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DIFFUSION OF CONTAINER PACKAGING METHOD INTO THE NIGERIAN TRANSPORT SYSTEM

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ABSTRACT

The study examined the diffusion of container method of packaging for the period 1968 – 2005 in Nigeria with a view to adopting the method in the Nigerian Transport System. This was done by collecting a comprehensive data set of import and export container traffic from seven selected ports in Nigeria. These are Apapa Bulkship terminal; AP Molers terminal, Ro-Ro terminal, Tin Can Island, Delta Port, Rivers Ports and Calabar Port. The collected data were used to determine the trend of import and export container traffic in the seven ports. The logistic S-curve model was then used to determine the pattern of adoption of the container packaging method in the studied ports. The curve fits were used to establish the relationship between the observed trend and the logistic trend of container traffic. The results showed that the take-off stage for import and export container traffic fell between 1968 – 1975 the diffusion stage between 1976 – 1993 while the saturation stage fell between 1993 – 2005. The logistic S-curves using the least square method of estimation showed that AP Molers terminal in Lagos and Calabar Ports had the strongest diffusion of container packaging in Nigeria.

Keywords: Diffusion process, Containerisation, Transport system, Import traffic, Export traffic.

INTRODUCTION

Development in global transport system is dynamic. Barry *et al.* (2002) used transport scenario to describe globalisation in transport system. Transport scenario is seen as a picture of future trend in transport within the pre-specified framework of movement of goods and persons. There are four basic variables identified by Barry *et al.* (2002) to evaluate the scenario. These are spatial organisation, distance, technology and modal split. Spatial organisation is evaluated based on globalisation of production and consumption, importance of ports and concentration of trade within a region. The distance variable is considered in terms of major or minor increases in average distance which can be measured through the cost of transport. Technological development is the

innovation and improvement in transport technicalities, planning and management such as Containerization, Information and Communication Technology. Modal .split is the growth of inter-modal transport such as the trend of traffic recorded for road, rail, air and shipping. All these variables change from time to time and in space. Countries all over the world strive to meet this changing trend by investing significantly in the provision of transport infrastructures to accommodate intermodal operation.

Transportation requires an integrated systems approach, to form a seamless transportation outfit in this age of globalisation. This is achievable only with an effective and efficient Multimodal Transport Operation, which in itself is a coordinated system of transport that offers connectivity to all modes of transport. In freight movement, connectivity of modes requires effective methods of packaging that is compatible with all modes and this is offered by container packaging method.

Unfortunately, transport studies in Nigeria in the past have paid less attention to this important aspect of freight transport. For example, Ogundana (1970) examined the interregional flow of large tonnage of freight which flow from Lagos to Western, Mid-Western and Northern states of Nigeria after breaking of bulk cargoes but the packaging methods of these cargoes were not considered. In the same vein, Onakomaiya (1970) studied the spatia1 structure of internal trade in delicacy foodstuff in Nigeria, while (Ogunsanya, 1979) examined the spatial aspects of urban freight transport in Lagos metropolis without examining the packaging methods commonly used in transporting these freights. These studies focused on interregional, inter-city or intra-city freight flow in Nigeria and in fact, most of these studies were a follow- up to Hay and Smith's work of (1970), which are concerned with the identification of the relationship between freight flow variables and the examination of interregional complementarities and urban dominance in the analysis of interstate trade (Ogwude, 1997).

A study on the trend of containerization in Nigeria is important for several reasons. Among such reasons is the fact that containerisation as a diffusion process possesses a distinct pattern of expansion both at global and national levels. A1so, it has changed the face of freight transport in that transferability has been more facilitated across modes (Brian *et al*, 1998). Containerisation facilitates multimodal transport operation. Multimodalism as a practice in Transport emerged in response to the changing marketing and distribution requirements for moving different types of cargo, and the need to reduce total transport cost in order to remain competitive in the global market. In recognition of this, the United Nations Convention on Trade and Development (UNCTAD) observed that the planning requirement for Multimodal Transport (MT) concept is the integrated approach to transport. All modes of transport need to be integrated in a complementary manner in order to achieve effective multimodal practice and better productive level of performance for transport.

One of the essential tools for effective inter-modal co-ordination is modal connectivity which is the ability of modes to adapt freight to each other without necessarily changing the loading unit. Unfortunately, this connectivity is seriously deficient in Nigeria transport system because container revolution which is an important instrument to which modal connectivity has been made possible is still not largely in use. Nigeria is extremely slow in tuning its transport system to imbibe the technology of containerisation. For example, container handling equipment and facilities at the ports are inadequate, while the rail and road networks are poorly prepared for container traffic innovation. The port congestion in Nigeria is often associated with the inability of the port to adapt port freights conveniently to other modes, resulting in un-stuffing of cargo in general form. This situation which started from the late 1970's and resulted in the building of purposefully built container terminal in Lagos can still be observed up till today.

Theoretical Framework

Diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. Everett Rogers, a professor of rural sociology, popularised the theory in his 1962 book titled *Diffusion of Innovations.* He said diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system.

In the book, Rogers synthesized research from over 508 diffusion studies and produced a theory for adoption of innovations among individuals and organizations. The book proposed 4 main elements that influence the spread of a new idea: the innovation, communication channels, time and a social system. That is, diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Rogers (1983) defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption". A communication channel is "the means by which messages get from one individual to another". The innovation-decision period is the length of time required to pass through the innovation-decision process". Rate of adoption is the relative speed with which an innovation is adopted by members of a social system. A social system is defined as a set of interrelated units that are engaged in joint problem solving to accomplish some goals.

Within the rate of adoption, there is a point at which an innovation reaches critical mass. This is a point in time within the adoption curve that enough individuals have adopted an innovation in order that continued adoption of the innovation is self-sustaining. Rogers defines several intrinsic characteristics of innovations that influence an individual's decision to adopt or reject an innovation. These are *Relative advantage* factor which is how improved an innovation is over the previous generation. The second factor he terms *compatibility* which is the level of compatibility that an innovation has to be assimilated into an individual's life. The third factor is *complexity or simplicity* and states that if the innovation is perceived as complicated or difficult to use, an individual is unlikely to adopt it. The fourth factor termed *Triability* describes how easily an

innovation may be experimented. If a user is able to test an innovation, the individual will be more likely to adopt it. The fifth and final factor is *observability* which is the extent that an innovation is visible to others. An innovation that is more visible will drive communication among the individual's peers and personal networks and will in turn create more positive or negative reactions. Further, Rogers suggests a total of five categories of adopters in order to standardize the usage of adopter categories in diffusion research. The categories of adopters, according to innovateness are innovators (venturesome), early adopters (respectable), early majority (deliberate), late majority (skeptical) and laggards (traditional) (Rogers, 1995).

Roggers also recognised the earlier work of the French sociologist, Gabriel Tarde who attempted to explain why some innovations are adopted and spread throughout a society, while others are ignored. In his book *The Laws of Imitation* (1903), Tarde introduced the S-shaped curve and opinion leadership, focusing on the role of socio-economic status. Even though he did not specify and clarify key diffusion concepts, his insights affected the development of many social scientific disciplines such as geography, economics and anthropology.

Many scholars have also supported Tarde's work. For instance, Fisher and Pry (1971) found that the adoption of an innovation follows an S curve when plotted over a length of time. Sociologist F. Stuart Chapin, for example, studied longitudinal growth patterns in various social institutions and found that S-shaped curves best described the adoption of phenomena such as the commission form of city government (Lowery and Defleur, 1995). In his work titled "The Geographical Structure of Epidemics", Haggett (1972) describes Epidemics as a Diffusion process and used S-shaped curve to depict the process. Also, Aderamo (2004) in his study of the growth of Ilorin, Nigeria found that the pattern of growth could best be described by the S-shaped curve or logistic curve (see also (Turner, 1974; Alokan, 1993). In an attempt to examine the diffusion of container innovation in Nigeria, this study uses the logistic S-curve to estimate the rate of adoption of container in-flow into the country.

MATERIALS AND METHODS

The data required for this study are the total volume of container traffic in all Nigerian ports for the period 1968 – 2005, volume of container traffic of each selected ports from 1985 – 2005, volume of freight transported by containers from each port for 1985 – 2005. Data on origin and destination of containers at in and out of selected ports.

Seven ports and terminals were selected for traffic and freight of container transported. These are ports and terminals that handle containerised cargo among the 4 port complexes in the country. These are Lagos complex comprising of Apapa Bulk Terminal; Apapa container terminal; Tin can island port and Ro-Ro terminal. The second is the Delta complex comprising of the Warri port

while the third is the Rivers complex comprising of Port-Harcourt and Onne port. The fourth is the Calabar complex comprising of Calabar port. These are shown on Figure 1.

These ports are strategic because they have regional spread especially along the coastal areas and deep enough to accommodate considerable size of container ships. Secondly, they handle about 90% of international trade in Nigeria. Data on origin and destination of containers were collected through port gate traffic survey. To do this, the Port Gate Survey of Containers coming in and out of ports and terminals was conducted for the five working days of the week, i.e. Monday, Tuesday, Wednesday, Thursday, Friday.

Descriptive statistical tools were used to analyse the data and presented in graphic and tabular forms. The linear regression method and time series analysis methods were used to determine the periodic changes in container traffic in Nigeria. Both inward and outward container traffic were subjected to the logistic S-curve analysis and the actual and observed values were compared in order to establish the proportion of container adoption over time.

RESULTS AND DISCUSSION

Trend of Total Import and Export Container Traffic at all Ports

The trend in the total export and import container traffic at all Nigerian ports for the period 1968 – 2005 is as depicted by the graph on Figure 2.0. The trend indicates a steep increase with occasioned declines in both import and export. While the import traffic started with just 182 TEUs of containers in 1969 constituting about 0.0054% of the total traffic for 36 years, the traffic increased steadily to about 248,393 TEUs in 2005 representing 7.42 per cent of the total. Export of containers did not start until 1972 when 34 TEUs containers were transported out of the shore of Nigeria. By 2005, export traffic containers had reached about 177,938 TEUs representing 6.29 per cent of total export traffic.

Three stages in the growth of import containers in Nigeria can be identified between 1969 and 2005. The first stage is the stage of slow increases from 1969 – 1975. This stage witnessed slow adoption before a steady increase was witnessed. This could be attributed to the fact that the technicality for transporting containers was not yet in place at the Nigerian ports as of the time. Secondly, the land haulage system was also not in conformity with container technology, hence many shippers preferred to use bulk shipping rather than containers.

The second stage was a smooth growth between 1976 – 1993 with occasional declines between 1981 to 1989. The period witnessed occasional surge without any significant increases above the preceding years. This period correspond with the periods of economic decline, inflation and the Structural Adjustment Programme (SAP) in Nigeria. This affected the purchasing power and Gross Domestic Products in Nigeria which advertently had implications on foreign exchange.

The last stage was a stage of continuous increases in the traffic which was witnessed from 1993 – 2005. This period correspond to an era of democratic rule in Nigeria when foreign investment started coming into the country after decades of military rule. Also, the improvement in the per capita income occasioned by increased salary and wages must have improved the purchasing power of Nigerians and increased the import trade.

Three stages in Export container traffic can also be identified in Nigeria. The first stage witnessed steady increases with occasional decline from 1972 to 1993. Figure 2.0 shows that from 1972 when the first batch of 34 containers were exported out of Nigerian shore till 1993 there were increases with insignificant decline from time to time. This scenario is expected especially considering the fact that as more containers flow into the country, more are likely to flow out as export.

The second stage in the growth of export container traffic was short and it was a stage of sudden decline between 1994 – 1996. The last stage was that of sporadic increases from 1997 – 2005. Figure 2.0 shows that there have been increases in the export of containers from 1997 to 2005.

Traffic at Apapa Bulkship Port

The total import and export traffic at Apapa Bulkship port between 1985 – 2005 is as shown on Fig. 3.0. The import container traffic had significant increases of between 7.2 per cent and 13.3 per cent between 1985 – 1993. However, between 1994 – 2005 import container traffic experienced declines of about 4.4 per cent. This could be attributed to the commencement of operation of the special built container terminal at Apapa. Prior to this time Apapa bulk terminal served as a multipurpose port which handled both containers and general cargoes. From 1994 to 2005, there were no appreciable increases in import container traffic except haphazard and insignificant increases recorded in 1995 and 2005.

The export container traffic at Apapa Bulkship port for 1985 – 2005 is as shown on Fig. 3.0. The graph shows that there were haphazard and insignificant increases and decreases between 1985 – 1993. The percentage contribution between 1994 – 2005 was less than 2.5 per cent of the total traffic. The most insignificant contribution was recorded in the year 2000 with just 22 containers. The decline recorded from 1994 can be attributed to the diversion of containers from Apapa Bulkship port to AP Moler (Container terminal) which was constructed purposely to handle containerized cargoes.

Traffic at AP Molers Terminal

Figure 4.0 shows the import and export container traffic at AP Molers Terminal at Apapa between 1994 and 2005. The port started operation officially in 1993 as Container Terminal before it was concessioned to AP Molers subsidiary of Meask Sealine, a leading container shipping company in Nigeria. The graph shows that between 1994 – 2005, import container traffic experienced steep increases at the Terminal. The lowest traffic of 43,717 TEUs constituting 2.94 per cent of total

import container traffic was recorded in 1994 when the Terminal started operation while the highest traffic of 210,897 TEUs constituting 14.16 per cent of total import traffic was recorded in 2005. These steady increases can be attributed to diversion of containers from other ports in Lagos area to the Terminal, most especially as the only terminal which specialises in containerised cargoes. Also, the increases recorded between 2003 – 2005 were as a result of the concession policy of the Federal Government.

The trend in the export container traffic of AP Molers Terminal shows a steady growth between 1996 – 2005. There was however a slight decline in year 2000 and 2004 when compared with previous years. The steady increases can be attributed to the Port's specialisation in containerised cargo.

Traffic at Ro-Ro Port

The Import and Export Container Traffic at Ro-Ro Port for 1985 – 2005 is as shown on Figure 5.0. The total containerised cargoes imported through the port amounted to 552,768 TEUs between 1985 – 2005. 1992 received the highest amount of 48,173 TEUs representing 9.21 per cent of total imported container traffic which was followed by 1991 with imported container traffic of 39,489 TEUs constituting 7.55 per cent of total import traffic. From 1992 – 2005, there were fluctuations in imported container traffic with the lowest value of 10,903 TEUs constituting 2.09 per cent of total import traffic. The commencement of operation at AP Molers Terminal at Apapa can be said to have accounted for the decline in the containerised cargo at the port.

The export container traffic at the Roro port shows fluctuations in the traffic between 1985 – 1991. A significant increase was recorded in 1992 when export traffic attained a value of 11.24 per cent of total traffic. The port started after 1993 to record significant decline in traffic until 2002 when it recorded the lowest traffic of 1.21% of total export traffic.

Traffic at Tin Can Island Port

Figure 6.0 shows the import and export container traffic at Tin Can Island Port between 1985 – 2000. There was almost a parallel trend between import and export traffic within this period. The import container traffic shows that the percentage contributions of each year to the total traffic ranges from 2.4 per cent to 4.56 per cent. However between 2001 and 2005, there were steady increases of between 5.83 per cent and 14.18 per cent.

The increases in container traffic from 2001 can be attributed to the inability of the AP Molers at Apapa to cope with increasing container traffic in the Lagos Port complex and as such traffic is often diverted to other ports around Lagos area, more so Tin Can Island port has capacity to handle container traffic.

The export container traffic at Tin Can Port between 1985 – 2005 as shown on Figure 6.0 shows an inconsistent trend with occasional fluctuations. Comparing both import and export container traffic, there was generally lower traffic for export than import.

Traffic at Delta Port

The trend in the import container traffic at Delta Port between 1985 – 2005 is as shown on Figure 7.0. The graph shows that import container traffic at the port has been inconsistent with intermittent increases and decreases. The lowest contribution of traffic amounting to 2.85 per cent of total import traffic was recorded in 1989 while the highest contribution amounting to 7.46 per cent was recorded in 2002.

The export container traffic as shown on Fig. 7.0 indicates that between 1985 – 1995, there were improvements in the traffic. Percentage contributions of 11.66 per cent and 5.39 per cent were recorded as the highest and lowest traffic in 1985 and 1995 respectively. From 1996 to 2005 there were clear indications of service decline in export container traffic. The decline in the export traffic between 1996 – 2005 is due to the shallow water of the ports which prevented bigger container vessels to berth at the port over the period.

Traffic at Rivers Ports

Import container traffic at Rivers Ports comprising Port Harcourt and Onne Ports is as shown on Fig. 8.0. Between 1985 – 1992, there were fluctuations in import container traffic with occasional increases. 1992 recorded 6.3 per cent contribution which was the highest between 1985 – 1992. There were declines after the 1992 increase and this persisted till 1998 when the trend improved. Year 2000 recorded 8.75 per cent contribution in import traffic after which there were unprecedented declines between 2001 and 2002.

The trend in export container traffic at Rivers Ports shows three distinct regimes between 1985 – 2005. The first was dominated by a steady decline from 5.15 per cent of total export container traffic in 1985 to 3.32 per cent in 1989. The second regime started with 7.10 per cent contribution in 1990 which started declining the following year but steady at between 5.93 per cent and 4.45 per cent and this regime terminated with further increases in 1999. The third regime started in 2001 with 14.32 per cent and the highest percentage contribution recorded. However, sharp declines were recorded between 2002 to 2005 with the lowest traffic of 0.96 per cent contribution in 2004.

Traffic at Calabar Port

The trend in import container traffic at Calabar Port is as shown on Fig. 9.0. The graph is of a wave form which clearly indicates an inconsistent trend. For example, between 1985 and 1988 there were increases of up to 8.12 per cent contribution of total import traffic. However, between 1989 and 1991, the traffic declined to 2.35 per cent. Also, 1992 – 1994 witnessed another era of increase in traffic, while 1996 and 1997 recorded the lowest traffic. Another era of increase in import traffic

was between 2003 and 2005 when the highest percentage contribution of between 7.08 per cent and 15.0 per cent were recorded.

The export container traffic at Calabar Port between 1985 – 2005 shows that apart from 1988 which recorded a percentage contribution of 10.5 per cent of total export traffic, other years had lower contributions. However, 2003 – 2005 recorded significant increases in export traffic. The graphs of both import and export container traffic taken together show that while there were intermittent fluctuations on import traffic, the export traffic consistently declined especially between 1989 and 2002.

Modelling Container Innovation in Nigeria

In an attempt to examine the trend of container innovation in Nigeria, the Logistic S-curve was used to estimate the rate of adoption of container in-flow into the country. The Logistic S-curve estimation of growth pattern has been used in many studies (Abler *et al.*, 1972; Haggett, 1972; Turner, 1974; Alokan, 1993; Aderamo, 2004). The Logistic S-curve takes the form:

$$P = \frac{U}{1 + e^{(a - bt)}} \quad \text{---------- (1)}$$

where

U = maximum number of adopters (represented by the container traffic)

P = proportion of adopters at different time periods

a = number of adopters at the start of the innovation (Number of containers at the base year)

b = the rate of changes of p with t (regression coefficient)

t = time

e = constant

From equation 1, we obtain

$$P\left(1 + e^{(a - bt)}\right) = U \quad \text{---------- (2)}$$

$$P + P\,e^{(a - bt)} = U \quad \text{---------- (3)}$$

$$P\,e^{(a - bt)} = U - P \quad \text{---------- (4)}$$

$$e^{(a - bt)} = U - P/P \quad \text{---------- (5)}$$

Taking the logarithm of both sides of equation (5), we have

$$a - bt = \log_e \frac{U - P}{P} \quad \text{---------- (6)}$$

The constant b in the equation above controls the trend of innovation curve when applied and this can be derived from the method of least squares regression (Abler *et al.*, 1972). In applying the

method, Haggett (1972) observed that low b values describe innovation. Considering Table 1.0, import traffic of container between 1968 – 1975 can be adjudged to fall within the take-off stage considering the proportion of adoption (P), which is far below the actual traffic. However, the period 1976 – 1993 is considered as the diffusion stage, while 1993 – 2005 witnessed saturated or equilibrium stage due to the fact that the logistic values are the same with the actual values from 1993 upwards.

Export traffic is not totally different from import traffic, the only difference is that there was a short period of take off between 1973 – 1977 after which the diffusion stage took off between 1978 – 1993. Saturation or equilibrium stage started from 1994 just like the import container traffic.

The result of the least square regression is indicated for import and export containers in Table 2.0. Comparing the regression coefficient on individual ports, AP Molers terminal had the lowest value, followed by Tin Can Island Port; Rivers Ports, Calabar and Delta Ports. The result obtained for AP Molers indicated a smooth growth of import container over the 11 years used for this study, while the result at Apapa Bulkship terminal and Ro-Ro port indicated high values of 1.359 and 1.037 respectively which confirmed that there was slow build-up initially but later in the middle, the container traffic had explosive in-flow and later there was a serious decline in the traffic at these ports. This further confirmed the low traffic of containers experienced at the port in the recent time. However, comparing the value for all ports in Nigeria which hitherto had low value of 0.927, this suggested a smooth growth of import container innovation over the last 35 years.

The regression of logistic-curve estimation as shown on Table 2.0 for export container traffic is not totally different from that of import containers. As expected, AP Molers had the lowest regression coefficient value of 0.886 when compared with other Nigerian ports, this was followed by Calabar Port with a regression coefficient of 0.965. These values indicate smooth growth in the innovation of export container traffic over the years. However, Delta and Rivers Ports which had lower regression coefficient values for import containers recorded higher values of 1.253 and 1.121 respectively which indicate a slow build up, increased traffic at the middle and is now experiencing a decline. This could be as a result of the crisis in the Niger Delta area of Nigeria which has effect on the shipping activities coupled with over-concentration of shipping activities in the Lagos area.

Figures 10 to 17.0 show the graphs of logistic S-curve estimation for both import and export container innovation in Nigerian ports for the period 1968 – 2005. The graphs depict the relationship between observed trend of container traffic and the logistic trend. From the figures, the observed trend of AP Molers almost follow similar trend for logistic values while other ports indicate a clear deviation between the observed trend and the logistic trend. This further strengthens the earlier result where AP Molers had the lowest regression coefficient value of 0.886 and interpreted to have a smooth growth of container innovation over the years.

Implication for Freight Transport Planning in Nigeria

Freight transport is a catalyst to industrial development and also economic growth of any nation. In this age of globalisation, an effective and efficient transport system is needed to meet the increasing demand for goods across borders and also within a country. These services must be rendered in an integrated manner which enables connectivity of modes. Containerization as a packaging method offers this integrated approach. Apart from being an efficient method of packaging which guarantees inter-connectivity of modes, it can also be used as a surrogate method for measuring the effectiveness of Multimodal Transport Operation in a country.

This study serves as a basis to assess the level of multimodal transport implementation in a developing country like Nigeria. Since container packaging is compatible with all modes of transport excluding pipeline transport, the study recommends the development of intermodal transport in Nigeria which is a pre-requisite to the implementation of multimodal transport across borders. There should be a complete departure from the current monomodal transport whereby only the road mode has dominated freight transportation in the country. To achieve this, transport co-ordination must be given serious attention and all modes should be developed in order to achieve optimum modal connectivity.

CONCLUSION

The study has examined the desirability of adopting the container packaging method in the Nigerian transport system. This has been done by studying the trend of both import and export container traffic at seven selected ports in Nigeria. The flow of container traffic of the selected ports was also found to conform with the Logistic S-curve which is usually used to explain the diffusion process of innovations. The study revealed three stages of container diffusion into Nigerian transport system in both export and import trade. Lagos port, especially AP Molers terminal has been found to have more container traffic than other ports in the country due to its specialisation in container handling. It is therefore recommended that the present policy on port concession of the Federal Government should encourage more container handling terminals among the concessioned ports especially in other geo-political zones in Nigeria. The present situation whereby container traffic concentrates in Lagos port area does not facilitate multimodal transport operation across other regions in Nigeria.

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Table-1. Proportion of Container Adoption

S/N	Years	Import Traffic		Export Traffic	
		Actual Value	Logistic Value	Actual Value	Logistic Value
1	1969	182	5.88	A	-
2	1970	909	70.70	NA	-
3	1971	2513	441.4	NA	-
4	1972	5168	1808.89	NA	-
5	1973	8281	4773.19	34	8.49

6	1974	9490	7352.03	37	16.48
7	1975	15457	13861.54	12009	7922.55
8	1976	24503	23436.63	23049	18990.69
9	1977	43294	42528.49	40565	37263.46
10	1978	63850	63406.16	54149	52232.08
11	1979	80345	80104.69	69902	68855.40
12	1980	86361	86274.73	67535	67112.19
13	1981	80334	80298.67	72302	72114.50
14	1982	81201	81187.20	86306	80115.87
15	1983	84239	84233.19	86306	86267.18
16	1984	66239	66237.21	92117	92099.50
17	1985	81203	81202.11	75821	75815.16
18	1986	71496	71495.70	83677	83674.32
19	1987	82526	82525.86	84363	84360.30
20	1988	62426	62425.96	85391	85390.53
21	1989	100121	100120.97	105479	105478.76
22	1990	109848	109847.99	99486	99485.91
23	1991	134278	134277.99	116954	116953.95
24	1992	111564	111563.99	102842	102841.98
25	1993	85627	85626.99	88470	88469.99
26	1994	94580	94580	76816	76816
27	1995	80857	80857	60005	60005
28	1996	102660	102660	87978	87978
29	1997	183517	183517	103335	103335
30	1998	141594	141594	121105	121105
31	1999	161146	161146	109794	109794
32	2000	190467	190467	167596	167596
33	2001	198778	198778	176641	176641
34	2002	222865	222865	165778	165778
35	2003	232920	232920	141663	141663
36	2004	248393	248393	177938	177938

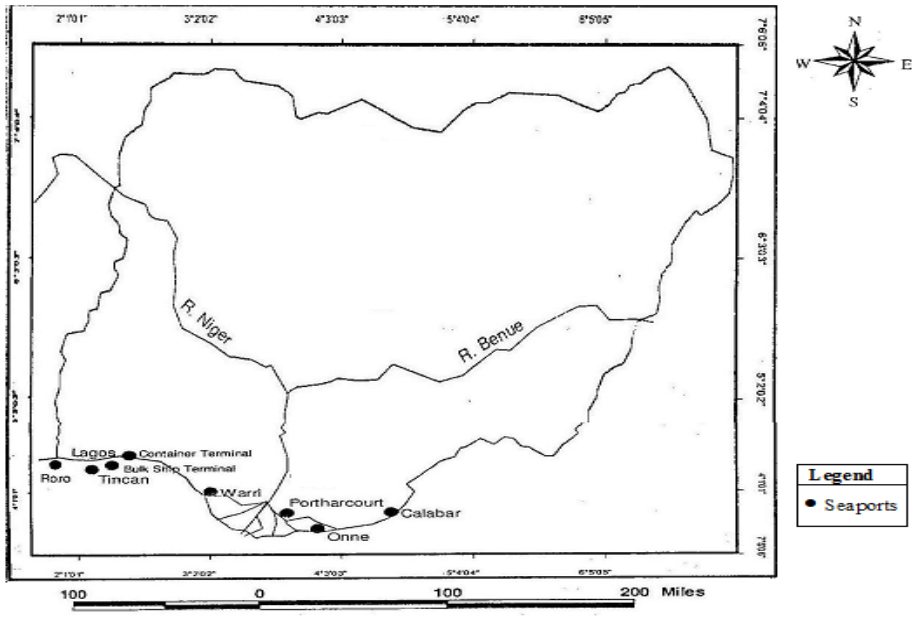
Source*: The Authors*

Table-2. Regression Coefficients for Logistic Curve Estimation

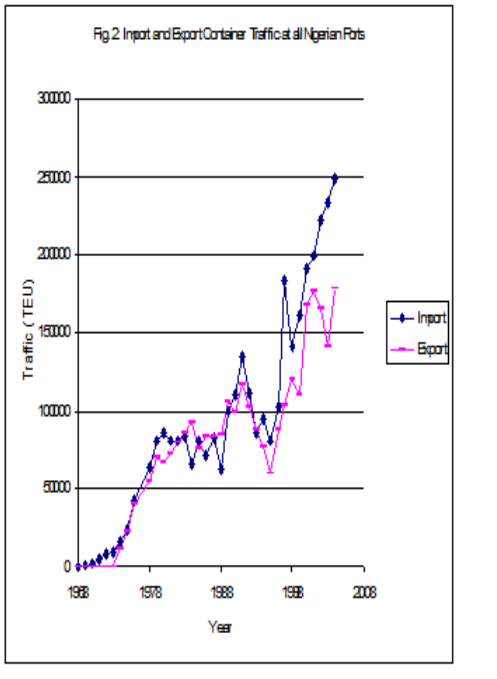
S/No.	**NIGERIAN PORTS**	**IMPORT**		**EXPORT**	
		b	**a**	**b**	**a**
1.	APAPA BULKSHIP TERMINAL	1.359	3.94	1.257	4.03
2.	AP MOLERS TERMINAL	0.862	2.91	0.886	3.0
3.	RO-RO TERMINAL	1.037	1.12	1.079	1.21
4.	TIN CAN ISLAND	0.964	8E+.026	0.965	2E.027
5.	DELTA PORT	0.974	1E+.019	1.253	3.8
6.	RIVERS PORTS	0.983	5E+0.010	1.121	5.72
7.	CALABAR PORT	0.967	3+.026	0.746	3.0
8.	ALL NIGERIAN PORTS	0.927	3.4	0.881	1.1

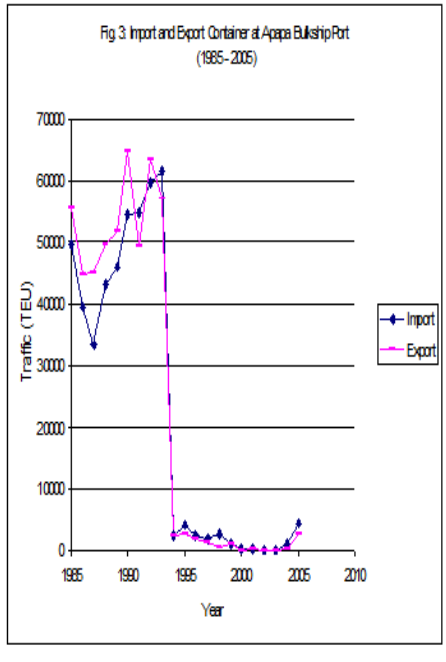
Source*: The Authors*

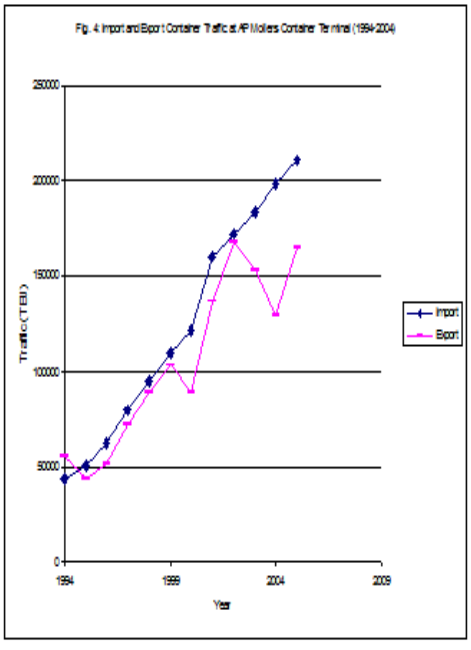
Fig.-1. Map of Nigeria showing the Seaports

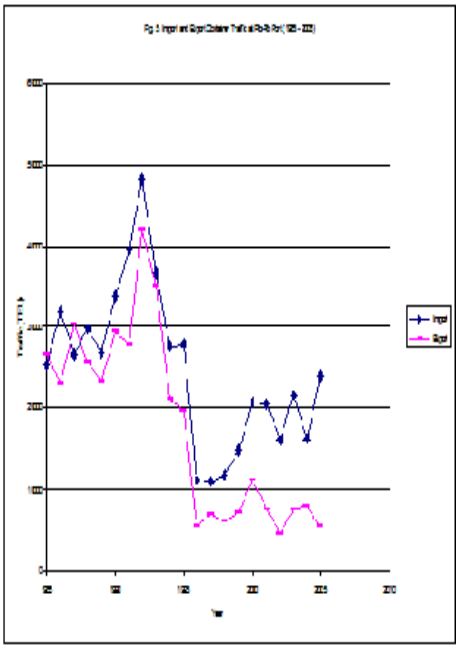


Source: *Adapted from Macmillan Atlas Map of Nigeria*






250000
200000
150000
100000
50000
0
1994
1999
2004
2009
Year
Import
Export


Import
Export

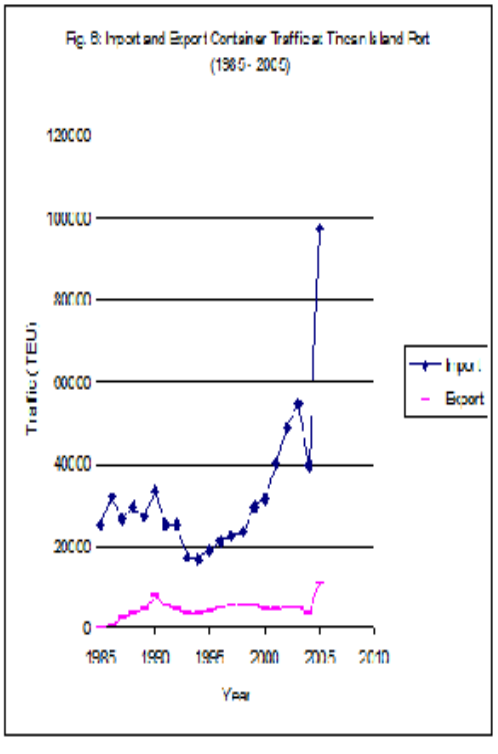


Fig. 8: Import and Export Container Traffic at Tincan Island Port
(1985 - 2005)
120000
100000
80000
60000
40000
20000
0
1985
1990
1995
2000
2005
2010
Year
Export

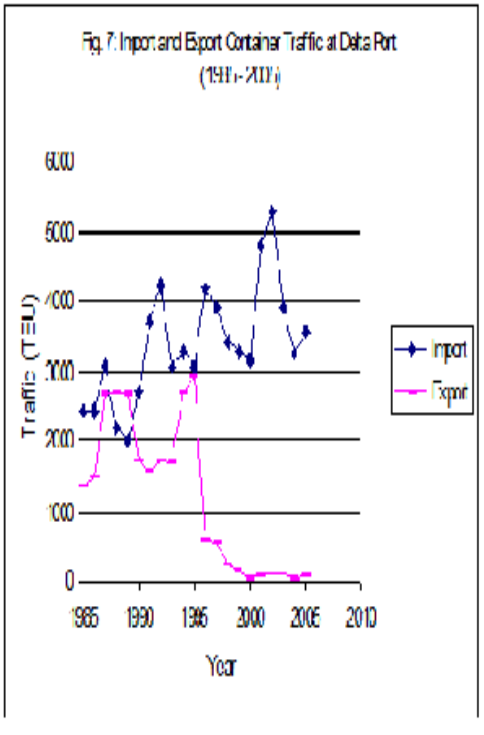


Fig. 7: Import and Export Container Traffic at Delta Port
6000
5000
4000
3000
2000
1000
0
1985
1990
1995
2000
2005
2010
Year
Import

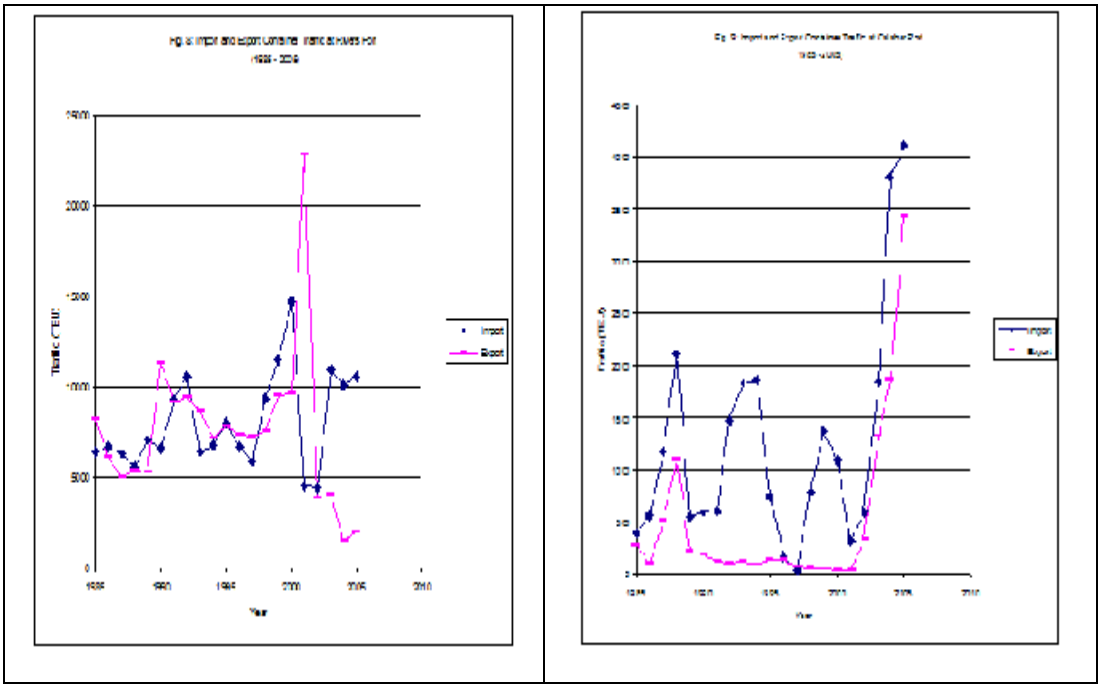


Fig. 10a: Important Traffic at all Nigerian Ports

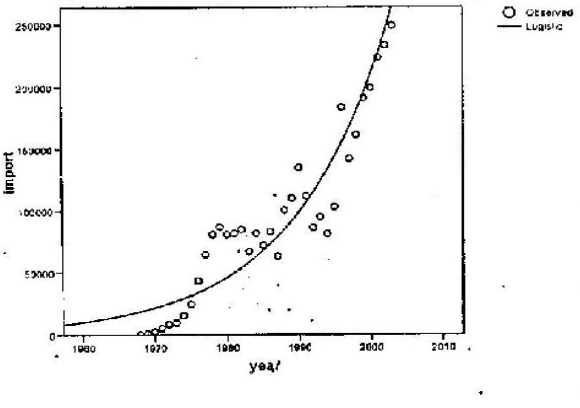


Fig 10b. Export Traffic at all Nigerian Ports

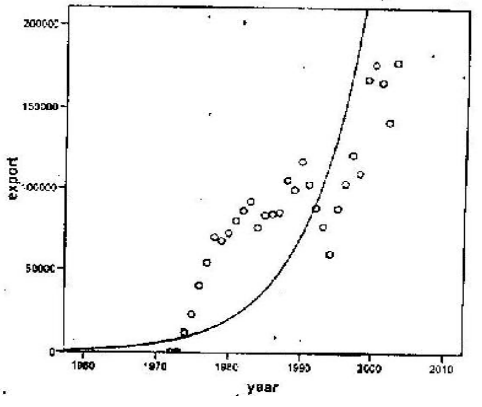


Fig. 11a: Important Traffic at Apapa Bulkship Port

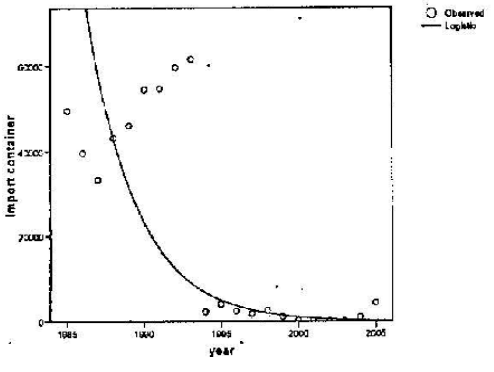


Fig 11b. Export Traffic at Apapa Bulkship Port

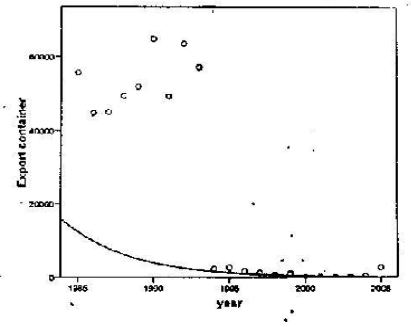


Fig. 12a: Important Traffic at AP Molers Terminal

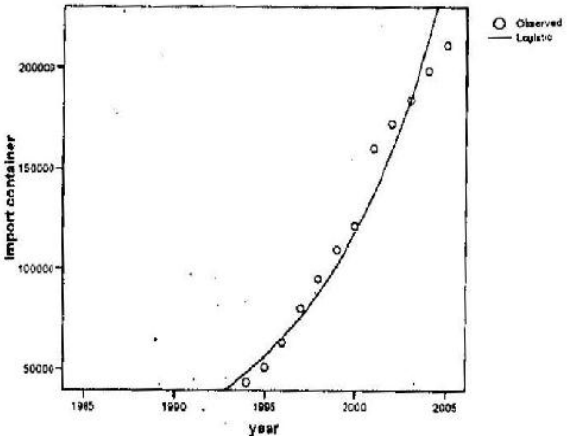


Fig 12b. Export Traffic at AP Molers Terminal

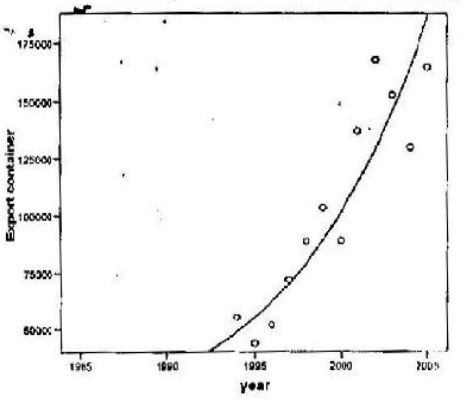


Fig. 13a: Import Traffic at Ro-Ro Terminal

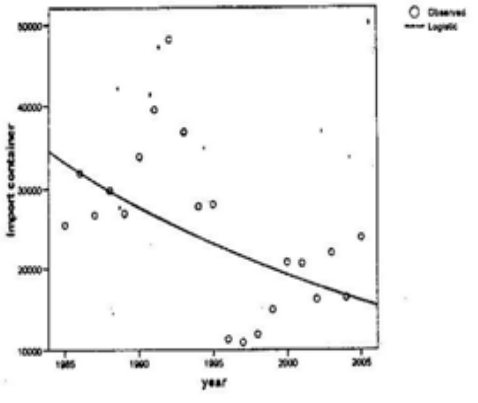


Fig. 13b: Export Traffic at Ro-Ro Terminal

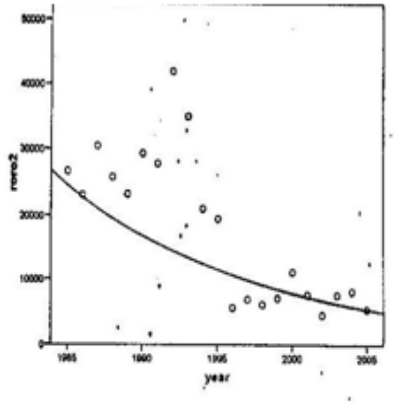


Fig. 14a: Important Traffic at Tin Can Island Port

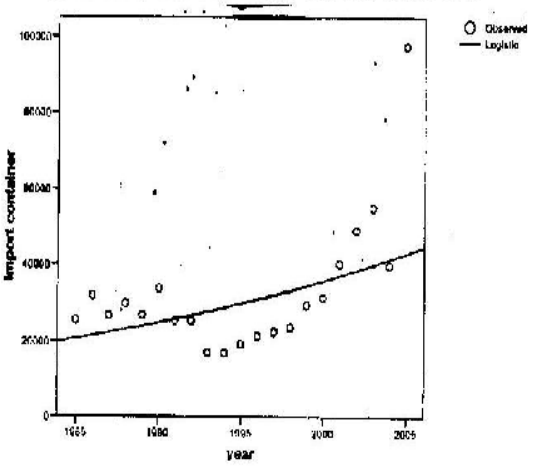


Fig 14b. Export Traffic at Tin Can Island Port

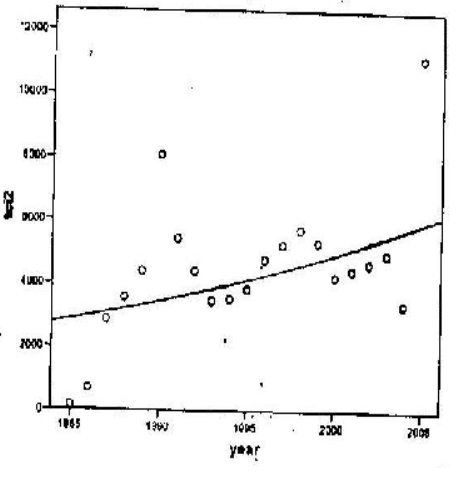


Fig. 15a: Important Traffic at Rivers Port

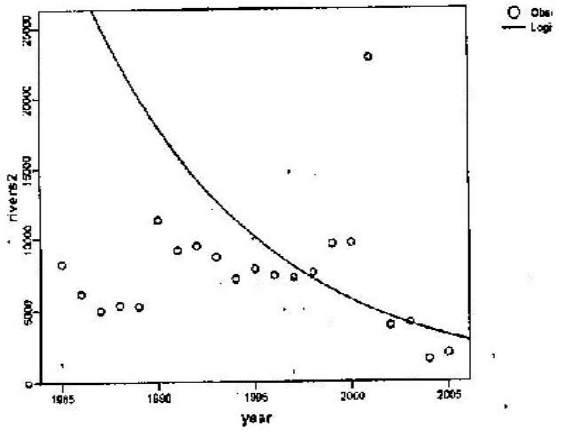


Fig 15b. Export Traffic at Rivers Port

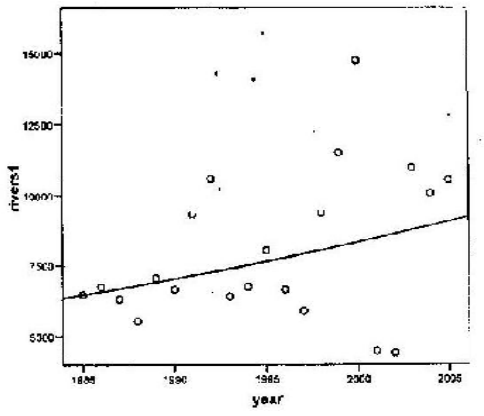


Fig. 16a: Important Traffic at Delta Port

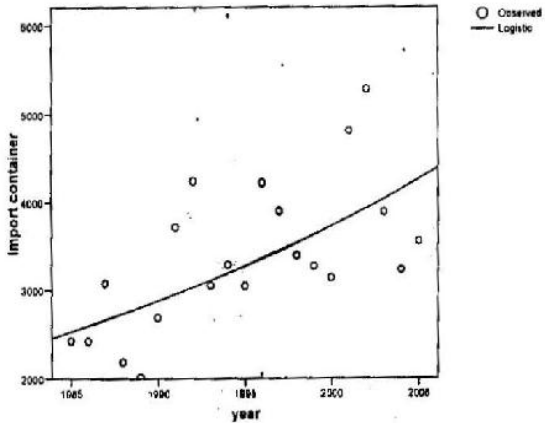


Fig 16b. Export Traffic at Delta Port

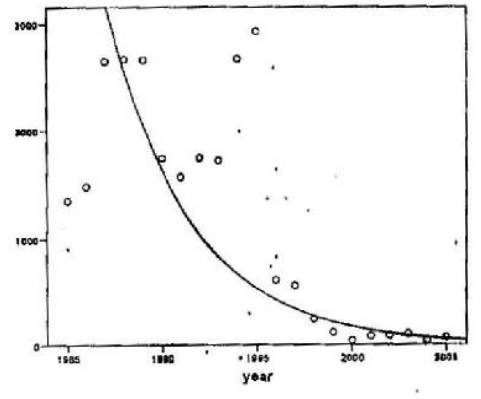


Fig. 17a: Important Traffic at Calabar Port

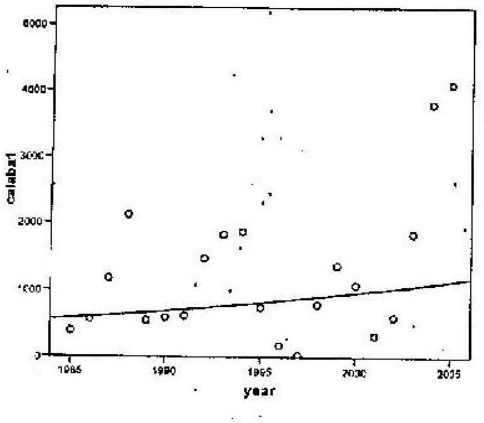


Fig 17b. Export Traffic at Calabar Port