LOGISTICS EFFICIENCY AND ECONOMIC GROWTH IN NIGERIA

AGBEDE, Moses Oyeyemi
&
FASEESIN Olabisi

Emails: yemi_agbede@yahoo.com and olabisifaseesin@yahoo.com
Department of Economics, Adekunle Ajasin University Akungba, P.M.B. 001 Akungba Akoko, Ondo State, Nigeria

ABSTRACT

Logistics sector plays a very cogent role in promoting economic growth and development of any nation. The inefficiency in logistics system could have a grievous impact on growth of the economy. This study investigated the effect of logistics efficiency on economic growth in Nigeria from 1981-2018. The study employed Dynamic Ordinary Least Squares (DOLS) technique with the use of time series data sourced from Central Bank of Nigeria Statistical Bulletin and Word Bank Development Indicator 2018. The findings showed that 1% rise in airway output, logistic efficiency and trade openness have a significant positive contribution of about 0.69%, 9.13% and 1% increase in economic growth in Nigeria, while the study revealed a negative significant effect between waterway output and economic growth in Nigeria which is attributed to piracy and underestimated of waterway output in Nigeria. The study concludes that logistic efficiency, airway output and trade openness stimulates economic growth in Nigeria, while waterway output depresses it. Therefore, the study recommends policies to stimulate domestic and foreign investors in logistic sector and put measurements in place in order to reduce piracy and under-estimation of waterway output in Nigeria to barest minimum level.

***Keywords: RGDP, Logistic Efficiency, Waterway Output, Airway Output,* Trade Openness**.

1.1 Introduction

In the present era of globalization, the role of logistic efficiency system on economic growt h and development has become increasingly noticeable in recent times due to its functions that re volve round channel of production, by enabling the flow of goods, services, and values from the point of production to consumption. Logistic system has been noted as a vital industry that can fa cilitate adequate growth and development in emerging economy. Logistics reflects the processes of the flow of information from the raw material (intended to turn to a consumable good) to the p

oint where the product (good or service) is consumed, controlling and planning the process both i n a well productive and low-cost manner through storage and good inventory facilities.

According to Adeyemo (2015) found that Nigerian logistic system is too poor to facilitate a dequate growth. Victor (2015) remarks that inefficiency in logistics system translate to lost of es sential materials when it fail to meet-up with their schedule in the manufacturer's supply chain. Moreso, poor inefficiency in logistics performance affect both manufacturers and final consume, therefore resulting in lost of gain when essential materials fail to meet-up as schedule. Hausman, Lee and Subramanian (2012) revealed that well developed logistic system in developed countries has continue to increase the probability of exporting to international markets and attracting forei gn direct investment, while emerging economic are still lagging behind.

Many past studies have attempted to establish the link between logistics system and econ omic growth especially in developing economies but scholars failed to considered effect of logist ics efficiency on economic growth using the interaction of different means of transportation and i nfrastructure in Nigeria. There is need to examine the impact of airway, waterway and other me ans of logistic effect on economic growth in emerging countries like Nigeria in this era of globali zation. In addition, pass studies failed to take into consideration the direction of causality betwee n logistics efficiency and economic growth. This therefore justifies the need for this study to exa mine the effects of airway and waterway on economic growth, logistics efficiency on economic g rowth, and shed additional insight into the inconclusive debate on the direction of causality betw een logistics efficiency on economic growth in Nigeria.

1.2 Literature Review and Theoretical Underpinnings

Sharipbekova and Raimbekov (2018) stated that logistics is associated with management and flow of goods, resources and information between the point of production and consumption.

According Sevgi and Tezcan (2017) logistics involves the process that entails movement of mate rials and products into and out of a company. World Bank (2015) defined logistics efficiency thr ough its performance in six assessment indicators that include customs, logistics competence, inf rastructure, international shipping, tracking, tracing and timelines. Onyimadu (2015) defined eco nomic growth as increase in growth rates of income per capital. One of the core values of econo mic growth is that it reveals the available resources within a society and the proportion allocated to individuals in trying to satisfying their utility preferences. This study is rooted on **e**ndogenous growth theory associated with long-run economic growth. The theory assumes that country exper ience growth through the aid of internal forces, particularly from forces governing the opportunit ies and incentives to create technological knowledge.

Uma, Ogbonna, Benson and Aniagolu (2014) studied the effect of transportation networkin g on economic development in Nigeria using the period of 1981-2009. The study employed ordin ary least square technique. The finding established positive and significant effect of road transpor tation on real gross domestic product. Similar study with the same techniques by Oyesiku, Onako ya, and Folawewo (2013) investigated the effect of public sector investment in transport on econ omic growth in Nigeria from 1980-2010 discovered no significant effect between public sector in vestment in transport and economic growth. Therefore, concluded that transportation system doe s not stimulate economic growth in Nigeria.

Ighodaro (2009) studied the effect of transport infrastructure on economic growth in Nigeri a using Error Correction Model (ECM) technique. Finding from Error Correction Model showed a significant negative effect of transport infrastructure on economic growth in Nigeria. The study concluded that there is about 20% declining in transport infrastructure yearly in Nigerian annual budget. Also, Zahir, Malik and Bashir (2011) studied the effect of transportation and telecommu

nication on economic development in Pakistan using Autoregressive Distributed Lag Model (AR DL). The ARDL result revealed that gross fixed capital formation and transport have significant and positive impact on GDP in Pakistan.

Sevgi and Tezcan (2017) examined the impact of logistics on economic growth in Organiz ation for Economic Co-operation and Development (OECD) countries using data from 1970-201 4. The study applied panel data technique. The panel data technique revealed that no significant effect between railroad freight transportation and economic growth, while infrastructure investm ents has positive and significant effect on economic growth. The study concluded that transportat ion, the length of highway network and the length of railroad network stimulate economic growt h in the Organization for Economic Co-operation and Development (OECD) countries. Similar, s tudy by Hayaloglu (2015) investigated the effect of logistics on economic development in 32 OE CD countries using panel data discovered that a positive and significant effect exist between logi stics and economic development in OECD countries.

Victor (2015) studied the relationship between maritime logistics and international trade i n Nigeria. The study distributed 100 questionnaires amongst the respondent that were actively in volved in logistics and trade. The findings revealed a significant and direct relationship between l ogistics performance and competitiveness in Nigerian logistic sector. The study therefore conclu ded that new trade-enabling policies and transport infrastructure through intermodal connectivity and link to hinterlands. Sharipbekova1and Raimbekov (2018) also examined the effect of logisti cs efficiency on economic growth in the Commonwealth of Independent States (CIS) countries u sing a time frame 2007-2016 discovered that a positive and significance relationship between log istics efficiency and economic growth in the Commonwealth of Independent States (CIS) countr

ies. Therefore, concluded that the development of logistics largely correlates with the overall level of the country's development.

Kayode, Onakoya, and Abiodun, (2013) studied the effect of transport infrastructure investment on economic growth in Nigeria from 1977-2009. The study employed granger causality test. The findings revealed that transportation infrastructural investments had an insignificant role in determination of economic growth. Obed (2013) critical examined the challenges and opportunities of shipping line services on Nigeria economy. In the study, 100 questionnaires were distributed amongst the respondents in the study area using Chi-square test. The findings revealed that there exist direct and significant relationship between government policies and shipping operations; similar finding was activities of pirates and the profitability of shipping lines and that sufficient cargo management machines leads to faster turn-round time of vessels. Chu (2012) investigated the effect of logistics on economic growth in China from 1993-2007 using a panel data approach of GMM. The study found a positive and significant effect between logistics industry investments that include storage, mail, transportation, and communications on economic growth. The study concluded that logistics investments were higher in continental provinces of China compared to coastal provinces.

1.3 Research Methods

Model Specification

The study adapted the model of Uma, Ogbonna, and Aniagolu (2014) which showed how road, railway, airway and waterway transportation affect economic growth. The functional form of the model is stated below

RGDP= f (RT, RW, AW, WW))…………………..……..………….(i)

Where; RGDP = Real gross domestic product, RT = Road transport output, RW = Railway outp ut, AW = Airway output and WW = Waterway output .

However, in order to achieve the aim of this study the model is re-modified to capture the interac tion of means of transportation with the inclusion of trade openness which make the study differs and unique compared to others studies. The functional and linear modified models for this study are specified below:

$$RGDP = f(TRANC, WAW, AIW, OPEN) \quad \text{(ii)}$$

$$lnRGDP = \beta_0 + \beta_1 lnTRANC + \beta_2 lnWAW + \beta_3 AIW + \beta_4 OPEN + \mu_t \quad \text{(iii)}$$

Where: *ln*RGDP = Natural log of Real gross domestic product (Proxy for economic growth) an d *ln*TRANC = Natural log of Logistic efficiency (interaction of transportation output and comm unication as proxy for Logistic efficiency) the data were sourced from Central Bank of Nigeria S tatistical Bulletin 2018 while *ln*WAW=Natural log of Waterway output that represents the yearl y output of Nigeria waterway AIR = Airway output which also stands for yearly output of Nigeri a airway and OPEN= Trade Openness measures of the sum of imports and exports of goods and services divided by gross domestic product in constant prices were sourced from Word Bank De velopment Indicator, 2018

A *priori* expectation

$\beta_1>0$, $\beta_2>0$, $\beta_3>0$, $\beta_4> 0$ or $\beta_4> 0$

The study adopted Dynamic Ordinary Least Squares (DOLS) technique to examine the effect of l ogistics efficiency on economic growth in emerging economies using Nigeria as case study from 1981-2018 over the period of 37 years. Descriptive statistics test was used to know the magnitud e of average variables in the model while Phillip Peron (PP) and Augmented Dickey Fuller (ADF) unit root test were used to test for the stationarity of the series. The Johansen Co-integration test was used to test for co-integration amongst the variables identified in the model

1.4 Data Analysis and Interpretation of Result

Table 1.4.1: Descriptive Statistics

	AIR	*ln*TRANC	*ln*WAW	OPEN	INRGDP
Mean	22.98256	0.364415	0.336193	0.063038	4.449360
Median	7.694427	0.482113	0.341338	0.008060	4.351205
Maximum	105.8625	1.954377	0.974495	0.284740	4.839000
Minimum	0.692354	-1.497930	-0.138454	0.000661	4.139226
Std. Dev.	31.40589	1.089462	0.339420	0.090003	0.238413
Skewness	1.504267	-0.410578	0.264260	1.351366	0.393016
Kurtosis	3.877996	1.775019	1.909847	3.570628	1.696231
Jarque-Bera	15.14249	3.352933	2.262807	11.76350	3.573061
Probability	0.000515	0.187034	0.322580	0.002790	0.167540
Sum	850.3546	13.48334	12.43913	2.332424	164.6263
Sum Sq. Dev.	35507.87	42.72942	4.147409	0.291617	2.046264
Observations	37	37	37	37	37

Source Researcher's Computation, 2019

Table 1.4.1 shows the descriptive statistics of real gross domestic product, logistic efficiency (*ln*TRANC), log of waterway output (*ln*WAW), airway output (AIR) and trade openness (OPEN). From the descriptive statistics result above airway output has the highest mean value (22.98256), follow by real gross domestic product (4.449360), logistic efficiency (0.364415), waterway output (0.336193) and trade openness (0.063038) with the lowest mean value. This implies that airway output has the highest central values of a discrete set of number, follow by real gross domestic product, logistic efficiency, waterway output and trade openness.

The median value also reveals that airway output has the highest median value (7.694427), follow by real gross domestic product (4.351205), logistic efficiency (0.482113), waterway output (0.341338) and trade openness (0.008060). This finding implies that airway output has the highest mean distribution, follow by real gross domestic product, logistic efficiency, waterway output and trade openness.

Furthermore, airway output (105.8625) is seen to have the highest maximum value while trade openness has the lowest maximum value, having its value as 0.284740. Real gross domesti

c product has the highest minimum value with a value 4.139226; while waterway output has the l owest minimum value (-0.138454). Also, it was revealed that the selected variables are skewed t o the right and left. From the table above airway output has a standard deviation value (31.40589), logistic efficiency (1.089462), waterway output (0.339420), real gross domestic product (0.238 413) and trade openness (0.090003). The finding for the standard deviation implies that airway o utput has the highest values around the mean, follow by logistic efficiency, waterway output, real gross domestic product and trade openness.

Also, the finding from Descriptive statistics Table reveals that airway output, waterway output, real gross domestic product and trade openness are skewed to the right; while logistic effi ciency is skewed to the left. Finally the Jarque-Bera test statistics for testing whether the series is normally distributed shows that real gross domestic product, logistic efficiency and airway outp ut are normally distributed, since their corresponding p-value is greater than 5%.

Augmented Dickey Fuller (ADF) Unit Root Test

This study applied test of Augmented Dickey Fuller to check the stationary in the variable s. The ADF test decision rule state that the test statistic must be largely negative, that is, it must b e greater than or equal to its critical values in absolute term before one can accept stationarity at 5% critical value.

Table 1.4.2: Augmented Dickey Fuller Unit Root Test

Variable	ADF at Level	ADF at First Difference	5% critical value	Level	S/NS
AIR	/1.599680/	/4.390064/	/2.976263/	I(1)	S
*ln*TRANC	/1.481023/	/7.971481/	/2.948404/	I(1)	S
*ln*WAW	/1.480415/	/6.918579/	/2.948404/	I(1)	S
OPEN	/2.139566/	/9.859401/	/2.945842/	I(1)	S
INRGDP	/0.058745/	/3.432149/	/2.945842/	I(1)	S

Source: Researcher's Computation (2019)

From Table 1.4.2, the findings inferred that real gross domestic product, logistic efficien cy, waterway output , airway output and trade openness (OPEN) were not stationanary (NS) at l evel since their t-statistics are not greater than the critical values at 5% level of significance in a bsolute term. But at first difference, finding revealed that real gross domestic product, logistic eff iciency, waterway output, airway output and trade openness were stationanary. Therefore, this im plies that all the variables are not characterized with unit root problem.

Table 1.4.3: Phillip Peron (PP) unit root test

Variable	Phillip Peron at Level	Phillip Peron at First Difference	5% critical value	Level	S/NS
AIR	/0.208238/	/3.602588/	/2.948404/	I(1)	S
*ln*TRANC	/1.463499/	/9.256928/	/2.948404/	I(1)	S
*ln*WAW	/1.073183/	/6.886368/	/2.948404/	I(1)	S
OPEN	/2.831610/	/9.606290/	/2.945842/	I(1)	S
INRGDP	/0.741115/	/3.278761/	/2.945842/	I(1)	S

Source: Researcher's Computation (2019)

Table 1.4.3 shows the results of Phillip Peron (PP) unit root test. The findings reveal that real gross domestic product, logistic efficiency, waterway output, airway output and trade openn ess were stationanary (S) at first level difference using 5% level of significance. Since their first difference statistics were greater than the critical values at 5% level of significance in absolute te rm /3.602588/>/2.948404/,/9.256928/>/2.948404/,/6.886368/>/2.948404/, /9.606290/>/ 2.94584 2/ and /3.278761/>/2.945842/. Therefore, under Phillip Peron (PP) unit root test, all the variable s were stationanary (S) at first level difference.

Co-integration Result from the Model

This study tested whether the variables in the model are co-integrated by comparing the T race Statistics and Max-Eigen respectively with critical values at 5% level.

Table 1.4.4: Johansen Co-integration Test

Trace Max-Eingen Statistics	Max-Eingen Statistics

H_0	Trace Statistics	Critical value at 5% level	Prob	Max-Eingen Statistics	Critical value at 5% level	Prob
r = 0	129.0748	69.81889	0.0000**	82.85016	33.87687	0.0000**
r = 1	46.22459	47.85613	0.0706	23.72119	27.58434	0.1448
r = 2	22.50340	29.79707	0.2713	16.56558	21.13162	0.1935
r = 3	5.937815	15.49471	0.7029	5.921181	14.26460	0.6234
r = 4	0.016634	3.841466	0.8973	0.016634	3.841466	0.8973
Trace test indicates 2 cointegratingeqn(s) at the 0.05 level, Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level; denotes rejection of the hypothesis at the 0.05 level ***** indicates statistically significant***						

Source: ***Researcher's Computation (2019)***

The result for Johansen Co-integration test is presented in Table 1.4.4**.** The findings shows that, the co-integration between real gross domestic product, logistic efficiency, waterway output, airway output and trade openness at None (r = 0), This implies that both the Trace and Maximal Eigen value test statistics rejected the null hypotheses of (r =0) co-integrating vector leading to the conclusion that co-integrating vectors occurred among the variables, since co-integrating vector could not be rejected at 5% level of significance. Therefore the findings from the study showed a long- run relationship between real gross domestic product, logistic efficiency, waterway output, airway output and trade openness.

Result of Dynamic Least Squares (DOLS)

Table 1.4.5: Dependent Variable: Real gross domestic product (*ln*RGDP)

Regressor variable	Coefficient	Std. Error	t-Statistic	Prob.
AIR	0.006918	0.000570	12.14506	0.0000**
*ln*TRANC	0.091319	0.015295	5.970698	0.0000**
*ln*WAW	-0.371139	0.089077	-4.166517	0.0006**
OPEN	1.006956	0.120562	8.352177	0.0000**
C	4.274502	0.013608	314.1233	0.0000**
R-squared	0.996906			
Adjusted R^2	0.993993			
***** indicates statistically significant***				

Source: Researcher's Computation (2019)

The coefficient value of airway output is 0.006918 and significant at 5% level with corres

ponding p-value of 0.0000. The implication of positive relationship means that 1% increase in air way output (holding other variables constant) brought about 0.69% increase in real gross domesti c product within the years under review. The magnitude and positive sign of the co-efficient of th e airway output was in consonance with the *study a priori* expectation formulated in the model. I n the case of airway output , it effect on economic growth implies that the higher the airway out put, the more the tax rate on individual and goods via through airway, therefore making funds av ailable for government to provide socio-amenities.

The coefficient of logistic efficiency (TRANC) is 0.091319 which is also positive with p-value of 0.0000. This means that 1% increase in logistic efficiency brings about 9.13% increases in real gross domestic product. The coefficient of logistic efficiency is positive and shows that th ere was direct relationship between logistic efficiency and real gross domestic product in Nigeria . The economic implication of the findings is that as there is improvement in logistic efficiency i n Nigeria, so does the country experience more economic growth .The magnitude and positive si gn of the co-efficient of the logistic efficiency agrees with the study *a priori* expectation in the m odel. The findings corroborated the studies of Ighodaro (2009), Uma, Ogbonna, Benson and Hya cinth (2014) and Sevgi and Tezcan (2017) that established positive links between logistic efficie ncy and economic growth, and concluded that logistic efficiency revenue enhance economic gro wth through continuous provision of funds for Nigerian government, this serves as an essential to ol to increase capital accumulation in both short-run and long run. Therefore, have a multiplier ef fect on the economy.

The coefficient of waterway output is -0.371139 which is also negative with p-value of 0. 0006, which is statistically at 5% significance level. This means 1% increase in waterway output brings about 37.1% decreases in real gross domestic product. The negative sign of the waterway

output negates the the study *a priori* expectation. Victor (2015) attributed this to piracy and unde r-estimated of waterway output in Nigeria by custom officers.

Finally, the coefficient of trade openness is 1.006956. This indicates a positive and signifi cant effect on real gross domestic product. It shows that a unit increase in trade openness causes about 1.0 unit increase in real gross domestic product. The economic implication of this is tha t Nigerian embrace or encourages liberalization through the process of removing trade barriers a nd allowing free trade which increase economic growth.

The value of the adjusted R^2 for the model is pegged at 0.996906 or 99.7%, which implie s that logistic efficiency, waterway output, airway output and trade openness explained about 99. 7 % systematic variation on real gross domestic product over the observed years in the Nigeria ec onomy while the remaining 0.3% variation is explained by other variables outside the model.

Diagnostic Checks for the Ordinary Least-Square Model

Autocorrelation Test of the Model

According to the correllogram residuals test of serial correlation, the null hypothesis of n o serial correlation is tested against the alternative hypothesis of serial correlation. In other to ver ify the status of serial correlation in the model, the probability value is observed. When the proba bility value is greater than 5% we accept the null hypothesis that there is no evidence of serial co rrelation in the model.

Table 1.4.5: Autocorrelation Test

Included observations: 34						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.085	-0.085	0.2689	0.604
**| . |	**| . |	2	-0.245	-0.254	2.5598	0.278
.*| . |	.*| . |	3	-0.138	-0.200	3.3080	0.347
. | . |	.*| . |	4	0.026	-0.089	3.3361	0.503
.*| . |	.*| . |	5	-0.066	-0.184	3.5205	0.620
.*| . |	**| . |	6	-0.184	-0.316	5.0006	0.544

. |*** |	. |** |	7	0.359	0.233	10.845	0.146
**| . |	***| . |	8	-0.212	-0.396	12.957	0.113
. | . |	. | . |	9	0.000	0.023	12.957	0.165
. | . |	.*| . |	10	0.007	-0.117	12.960	0.226
. |*. |	. | . |	11	0.156	0.032	14.253	0.219
. | . |	.*| . |	12	-0.054	-0.101	14.415	0.275
.*| . |	. | . |	13	-0.136	-0.001	15.490	0.278
. |*. |	.*| . |	14	0.095	-0.202	16.042	0.311
.*| . |	. | . |	15	-0.141	-0.029	17.330	0.299
. |*. |	.*| . |	16	0.086	-0.127	17.839	0.333
*Probabilities may not be valid for this equation specification.						

Source: Researcher's Computation (2019)

The finding shows that the probability values are greater than 0.05 levels of significance w hich imply that the null hypothesis of no serial correlation is accepted. Hence, this requires the ac ceptance of null hypothesis and therefore concludes that the model has no serial correlation.

Normality Test for Residual

Figure 1: Histogram Normality Test for Residual

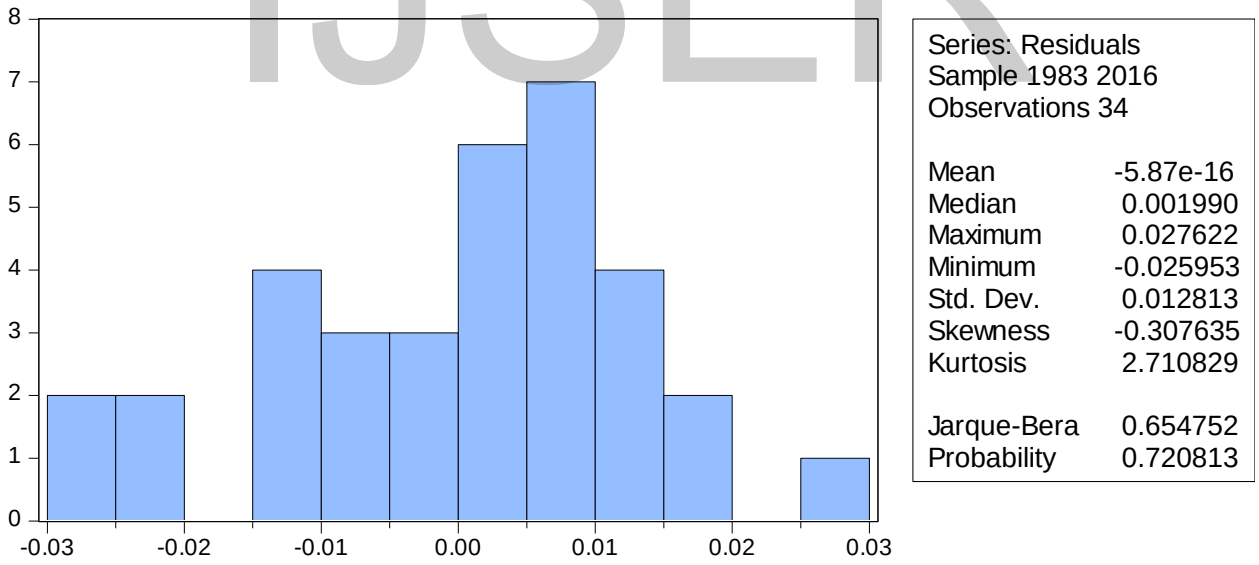

Figure 1 shows the histogram normality test for the residual, where the coefficient of Jarg uebera (0.654752) with a corresponding p-value of 0.720813 which is greater than 5%. Since the corresponding p-value is greater than 5%. The residual of the model is normally distributed.

1.5 Conclusion and Recommendations

The study concludes that logistic efficiency, airway output and trade openness stimulates economic growth in Nigeria, while waterway output depresses it. Based on the result, governmen t should keep investing sufficient resources into logistic sector through yearly budget into the sec tor. Empirical finding has established a positive and significant relationship between logistic effi ciency and economic growth which implies that the sector is capable of stimulating economic gr owth even if it means deficit financing. This shows that the sector is capable of servicing debt ob ligation of productive sector. Nigerian government should put in place policies that would encour age domestic and foreign investors in investing in logistic sector. Government alone does not hav e the required funds to enlarge and increase manpower skilled in the sector, therefore governmen t must provide conducive environment in order to attract and sustain investment in the sector. G overnment must put measurements in place in order to reduce piracy and under-estimation of wat erway output in Nigeria to barest minimum: There is urgent need to put in place stringent measur ements such as rule of engagement to check-mate continuous rise in piracy and other vices on Ni gerian water ways.

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