade Area (AfCFTA). Key issues include trade facilitation challenges leading to increased costs and reduced competitiveness, sustainability concerns due to higher emissions, and missed opportunities to fully benefit from AfCFTA's market access. The objectives of AfCFTA are to lower trade costs, enhance regional integration, and foster sustainable economic growth. To address these challenges, recommendations include investing in transport infrastructure, promoting a shift to more efficient transport modes, and implementing policies to optimize logistics.

Table 4.1 Percentage Frequency Distribution

Variable	Percentage
Highest Education Qualification	
Degree/HND	52.2
Post graduate degree	47.8
Years of Work Experience	
6 - 10 years	26.1
10 - 15 years	17.4

15 - 20 years	34.8
20 and above	21.7
Section of Work	
Managerial/CEO	4.3
Logistics	95.7
Manufacturing Sector	
Consumer goods	31.8
Industrial goods	18.2
Health care	45.5
Others	4.5
Factory Location	
Lagos	43.5
Ogun	56.5
Company's Age	
11 -15 years	10.0
16 - 20 years	10.0
20 years and above	80.0
Where your Container is Mostly Cleared	
Apapa port	81.8
Tin Can port	18.2
Frequently used Transport mode from Seaport to Site	
By truck	88.9
By barge on waterways	11.1

Source: SPSS, (2024).

4.2 Relationship between cost of transportation and cost of clearance

The Pearson Correlation analysis in Table 4.2 illustrates the relationship between port-hinterland transportation costs and port clearance costs at Lagos seaports.

Table 4.2 Relationship between cost of transportation and cost of clearance

		Mean Cost of Clearance ('000)	Mean Cost of Transportation from Port to Site
Mean Cost of Clearance ('000)	Pearson Correlation	1	.056
	Sig. (2-tailed)		.799
	N	23	23
Mean Cost of Transportation from Port to Site	Pearson Correlation	.056	1
	Sig. (2-tailed)	.799	
	N	23	23

Source: SPSS, (2024).

In the analysis shown in Table 4.2, the correlation coefficient (r) is 0.056, suggesting a very weak positive association between the cost of transportation from the port and inland destinations and the cost of port clearance. With a ' r ' value approaching zero, it can be inferred that the two variables are almost independent and that changes in one do not significantly affect the other. The weak correlation between transportation costs and clearance costs suggests that knowing the cost of transportation from the port to inland destinations does not provide much

information about the costs of clearance in seaports, and vice versa. Similarly, the weak correlation may indicate that other factors, such as regulatory procedures, infrastructure, or logistics efficiency, play a more significant role in the determining clearance costs than transportation costs.

5. Conclusion and Recommendations

This paper explores improving port-supply chain relationships to maximize the benefits of the African Continental Free Trade Agreement (AfCFTA) in Nigeria. It highlights the importance of this understanding for developing strategies that reduce trade costs and enhance performance, noting a very weak positive correlation between transportation costs from ports to inland areas and port clearance costs. The correlation result ($r = 0.056$) indicates that there is almost no linear relationship between the cost of transportation and the cost of clearance in the data you looked at. Practically speaking, you cannot determine how much it will cost to clear a shipment via customs procedures by knowing how much it costs to transport. Only roughly 0.3% of the variation in clearing costs can be described by transportation expenses, according to the squared coefficient ($r^2 = 0.003$); the other 99.7% is driven by other factors including tariff rates, documentation complexity, inspection procedures, or even random fluctuations.

The African Continental Free Trade Area (AfCFTA) seeks to enhance intra-African trade by lowering trade barriers. In Nigeria, achieving competitiveness requires addressing cost independence in logistics, as inefficiencies in one area, like port clearance, can hinder overall trade. A weak correlation ($r=0.056$) between port clearance and inland transport costs suggests that enhancing one may have minimal effect on the other. Nigerian competitiveness under AfCFTA can be enhanced by optimizing port clearance and inland logistics separately to improve overall cost efficiency. Identifying specific bottlenecks is crucial for enhancing trade competitiveness. Reducing trade costs will be essential for accessing regional markets; if these costs are independent, targeted improvements such as technology in ports and better road infrastructure inland can strengthen Nigeria's competitive position.

Similar findings in other studies, such as Amponsah and Kwaakey (2024) on Ghana's port logistics, exhibit weak links between specific logistics costs, paralleling your result of $r=0.056$. Other studies, including Alamoush (2016) in Aqaba, Jordan, found a positive correlation between port efficiency and hinterland transports. Likewise, Ashakah, Okeudo, and Onyema (2025) in Nigeria identified that the Logistics Performance Index, domestic logistics costs, and liner connectivity significantly impact hinterland integration and enhance port performance. These findings contrast with the current study's results. Results suggest that context, such as the country and logistics setup, may influence cost associations, with the Nigerian context showing specific factors like infrastructure gaps that drive cost independence. Implications for managers and policymakers encompass essential information that influence effective decision-making and strategic planning. These include:

- i. Optimize port clearance and inland logistics separately to achieve overall efficiency, as costs appear somewhat independent.
- ii. Identify bottlenecks by auditing specific pain points in the logistics chain without assuming that one issue impacts another.
- iii. Investing in technology for port logistics and enhancing inland transport infrastructure is essential for improving efficiency in transportation systems.
- iv. Logistics strategies should be aligned with AfCFTA goals to enhance regional competitiveness.

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