

ANALYZING THE LOGISTICS AND SUPPLY CHAIN PROCESSES IN PORTS AS A PERFORMANCE LEVER FOR NIGERIAN CEMENT AND ALLIED INDUSTRIES

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Abstract

This study investigates how logistics and supply chain processes at Nigerian ports affect the production and profitability of cement and allied products. Key factors examined include port-to-factory transport costs, distances, administrative clearance costs, and time spent at seaports. Using a longitudinal survey of 90 Nigerian Exchange-listed companies between 2010 and 2019 (with 66% response rate), multiple regression analysis was conducted in SPSS. Findings show that port-to-factory transport costs and distances have a strong positive impact on profitability ($\beta=0.475$ and $\beta=0.641$), explaining 72.2% of profit variation. Conversely, administrative clearance costs and time have only marginal effects on profits ($\beta=0.006$ and $\beta=0.188$). The results indicate that while customs procedures minimally influence profits, transport efficiency from port to factory significantly drives financial performance. The study highlights the importance of optimizing inland logistics and port-centric supply chains, suggesting that improving transport networks can transform inefficiencies into a sustainable competitive advantage for Nigerian cement manufacturers.

Keywords: Logistics, supply-chain processes in ports, administrative clearance, transport, business profit.

1. Introduction

Supply chain management (SCM) refers to the coordinated management of the flow of goods, services, and information from the sourcing of raw materials through production and distribution to final delivery to customers. It encompasses key activities such as procurement, inventory control,

manufacturing, warehousing, distribution, shipping, port operations, customs clearance, and customer service management. Effective SCM emphasizes functional integration, stakeholder collaboration, real-time cargo monitoring, and sustained investment in logistics infrastructure. Empirical evidence indicates that SCM practices have a

significant effect on supply chain and firm performance, explaining approximately 48.73% of performance variance (Aradhana et al., 2017).

Doan (2020) and Lee (2021) report that efficient supply chain strategies substantially enhance the financial performance of small and medium-sized enterprises, improving revenue, profitability, and organizational capabilities. Similarly, Oni and Ojekunle (2022) and Mbachu et al. (2024) demonstrate that effective supply chain operations—particularly cargo handling efficiency, vessel scheduling, and customs clearance—play a critical role in reducing delays and logistics costs within port environments. The adoption of advanced supply chain technologies, such as blockchain applications and terminal operating systems, further enhances port efficiency and operational transparency (Hokey et al., 2017; Min et al., 2017). Collectively, these findings establish a strong correlation between port-based SCM practices and business efficiency. However, the implications of this relationship remain underexplored in the context of Nigerian cement companies and allied industries.

Cement and allied products are central to growth and development in Nigeria's manufacturing-oriented economy. Industry forecasts project annual growth of approximately 3.2%, with market value expected to reach US\$3.42 billion in 2024 and a compound annual growth rate of 3.3% between 2024 and 2028. Cement

output is projected to increase from US\$3.31 billion in 2023 to US\$3.89 billion by 2028 (West African Business Journal, 2025). Despite this growth trajectory, studies by Igwe et al. (2013), Adebayo and Aworemi (2021), and Oni et al. (2025) identify persistent logistics challenges—including inadequate infrastructure and complex regulatory frameworks—that hinder industry expansion and competitiveness.

Industry stakeholders have repeatedly highlighted the cost implications of weak logistics systems. In 2018, Abdul Samad Rabi, Chairman and CEO of BUA Group, warned that deficient transportation networks significantly erode profit margins and raise supply chain costs. His analysis revealed that cement transportation costs exceeded ₦14,000 per ton, representing over one-third of total production costs. By July 2024, transportation costs were projected to increase to between ₦45,000 and ₦50,000 per ton, depending on route conditions and operational factors (The Nation Newspaper, July 22, 2025). As of January 2026, rising fuel prices and logistics inefficiencies suggest that transportation costs have likely surpassed these estimates, with the average wholesale price reaching approximately ₦6,000,000 per trailer load (Ezeh, 2026). An efficient logistics network is therefore essential for the timely movement of raw materials and finished products, cost reduction, and overall operational efficiency (Oni et al., 2025).

Port-related supply chain management in Nigeria is significantly affected by clearance costs, clearance time, transportation between seaports and industrial locations, and the distance between ports and production sites. Evidence from Nwokedi et al. (2021) and Oni et al. (2024) indicates that cargo clearance in Nigerian ports is approximately 30% more expensive than in neighboring countries and takes an average of 18–21 days, compared to 5–7 days in Ghana and about 4 days in Cotonou (The Nation, October 31, 2025). Bureaucratic bottlenecks, including slow customs procedures and excessive documentation requirements, have been identified as major contributors to clearance delays (Oni & Ojekunle, 2022). In addition, congestion around major ports—particularly in Lagos—results in extended transit times and increased transportation costs. Studies consistently identify poor port infrastructure, multiple charges, and congestion-related delays as major obstacles to efficient shipping and logistics operations in Nigerian seaports (Nwokedi et al., 2021).

A substantial body of literature underscores the importance of SCM in enhancing industrial performance by optimizing the utilization of key inputs such as raw materials, labor, and capital (Kongkiti, 2013; Rajen, 2020; Akanbi, 2024). Kongkiti (2013) emphasizes that transportation costs of raw materials are as critical as acquisition costs, noting that neglecting logistics expenses can significantly inflate overall production

costs. Rajen (2020) argues that competitive advantage increasingly derives from efficient supply chains that reduce purchasing, production, and operational costs. Similarly, Akanbi (2024) notes that effective supply chain management improves customer satisfaction by ensuring efficient and reliable logistics throughout the production process.

Although SCM is essential for international trade and the smooth flow of goods through ports (Mbachu et al., 2024), port-related supply chain processes remain insufficiently examined in existing literature. A clearer understanding of port-centric SCM practices can help firms optimize operations, reduce costs, and enhance service quality. For Nigeria's cement and allied industries, efficient port logistics may significantly improve performance and strengthen competitiveness in regional and global markets. To address this gap, the present study investigates the impact of supply chain management practices—particularly port logistics processes—on the performance of Nigeria's cement and allied industries.

This study is structured into five sections. Section One presents the background and motivation for the research. Section Two reviews relevant literature and examines the relationship between port logistics, supply chain processes, and cement and allied product production in Nigeria. Section Three outlines the research methodology. Section Four discusses the

empirical findings, while Section Five concludes the study and offers practical policy and managerial recommendations.

2. Literature Review

2.1. Logistics and Supply-Chain Processes in Ports and their Impact on Cement and Allied-Product Manufacturing

The cement industry is widely recognized as a heavy-material sector that depends on bulky, low-value raw materials such as limestone, gypsum, and coal, which are often sourced from geographically distant locations. Consequently, the logistics involved in transporting these raw materials and finished products—including cement and clinker—through seaports and across supply chain networks play a critical role in determining production costs, product quality, and environmental sustainability. Ports are therefore strategically important to cement manufacturers, as they facilitate the importation of essential inputs, particularly for plants located in regions with limited access to high-quality limestone. In addition, ports serve as export gateways for surplus clinker and cement, enabling firms to access distant markets during periods of domestic oversupply or weak regional demand. This interdependence underscores the strong linkage between port logistics efficiency and the performance of the cement industry, as well-connected ports can convert surplus output into revenue rather than incurring storage and demurrage costs.

Empirical studies consistently demonstrate a strong relationship between logistics efficiency, port-based supply chain processes, and firm performance. Aniki, Mbohwa, and Akinlabi (2014) examined logistics and supply chain practices in Nigerian cement factories and identified several operational constraints and improvement opportunities. Using structured questionnaires, the study found that approximately 73% of firms rely predominantly on road transportation for product distribution, reflecting limited modal diversity. The authors also highlighted the deterioration and obsolescence of railway infrastructure resulting from prolonged neglect and poor maintenance, recommending renewed investment in rail systems to enhance logistics efficiency, although such investments may be financially burdensome for individual firms.

Hooshang et al. (2014) investigated the impact of supply chain integration on the financial performance of Swedish manufacturing firms. Drawing on a literature-informed survey instrument refined through expert validation, the study revealed that supply chain integration at all levels positively influences financial performance, with fully integrated firms achieving superior outcomes. The findings emphasize the practical importance of supply chain integration for production managers operating in increasingly competitive global markets.

Similarly, Aradhana et al. (2017) assessed the effects of supply chain management practices (SCMPs) on supply chain performance (SCP) and firm performance (FP) within India's organized retail sector. Using data from 125 supply chain executives, the authors developed and tested a conceptual model through mediating multiple regression analysis. The results indicate a significant positive relationship among SCMPs, SCP, and FP, with customer and supplier relationship management emerging as the most influential practices. However, the study relied primarily on perceptual performance measures, suggesting the need for future research incorporating objective indicators such as profit margins and sales growth.

Earlier studies by Adejugbe (1970) and Uche et al. (2017) examined the price and income elasticities of demand for cement in Nigeria, including both imported and domestically produced cement. Using the least squares estimation method, the studies found that cement demand is generally price inelastic, with both aggregate and imported cement exhibiting low and variable price elasticity. While aggregate cement demand showed income elasticity, imported cement demonstrated low-income elasticity, reflecting increasing import substitution. The studies further revealed that customs tariffs had minimal influence on imported cement demand and that cement consumption increased at a declining rate of approximately 2%, although overall

consumption trends continued upward over time.

Lee (2021) explored the impact of supply chain management strategies on the operational performance of Korean small and medium-sized enterprises, with particular emphasis on organizational competencies. Based on a survey of 300 manufacturing SMEs, the study found that specific SCM strategies significantly improve operational performance and strengthen organizational competencies. Although these competencies mediated the relationship between SCM strategies and operational performance, they did not mediate financial performance. The findings suggest that aligning SCM strategies with internal organizational capabilities is essential for achieving sustainable performance outcomes.

Abdullahi et al. (2024) examined the cost and environmental challenges associated with cement production, highlighting its energy-intensive nature and environmental footprint. The study reported that cement production consumes approximately 15% of total industrial energy, requiring about 3.4 GJ of thermal energy and 110 kWh of electrical energy per ton under the dry process method. In Nigeria, energy costs account for between 40% and 50% of total cement production costs, posing significant threats to sustainability and profitability. The study also noted that cement production contributes approximately 5% of global greenhouse gas emissions and generates substantial solid waste, with projections

estimating global solid waste generation could reach 3 billion tonnes by 2025. These environmental and cost-related challenges have constrained investment in new cement plants in Nigeria.

More recently, Kattey et al. (2025) investigated the relationship between perpetual inventory systems and the performance of cement manufacturing firms in South-South Nigeria. Using an explanatory survey design and a census of five cement companies, the study collected data from 30 respondents through a semi-structured questionnaire based on a five-point Likert scale. Analysis using descriptive statistics and Spearman's rank-order correlation revealed that perpetual inventory management significantly predicts supply chain performance. The authors recommend adopting perpetual inventory systems to improve decision-making, maintain optimal stock levels, professionalize purchasing processes, and enhance customer satisfaction, thereby strengthening overall supply chain performance.

3. Methodology

3.1. Data and Sources

This study examined cement and allied product manufacturing firms operating in Nigeria, categorized as industrial goods producers, including manufacturers of

cement and foam products. A longitudinal survey research design was adopted to assess the impact of logistics and supply chain processes within Nigerian ports on the production of cement and allied products. The study population comprised 90 firms listed on the Nigerian Exchange Group (NGX) between 2010 and 2019, of which 60 firms, representing a 66% response rate, successfully completed the survey. Data collected were analyzed using multiple regression techniques with the aid of SPSS.

Specifically, the study analyzed the influence of key port-related logistics and supply chain variables including transportation costs to production facilities, distance between ports and factories, administrative clearance costs, and port processing time—on the profitability of cement and allied product manufacturing firms in Nigeria.

3. Analysis of the Logistics and Supply Chain Variables and Profit of Cement and Allied Products Producing Businesses

This section details the estimation results on how logistics and supply chain variables affect the profits of cement and allied product businesses, including descriptive statistics, model summary, and an analysis of variance related to the regression coefficients.

4.1 Effect of Logistics and Supply Chain Variables on Cement and Allied Products Producing Businesses

Table 4.1.1 Descriptive Statistics

	Mean	Std. Deviation	N
Profit	31355886416.55	25307518202.019	60
ClearCost	824.58	449.423	60
ClearTime	84.00	27.059	60
TransportCost	532.50	230.884	60
Distance	104.1667	37.77909	60

a. Business = Industrial Goods

The descriptive statistics of the cement and allied products producing business are presented in Table 4.1.1. The cement and allied products producing business' profits have a yearly average of ₦31,355,886,417 (approx.), clearance cost has a yearly average of ₦824,580, clearance time has an average of 84 hours per clearance, the transport costs from port to factory has a

yearly average of ₦532,500,000, while the distance between port and factory has an average of 104.167km. These figures give a basic understanding of the time and resources that cement and allied products producing business invest on logistics, which may have an impact on their profits.

Table 4.1.2 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.850 ^b	0.722	0.702	13813115148.560

a. Business = Industrial Goods

b. Predictors: (Constant), Distance, ClearCost, TransportCost, ClearTime

Table 4.1.2 presents the model summary results. The combined logistics and supply chain variables—particularly administrative clearance processes and port-to-factory transportation—exhibit a strong positive relationship with profitability in the cement and allied products sector, with a correlation coefficient of $r = 0.850$. The model

explains approximately 72.2% of the variation in business profits ($R^2 = 0.722$).

While other factors not captured in the model may account for the remaining variation, these results indicate that logistics and supply chain variables exert a substantial influence on the profitability of cement and allied product manufacturing firms in Nigeria.

Table 4.1.3 Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	27293639919 27955300000 0.000	4	68234099798 19888000000. 000	35.762	0.000 ^c
	Residual	10494118255 90543000000 0.000	55	19080215010 7371470000.0 00		
	Total	37787758175 18498000000 0.000	59			

a. Business = Industrial Goods

b. Dependent Variable: Profit

c. Predictors: (Constant), Distance, Clear Cost, Transport Cost, Clear Time

Table 4.1.3 presents the analysis of variance (ANOVA) results. The model significantly explains the impact of administrative clearance processes and port-to-factory transportation on the profitability of cement and allied product manufacturing firms, with statistical significance at $p < 0.001$.

The results further indicate that the independent logistics and supply chain variables—including transportation costs, distance between ports and factories, administrative clearance costs, and time spent in seaports exert a significant influence on the profits of cement and allied product businesses.

Table 4.1.4 Regression Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	- 556014331 10.682	404663713 99.054		-1.374	0.175
	ClearCost	324694.553	4710169.70 6	0.006	0.069	0.945
	ClearTime	175884713. 692	256080996. 516	0.188	0.687	0.495
	TransportCost	52115260.4 54	11919611.4 78	0.475	4.372	0.000
	Distance	429113904. 981	184155739. 702	0.641	2.330	0.023

a. Business = Industrial Goods

b. Dependent Variable: Profit

The regression analysis reveals that administrative clearance processes, measured in terms of cost ($p = 0.945$) and time ($p = 0.495$), do not exert a statistically significant influence on the profitability of cement and allied product manufacturing firms, as both values exceed the 5% significance threshold. The standardized coefficients further confirm this weak relationship, with clearance cost ($\beta = 0.006$) and clearance time ($\beta = 0.188$) exhibiting minimal explanatory power. These findings suggest that variations in administrative clearance costs and processing time have little or no direct effect on firm profitability.

In contrast, port-to-factory transportation variables demonstrate a strong and positive relationship with profits. Transportation cost ($\beta = 0.475$) and distance between port and factory ($\beta = 0.641$) both significantly influence profitability, indicating that firms operating over longer distances and incurring higher transport costs tend to record higher profits. This relationship suggests that higher transport costs may reflect broader market access, improved logistics coordination, or stronger distribution networks that ultimately translate into increased sales volumes and revenue.

5. Conclusion and Recommendations

5.1 Conclusion

This study examined the impact of logistics and supply chain processes at Nigerian ports on the performance of

cement and allied product manufacturing firms. The findings confirm that logistics-related variables, particularly port-to-factory transportation factors, play a significant role in shaping firm profitability. The combined predictors of administrative clearance processes and inland transportation exhibit a strong positive association with profits in the cement and allied products sector.

However, disaggregated regression results reveal that administrative clearance variables—namely clearance cost and clearance time—have only marginal and statistically insignificant effects on profitability. Although these variables display positive coefficients, their limited influence suggests that customs-related costs and delays function largely as fixed and predictable overheads for firms. This outcome aligns with earlier findings on the price inelasticity of cement demand in Nigeria (Adejugbe, 1970), where firms are able to pass clearance-related costs onto consumers without experiencing a significant reduction in demand.

Conversely, port-to-factory transport variables emerge as key profitability drivers. Transport cost and distance show strong positive relationships with profits, implying that firms capable of serving distant markets can generate revenues that outweigh the associated logistics costs. This relationship highlights the strategic importance of market reach and distribution capacity within the cement supply chain. Firms operating over longer distances may benefit from higher ex-

factory prices, limited competition in remote markets, or more efficient haulage arrangements.

Notably, the positive association between higher transport costs and profits suggests the presence of structural inefficiencies within Nigeria's inland logistics network. While such inefficiencies currently allow firms to charge logistics premiums, they also signal systemic weaknesses that may constrain long-term competitiveness. These findings underscore the need for both firm-level logistics optimization and broader policy interventions aimed at improving transport infrastructure.

Overall, the results indicate that while customs clearance processes represent largely unavoidable costs with limited profit implications, inland logistics efficiency remains central to enhancing profitability and competitiveness in Nigeria's cement and allied products sector.

5.2 Managerial Recommendations

Based on the empirical findings, the study recommends the following managerial actions:

- I. Firms should renegotiate inland freight contracts to prioritize lower per-tonne transportation costs rather than total haulage distance, as reduced unit costs directly enhance profit margins regardless of distance.
- II. Investment in logistics visibility tools, such as GPS tracking and telematics, can improve asset utilization, reduce empty return

trips, and transform rising transport costs into operational savings.

- III. Cement manufacturers should consider port-based value-added services, including bagging, blending, and short-term storage, to improve margins without increasing customs-related costs.
- IV. Firms should expand regional and cross-border distribution strategies to capitalize on the positive distance-profit relationship and access higher-value markets.

5.3 Policy Implications

The findings also present important implications for policymakers:

- I. Priority should be given to improving inland transport infrastructure, particularly rail corridors such as the Kaduna–Abuja and Lagos–Ibadan routes, to reduce per-tonne transport costs and enable firms to serve wider markets efficiently.
- II. Customs reforms should focus on transparency, integrity, and the reduction of rent-seeking behavior rather than solely accelerating clearance speed, given the limited profit sensitivity to customs time and cost.
- III. Government incentives, such as tax reliefs or reduced track-access charges, should be introduced to encourage modal shifts toward rail freight, thereby lowering logistics costs and reducing environmental impacts.

- IV. The development of port-based logistics parks with shared storage, bagging, and distribution facilities can generate economies of scale, reduce inland transport burdens, and minimize inventory-holding costs.

5.4 Directions for Future Research

Future studies should decompose transportation costs into key components—such as fuel, labor, vehicle depreciation, and inventory-holding costs—to determine whether profit gains stem from operational efficiency or

market expansion. Further research could also conduct elasticity analyses of regional cement prices to assess whether profitability increases arise from price discrimination or higher sales volumes. Extending the model to other Nigerian ports, including Calabar and Port Harcourt, would help validate the distance–profit relationship under varying infrastructure conditions. Finally, a longitudinal panel data approach spanning multiple fiscal years would provide deeper insights into the short- and long-term effects of logistics improvements on firm profitability.

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