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Comparative Analysis of Port Performance in Nigeria: A Study of Ports in Rivers State

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Abstract:
"Comparative Analysis of Port Performance in Nigeria. (A study of selected ports in Rivers State)" was carried out to empirically determine factors that influence port performance. Secondary data were utilized in the data analysis and testing of hypotheses respectively. The secondary data were collected from Information Communication Technology (ICT) department of the ports. Four hypotheses were tested with the aid of E-view version 3.1, econometric software. Hypothesis one revealed that there is a significant positive relationship between turnaround time and revenue generation by ports in Port Harcourt because at 5% level of significance. Also hypothesis two showed that there is significant positive relationship between cargo throughput and revenue generation in the ports because at 5% level of significance. Hypothesis three revealed that there is a significant positive relationship between ship traffic volume and revenue generation by ports in Port Harcourt because at 5% level of significance.. Hypothesis four revealed that there is no significant relationship between berth occupancy and revenue generation by ports in Port Harcourt because at 5% level of significance. It was also found that inadequate infrastructure stalls port performance efficiency. It is recommended that government should provide infrastructure and security in the ports seeing the positive effects they have on revenue and generation in the ports.

Keywords: *Port performance, port productivity, revenue, cargo*

1. Introduction

Port performance is a cardinal consideration in the choice of port in international trade. Revenuegeneration, cargo throughput, ship turnaround time and ship traffic volume are variables/indices used in assessing or evaluating port performance. Nigerian ports have been undergoing series of reforms which were started during President Olusegun Obasanjo's administration of 2003 – 2007.These reforms were necessitated by the numerous challenges that hampered the smooth performance of our ports. The reforms came especially in form of Port Concessioning. These measures were designed to enhance port performance.

Before this period the rate of insecurity and deplorable infrastructure were alarming. Again, policy inconsistencies of government and poor management have been identified by analysts as problems militating against improved port performance and efficiency in Nigeria. Emeghara (2008), Adebayo (2005), Ndikom (2008), Uzoanya (2000) and Gwandu (2000) had examined graphically the litany of such problems. Hence the extent to which these problems are identified and confronted headlong will enhance the performance of our ports in terms of revenue generation.

Brunet (2003) defined port performance as the capacity to produce positive results. Enormous effort is usually expended in physical and management sciences to measure performance since it is the yardstick to determine productivity, efficiency and motivation. Performance measurement is relatively simpler and easily carried out in physical sciences than in management sciences because of the nature of variables that are involved. In physical sciences the variables are easily controlled, whereas in management sciences the variables are not under the control of the researcher.

Seaports are the gateways to any country's economy and it is imperative to determine the extent of performance efficiency of such ports to guide investors. Ports like other service provider are known to have an impact on local and regional employment trade and the economy as a whole (Banister, 2005). Port performances indices are often presented in terms of quantity, e.g. revenue generated in the

port. The quality of jobs in terms of services rendered to client (vessels and shippers) depends on the availability of equipment. Emeghara (2008) noted that if a port is efficient, there is low turnaround time which is usually influence by lots of causative factors.

1.1. Objectives of Study

The study sets to give a comprehensive analysis of the effect of port performance efficiency on revenue generation. Other objectives are to:

i. To examine how turnaround time affects revenue generation.
ii. Examine the impact of cargo throughput on revenue generation.
iii. To assess the impact of ship traffic in relationship to revenue generation.
iv. To determine berth occupancy rate with respect to revenue generation.

2. Literature Review

Langen (2006) advised that ports vying for a spot as primary hub must be sure of large scale financing. The huge fund is needed for dredging activity, berth improvements, equipment investment and container yard enlargement. Also, there is need to embark upon the establishment of inland Container Depots as well as good rail network for quick evacuation of the Containers to the inland depots or dry ports. These facilities mentioned are also needed for a smooth operation of a port whether in load centre situation or not. Nigerian port system before early 2006 is a public investment, run by budgetary allocation, which in most times, are released very late and in some places inadequate for prompt equipment and facility replacement and refurbishment. Oritse G. and Olarenwju (2004) identified obselete infrastructures as the major constraint impending the smooth port operations in the country, they explained that most Nigeria ports e.g. Apapa, Port Harcourt, Sapele, Burutu, Old Calabar and Warri ports were built over fifty years ago with simple construction materials not intended to cope with prolonged environmental hazards. These overage facilities were designed mostly for agricultural exports. Also the use of manual labour, an outdated method of cargo operations in most ports such as stuffing and stripping of containers mostly in the port premises are other problems inhibiting efficiency at the waterfront. The intensive manual usage which is associated with labour problems such as frequency strikes, cargo damages and pilfer.

Adebayo (2005) identified cumbersome clearing system as one of the problems of port efficiency in Nigeria. According to Adebayo (2005) the cargo clearing system which depends on manual transactions or paper and physical movements of documents to and from various processing centres spread across vast locations within and outside the ports is obsolete. He also decried the situation whereby the nation depends on trucks rather than rail transport for mass movement of hinterland bound goods from the ports. The situation is aggravated by the absence of designated holding areas for trucks to park, awaiting their turn to load in the port.

Uzoanya (2000) is of the view that the presence of so many government agencies in the port, all performing the same duty of physical examination of cargo causes delay in cargo clearances as well as high cost of doing business in Nigerian ports. According to Uzoanya, these illegal government agencies engage in money extortions from clearing agents and shippers thereby escalating the cost of clearing goods in the port. He compared the delay witnessed in clearing goods in both Cotonou and Lagos port ports as three days in Cotonou as against seven days or more in Lagos port. Uzoanya concludes that no amount of patriotism could make a shipper abandon a port where he could obtain quicker and cheaper services for where he could waste time, hence, the preference of Cotonou port to Lagos port by Nigerian shippers. There is always a significant inducement in both monetary cost and time which makes Cotonou port friendlier than Lagos. Cotonou port, he said, has all necessary equipment for cargo handling efficiency.

Apart from the over twenty six (26) government regulatory agencies operating in the ports, the customs inclusive, Uzoanya identified the splitting of the customs staff into various units such as federal operations unit, customs investigation unit, Customs enforcement unit, as well as controller General monitoring unit as another problem militating against fast cargo operation in Nigerian ports. These various units allegedly carry parallel custom documentation procedures. All these problems make cargo clearance procedures cumbersome, painful, expensive and time consuming as these custom officials make indiscriminate and unreceipted monetary demands. However, the customs department claimed that the setting up of the various units is a measure to check the excesses of fraudulent shippers who engage in irregularities and malpractices associated with import declaration. Consequently, the delay caused by the presence of these government officials in cargo clearance procedure could be attributed to a certain extent on the dubious activities of the importers.

Gwandu (2000) attributed the inability of Nigerian ports to deliver customers friendly services to corruption. According to Gwandu, corruption is the greatest headache the ports in Nigeria have to tackle in order to remain relevant to the economic growth. Delivering a paper titled "Eradication 0f Corruption and Sharp practices in the Seaports," he posited that Nigeria aspirations of capturing all her foreign trade through her ports and playing a leading role in maritime industry in the West and Central African sub-region can only be achieved in an atmosphere devoid of corrupt practices. This situation can only be achieved under an atmosphere of transparency, accountability and commitment to universal accepted ethical standard which will lead to universally accepted operational standard in terms of port costs and operational delay in the ports. In a world faced with the challenges of growing competition and globalization, the way a port industry could meet the customer's desire is by ensuring satisfactory service delivery. A port could only continue to be relevant to customers if it operates with minimum delay, utmost efficiency and at a reasonable cost to users.

Akabogu (2005) decried the low productivity at the Nigerian ports. According to Akabogu, no stevedoring company in Nigeria is able to deploy high-caliber and sophisticated cargo handling equipment to ensure high productivity and low turnaround time of ships in ports. He maintained that stevedoring companies in Nigeria are simply glorified labour contractors that simply employ causal labour and hire them to shipping companies willing to use their services. Stevedoring companies across the world utilize high technology

equipment which involves the deployment of high technology equipment which ensures high productivity and low turnaround time which ordinary manual labour operation could not achieve. Akabogu therefore concludes that Nigerian economy needs a functional port system to lift the economy to a greater height since the port is a gateway to the economy. He therefore called for port reformation which if implemented effectively will yield positive result to the economy.

Uzor (2003) had earlier suggested reformative actions to be taken in order to move the Nigerian port industry forward. He is of the opinion that the high cost of clearing goods in the port is a major factor militating against the operational efficiency of the ports and its consequent diversion of ship and cargo traffic to the neighbouring ports of Contonou and Lome. These ports catch on the defects of Nigerian port pricing policy to secure traffic destined to Nigerian ports. They consequently expand their ports to absorb Nigerian bound traffics. According to Uzor, there are numerous charges which together increase cargo clearing cost. These are as follows:

a. Seven percent (7%) development levy
b. Two percent (2%) National Automotive Council Level
c. One percent (1%) Free on Board (FOB) Levy
d. Value Added Tax (VAT)
e. Trade Liberalization Scheme Levy
f. Three percent (3%) benchmark rate charged on all imports
g. Five percent (5%) sugar levy
h. Other illegal local shipping charges by shipping companies e.g from September 21st 2005 Container vessels servicing West African Market implemented the Emergency Terminal Congestion Surcharge (ETCS) of one hundred dollars ($100)s or fifteen thousand Naira (₦15,000.00) on all containers going to Apapa Port. This, according to the shipping lines is to cushion the effect of container built up at the port which led to congestion.

In 1998, similar extra charges were imposed on shippers to the Eastern zonal ports Port Harcourt by the conglomeration of shipping lines operating to the ports. The shipping companies demanded an additional $750 on each 20 ft and $1,000 on each 40ft container. According to them, this is to cushion the effect of extra cost incurred in steaming to the ports from Lagos. Failure to pay the extra charges by the shippers meant dumping such cargoes at Lagos port despite the fact that contract of affreightment to Port Harcourt port as the destination. The lines also argued that such extra charges was necessary to compensate for the losses incurred as vessels have to leave the ports in ballast. Similarly, in 2002, the Nigerian Ports Authority hosted the Maritime Organization of West and Central Africa Sub-Region (MOWCA). Consequently, NPA had to impose a ten cents ($0.10) equivalent of Eleven Naira Sixty Kobo (₦11.60) levy on every tonne of cargo discharged at the nation's ports. These additional levies do not augur well with the shippers hence they termed the nation's ports as unfriendly. Consequently they resort to diverting their goods to neighbouring ports and later these goods are smuggled into the country through many bush paths, denying the country the much needed revenue. Although it is tempting to compare the performance of one port to another, such comparisons may be misleading. Ports operate in different economic, social and fiscal environments. For example, even if ports have the same economic objective of maximizing annual throughput subject to a profit constraint, the profit constraint is likely to differ among ports. Also, one port system at the least cost may have a negative profit (or deficit) constraint that is to be subsidized, while another port may have a positive or break-even profit constraint. Ports may also have different economic objectives (Suykens, 1986).Thus, in a multiport performance evaluation approach, where the performance of one port is compared to that of another, similar ports should be used in the comparisons. A principal component analysis for identifying similar ports in a group of ports is found in a study by Tongzon (1995).

Multi-port performance evaluations of the technical efficiency of ports generally rely upon frontier statistical models. These models utilize the throughputs (or outputs) and resources (or inputs) of a group of ports to investigate whether the ports are technically efficient – i.e. whether their throughputs are the maximum throughputs for given levels of resources (or on their production frontiers) – or technically inefficient, where their throughputs are less than their maximum throughputs for given levels of resources and therefore lie below their production frontiers.

Frontier statistical models used in multi-port technical performance evaluations generally utilize data envelopment analysis (DEA) techniques – non-parametric mathematical programming techniques for deriving the specification of the frontier model. DEA techniques derive relative efficiency ratings for the ports that are used in the analysis. Thus, the development of standards against which efficiency can be measured is not required, although such standards can be incorporated into the DEA analysis. DEA techniques make no assumptions about the stochastic properties of the data. When such assumptions are made, the frontier statistical model is referred to as a stochastic frontier model (Tongzon, 1995).

3. Research Methodology

Data employed in the study were analysed using ordinary least Square (OLS) of simple regression.The optimal properties of best, linear and unbiased nature was employed to test the hypotheses. Specifically the usage of the OLS is to give room for random term in the analysis. The random term entails other independent variables not captured in the study.

Arising from the above, in order to capture the variables property of and their likely effects the econometric software called E-view version 3.1 was employed

3.1. Data Presentation and Analysis

YEAR	Revenue Generation (REG) (₦)	cargo throughput (CTP)	Ship Traffic Volume (STV)	Turnaround Time (TAT) (days)	Berth Occupancy (BOY) (%)
2002	1,609,625,313	3,666,413	4,171,021	14	90
2003	1,701,797,951	3,702,553	4,295,203	17	94
2004	13,89,970,000	13,688,375	22,088,088	13	72
2005	169,4847,626	3,471,432	3,111,102	12.24	80
2006	1,966,777,262	3,001,019	3488853	11.71	79
2007	952,205,612	4,878,757	6,096,882	9.99	84
2008	731,817,795	4,894,111	6,052,206	9.57	66
2009	695,005,758	5,141,451	5,972,549	8.3	75
2010	564,520,961	5,808,533	6388630	10.5	70
2011	963,306,522	4931,647	6195,929	10.2	90

Table 1: Port Harcourt Variables From 2002 – 2011
Source: NPA statistical bulletin

YEAR	Revenue Generation (REG) (₦)	cargo throughput (CTP)	Ship Traffic Volume (STV)	Turnaround Time (TAT) (days)	Berth Occupancy (BOY) (%)
2002	858,620	1,893,771	18,158,063	1.86	71
2003	867,615	11,994,981	18,166,084	1.87	72
2004	1,389,975	136,88,375	22,088,088	1.87	74
2005	1,911,130	13,818,843	21,958,086	1.82	71
2006	2,391,450	15,820,371	25,683,104	1,96	71
2007	1,868,171	2,482,177	29,562,631	1.80	71
2008	1,988,608	3,222,663	27,901,126	2.8	34
2009	2,724,013	3,385,455	21,371,664	3.4	35
2010	2,341,922	2,921727	32823926	2.5	35
2011	2,456,776	2,944,689	3,6716,903	2.7	27

Table 2: Variable of Onne Port Complex from 2002-2011
Source: NPA statistical bulletin

3.2. Testing of Hypotheses
There is no significant relationship between turn round time and revenue generation by ports.

Dependent Variable: RVG				
Method: Least Squares				
Date: 07/29/12 Time: 13:19				
Sample: 2000 2011				
Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.06E+08	7.44E+08	-0.546155	0.5969
TAT	1.29E+08	61877770	2.078762	0.0643
R-squared	0.301737	Mean dependent var		1.11E+09
Adjusted R-squared	0.231911	S.D. dependent var		5.30E+08
S.E. of regression	4.65E+08	Akaike info criterion		42.90319
Sum squared resid	2.16E+18	Schwarz criterion		42.98400
Log likelihood	-255.4191	F-statistic		4.321252
Durbin-Watson stat	0.808517	Prob(F-statistic)		0.064331

Table 3: Regression Analysis for turnaround time (TAT) and revenue generation (RVG) Model at 5% Level of significance
Source: Researcher's computation from E-View

From the result in table 3 above, the dependent variable is revenue generation (RVG) while the independent variable is turn round time (TAT).The positive coefficient of TAT does not conform to theoretical expectation. Ideally, it is expected that a decrease in TAT will lead to increase in revenue generation (RVG).

On the other hand, the R^2 of 0.302 tells us that about 30.2 percent in the total variation in RVG is explained by TAT. The overall model is significant since the F- ratio calculated is less than 20 percent. More importantly, the Durbin-Watson (DW) test for detail autocorrelation calculated of 0.81 is not up to 2; hence, there is seemingly the presence of autocorrelation. However, since the variables are time series, and relatively less than fifteen years, it could be used for policy formulation and implementation.
Looking at the t-value calculated of 2.08 (0.06 percent) shows that the model is significant at 5 percent level. Thus, the null hypothesis is rejected while the alternative hypothesis which says that that there is a significant relationship between turnaround time and revenue generation is accepted.
Model for hypothesis one
$RVG = a_0 + a_1 TAT + U_{1t}$ ----------(1)
Where

REG = Revenue generation
TRT = Turn round time
a_0 = Autonomous revenue generation
a_1 = Coefficient of estimate
U_{1t} = Error term
Aprioro, $a_1>0$

There is no significant relationship between cargo throughput and revenue generation by ports.

Dependent Variable: RVG				
Method: Least Squares				
Date: 07/29/12 Time: 13:24				
Sample: 2000 2011				
Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.07E+09	7.04E+08	2.945886	0.0146
CTP	-275.3477	197.7775	-1.392209	0.1940
R-squared	0.162356	Mean dependent var		1.11E+09
Adjusted R-squared	0.078592	S.D. dependent var		5.30E+08
S.E. of regression	5.09E+08	Akaike info criterion		43.08518
Sum squared resid	2.59E+18	Schwarz criterion		43.16600
Log likelihood	-256.5111	F-statistic		1.938247
Durbin-Watson stat	0.956304	Prob(F-statistic)		0.194042

Table 4: Regression Analysis for cargo throughput (CTP) and revenue generation (RVG) Model at 5% Level of significance
Source: Researcher's computation from Eview

Table 4 above shows the regression result for cargo throughput (CTP) and revenue generation (RVG). The coefficient of CTP is negative. This negates the theoretical expectation that an increase in CTP will promote revenue generation in the ports. More importantly, the R^2 calculated is 0.162 which means that about 16.2 percent of the total variation in the model is explained by independent variable CTP while the remaining 83.8 percent is explained by variables not captured in the model but covered by the error term. By extension, the overall model is not significant and equally characterized by a seemingly lesser degree of autocorrelation too.
Furthermore, the calculated t-value of -1.39 (in absolute term) is less than the criterion value. Simply put, 19 percent t-value calculated hence, the null hypothesis which says that there is no significant relationship between cargo throughput and revenue generation is accepted.

Model for hypothesis two
$REG = b_0 + b_1 CTP + U_{2t}$ ----------(2)
Where

RVG = Revenue generation
CTP = Cargo Throughput
b_0 = Autonomous revenue generation
b_1 = Coefficient of estimate
U_{2t} = Error term
Aprioro, $b_1>0$

There is no significant relationship between ship traffic volume and revenue generation by ports.

Dependent Variable: RVG				
Method: Least Squares				
Date: 07/29/12 Time: 13:27				
Sample: 2000 2011				
Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.23E+08	5.73E+08	0.913239	0.3826
STV	100.9285	94.18865	1.071557	0.3091
R-squared	0.102997	Mean dependent var		1.11E+09
Adjusted R-squared	0.013297	S.D. dependent var		5.30E+08
S.E. of regression	5.27E+08	Akaike info criterion		43.15365
Sum squared resid	2.78E+18	Schwarz criterion		43.23447
Log likelihood	-256.9219	F-statistic		1.148235
Durbin-Watson stat	0.694050	Prob(F-statistic)		0.309098

Table 5: Regression Analysis for ship traffic volume (STV) and revenue generation RVG Model at 5% Level of significance
Source: Researcher's computation from E-View

Table 5 documents the regression result for ship traffic volume (STV) and revenue generation (RVG). It shows the coefficient of STV having positive sign. This means that there exist a positive relationship between STV and RVG. That is in conformity with the theoretical expectation.
Again the calculated t-value of 1.07(0.31 per cent) supports the above theoretical observation. It means that the null hypothesis which says that there is no significant relationship between ship traffic volume and revenue generation is rejected.

Model for hypothesis three
$RVG = C_0 + C_1\ STV + U_{3t}$ ---------- (3) Where
RVG = Revenue generation
STV = Ship traffic volume
c_0 = Autonomous revenue generation
c_1 = Coefficient of estimate
U_{3t} = Error term
Aprioro, $c_1>0$

There is no significant relationship between berth occupancy and revenue generation.

Dependent Variable: RVG				
Method: Least Squares				
Date: 07/29/12 Time: 13:28				
Sample: 2000 2011				
Included observations: 12				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.65E+08	4.53E+08	1.469643	0.1724
BOY	209992.8	199085.4	1.054788	0.3163
R-squared	0.100119	Mean dependent var		1.11E+09
Adjusted R-squared	0.010131	S.D. dependent var		5.30E+08
S.E. of regression	5.28E+08	Akaike info criterion		43.15685
Sum squared resid	2.78E+18	Schwarz criterion		43.23767
Log likelihood	-256.9411	F-statistic		1.112578
Durbin-Watson stat	0.673889	Prob(F-statistic)		0.316340

Table 6: Regression Analysis for berth occupancy (BOY) and revenue generation (RVG) Model at 5% Level of significance
Source: Researcher's computation from E-View

The regression results in table 6 above shows that there is a positive relationship between berth occupancy (BOY and revenue generation (RVG). This is because the coefficient of BOY is positive. It means that it agrees with the theoretical expectation that an increase in BOY will enhance the volume of RVG.
On the other hand, the computed t-value of 1.06 (0.32 percent) is less than the criterion value. Thus, the null hypothesis which says that there is no significant relationship between berth occupancy and revenue generation is accepted.
Model for hypothesis four

$RVG = W_0 + a_1 BOY + U_{4t}$ ---------- (4)

Where

RVG = Revenue generation
BOY = Berth occupancy
W_0 = Autonomous revenue generation
W_1 = Coefficient of estimate
U_{4t} = Error term
Aprioro, $W_1>0$

4. Discussion of Research Findings

Hypothesis one revealed that there is a significant negative relationship between turn round time and revenue generation. The negative relationship depicted by the model shows that as turn round time reduces, revenue generated by the ports increases. An efficient port has less turn round time. This enhances the revenue generated since ships do not waste much time during loading and unloading of cargos in and out of vessels in the port. Again, charterers of vessels will always patronize a port that has low turn round time to avoid incurring demurrage. The speed which cargos are loaded on and unloaded from vessels depends on the nature of cargo handling equipment, skills of personnel, motivation of employees in the port and the level of training of such employees.

Hypothesis two shows that there is no significant relationship between cargo throughput and revenue generation. An efficient port is capable of handling large tonnage of goods. The efficiency of a port is mainly measured in terms of throughput, the more efficient a port is, the higher the throughput. When a port is performing efficiently, there is less delay in the discharge of cargoes to their owners. Importers of goods have to pay for the services rendered. The more cargoes that are loaded and unloaded onto vessels, the more revenue that is accruing to the government. In the case of ports that were studied, since there is a negative relationship between cargo throughput and revenue generated, it is a pointer that all not well with our ports. Adequate measures must be put in place to check administrative bottleneck, corruption, poor facilities, security in the port etc.

When hypothesis three was analysed, it showed that there exist a positive significant relationship between ship traffic volume and revenue generated. This confirms the expectation of the study. An increase in ship traffic volume should lead to increase in revenue. The increase in the revenue generated by the ports over the 12 years can be attributed to improvement in efficiency of our ports viz-a-viz increased in ship traffic volume. In as much of as there is a positive relationship between the two variables i.e. ship traffic volume and revenue, then the efficiency of operations in the ports that were studied is greatly enhanced.

Hypothesis four revealed that there is no significant relationship between berth occupancy and revenue generation in Rivers' ports. When there is adequate provision for berthing of ships in the port, there will be increase in revenue. However, this is not the case based on the data analysed. Since ports play significant roles in revenue generation, infrastructure needed to stimulate port activities should be provided by government as it was revealed that among all the problems that are militating against port performance efficiency is lack of basic infrastructure like good access roads and electricity in the ports.

5. Conclusion

Port is one of the infrastructures that drives the economy. It is the gateway to international trade of all developing and developed economies. Nigeria is making a tremendous effort to pull its economy out of the woods. Significant efforts have been made by successive governments to open up the economy for more investment.

No country can boost off increase in trade and investment by neglecting its ports. The impact of ports transcends all sectors of the economy. Thus, any action taken by government to industrialize the economy is not done in isolation. The port is usually given prime attention since the high volume of goods produced will have to be exported through it. The findings suggest that there is a significant relationship between turn round time, cargo throughput, ship traffic and revenue generation by ports in Port Harcourt and Onne ports.

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