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Assessment of container trade growth of privatized seaports and improved terminal operations in Nigeria maritime industry

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Abstract

This paper examines the container trade growth of privatized seaports in Nigeria maritime industry. It obtained time series data covering a period of twelve years (2008-2019) on the performance of container cargo throughput of Nigerian ports measured in twenty-foot equivalent units (TEUs) through a secondary source of data collected online. The arithmetic progression model (APM), and trend analysis were the statistical tools used to analyze the collected data on the study. Microsoft Excel and SPSS version 22 were computer based software used in data presentation and analysis. Three hypotheses were postulated to answer the research questions and the study found that there is significant increase in the trend line of container throughput in Nigerian ports industry; there is significant growth in the pattern of container shipments in Nigerian ports industry and there is significant growth in future forecast of container shipments in Nigerian port industry. The study attributed this growth to innovations in port industry adopted by the terminal operators in the port privatization era of Nigeria ports. The study recommends that governments as well as terminal operators should continue to adopt new innovations in knowledge and technology to enable the port industry meet the growing needs/wants of ever increasing Nigeria population.

Keywords: Assessment, container-trade, privatized-seaports, terminal-operations

1. Introduction

Container trade has evolved rapidly in the 21st century. Ports and shipping lines all over the World have adopted the new technology in container shipping. Consignments which were formally shipped under the umbrella of general cargoes or bulks cargoes are presently shipped in various containers. They are now unitized and structured to fit in container loads for effective transportation. Cargo unitization and containerization concepts have generated strong waves in the maritime trade leading to innovations and transformation from traditional ideology to the implementation of world best practices in terminal operations, ports and ship designs as well as infrastructural development in the maritime system globally. Unitization is a concept that enables consolidation of cargoes into a unit load. It is the fragmentation of cargoes in units which enhances easy handling as a unit load. Cargoes are fragmented in bags, drums, pallets, etc., which are made easy for handling and transferring from one point to another by the use of port simple machines. This concept has helped in consolidation of different cargo units in a container load. On the other hand container is a solid metal box structure of standardized sizes efficient for cargo consolidation. Containers serve the purpose of cargoes consolidation in a bigger unit load and as well as enabling transferring from one mode of transportation to another without handling of the cargoes itself in terms of repackaging in moving or change modes as it is best explained in intermodal transportation concept. The core difference between cargo unitization and containerization is that unitization tends to put single items into a unit form to enable carriage as a unit load. These items are homogenous in nature and can be consolidated in bags, drums and pallets which are designed to be lifted using port simple machines such as forklift, gantry cranes etc., while container concept allows the consolidation of common items (homogenous) and unitized items (heterogeneous) in a containerized manner. The idea of containerization is to provide a uniform unit load that can serve the purpose of intermodalism in cargo transportation in a supply chain logistics system without handling or altering the structure of the cargo itself in changing mode. Intermodal Transport as defined by OECD (Organisation for Economic Co-operation and Development) is the "Movement of goods (in one and the same loading unit or a vehicle) by successive modes of transport without handling of the goods themselves when changing modes". It is also defined as "The Carriage of Goods by more than two modes of transport without any handling of the freight when changing the modes through an intermodal transport chain with one single contract of carrier. In all, this suggests that containerization has made this concept practicable in the maritime industry of the 21st century.

A terminal is a point in the transport logistic system where shipments can be received, stored and/or transfer from one mode to another. A port terminal provides the necessary infrastructure required for effective operations in handling cargoes received and transferred through the terminal systems. Container terminals are designated port terminal for the handling, storage, and possibly loading or discharging of cargoes into or out of containers and where containers can be picked up, dropped off in the stack areas, maintained, stored, or transfers from one mode of transport to another be it vessel, truck, barge, or rail facilities. Hence, a container terminal can also be considered as an intermodal terminal with the fix of

equipment and facilities that allows the possible handling of containers and transferring between modes of transport in the logistics system. To perform its operations, a container terminal relies on an array of intermodal equipment which includes straddle carriers, gantry cranes, portainers and so on. The choice of terminal equipment and its mix is related to a number of factors in terms of capital investment, volume of container, tonnage, stacking density, and overall productivity of the terminal. Other mix of container port terminal equipment includes forklift, hostler truck, the front-end loader, the reach stacker (also known as a side loader), the rubber-tired gantry (RTG), the rail-mounted gantry (RMG) and the ship-to-shore crane (STS).

Well developed terminal infrastructure and equipment is foremost and represents the interface between the containership and the waterfront which means without it there would be no need of vessel coming to the berthing. In the modern technology port cranes are designed with technical specifications in terms of the number of movements per hour, maximum weight, and lateral coverage. A modern container crane can have an 18-24 wide coverage, implying that it can service a containership having a width of 18 to 24 containers. A gantry crane can perform about one movement (loading or unloading) per two minutes. The more the number of cranes assigned to a vessel at terminal, the faster ship/cargo operations can take place. However, significant portside capabilities must be present to accommodate this throughput. In general, the increasing trend in container trade of the world shipping industry has impact on the ongoing automation of intermodal/container port terminal equipment which has gradually replaced the manually operated conventional equipment with partially or fully automated improvements in which the private operators of the container port terminals have invested massively in the recent time in port history. The new technologies have been widely adopted particularly the case for portainers, gantries, and straddle carriers, which can be remotely controlled which offers better operational efficiency.

Terminal operations are basically those activities that are involved in container handling and movement of containers through the port industry. Terminal operations are wide range of activities which involves loading and discharging, transferring, stacking and movement of containers within and through the port industry. This made container port terminal an intermodal terminal. It also includes warehousing, storage and other ancillary operations such as repairs and/or maintenance of containers within the terminal area. Port terminal operations can be categorized into three segments. The first segment of the container terminal operations concern maritime operations which include tug operations (towage), pilotage, berthing and mooring operations at the port terminals. Second is, ship operations which involve the activities enabling discharging and loading/stowing of the vessel at terminals. Ship turnaround time is expected to be short and the terminal must accommodate the schedule integrity of shipping lines. Hence, ship operations enable and deploy quick attention to vessels on arrival at port terminal. Thirdly, cargo operations on the other hand refer to all activities involving cargo handling at terminal. The transferring of containers from quays to transit shed, stacking of containers, loading and unloading from truck chassis and railcars; also transferring to warehouses and storage areas within port terminal.

Furthermore, the development in shipping industry as a result of innovations in global container trade and jumboization of vessels for economies of scale has also its attendant effects on dock design in modern port system of private terminal operations. Docking area is a berth-space where a containership can dock with technical specifications such as length and draft. These specifications have been under pressure in recent time as the size of containerships increases, demanding longer berths and deeper drafts. A standard post-panamax containership of 8,000 TEU requires about 325 meters of docking space as well as a draft of about 45 feet (13 meters). Ships of the Neo-Panamax class (12,500 TEU) require 370 meters and a draft of 50 feet (15.2 meters). Therefore, a pier length of 400 meters is considered the expected size to accommodate the largest containerships. The largest container vessels have a length overall (LOA) of above 400m, requiring a berth length of 450m. Some terminals have separate facilities for handling barges, although most barges can be handled alongside the deep sea quays.

Notwithstanding, in the same vein, the increasing port container throughput demands that port terminals should have good connectivity or distribution channels to hinterlands for quick evacuation of containers. In the modern port system, this can be achieved through inland transportation modes such as, truck roads, inland waterways and railroads. Many large container terminals have an adjacent rail terminal to which they are directly connected to on-dock or near dock rail terminals enabling large containerized unit trains to reach long-distance inland markets through inland ports. An important advantage of on-dock rail facilities compared with near-dock rail facilities is that the container does not require clearing at the gate of the marine terminal. Most of the inspection is done remotely with cameras and intercom systems. An operator can remotely see the container identification number and verify if it corresponds to the bill of lading. Modern management systems no longer require paperwork since all the documentation is kept in an electronic format interchangeable through secure connections. Hence, in the modern port terminal operations, the private operators work at very high speed and efficiency to achieve high level of productivity.

In the era of private operations of the seaport industry, the modern technologies have been adopted to replace the conventional traditional practices by the new technologies of automated port terminal infrastructure and equipment. In the port industry today, the shifting from conventional to automated practices has a lot to do with the port container terminal setting or configurations. However, the impacts of automation are yet to be fully implemented on terminal operations due to the need for configuration changes. Although the functions of both conventional and automated port terminals are the same (ship to shore transfers), their operations differ. In a conventional terminal, containers are brought to a pickup/drop-off area, where they will be moved to the stacking area by a holster or a straddle carrier. Then, they will be brought quay-side by another holster or straddle carrier when ready to be loaded onto a ship. The concept of emerging automated container terminal models a block layout of stacked containers that are perpendicular to the piers. These stacking blocks are serviced by automated stacking cranes (ASC), allowing quick storage and retrieval. On the gate-side, stacks are serviced by trucks that have their containers picked up by an ASC. On the pier-side, containers are retrieved by straddle

carriers or automated guided vehicles (AGV; for fully automated terminals) and brought to the end of a stack. The main differences between conventional and automated container terminal configurations are that the latter is reducing horizontal ground movements and removing vehicles from the stacking areas, enabling a higher stacking density. Areas nearby container terminals tend to have a high concentration of activities linked to freight distribution, such as distribution centers, empty container storage depots, trucking companies, and large retailers. This is commonly associated with high congestion levels around the port terminal facilities. To deal with the issue, the design of several container terminals has been modified to include coordination between on-dock rail facilities and satellite terminals as well as container depots. The goal is to transfer a part of the container cargoes and transport services to another less constrained location as practice by the concept of inland container depots.

1.2 Statement of the Problem

Terminal operations are those operations required for cargo and ship handling at the port industry. It involves the reception, processing, transit, storage, and marshalling of cargoes; the loading and unloading of modes of transport conveyances; and the manifesting and forwarding of cargo to destinations. Carrying out these operations requires human intelligence (knowhow) and technology in terms of equipments, warehouses; transit sheds, stacking areas, berthing space and so on. The availability of these infrastructures enhances port terminal efficiency and productivity. In the global industry today, shippers select ports with high efficiency reckoning on the speed at which containerships and cargoes are been attended to at the various ports of call. Private terminal operators in the ports seek to invest massively in port terminal development to world best practices to accommodate the growing rate in market demand of container shipments in Nigerian ports as a hub port for West African sub region. Container trade as earlier mentioned has gained ground in shipping industry and is increasingly used as demand for shipping container cargoes (import and export) are concerned. Studies have shown that Nigerian ports have recorded in the recent time total cargo throughput of over 18.8million tones and has welcomed over I,045 vessels with gross registered tonnage of 32.97million tones in the first three months of 2019 (Hellenic, 2019). Container shipments in Nigerian ports are gradually on increasing rate; in 2012, Nigeria exported 137540 metric tons of containerized cargoes (non oil commodities) through Nigeria designated export ports- Apapa and Tincan Island ports (BusinesssDay, 2013). Also in November 2020, Nigeria had an upsurge on imported cargoes rising up to 239722,000 metric tons (Nwoloziri, Nwabueze, and Ndubuisi, 2021) and this suggest growth of container shipment in privatized ports industry in the 21st century. Therefore this study is aimed to assess container trade growth of privatized seaports and improved terminal operations in Nigeria maritime industry.

1.3 Aims and objectives of the study

The study is an assessment of container trade growth of privatized seaports and improved terminal operations in Nigeria maritime industry. The aim of the study is to assess the trend in container trade growth of privatized seaports in Nigeria and develop forecast for future growth estimation as a benchmark/framework for improving terminal operations. Other specific objectives include:

i. To determine the trend of container throughput in Nigerian ports industry.
ii. To estimate growth pattern of container shipments in Nigerian ports industry.
iii. To forecast future container shipments in Nigerian port industry.

1.4 Research questions

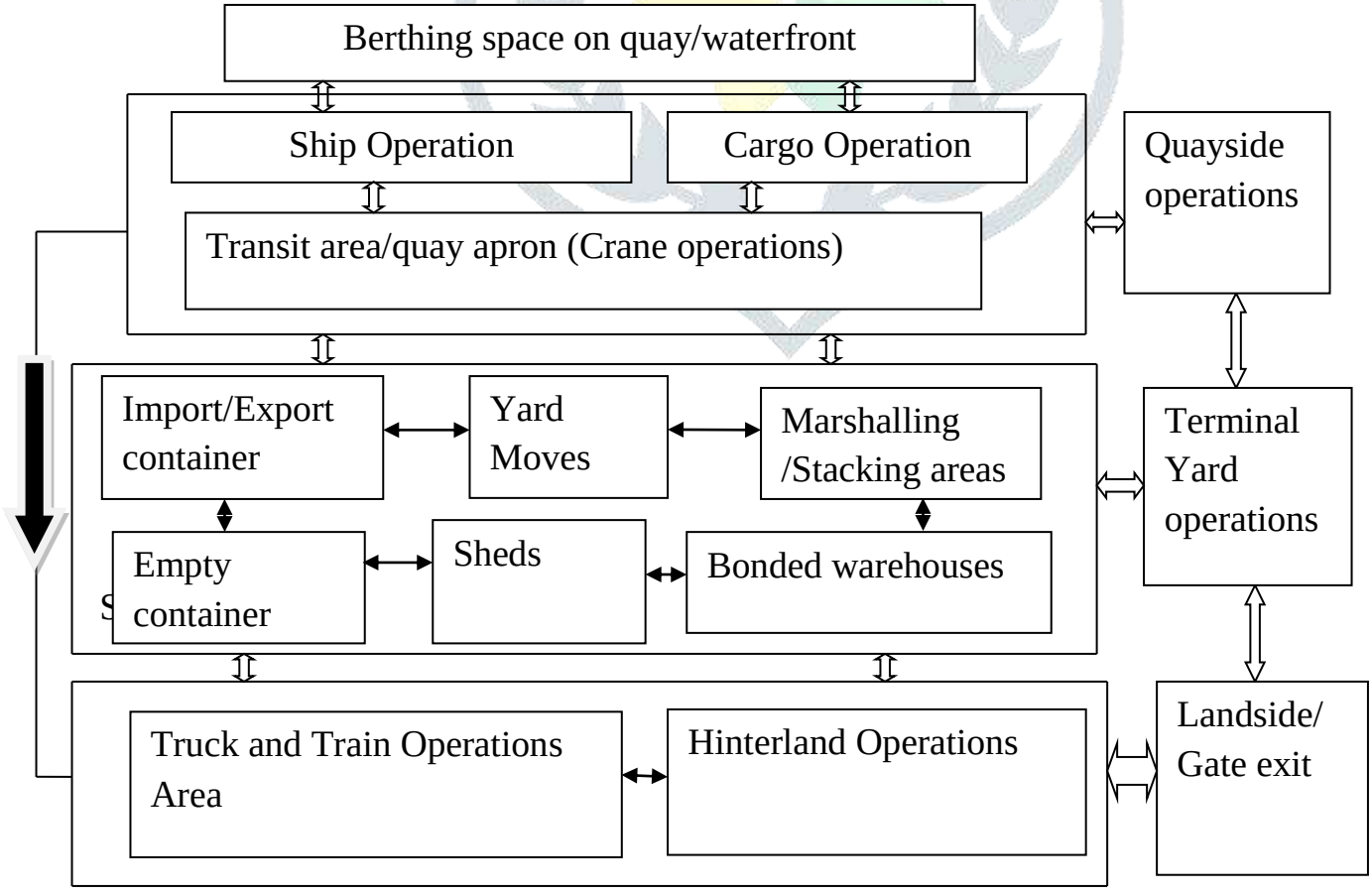
i. Is there significant increase in the trend line of container throughput in Nigerian ports industry?
ii. Is there significant growth in the pattern of container shipments in Nigerian ports industry?
iii. Is there significant growth in the future forecasts of container shipments in Nigerian port industry?

1.5 Research hypotheses

i. H_{01}: there is no significant increase in the trend line of container throughput in Nigerian ports industry.
ii. H_{02}: there is no significant growth in the pattern of container shipments in Nigerian ports industry.
iii. H_{03}: There is no significant growth in future forecast of container shipments in Nigerian port industry.

2. Conceptual framework

Fig1: A structural representation of container port terminal operations



A container terminal in the first place requires vast land space for its operations. Terminal operations of any seaport are complex activities which involve several stages of operations and use modern technologies and knowhow. Although container terminals differ considerably in size, function, and geometric layout, they principally consist of the same subsystems (Günther and Kim, 2006). These subsystems can be described by the operations processed in the main operation areas, i.e., the berth, quay, yard, and gate (Yang, 2015). The berth and the quay areas are considered quayside operations, whereas the yard and the gate areas are considered terminal yard and landside operations respectively. The yard, where containers are stored in stacks, is the intersection of the quayside and landside areas (Carlo *et al.*, 2013). The diagram above represents a hypothetical port terminal structure. It shows the main operational areas and the flow of containers. Generally, containers are loaded and discharged from vessels at quayside, where the vessel is berthing and handling area within the quay is equipped with Quay Cranes (QCs). Import and export containers are stacked in the yards, which is usually divided into various blocks. Special stack areas are reserved for reefer containers or to store hazardous goods. Containers are taken into/out of the terminal by the truck/train that links the terminal to outside transportation systems. Additionally, separate areas are used for empty containers. Some terminals also use sheds either to stuff and strip containers or to provide additional logistical services.

2.1 Theoretical framework

Growth in the container trade is ultimately driven by economic growth (Olapoju, 2019). The underlying assumption of this study is that there is a structural relationship between economic growth and container trade growth. This study is anchored on two economics principles of New Growth Theory (NGT) and Neoclassic Economics (NE).

The NGT is a growth theory which proposes that productivity and growth of the economy are tied directly to people – more specifically, to what they want and need (Daniel, 2021). The basic underlying reasoning is that people's wants which are virtually unlimited, insatiable and endless drive their purchasing and investment decisions; whereas purchasing and investing drive the economy. This theory is likened to the port industry, where the import and export of container cargoes in and out of the country are driven by people's wants. Terminal productivity and growth of container throughput is tied to the need of people and investments. As people tend to import and export container cargoes to meet daily needs invariably it drives their purchasing and investment decision in the port industry. The New Growth theory is primarily arguing that in pursuit of personal gain and fulfillment of needs, the people's purchases and investments will steadily rise and cause increase in productivity and growth over time. The New Growth Theory concludes that technology, knowledge and entrepreneurship are the basic factors of economic growth. Hence, a port adopting new technology, knowhow, and entrepreneurship will definitely increase vessels calls and container traffic.

On the other hand, the neoclassic economics can be described under two distinct models of economic growth which are exogenous and endogenous growth models. The Exogenous Growth Theory is a theory of neoclassical economics which asserts that the outside factors refer to as "exogenous factors" are more critical in determining the success of an economy, port industry, or individual business which include the impact of global innovations in technology and shared knowledge in the global system. The fundamental idea of the exogenous growth model is that the determining factors for growth are largely outside of the control of the port industry. Therefore, the port industries operators cannot ignore only react to the external factors for expected growth to take effect. In this case the advancement in technology refers to technology advancement in the global maritime industry rather than those that are considered industry-specific. This is a global effect on regional port industry. In the recent years there are innovations in the global shipping industry in which mother vessels (ultra large vessels) are now used in container shipping trade to achieve economies of scale which in variably requires technological improvement in regional ports in the areas of berth design, berth infrastructure, channel dredging and expansion and use of modern equipment in container handling at the port terminals. These external factors affect the container throughputs and productivity of port terminal. The exogenous growth theory maintains that these external forces, rather than industry or port specific factors, are what ultimately drive containership throughput and port terminal productivity. Advancements in technology in this era are considered especially important and if rapid technological advances and innovation are occurring within the global maritime sector as a whole, then the port industry adopting the innovations would experience overall growth.

The endogenous theory on the other hand argues that growth depends on the internal forces which the industry has control to effect changes for growth to take place. The endogenous growth theory emphasizes on factors that determine supply and demand situation within a specific nation's port industry. This growth model takes into account the key economic factors that are specific to a port industry which are the forces of "supply and demand". For example, import and export containers for liners are subject to demand and supply factors that can significantly affect port investment and productivity. This simply implies that if the port industry cannot generate enough demand and supply, the effects of the external forces would be meaningless to the industry. Hence, the endogenous model emphasizes that for growth to take place the port industry must be able to generate the forces of supply and demand. Other endogenous forces include how competitive the port industry is and technology advances that are specific to the port industry. According to the endogenous growth theory, technological advances should only be considered with respect to their likely impact within the industry. For example, regardless of whether technology is rapidly advancing overall, if there are significant technological innovations in a particular port services, then operators that provide such services are likely to outperform or experience customer patronage in market sectors and subsequently observe growth. Endogenous model assumes that the key determinants of economic growth are population growth, technology, the accumulation of human capital and knowledge. In a knowledge-based economy, supported by robust intellectual property rights, there are no diminishing returns to capital accumulation. These concords with the port industry privatization policy which allows the ports resources or facilities to be manned and provide services by experts and huge capital

investments are made in the port industry to meet the demands of ever growing Nigeria population.

2.2 Analytical framework

Since the early 1950s, global shipping industry had witnessed innovations based on technological advancements following containerization and intermodalism, which led to reconstruction of vessels and other modes of transportations carrying units, modernization of terminal equipment and facilities; and most recently the use of ultra large vessels in container trading for economies of scale that are evident in the industry and have improved both the supply chain connectivity and the cost effectiveness of the maritime sector (Stopford, 2013). However, of all the changes that the industry has gone through in past decades, the most significant one is the containerization of cargoes which is the major reason the maritime transportation has been revolutionized (Levinson, 2016). The latter innovation has led to the creation of the twenty-foot equivalent units (TEUs) and forty-foot equivalent units (FEUs) that are currently in use in international maritime industry. The standardization of transportation has immensely decreases the total logistic costs significantly (Pham and Sim 2020) and increasing use of containers have improved terminal productivity by 16 times when compared to the previous state of bulk cargo transportation (Bernhofen, El-Sahli and Kneller, 2016). In addition to the standardization of sizes, which has enhance cargo handling at the terminals and across other modes of transportation, it has as well eased logistic costs and sea-going container vessels have also benefited from economies of scale (Coşar & Demir, 2018).

In the modern era ultra large container vessels have been increasingly using regional hubs with efficient terminal equipment for transshipment of containers. This is accomplished most effectively in the privatized seaports having a network of regional and sub-regional hubs with onward service to outlying locations, in this way major ports developed so called feeder services (Carbone and Martino, 2003). The largest ports have become key logistics centers, while smaller ports then play the role of feeder ports for large port terminals. Feeder vessels transport cargo to the port, where it is placed onto large vessels to be taken to its final destination. The growth in container volumes and the concentration of container flows on a limited number of hubs, which partially derives from the increasing vessel size, requires the development of new terminal infrastructure at port terminals (Carbone and Martino, 2003). In addition to the pressure that such vessels impose on the terminal cargo handling capabilities, those larger vessels also require higher capacity in hinterland transportation or a rationalization and better use of existing transport alternatives (France and Horst van der. 2010). Facilities for loading, unloading, stacking, clearing, and storing of container cargoes are increasingly shifting inland, thereby becoming more decentralized to reduce congestion at port terminals (Michail, 2020).

Samuel (2014) identified a number of factors that determine terminal operational efficiency to include quay/yard crane equipment, berth time of container ships, dwell time of vessels and containers at ports, container ship and truck turnaround time, custom clearance, container storage capacity, multi-modal connectivity to hinterland and infrastructure

directly influence container terminal efficiency. Efficiency often refers to speed and reliability of container terminal services. UNCTAD (2011) has noted that "on-time delivery" is the major concerns of the ship liners and cargo owners; hence, port terminals are important nodes in logistics chain and as such must be in a position to warranty ship liners quick and reliable service levels. These include on-time berthing of vessels, quick vessel turnaround time, efficient container handling equipment and inland connectivity (Tongzon and Ganesalingam, 2009). Terminal efficiency can be reflected in the freight rates charged by shipping companies, turnaround time of ships and cargo dwelling time. The larger a ship stays at berth, the higher is the cost that a ship will have to pay. This can be passed on to shippers in terms of higher freight charges and longer cargo dwelling time, thus reducing the attractiveness for them to hub at a port. Tongeon and Ganesalingam (2009) identified several indicators of terminal efficiency and categorized them into two broad groups, namely: operational efficiency measures and customer-oriented measures. The first set of measure deals with capital and labour productivity as well as asset utilization rates. The second set includes direct charges; ship's waiting time, minimization of delays in inland transport and reliability (Tongzon, Chang, and Lee, 2009).

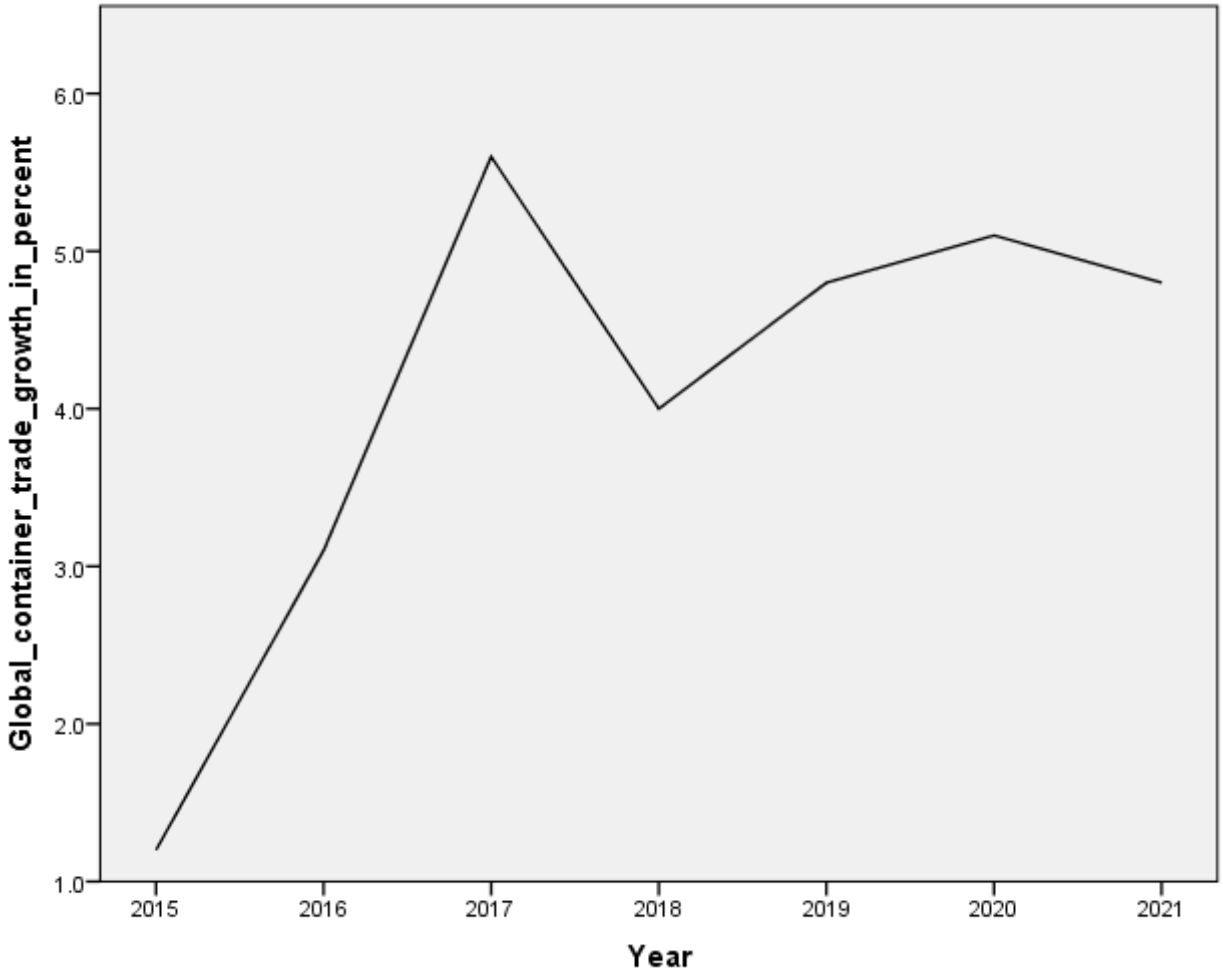
Container trade globally has evolved rapidly. Almost every part of the world today imports and exports their cargoes in container units of twenty/forty-foot equivalents. In West Africa maritime trade especially container trade has experienced an impressive growth along with increased demand for transport logistics services and the West African container throughput has expanded on average by 10% on yearly basis (Kalgora, 2019). There is also increasing growth in the World shipping container trade. According to Statista Research Department (2021), report shows that global container trade market is growing speedily annually, only in 2018 that volume was 146.4 million twenty-foot equivalent units (TEU) which was a bit lower than the preceding year and projects that by end of 2021, the global container trade will exceed 4.8 percent. The table below shows the Global container trade growth in percentage from 2015 to 2021.

Tableb1: Global container trade growth from 2015 to 2021 (%)

Year	Global container trade growth (%)
2015	1.2
2016	3.1
2017	5.6
2018	4
2019	4.8
2020	5.1
2021	4.8

Source: Statista Research Department (2021)

Figure2: Global container trade growth from 2015 to 2021 (%)



Source: Author

In the same vein several other studies have observed annual growths in container throughput of ports around the world (Kalgora, 2019; Statista, 2017). Statista Research Department (2021) observes that it was only in 2020, global container throughput was approximately 775 million twenty-foot equivalent units (TEUs) with little decline compared with the previous year. The report shows container throughput at ports worldwide from 2012 to 2020 with a forecast for 2021 to 2024 (in million TEUs).

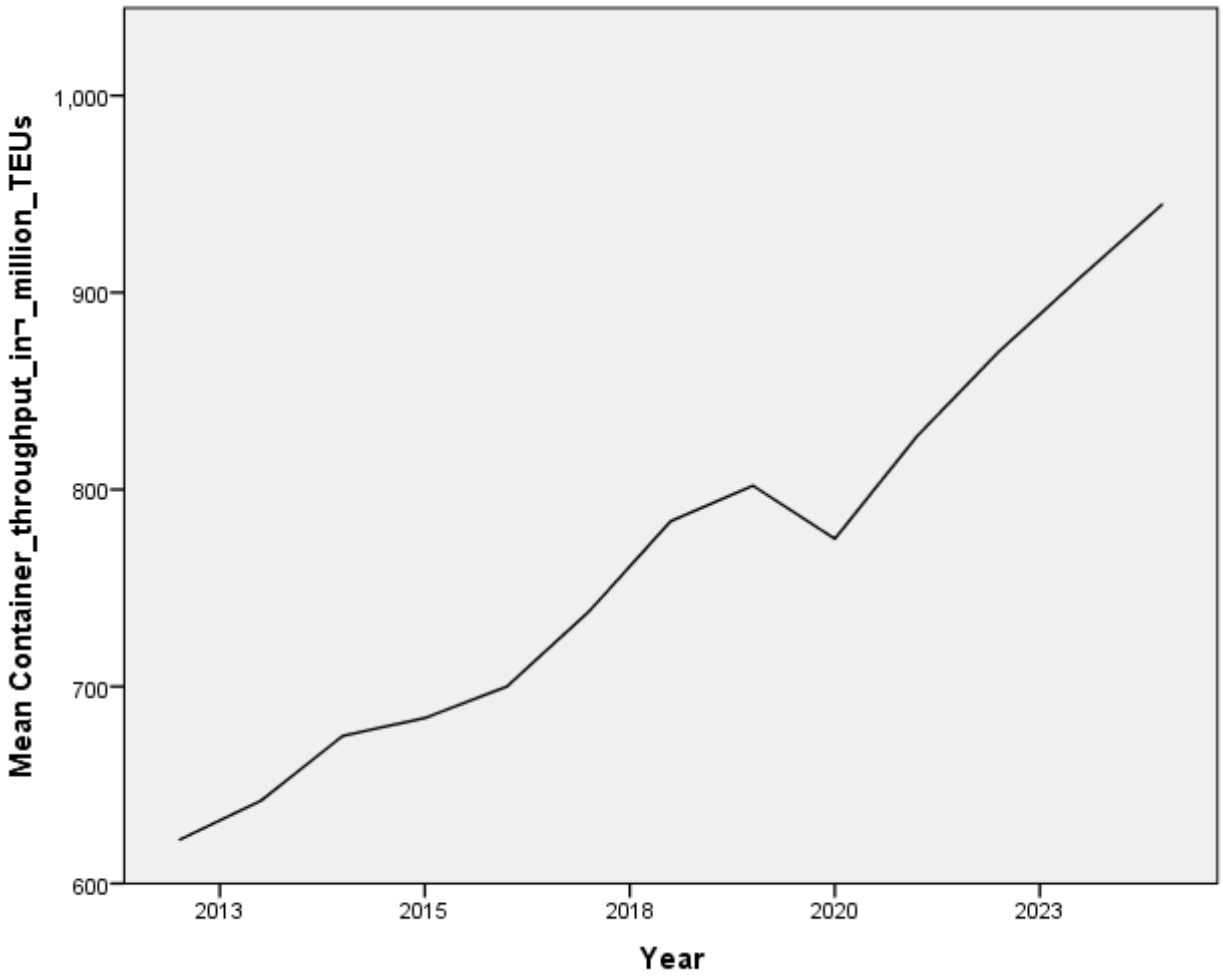
Table2: **c**ontainer throughput at ports worldwide from 2012 to 2020 with a forecast for 2021 to 2024 (in million TEUs)

Year	Container throughput (in million TEUs)
2012	622
2013	642
2014	675
2015	684
2016	700
2017	738
2018	784
2019	802
2020	775

2021	827
2022	870
2023	908
2024	945

Source: Statista Research Department (2021)

Figure3: Line graph for **c**ontainer throughput at ports worldwide from 2012 to 2020 with a forecast for 2021 until 2024 (in million TEUs)



Source: Author

3. Research Methodology

The secondary data source was used and data was collected from United Nations Conference on Trade and Development (UNCTAD) annual reports online. The data collected were analysed using Arithmetic Progression Model (APM) and Linear Trend Model (LTM). The researcher used Microsoft Excel and SPSS version 22 computer aided software models to present and analysis the data on this study to arrive at unbiased results and judgments on the tested hypotheses.

Linear Trend Model (LTM) is a model that fits the data into a straight line. It provides the line of best fit that can be used to represent the behavioral aspects of the data to determine if

there is any particular pattern. Linear trend model expresses the data as a linear function. The linear trend is the steady increase or decrease of the variables over the period of time.

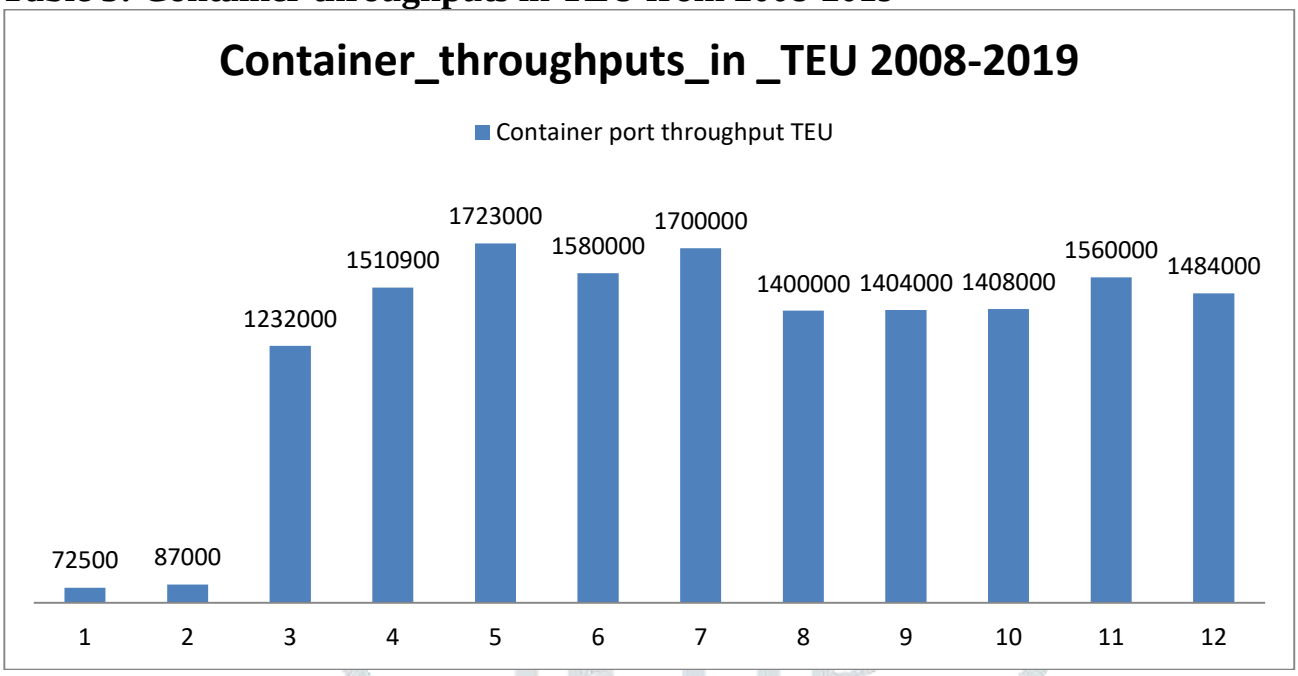
For the arithmetic progression model, container throughput growth is expected to be sustained at or beyond the 1st term being the base year (2008). The equation for the series is given as: Ctn = a, a + d, a + 2d, ---------- a + (N – 1) d. Where Ctn = Container throughput growth at a given year n, a = the 1st year Container throughput (2008 base year) of the sequence, d = common difference and N is the annual terms. However, the difference is found not to be common for the container throughput values from the 1st term to the 12th term as shown in the data collected but the researcher calculated the common difference from the equation of the sum of the series. To determine the common difference, we use the sum of an arithmetic series given as: Sn = n/2 [2a + (n – 1) d]. Thus the common difference d for container throughput can be computed by making d the subject of the equations d= [($\frac{2Sn}{N}$ - 2a) ÷ (N – 1)] hence, d is obtained. The Ctn ≤ a+ (n-1) d can be used to forecast for container throughput growth of privatized seaports in Nigerian ports industry. The researcher used the less than or equal to sign (≤) to indicate a benchmark or range of growth expectation of a given year forecast. This is because the arithmetic difference (d) smoothed the data series. The assumption here is that the forecasted values are greater than the base year with respect to forces of demand and supply which increases with increase in human population (needs/wants) i.e. (a+ (n-1) d > a).

4. Data presentation, analysis and discussion of findings

4.1 Data presentation

The table below shows the container throughput in Twenty-foot Equivalent Units (TEUs) of privatize seaports in Nigerian maritime industry for the periods of twelve years (2008 – 2019) represented by the researcher statistically using bar chart on Microsoft Excel.

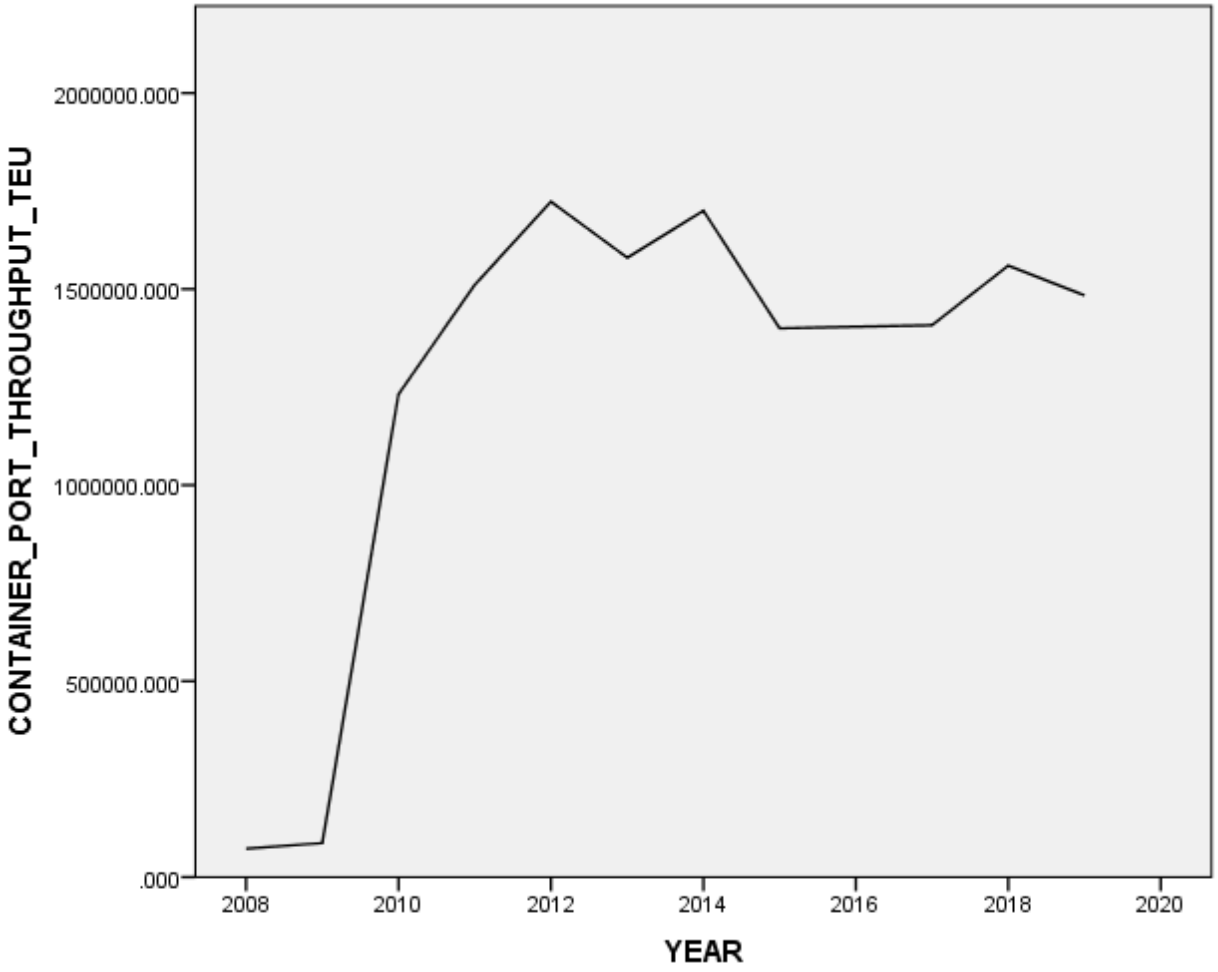
Table 3: Container throughputs in TEU from 2008-2019



Source: UNCTAD available online www.CEICDATA.com

The values on the table show the container throughput performance of the privatized seaports for the periods in the post concession era. The data values depict a rapid and continuous growth in container traffic of the port industry measured in TEUs.

Figure 4

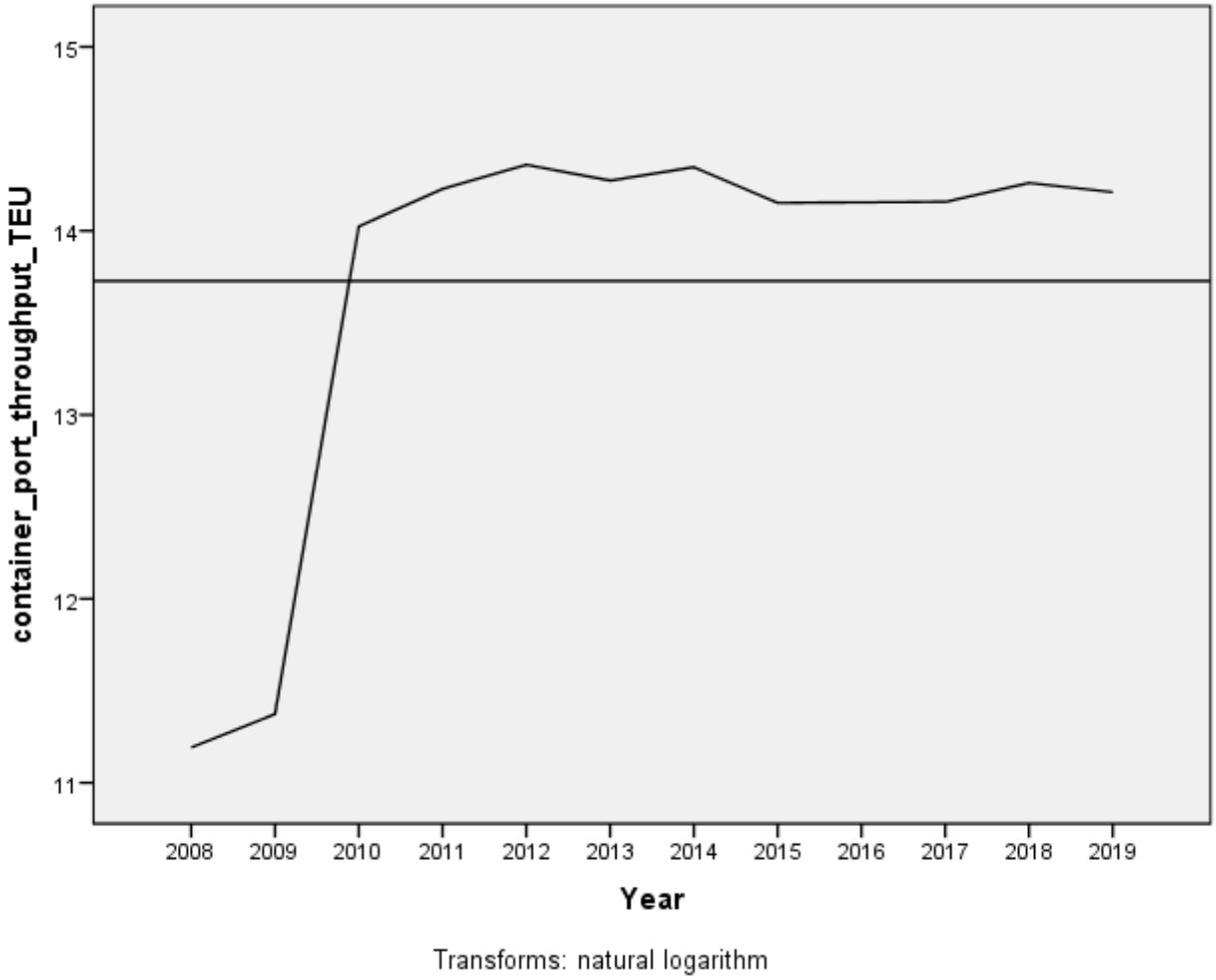


Source: Researcher using SPSS

The graph represents container throughputs growth from 2008 to 2019. The graph indicates instant and rapid growth from the inception of port concession. Concession of Nigerian ports took place in 2006 in which the first concessioned ports were handed over to the concessionaires to commence operations in 1st June, 2006. The data collected on the study shows that the ports experience increase in container throughput immediately from 2008 and rapidly increased from 2009 after all the port terminals in western and eastern zones were fully handed over to the respective concessionaires to commence operations.

4.2 Analysis and discussion of findings

Fig5: Trend line of container throughputs of the port industry from 2008 to 2019



Source: Author

This trend line shows drastic growths which sky rocked in 2009 and the industry has maintained high container throughputs over the years. The horizontal line indicates the mean throughput which emphasizes that the growths in container traffic of the ports are sustainable and will continue to grow over time.

Table4: Container throughput appraisal

N	Year	Container_ throughput(Ctn)	Container_throughput_appraisal(Ctn-a)
1	2008	72500 (TEU)	
2	2009	87000 (TEU)	14500 (TEU)
3	2010	1232000 (TEU)	1159500 (TEU)
4	2011	1510900 (TEU)	1438400 (TEU)
5	2012	1723000 (TEU)	1715800 (TEU)
6	2013	1580000 (TEU)	1507500 (TEU)
7	2014	1700000 (TEU)	1627500 (TEU)
8	2015	1400000 (TEU)	1327500 (TEU)
9	2016	1404000 (TEU)	1331500 (TEU)
10	2017	1408000 (TEU)	1335500(TEU)

11	2018	1560000 (TEU)	1487500 (TEU)
12	2019	1484000 (TEU)	1411500 (TEU)
	S_{12}	15161400 (TEU)	d = 216536

Source: Researcher using MS Excel

The appraisal of container throughputs on the table above is obtained by subtracting the base year performance from the subsequent years. The figures indicate that the subsequent year's performances were higher than the base year and that the privatized container port terminals have experienced high productivity and growth in container trade over the years. It also signifies that terminal operators have invested so much to ensure that the terminals are performing well to attract container throughputs (imports and exports) to the ports industry.

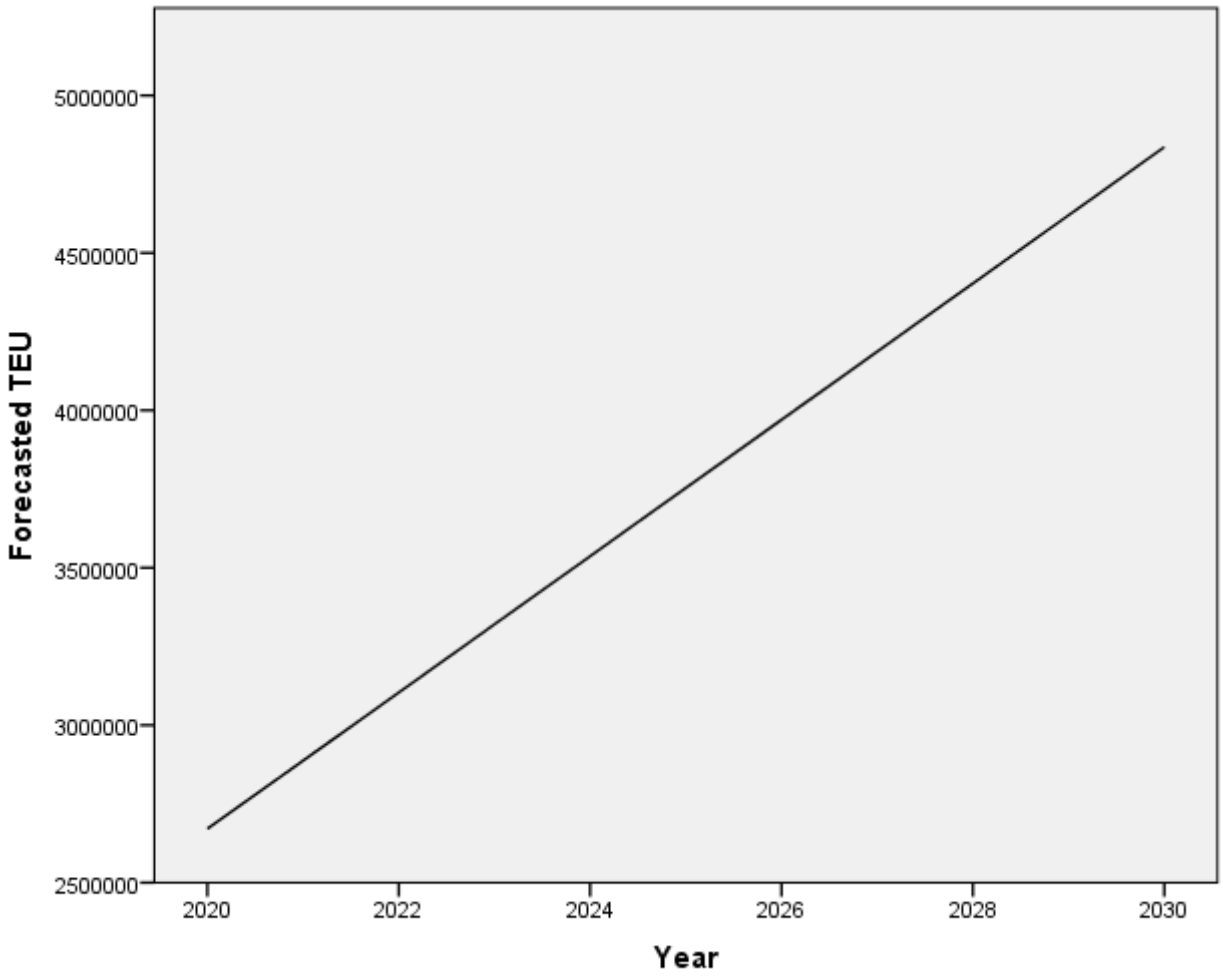
Table5: Container throughput forecast from 2020 to 2030

N	Year	Ctn ≤ a+(N-1)d
13	2020	≤ 2670932
14	2021	≤2887468
15	2022	≤3104004
16	2023	≤3320540
17	2024	≤3537076
18	2025	≤3753612
19	2026	≤3970148
20	2027	≤4186684
21	2028	≤4403220
22	2029	≤4619756
23	2030	≤4836292

Source: Researcher

The table shows ten years forecast for container throughput from 2020 to 2030. It shows a continuous growth in container throughput. The researcher used 'less than or equal to sign' to observe some of the economic factors which affect economic growth that could eventually result in 'up and down' fluctuations of container throughputs such as changes in government policies, exchange rate, global pandemic and economic recession. The researcher on this study implies that the container throughput would always be greater than the base year values. The assumption of the arithmetic increase of the analysis is based on the fact that population growth is directly proportional to economic growth (Furuoka, 2005). This simply means that the more the population the more the demand and supply of human needs and wants. Uche (2020) has noted that Nigeria has an estimated population of about 206million and projected that the population will increase to 263million 2030 and 401million in 2050. This is because the Nigeria population continues to grow annually at a high rate of 2.6% (Uche, 2020; Statista, 2021). Also Mankiw (2010) in his study to assess the controversial relationship between population growth and per capita income using a sample of 30 most populated countries in the world found that there is a long run relationship between population growth and per capita income. Hence, it was included in Jacob *et al.*, (2016) that population growth and economic growth is positively related.

Fig6: graphical representation of the forecasted container throughput (TEUs)



This shows a straight line graph which indicates an upward continuous growth of container throughputs. The reason for the continuous growth is because the common difference smoothed the data variables removing the effects of factors responsible for fluctuation in the data variables. The basic assumption of the study is that; there is observed growth in the forecasted container throughput of the privatized ports which is sustainable and greater than the base year figures. Secondly, the reasons for the growth lies on forces of supply and demand tied to needs/wants which increases with increase in human population and the adoption of the global innovations in technology and knowhow in port terminal operations which the private terminal operators (private investors) have imbibed in the post concession era which has increased the calling of containerships into the port industry.

5. Summary of findings, conclusion and recommendations

5.1 Summary of findings

The study obviously has identified spontaneous, rapid and continuous growth of container throughput in the privatized seaports. This growth can be attributed to port privatization and adoption of new port terminal technologies and knowhow as well as modernized operational strategies through the huge investments made by the terminal operators. Adopting the world innovations and best practices in Nigerian seaports are the main reasons

for growth in the container traffic volume. Container cargoes are no more diverted to other neighbouring countries for the reasons of long waiting time at the port, demurrages due to insufficient cranes to work on the vessels at berth and containers at yards. The inland container depots situated outside the port industry has reduced the cases of congestion and provided space for quick handling of new arrivals. In summary, the study has provided basis for the following conclusions: there is significant increase in the trend line of container throughput in Nigerian ports industry, there is significant growth in the pattern of container shipments in Nigerian ports industry and there is significant growth in future forecast of container shipments in Nigerian port industry.

5.2 Conclusion

The study has spotted out continuous growth in container trade of the industry. Several theories reviewed on this study inform that there exist positive relationship between population growth and economic growth. Human needs/wants, technological advancement and education are the drivers of economic growth which propels the force of demand and supply. The study noted the growing population of Nigeria nation at 2.6% annually, which increases needs/wants, production and shipment of goods and services. Privatization has proved its efficacy in port terminal development and growth in container throughput. This study supports the privatization policy and innovations in the port terminal operations as a driving force for growing container trade in Nigerian seaports without which containers would be diverted to other neighbouring ports.

5.3 Recommendations

New growth theorists believe that companies generally undervalue the usefulness of knowledge and, as a result, argue that it is mainly up to governments to invest in human capital development. However, recent innovations in the port terminal operations have proven the need for experts and knowhow in terminal operations. Governments are encouraged to facilitate access to better education, as well as provide support and incentives for private-sector research and development (R&D) in the port industry.

Secondly, under the new growth theory, adapting to global system and nurturing innovation internally is one of the reasons for port organizations to invest in human capital and technology. By creating opportunities and making resources available within the terminals, the expectation is that individuals will be encouraged to develop new concepts and technology for the container cargo market. The desire of the terminal operators to launch a new innovation is spurred by the possibility of increasing container throughputs and terminal productivity. Achieving such knowledge-driven growth requires a sustained investment in technology and human capital. This can create an environment for skilled professionals to have an opportunity to not only fulfill their primary jobs but also explore the creation of new services that can be of benefit and use to the broader public in providing port terminal services for the growing demand and supply.

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