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Effect of Port Inefficiences on Container Shipment Cost and Prices of Imported Goods in Nigeria (1990-2024)

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Abstract

The study focuses on effect of inefficiencies on container shipment cost and selling prices of imported goods in Nigeria seaport. Seaports are critical infrastructure and a gateway that connects the economic propensity of producers and consumers across the globe, which have long been recognized as an essential valuable for the economic growth and development of nations, whose development has been a major priority for governments and businesses. Sequel to these two objectives were investigated, these include,how port inefficiencies contribute to shipment cost as well examine the trend analysis of port inefficiency on container shipment cost. This study based on quantitative method of secondary data collection method. Ex-post-factor research design was adopted to achieve the objectives of the study. Data were drawn from Nigerian Port Authority, Nigeria Statistical Bulletine, from 1990 to 2024 for the period of 34 years. Multiple regression was adopted to evaluate the results The study findings shows that equipment breakdowns have significant and direct impacts on freight rate and prices and it is direct but negative and less significant impact on port efficiency as the *p*-value is above the threshold of 5% at 16.81%.Based on the findings, the study therefore recommends that automation of port operations is

paramount and should be pursued to improve efficiency particularly at the legacy ports of Apapa, Tin Can Island and Roro.

Keywords: container, costs, goods , import, port, prices, seaport, shipment.

Introduction of the Research

Seaports are a critical infrastructure and a gateway that connects the economic propensity of producers and consumers across the globe, which have long been recognized as an essential valuable for the economic growth and development of nations, whose development has been a major priority for governments and businesses globally. Onwuegbuchulam (2020) adjudicated that, seaport is a strategic asset for national security and it's economy, which has grown over the years to become a major component of the transport sector and the maritime subsector.

Seaport is a subsystem of the maritime transportation system. It is an essential organ a of the maritime transportation system of a nation. Okotie and Attah (2005) noted that a seaport is established as a resting place for vessels bringing in goods coming into a country from other countries just as it is an exit point for goods leaving the country for other countries. Also the UNCTAD (2008), stated that seaport has a huge role in maritime transportation as it plays a vital role of being many nations' major gateway for international trade and a veritable tool for evaluating the economic health of any nation.

Seaports have a number of difficulties, including traffic, limited infrastructure, environmental issues, security risks, digitization, and automation. Despite these obstacles, seaports continue to be the main driver of economic growth, creating substantial income, jobs, and investment opportunities, thus their economic advantages go beyond the surrounding area. With yearly cargo volumes reaching 10 billion tons, they manage around 85% of all international trade (Onwuegbuchunam et al. 2021).

Among the several activities that take place in the ports are loading/discharging cargo onto/from vessels; providing value-added services (labelling, packaging, cross-docking and others); and acting as warehouse and distribution centres (World Bank, 2007). Additional value is added by ports to shipments located in the port area, which are further integrated to value chains. Many ports are increasingly being perceived as integrated and inseparable nodes in their customers' supply chains. As a nexus linking different transport modes in the universal logistics chain, container ports are vital to the efficiency of the whole chain. Nigeria seaport that are paramount to trade and commerce, linking the nations to global markets are Apapa, TinCan Island ,Onne,and port Harcourt.(Ndalu & Umennaihe,2024).

Meanwhile, container shipment facilitates international trade which enables developing nations to import and export goods globally. As transportation plays a vital role in the survival and functionality of any nation, it is a fundamentally the desire for man to access the movement of goods from one place to another in line with consumer's demand. Thus, container shipment accounts for nearly 90% of trade requirements of the world. Seaborne trade, which also constitutes a larger chunk of water transport trade that accounts for over 60% of the total Gross Domestic Product (GDP) of sixteen (16) countries in Africa these include (Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo) that make up the Economic Community for West African States (ECOWAS) (Airahuobhor., 2011).

In 2020 container shipment contributed so much to the GDP of countries like India (28.1%), China (29.7%), Russia (15.9%), Brazil (12.8%), South Africa (9.3%) and Nigeria (4.15%). In line with this increase, container transportation is experiencing very significant growth, due to its many advantages over other traditional transportation. Therefore, the maritime sector encompasses diverse components of shipping operations that ensure the successful handling and transshipment of goods from the sea to the hinterlands and vice versa through container (Adenigbo *et al* 2023).

Containers shipment has increased seaports productivity by sixteen times when compared to the previous state of bulk transportation (Bernhofen, El-Sahli and Kneller., 2016). The economic growth of a country seriously relies on the success of its shipping industry, therefore the global shipping chain is directly connected to economic growth of any nation, (Ubaid *et al,* 2020). CISION PR Newswire (2022) reported that the value of global shipping containers has reached US$ 9.5 billion in 2021 and it is projected and value at US $ 15.3 billion by 2027.This prediction about the growth in international shipping trade is subjected to influences different factors such as digitalization, e-commerce, protectionism and climate change (UNCTAD 2018a). Alphaliner (2021) also asserted that 6,254 container ships are in operation globally, with a total capital of 24,938,712 twenty foot equivalent units (TEUs) (Alpaliner TOP 100, 2021) this also shows that, there is a huge demand of container linear shipping transportation. Container as an essential parts of a unit-load concept has achieved undoubted importance in international sea freight transportation. With ever increasing containerization, the numbers of seaport container terminals and competition among others have become quite remarkable through international trade (Stennke *et al* 2004). Since the introduction of the containers in the transport sector, several studies have investigated the massive evolution of containers traffic over time on international trade in different seaports in the world, where the movement of goods across borders plays a crucial role in determining the final prices consumers face.

Container terminal has a strategic function in the country's economic developments. Thus, the container terminals will experience several challenges and restructuring, to deal with the increasing flow of goods trade through the sea route by using containers. As a result, container terminals become complex systems part which operates in an uncertain global logistics environment that requires efficiency in terms of operational performance. Nigeria is known as the largest archipelago countries in the world located in West Africa and has a strategic location between the Atlantic Ocean boarders in South and West. Each of the port activities cogently influences port efficiency with consequences on the local and global economy of the freight transport system.(Armando, 2010) However, in Nigeria, Nigerian Port Authority regulates the activities of the port, ensuring that all activities are in the interest of the port, administers land and ensures the maintenance of the infrastructure including the depth of the berths (Pinwa, 1999). From a strategic point of view it allows control to be exercised in a part of the supply chain beyond the seaborne frontier (Haralambides and Benacehi, 2002).

Research Questions

The mind boggling question considered necessary in this study is;

i. what are the factors contributing to inefficiencies in port operations in Nigeria ?ii
ii. what is the trend analysis of port inefficiency on container transportation costs

Aim and Objectives of the Study

The study aims to explore container shipment costs and the prices of imported goods in Nigeria, with a focus on identifying key factors contributing to high shipment costs and their effects on the economy. The specific objectives of the study are

:i assess how port inefficiencies contribute to shipment cost;

ii examine the trend analysis of port inefficiency on container shipment cost

Research Hypotheses

Based on the specific objective of the study, the following (Ho) hypotheses have been formulated:

Ho1:Port inefficiencies contribute to high container shipment costs in Nigeria.

Ho2: :Port inefficiencies has not contribute to high container shipment costs in Nigeria.

REVIEW OF RELATED LITERATURE

Seaport Infrastructure

The port has been a fulcrum through which activities of international trade is coordinated. The seaport is an important component in international trade and is a cruc**i**al interface between the land and the ocean (Ndikom 2006). Seaports as critical infrastructure and a gateway that connects producers and consumers across the globe, have long been recognized as an essential importance for the economic growth, whose development has been a major priority for governments and businesses globally. Seaports have a number of difficulties, deficiencies ,particularly in the port sector, including traffic, limited infrastructure, environmental issues, security risks, digitization, and automation, these have become barriers to smooth trade and economic development (Oyewole,2019) . Despite these obstacles, seaports continue to be the main driver of economic growth, creating substantial income, jobs, and investment opportunities, thus their economic advantages go beyond the surrounding area. The port state of port infrastructure increases operational costs, reduces the competitiveness of Nigeria goods and reduces the nation's economic growth. Globally, port infrastructure plays an important role in quacking trade and economic growth by ensuring the smooth flow of cargoes in and out of the port. Good and high quality port infrastructures are closely linked to nation's economic performance (Ahmed, Bouzir, Mbarek, & Benammou, (2023). Victor in (2015), stated that logistics inefficiency resulted to loss of essential materials. Therefore, a well develop logistics and port infrastructure system in developing nations will increased its potentials of exploiting to foreign markets and attracting foreign direct investment.(Hausman Lee and Subramanian 2012).Seaports are also ranked these days according to a variety of factors. Among the factors are their workforce's abilities, the quantity of automation equipment they have, their access to important markets, the berth occupancy rate, the cargo throughput, turnaround time, dwell time, and customer happiness. Pinwa (2019). With yearly cargo volumes reaching 10 billion tons, they manage around 85% of all international trade (Onwuegbuchunam et al. 2021).For seaport it infrastructures include:-

*Cargo handling plants and equipment, the superstructure;

*Berthing facilities

*Transit shad for storage

*Harbor /Port Channel

*Mechanical handling equipment

Impact of Ports and Maritime Transport Infrastructures on Container Shipment

The relationship between port and maritime transportation infrastructures and container shipment is that of ingenuity in service delivery and profitability. When a country economy grow its trade grow as well and attract foreign investors to the country. The impact of container shipment are greatly appreciated when cargoes are imported and exported and are fully attended to. The ports infrastructures can impact both positively and negatively on container shipment depend on the technology employed. Where modern and state of the act infrastructures are available within the ports and transportation sub-system the following are the positive impact ports on container shipment as cited by (Onwueghuchumam *el al* 2021).

*Increase in cargo throughput

*Quick turn round time of vessels

*Effective distribution of goods

Cargo storage operations

*Revenue generation

*Efficient cargo handling and transfer operation

*improve efficiency

*Reduce freight rate costs

*Reduce distribution ,transit and delivery time

*Removal of trade barriers

Thus an efficient port have better quality infrastructure and logistics performance than inefficient ones. On the other hand inefficiencies port can reduce of container shipment costs national and international trade which can affect economic growth which the study seek to address.

METHODOLOGY

The study uses both quantitative and qualitative approaches (mixed-methods) to achieve the laid down objective. The study draws it data from annual reports of the Nigerian Port Authority CBN Nigeria Beaure of Statistics with focus on port inefficiencies on container shipment cost The use of tabulations, charts, and graphic illustrations to present data analysis was applied to determine the periodic changes

in Nigeria ports as well as trend analysis of containers towards the ports from 1990 to 2024. The method of data analysis used was multiple regression

Model Specification

The model specification is as indicated below:

The study will examine how Port Inefficiencies (I_i) contribute to shipment cost.

$$I_i = \lambda_1 I_1 + \lambda_2 I_2 + \lambda_3 I_3 + \epsilon_i \quad \text{(1)}$$

where

- I_i: latent variable measured by
  - I_1: Average port waiting time
  - I_2: Cargo clearance time
  - I_3: Handling efficiency inde

Result and Discussions

ASSESSMENT OF HOW PORT INEFFICIENCIES CONTRIBUTE TO SHIPMENT COST

To understand how port inefficiencies contribute to shipment costs, there is need to examine the various factors that affects port efficiencies. The first to be considered is turnaround time.

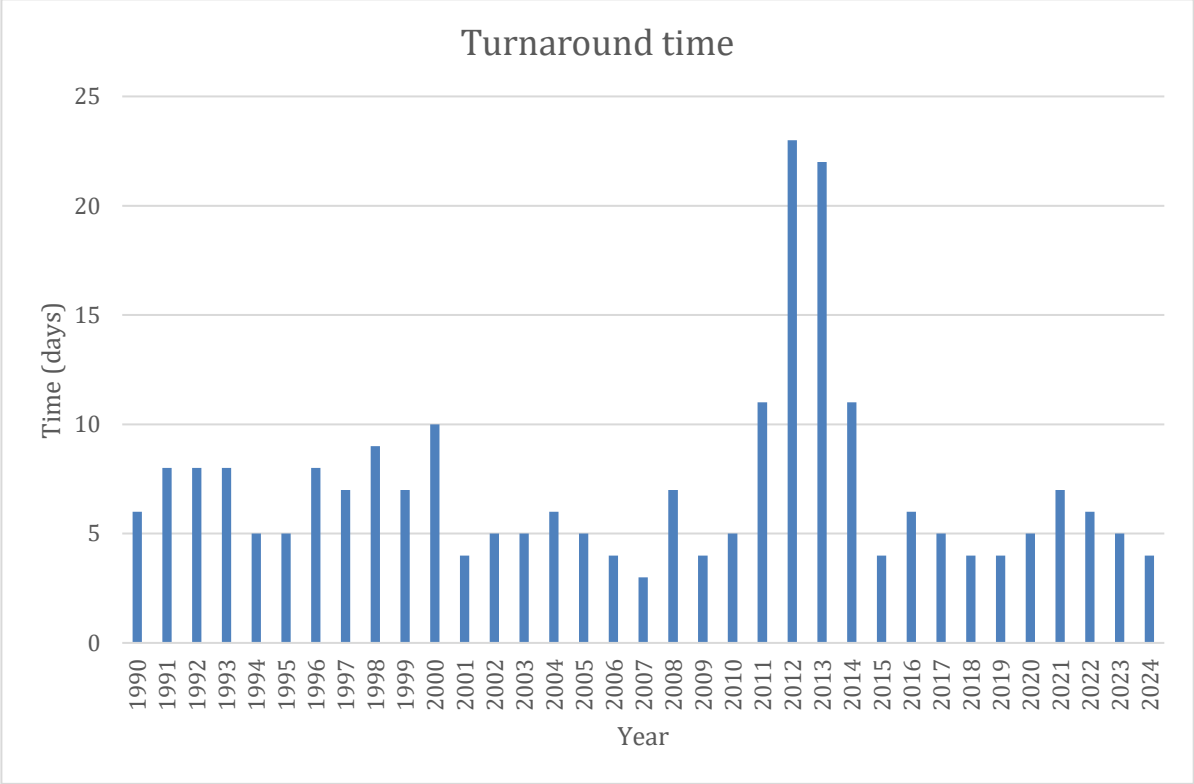


Figure 4.1: Turnaround time

4.2.1 Turnaround time: Figure 4.1 showed that turnaround time (TAT) in the study area has been on general steady decline from 1990 to 2010 though there are noticeable peaks and troughs in 1994, 1995,

2001 and 2007 (for troughs) and 1996, 1998, 2000 and 2008 (for peaks). Note that when there are peaks in TAT it means that there are delays and likewise, when there are troughs, it signifies efficiency improvements. The surge in TAT in 1991 till 1993 were due initially to expected improvements in economic outlook from the democratization process that boosted confidence of investors and led to increased output and importations but with poor port efficiencies. However, with the truncation of the democratic process due to the annulment of the June 12 presidential elections in 1993, that confidence disappeared and the cargo throughput and calling vessel rates went with it resulting a reduced TAT in 1994 and 1995. Gradually, the economy picked pace again and with the poor infrastructure still in place at the ports, TAT rose again from 1997 till 2000. The military rule of the 1990s led to bureaucratic inefficiencies, corruption and poor port management. Also, the Structral Adjustment Programmes (SAPs, 1986 to 1990) manadated by IMF led to port congestion due to reduced public spending. This corroborates the findings of Oshodi *et al*., (2017) and Nwafor (2020).

Port infrastructure and operational efficiencies were another factors that affected TAT. Pre-concession era (before 2006) was period that the Nigerian ports were notoriusly inefficient and manual processes causing delays that led to high TATs. This is in agreement with the finfdings of Tally (2009). But after the concessioning of the ports (post-2006), private sector (for example, APM Terminals and Dangote Ports) involment led to reduced TAT.

However, the noticable spikes in the post-2006 era were caused by Apapa port gridlocks as the poor access road, congestion (cuased by poor road and checkpoints mounted by corruption officers of the Nigeria Police Force and other agencies in and around the ports) caused severe delays for outgoing and inward moving land-based vehicles to the ports.

Another factor for the troughs noticed in 2003, 2007, 2015, 2019 and 2023 was the perceived political instability as these were general election years in the current democratic dispensation. Importers are usually careful of political changes and possible shifts in policies and so they reduce the volume of importation (throughputs in ports) till they regain confidence. This corroborates the findings of Adegbite & Nakajima (2021) in their work on political uncertainty and economic performance in Africa.

Economic crises and trade volatility also played it role in the observed records of TAT. Noticeably are the oil price shocks of the 2008, 2014 to 2016. Nigeria's reliance on oil exports caused foreign exchange shortages and that led to delays in imports. Also, the COVID-19 Pandemic of 2020 to 2021 disrupted global supply chain and the lockdown spiked TAT. This simply showed that economic crises and trade volatility as observed affect TAT records in Nigeria, TAT, therefore cannot be dissociated from global and local trade. This agrees with the reports of CBN (2020) and UNCTAD (2021).

Security challenges such as piracy and theft between 2000s and 2010s in the Gulf of Guinea led to increased cargo inspections slowing TAT. Terrosim (Boko Haram and others) made the northen trade routes tp suffer disruptions. These disruptions and challenges led to increased TAT and corroborates the works of Adekola, Fischhendler, & Rosenboim (2022).

The significant drop in TAT noticed from 2015 can be linked partly to the introduction of e-customs (for example, the Nigerian Integrated Customs Information System [NICIS II]) which enabled a single-window policy. Clearance time greatly reduced and that in turn led to reduced TAT. The automation was further built upon by the introduction of African Continental Free Trade Area (AfCFTA, 2021) that allowed the streamlining of cross-border trade within Africa.

Port Handling Fees: Handling fees at the port is significant contributor to the total cost of shipping. It is the cost spent in processing cargo through a seaport. Figure 4.2 showed the trend of the port handling fees (PHFs) and it can be observed to have been rising since 1990, the start portion of this study till 2020. Then it dropped abruptly in 2021 and later peaked again in 2022 before dropping in 2023 and rising again in 2024. The slope of the graph showed that will continue to be a steady rise into the future (see linear equation on Figure 4.2).

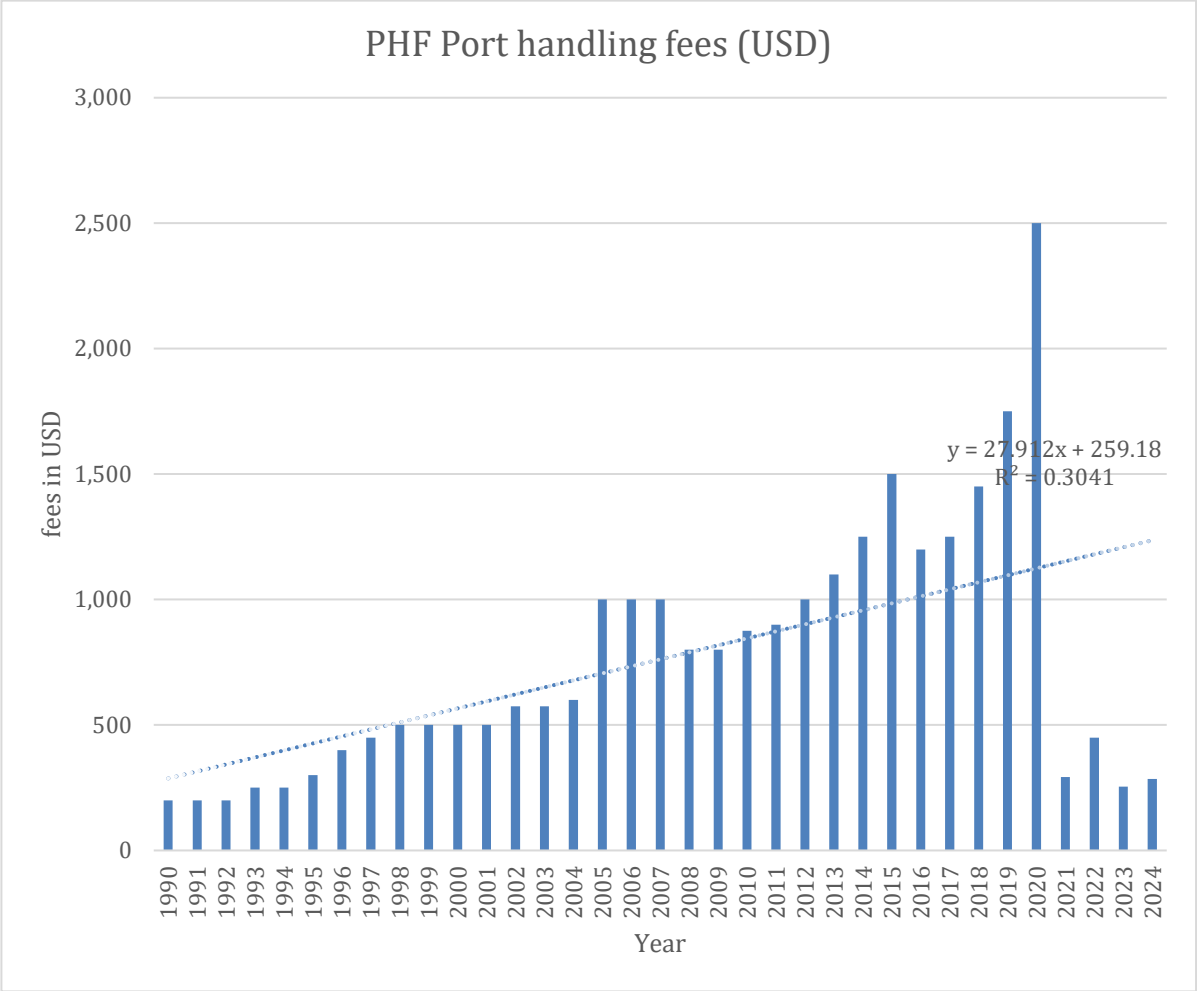


Figure 4.2: Port Handling Fees

The consistent increase in PHF from 1990 to 2020 is caused by inflation and currency devaluation as Nigeria experienced hyperinflation (especially in the 1990s) and repeated Naira devaluations. In addition to this, port congestion and inefficiency when Nigerian ports were government run before 2006 (pre-concession) and they were plagued by corruption, bureaucracy, and inefficiency. The post-2006 concession also witnessed increase PHFs as the private terminal operators increased handling fees to recover investment when they put in place better facilities to improve efficiency. The rising security and insurance costs due to piracy in the Gulf of Guinea increased the insurance premium, which were later passed on as higher handling fees. This along with theft and vandalism forced port operators to invest

in extra security which were also passed on as part of PHF. Frequent diesel price hikes due to subsidy removals increased port operational costs for equipment.

On the other hand, the sudden drop in PHF in 2021 was because of COVID-19 and the resultant reduced trade volume dues to supply chain disruption that led to fewer shipments forcing to ports to lower fees to attract business. Governmental led to the temporary waiver of some charges to ease economic strain.

The fluctuations experienced from 2022 to 2024 when there was an increase in 2022 occurred as a result of the recovery from the COVID-19 strain and the fuel subsidy crisis that forced the PHF to be increased to wade of the sudden surge in demand due to sharp increase in trade volume and importation as well as the transfer of increased cost due to increase fuel cost as a result of subsidy crisis. The dip in PHF witnessed in 2023 was a result of fear and anxiety on the part of importers and shippers who do not want to be caught by the change in government and or policies and therefore reduced demand for port services that forced the PHF to be reduced by the port operators. Aside this election uncertainty, the AfCFTA adjustments also led to reduced PHFs so that Nigerian ports can remain competitive regionally.

TREND OF CONTAINER SHIPMENT COST

4.3 Cargo Dwell Times: Just as turnaround time is a major indicator of the efficiency of ports, cargo dwell time (CDT) which is a measure of how long it takes a consignment that arrived at a seaport to be taken out or delivered to the consignee.

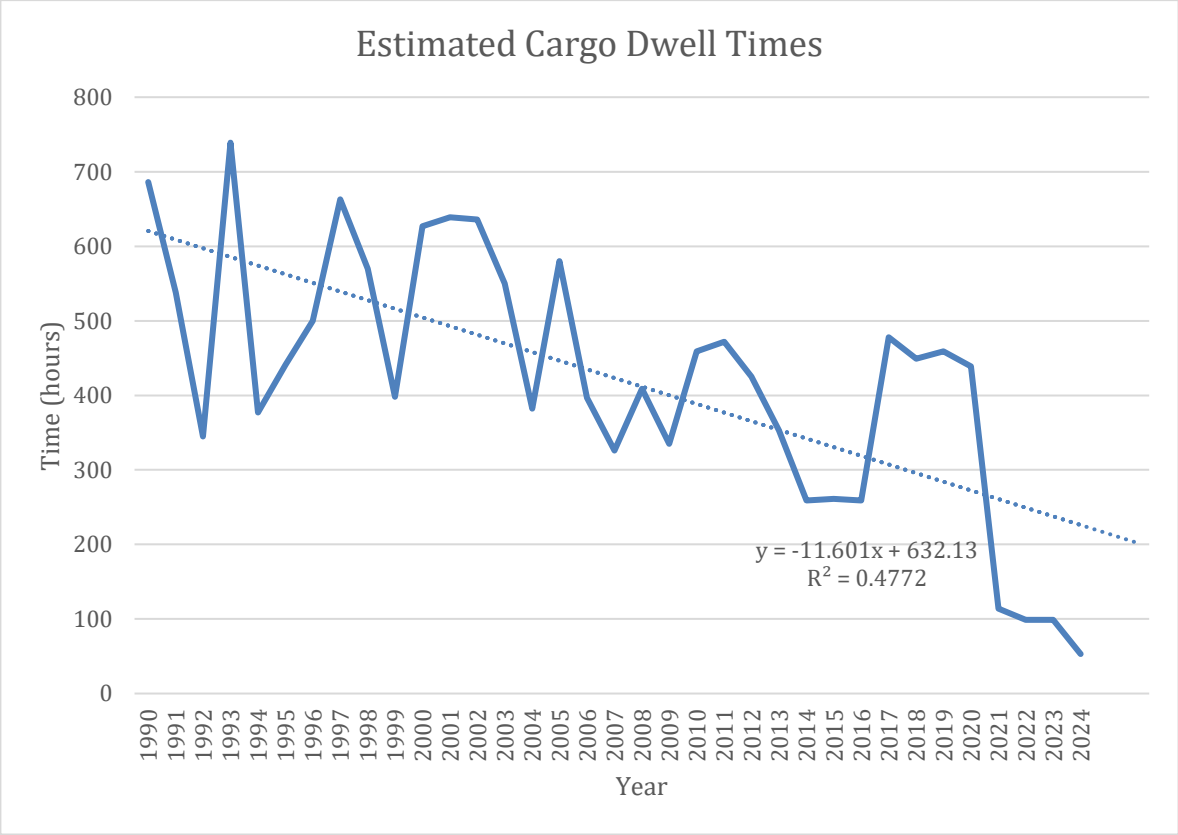


Figure 4.3: Estimated Cargo Dwell Times

From the results as shown on Figure 4.3, CDTs have been on steady decrease since 1990 and it all-time-high level in 1993 to the lowest ever level in 2024. The key drivers for this development are the port concession and private sector efficiency (and their adoption of automation instead of manual processing that causes delays) that cut CDT from around 30 days in the 1990s to approximately 10 days in 2024.

Another key driver is the digitalization and paperless customs services that started in the 2013 till date with the introduction of NICIS II and the national Sigle Window (NSW) policy that streamlines documentation and led to reduced clearance time. This agrees with the World Trade Organization (2022) report on trade policy review of Nigeria.

Improved port infrastructure notably the commencement of the operation of Lekki Deep Seaport reduced congestion at Apapa ports and subsequently the CDT. The revitalizaed use of rail links to the improved cargo evacuation and reduced the CDT which is in total agreement with Stephens & Ukpere (2011).

The noticeable peaks (high CDTs) for the years are explained as follows: 1993 was caused by SAPs economic crisis, port strikes and fuel shortages; 1997, was caused military regimes inefficiency, corruption, and manual processing of port operations; 2003, was caused pre-election trade restrictions, and customs slowdowns; 2005, was caused by pre-concession port congestion due to government-run port inefficiencies; 2011, was caused by high import demand and huge traffic backlog at seaports; 2017, was caused Apapa gridlock crisis as road access around the seaports collapsed; 2019, was caused by border closure policy of the Buhari administration that led to customs delays for cargo inspection and clearance. These findings agreed with those of Nwafor (2020) and Adegbite & Nakajima (2021).

The troughs recorded for 1992 was caused by early SAPs reforms that gave temporary efficiency gains; 1994, was caused by currency devaluation which reduced the buying power of the Naira and led to reduced import volumes; 1999 trough was caused by the return to democracy and relative policy stability; 2004 early port reforms, prior to pre-concession cleanup for the concession to take place; 2009 trough was caused by global financial crisis caused by 2008 global financial meltdown that led to lower trade volumes and throughput at the seaports; 2014 trough was as a result of oil price crash and reduced imports; 2015 was caused by efficiency drive by the Buhari government which came up with anti-corruption measures; and the 2024 trough was as a result of the coming into full operations of the Lekki Deep Seaport and full digitalization of the other ports' operations.

The long-term decline in CDT was driven by private sector participation, digital reforms, and infrastructure upgrades, while the peaks were caused by political instability, policy shocks, and congestion. Troughs coincided with economic reforms, reduced trade volumes, and efficiency drives.

4.4 Waiting to Berth Time: The Lagos Port Complex has experienced chronic and escalating berth congestion over the past three decades, evolving from moderate delays in in the 1990s to severe operational crises in 2020s. this deterioration stems from infrastructure neglect, rapid trade growth, and external disruptions, directly impacting container freight rates and ultimately increasing prices of shipped goods in Nigeria. The port's average waiting-to-berth time has surged from 1-2 days in the 1990s to current extremes exceeding 5 days in peak periods, positioning Lagos among the world's most congested ports by 2024 (see Figure 4.4).

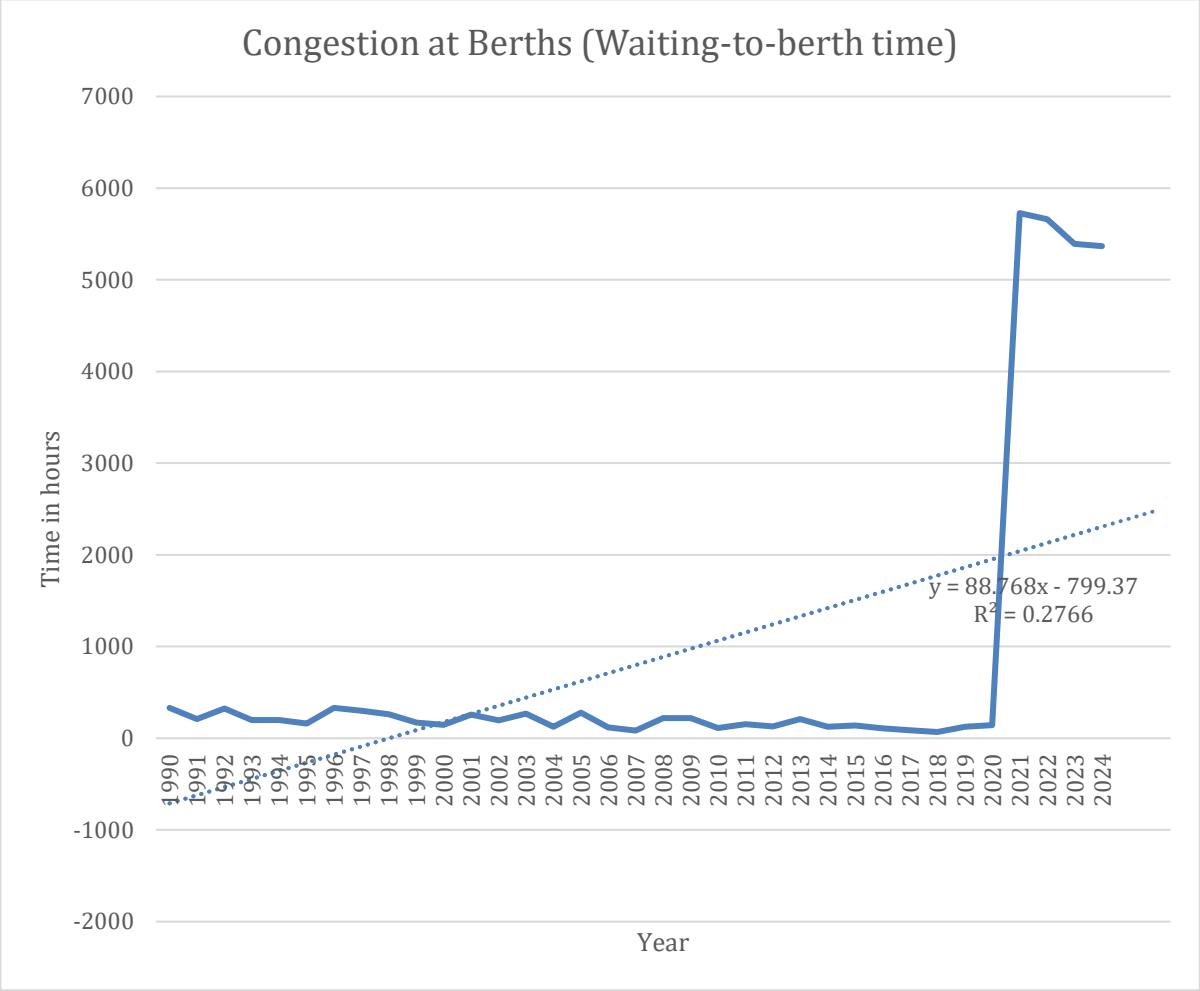


Figure 4.4: Congestion at Berth

As can be seen on Figure 4.8, the waiting-to-berth times has evolved over the years. Between 1990 and 1999, it was an average of 1 to 2 days caused by basic infrastructure limitations, moderate trade volumes and manual operations and this caused occasional delays during peak seasons. From 2000 to 2009, the average waiting time remained fairly stable despite the trade liberalization surge and containerization growth. The fair stability witnessed instead of more congestion was attributable to the change in operator of the terminals in the post-concession era. Even at this, there was still chronic equipment shortages and growing vessel queues. In the period between 2010 and 2019, there was no improvement in the congestion case in the seaport. The APMT terminal expansion and the road/rail link failures and customs inefficiencies marked the beginning of faster deterioration of the ports' ability to process their throughput efficiently. This led to systematic congestion and frequent demurrage disputes. Between 2020 and 2023 the congestion at the berths rose to new high levels of 4 – 7 days, the causes were found to be COVID-19 supply chain shocks, global container shortage and fuel subsidy crises. This led to freight rates volatility and import inflation spikes. Currently, the congestion situation has worsened as vessels now spend between 5 – 9 plus days. The conflict in the Middle-East and the support given by the Houthi rebels of Yemen for Hamas in Gaza to force Israel to stop the war with Hamas by disrupting the vital Red Sea route led to rerouting of Central and Sahel Africa-bound vessels from the Middle East

via the Cape of Good Hope to West African ports and the pressure created on the collapsed infrastructure coupled with extreme weather disruptions as happened in May 2024 in Mississippi flooding can be pointed out as the causes of the surge in congestions experienced in the ports in Lagos. All of these led to critical supply chain breakdowns as vessels were concentrating arrivals at Lagos during the recovery periods. It not news that Lagos Ports struggles with severely outdated facilities and limited capacity which make them unable to handle modern vessel sizes. Unlike automated global hubs, Lagos relies on manual operations, causing processing delays that cascade into berthing queues. The port was designed to handle approximately 1.1 million TEUs but is now overwhelmed by volumes that exceeds 1.8 million TEUs in 2024 that leads to structural congestion deficit. The level of congestion in Lagos, as at June 2024, rivals Durban (at 9.8 days) and Ningbo-Zhoushan (9.8 days), exceeding delays at Los Angeles (3.7 days) and Vancouver (3.6 days). Lagos lacks digitalized traffic management or buffer zones, making recovery from disruptions slower.

Waiting times of 5 – 9 days trigger massive congestion surcharges ($800-$2,000/TEU) and demurrage fees, elevating imports costs by 25-40% as freight costs went up. The pricing of goods particularly the perishable imports (like food, pharmaceuticals) face spoilage, even as manufacturers absorb delays through inventory holding – costs passed to consumers as 15 - 30% price inflation. Nigerian businesses faced stockouts or had to pay overstock penalties both of which damaged competitiveness. The port congestion alone contributed about 2.1% to Nigeria's core inflation (2024) which agreed with Oyelana & Akinbola (2021) that opined that inflation in Nigeria, like any other economy is impacted by many factors and in this case, this study had shown that port congestion was a contributory factor. Seventy percent of delays originated from trucking gridlocks and customs inspections (Nwachukwu, Akpudo, Enyinda , & Stephens , 2023).

The implications of these ugly trends to Nigerian shippers and supply chain is that:

there will continue to be freight rate volatility as shipping lines will increasingly be imposing "Nigeria Risk Surcharge" (NRS) due to unpredictable berthing times, raising base freight rates by as much as 50-70% versus the 2021 levels;

there will be import dependent inflation that will be caused by congestion-induced cost that is already contributing about N3.2 trillion annually to consumer goods prices (Central Bank of Nigeria, 2020), which in turn disporporionately affects food and medicine prices;

the poor efficiency records of the ports due to congestion will erode export competitiveness off the Lagos ports as agricultural exporters will face reliability penalties in international contracts, reducing non-oil export growth further leading to the depreciation of naira; and without urgent dredging to about 16m depth, terminal automation, and 24/7 operations, Lagos ports may face functional collapse by 2026 under projected trade growth by UNCTAD (2021).

4.5 Calling Vessels: Lagos ports have experienced transformational shifts in vessel call patterns as show by Figure 4.5 over the past three decades, evolving from manual operations in the 1990s to complex landscape dominated by mega-vessels and private terminals in 2024. These dynamics have directly influenced container freight volatility and imported inflation in Nigeria.

The vessel calling analysis can be examined in three phases – pre-privatization era (1990-2006), post-privatization surge (2006-2019) and crisis and transformation times (2020-2024).

The Lagos ports operated under a state-controlled landlord model with predominantly breakbulk cargo and limited containerization between 1990 and 2005 and that period marked times of steady growth in number of vessels but volume of throughput was not equivalent the to the number of calling vessels in later times. Average annual vessel calls stagnated at 1,800- 2,350 ships with troughs and peaks in this period and dominated by vessels less than 30,000 DWT (dead weight tonnage) due to shallow berths (11m draft). By 2000, vessel turnaround averaged about 5.34- 6.4 days at Apapa (see Figure 4.5) – already three times longer than global benchmarks – due to manual documentation, labour strikes, and equipment shortages and breakdowns. This added 9-14 days to cargo clearance, triggering early "Nigeria Risk Premiums" (NRP) in freight rates.

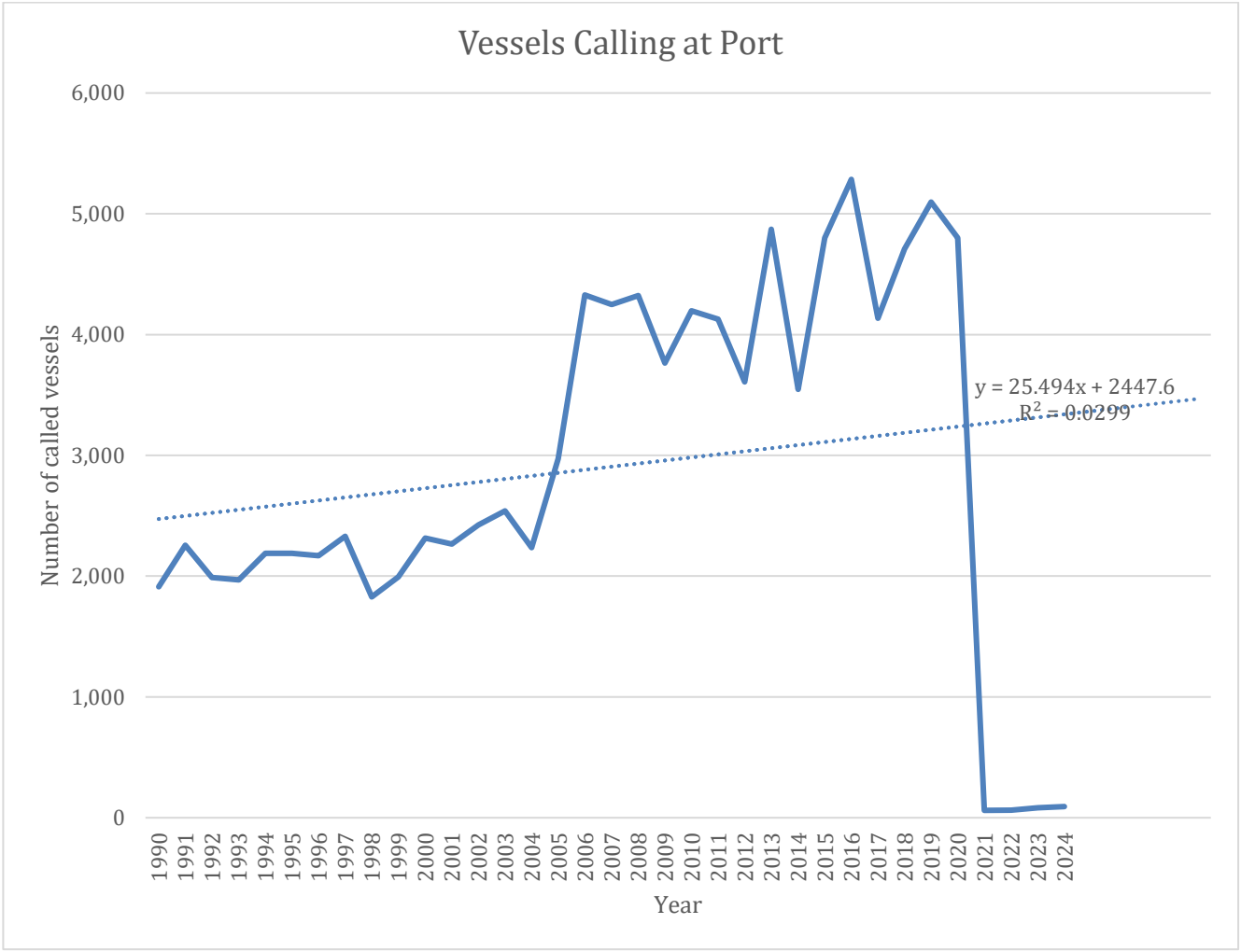


Figure 4.5: Calling vessels

The 2006 port concessions triggered dramatic changes that included terminal specialization as seen with the arrival of APM Terminal (Container Terminal) and ENL Consortium (Breakbulk) invested in cranes and IT systems, which in turn attracted deep-draft vessels of up to 45,000 DWT. The number of calling vessels grew but there was a mismatch of volume-capacity with as container traffic grew by 12.7% annually (2006-2019) but infrastructure upgrades lagged. By 2019, Apapa's average waiting-to-berth

time hit over 4.7 days – costing shippers $1.2m daily in demurrage. A vessel size revolution took place as vessel size increased from 15,000 Gross Tonnage (GT) (2005) to 42,500 GT (2019) as shipping lines deployed Panamax-class vessels, straining Apapa's 13.5 depth and led to increased PHF that peaked in the same period (see Figure 4.2).

Between 2020 and 2024, there was the pandemic disruptions that occurred in 2020 and 2021 due to COVID-19 that saw vessel calls drop by 14% but the congestion worsened as supply chain was affected which concentrated traffic at Lagos. Average turnaround time peaked at around 7 days (see Figure 4.5) and number of calling vessels drop sharply (see Figure 4.9). The commencement of operation (in 2023) of the Lekki Port became a game-changer as the new port was able to handle vessels up to 160,000 DWT (as against Apapa's 45,000 DWT cap) with a 16m draft. Its (Lekki port) 1-day turnaround pulled 18% of container traffic from the legacy ports of Lagos by 2024.

Total vessel calls fell by 4.3% (251 ships called in the first half of 2024) but the gross tonnage rose by 6.9% which confirmed the mega-vessel trend, even as export containers dropped by 1.2% due to prolonged dwell times. This can be called the 2024 paradox – fewer ships but higher costs – that epitomizes how infrastructure decay negates privatization gains in agreement with the Drewry Shipping Consultants (2023) position and the opinon of Stephens & Ukpere (2011) on the importance of port infrastructure and land-based transport infrastructure on the cost of port usage.

Worthy of note is the shift in cargo as breakbulk dominated the 1990-1999 period at 75%, with the congestion hotspot being Apapa berths 1 – 5; then we noticed a shift to containerization due to its adoption as it recorded 35% and Apapa Container terminal being the hotspot of congestion for 2000-2009; then for 2010-2019, cargo shift went for LNG/gas carriers due to the growth of Onne port and the change in land-use around Apapa and Tin can Island ports with the establishment of oil and gas tank farms which made Tin-can Island the congestion hotspot; and lastly the shift to Lekki deep-draft dominance as Apapa became the landside corridor with congestion.

4.6 Equipment Breakdowns: Pre-privatization era (1990-2005) witnessed manual operations and chronic failures. The cranes were operated manually and they had capacities of 5-10 ton and there were also diesel-powered straddle carriers. The frequency of breakdown was between 3-5 major cranes failures/month, causing 18-22% idle time across terminals. Averagely on an annual basis, about 180 breakdowns of equipment were recorded (see Figure 4.10). The impact was that vessels turnaround time averaged about 5.34 days in Lagos ports due to cargo-handling delays. Also export processing was delayed between 9-14 days on the average adding 10-15% to freight rate costs (see Figure 4.2).

The partial modernization that heralded the post-privatization did not yielded expected results due to persistent issues like lack of spare parts because of delayed imports of components and training deficits as the port then lacked skills to run and maintain the new equipment so extending repair times by as much 48-72 hours. This made idle time to averaged 28-32% costing $2.8 million/month in demurrage fees.

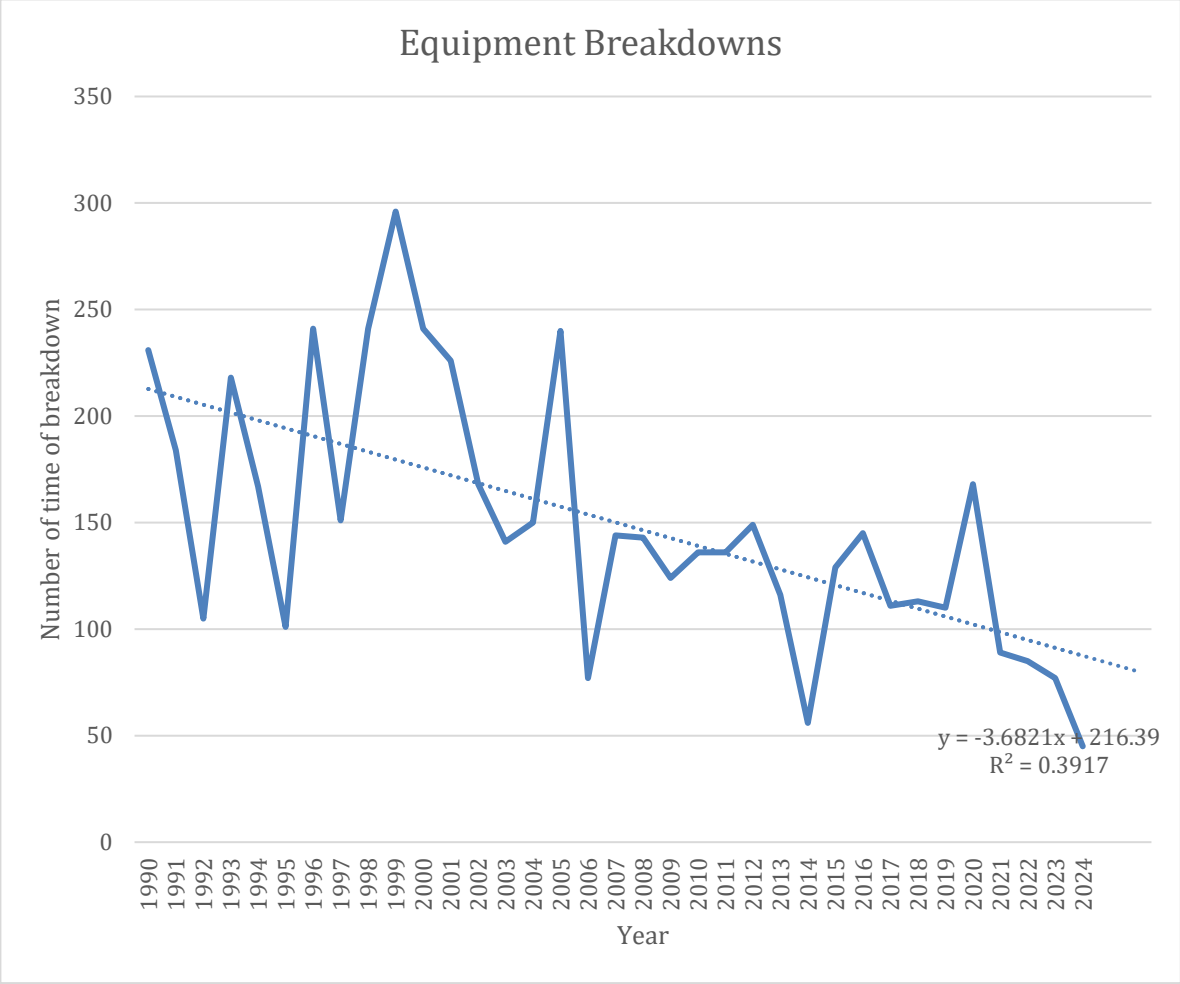


Figure 4.6 Equipment breakdowns

The equipment breakdowns at Lagos ports have evolved from chronic manual-handling inefficiencies in the 1990s to systemic automation failures in the 2020s, directly inflating cernmhjtontainer freight rates and consumer goods prices. Idle time due to equipment failures surged from 18-22% in the 1990s to 40-45% at Apapa in 2024, costing shippers $5,000/hour in productivity losses. The 2023 Lekki Deep Seaport lunch introduced advanced automated systems, cutting idle time to less than 5%, yet the legacy terminals in Lagos remain crippled by outdated infrastructure and maintenance gaps. Equipment failures contribute $1,200-$1,800/TEU to freight surcharges (see Figure 4.3) and 15-25% inflation on containerized goods.

SUMMARY OUTPUT: Port Inefficiencies Contribution to Shipment Costs

Regression Statistics	
Multiple R	0.919136
R Square	0.844811
Adjusted R Square	0.804576

Standard Error	1428.2
Observations	35

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	7	3E+08	42829297	20.99728	2.2E-09
Residual	27	55073385	2039755		
Total	34	3.55E+08			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-62878.8	71167.99	-0.88353	0.384751	-208903	83145.83	-208903	83145.83
LC	1.688531	0.297608	5.673669	5.02E-06	1.077889	2.299173	1.077889	2.299173
Road	632.1098	711.0334	0.889002	0.381855	-826.81	2091.03	-826.81	2091.03
Rail	582.516	694.5245	0.838726	0.408987	-842.531	2007.563	-842.531	2007.563
GMPH	-106.697	131.19	-0.8133	0.423159	-375.877	162.4825	-375.877	162.4825
Inland waterways	616.198	789.2184	0.78077	0.44173	-1003.14	2235.541	-1003.14	2235.541
UE	-6.47165	38.76665	-0.16694	0.868662	-86.0143	73.07095	-86.0143	73.07095
CCT	0.301802	2.204352	0.136912	0.892116	-4.22115	4.824759	-4.22115	4.824759

Note that: UE – Underutilized Equipment (cranes and lift trucks); GMPH (Crane moves per hour); LC (Average Annual Labour Costs (USD); CCT (Custom Clearance Time; Road (Percentage share of connectivity to hinterland); Rail (Percentage share of connectivity to hinterland); Inland waterways (Percentage share of connectivity to hinterland).

SUMMARY OUTPUT: Port Inefficiencies Contribution to Shipment Costs

Regression Statistics	
Multiple R	0.995577
R Square	0.991174
Adjusted R Square	0.949996
Standard Error	347.0911
Observations	35

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	9	3.52E+08	39082909	364.9661	3.08E-24
Residual	26	3132278	120472.2		
Total	35	3.55E+08			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1556.463	636.9581	2.443588	0.021639	247.1769	2865.749	247.1769	2865.749
PHF	4.217933	0.18435	22.88009	9.44E-19	3.838997	4.596869	3.838997	4.596869
ESA	-9.46918	4.074783	-2.32385	0.028217	-17.845	-1.09334	-17.845	-1.09334
EB	-2.09676	1.478943	-1.41774	0.168139	-5.13677	0.943248	-5.13677	0.943248
TAT	19.88488	14.47071	1.374147	0.181127	-9.86008	49.62985	-9.86008	49.62985
VC	0.080377	0.134936	0.595668	0.556547	-0.19699	0.357741	-0.19699	0.357741
CDT	-0.17131	0.626739	-0.27334	0.78675	-1.4596	1.116967	-1.4596	1.116967
WTBT	0.237898	1.096976	0.216867	0.830005	-2.01697	2.492765	-2.01697	2.492765

Note that: TAT (turnaround time); PHF (Port handling fees); CDT (Estimated cargo dwell time); SWTBT (Congestion at berths – waiting to berth time); VC (Vessels); EB (Equipment breakdowns); RPT (Revenue per TEU); BUR (Berth utilization rate - % of capacity); ESA (Empty storage areas (dwell time vs capacity).

FINDING.

This study revealed that equipment breakdowns have significant and direct impacts on freight rate and prices and it is direct but negative and less significant impact on port efficiency (see Table 4.4) as the *p*-value is above the threshold of 5% at 16.81%. However, when crane breakdown, it leads to increase in idle time to the tune of about 40-45%, this in turn will lead to about 16.73-day processing delays, adding to congestion surcharges of about $1,200-$1,800/TEU. Congestion surcharges lead to about 25-40% import price inflation. Congestion charges lead to higher demurrage of between $120-$350/day which will further lead to import price inflation. The economic impact of the equipment breakdowns showed that it adds about 2.1% to the nation's core inflation and leads to cargo diversion which agrees with Chikere *et al*. (2014) as our Apapa ports have lost their competitiveness because over 14,000 TEU vessels bypass Apapa for Togo's deep ports, increasing transshipment costs by 18% and the agricultural exporters now faces about $700/TEU reliability penlaties.

CONCLUSION

In conclusion, while direct statistics for empty storage area capacity utilization from 1990-2024 are difficult to pinpoint, the consistently high dwell times and the widely reported challenges of empty container accumulation at Lagos Ports strongly suggest that available storage capacity has been inefficiently utilized throughout the period, largely due to systemic inefficiencies rather than a pure lack of physical space. The issue has significant economic ramifications, contributing to higher logistics costs and ultimately impacting the prices of shipped containerized goods in Nigeria

RECOMMENDATION

The research therefore recommend as follows

a. Export revenue enhancement can be done via the subsidization of empty container repositioning to boost exports and balance trade flows; subsidization of agricultural containerization to reduce empty exports. This should target about 50% utilization of export containers by 2027 and implementation of reliability rebates for export-focused vessels at our seaports.
b. Automation of port operations is paramount and should be pursued to improve efficiency particularly at the legacy ports (Apapa, Tin Can Island and Roro). This can be done by automating ship-to-shore (STS) cranes to eliminate crane idle time and the introduction of AI-powered predictive maintenance systems as done in Lekki Deep Seaport to further reduce breakdowns by as much as 80%. Lease modern RTGs to replace Apapa's oldest cranes to reduce downtime by as much as 25% and ensure that technicians are trained to maintain the automated cranes and port operations.

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