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A Benchmark Study of Shipping & Cargo Throughput in West and Central Africa

Chinedum Onyemechi [BSc Tech (Hon), MSc,PhD]
Dept of Maritime Management Technology, Federal University of Technology Owerri, Nigeria
E-mail: c_onyemechi@yahoo.com

Abstract
The work analyzed trade flows for major commodity groups in the West and Central Africa sub region with view to creating a trade hub for the region. Direction of trade and major export commodities in the region were identified and analyzed with a view to determining the pattern of trade flow in the region. A trend flow analysis of the import and export trade flows were analyzed and major trade hubs identified using several analytical methods including principal component analysis, trend analysis and other economic tools. Three major coastal ports situated along the West and Central Africa coast were analysed in terms of their varying suitability for a trade hub if eventually chosen as a trade hub. These analyses were further extended to identify most centrally located ports in the region in terms of both distance and cargo throughput.
Keyword: Principal component analysis, port benchmarking, trade hub, West Africa, Central African ports

1.0 INTRODUCTION

The demand for trade in West and Central Africa since the eighties has been on the increase. This growth on trade demand is reflected in the number of ports concessioned to mainly Europeans terminal managers in the current millennium. Such a concession was made necessary resulting from cargo congestion in the ports of this region earlier being handled by inefficient government agencies that had poor knowledge of the arts and sciences of modern day port management.

For use in port planning a good analysis of the region's trading capacity is often carried out. This is indeed what this paper sets out to accomplish. In the first instance, vessels will only visit a region to offload cargoes bought by a citizen of that nation. In this sense good estimation of imports and exports of the goods flowing into the West and Central African sub-region becomes a necessary one.

Beside the planning need requirement is the necessity to understand the flow pattern of both imports and exports into the wide active hinterland of the West Africa sub-region. A great number of countries in the region are landlocked, most often connected with dilapidated and often abandoned rail linkages. The choice of ports of these hinterland nations are important, otherwise they may be locked out from world trade on the extreme, the output of these nations may become unavailable to world market due to poor connectivity. In this perspective, this work sets out to locate existing clusters of cargo zones located within the hinterland of West and Central Africa. The presence of such cargo clusters is therefore seen in this work as the proximate reason for corridor development across the entire West Africa sub- region.

1.1 OBJECTIVE

Considering the fact that the West and Central Africa sub –region is rich with import and export activities covering both hinterland and coastal states, this work sets out to carry out a benchmark study of shipping and cargo throughput in the region.

1.2 HYPOTHESIS

Null Ho: There does not exist possible clusters of export cargo in the West and Central Africa sub–region.

2.0 LITERATURE REVIEW

Maizels et al (1971) made projection on the export growth of primary commodities such as cocoa and coffee in some West African countries. His projections indicated that the average growth rate for the 1975 period for cocoa would be 2.6 – 3.0 percent and that for coffee 2.6percent per year. This prediction was made based on consumption of these products in the developed countries as gathered from available statistics.

Another good analysis of trade in West Africa was that done by Bauer,P.T (1954) .The work by Bauer analyzed the growth in West African Export and Import from 1899 to 1951.Some products included in his analysis were export commodities of Agricultural origin like palm kernel, groundnuts, cotton, cocoa, hides and skins, timber, mineral export, and principal import products of the region from 1899 to 1951.

Edozien et al (1982) also carried out a research on the flow of freight flow using the direction of trade matrix. Hans, A, (1987) suggested the use of past trend analytical method as a tool for traffic forecasting. Han's method involved an estimation of volume and location of future agricultural, industrial and mining output and consumption including import and export.

It must be stated that not much has been done in the West and Central Africa Sub- region in the area of traffic

forecasting and estimation. Much of the work done has been simply on the trade direction estimation of imports and exports. Further works on trade in the West African region include that done by Rimmer,D (1984). An analysis of trade growth in the sub-region between 1950 and 1979 utilizing the percentage average growth rate method, and three-year moving average method was made. This work though restricted to just West Africa showed that Nigeria, Ghana and Ivory Coast are the clear leaders of trade in the region. Ezenwe,U(1984) established from his work that much of the intra- regional trade in West Africa were more in the North-to-South direction than East-to-West. His assertion was based on the ecological crop belts of the region which lie positional across the region from South-to-North. On the basis of the above, he established nine countries that traded with each other in the West African region. They are: Ivory coast, Mali, Ghana, Upper Volta, Mauritania, Niger, Benin, Nigeria and Senegal.

Onwuka ,I.R (1985) noted in his work that most of the west African states depend in raw agricultural merchandise export whose income trend growth have fluctuated over the years in an unfavorable direction. He suggested four ways through which these countries can increase their export earnings. These include trade preferences, commodity agreements, compensatory financing and finally regional arrangements.

In respect of port cargo throughput analysis, one can reliably say that not much has been done in this area within the sub-region.Post-graduate and published research works in the subject area are few.

Lebuscher,C (1963) noted that ships needed to call at a large number of ports in the West and Central African sub-region in order to load or unload cargo. The same result was founded by a research carried out by UNCTAD on container port development, with the later observing further that ports of this region are inadequately supplied with shore-handling facilities.

Ikoku,E.U(1980) analyzed the contribution of African Caribbean and Pacific countries (ACP) exports toward the satisfaction of European Community (EC) imports.

Ogwude,I.C (1992) carried out a research on the method of estimating model choice in industrial freight transportation in Nigeria. Nigeria as we know controls the largest amount of freight in the sub-region.

3.0 METHODOLOGY

The method applied in the research is the multivariate analytical tool called principal component analysis.The computer software applied is MINITAB.

Also applied in the work are methods of trend analysis and cluster analysis in determining the distribution of export and import merchandise commodities in west and central African subregion. At the end a benchmark assessment of trade in the sub region was done using these methodologies.

4.0 RESULT OF FINDINGS

The above figure represents a trend analysis drawn on the export merchandise trade of West African nations in the year 1987.The result shows a peaking of trade in index 12 representing Nigeria with more than 7000 million dollar trade in the period . The second country in the region is Cote D'Ivoire with an export score of nearly 3000 million dollars.

The choice of a hub port for the entire West Africa subregion will depend on the volume of traffic passing through the region as well as government support for the hub port concept. Apart from commercial considerations ,technical considerations in terms of minimum draft level will also play some role. Assessed by volume of exports, Nigeria by far exceeds other West African states .Cote D'Ivoire, Ghana and Cameroun are the next major trade nations in the region.But Cameroun is close to Nigria while Ghana is close to Cote D,Ivoire. This means that any geographical assessment of trade that seeks central location for a hub port must strike a balance between these two subsectors of Nigeria-Cameroun and Cote D'Ivoire-Ghana.

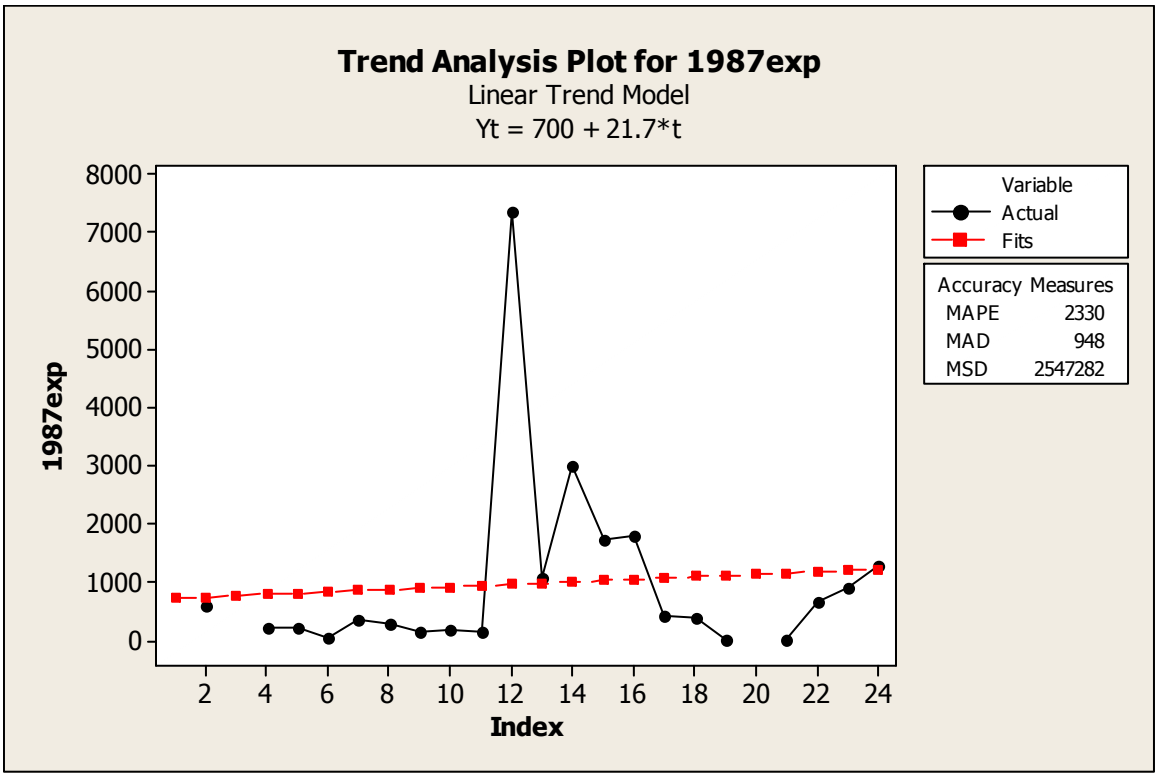

Figure 1Trend analysis of West Africa's Export trade

Thus assessed, Nigeria-Cameroun sub sector comes up with a higher trade volume and as such should hibernate the West African hub port. Alternatively, two hub locations may be chosen, one for each sub sector.For the Nigeria-Cameroun subsector ,Nigeria should be asked to develop the hub, while for theCote D'Ivoire- Ghana,sub sector, Ghana should be asked to play the lead.

Table 1:Coacoa exports in' 000 metric tonnes West Africa

Table 1:Coacoa exports in' 000 metric tonnes West Africa

1980				81	82	83		84		85	86	87	88	
105	102	79	91	105	96	106	129	135	109					Cameroun
332	500	387	345	518	503	550	561	451	559					Cote D'Ivoire
218	207	260	166	162	188	211	219	223	294					Ghana
151	214	155	228	151	116	175	112	212	126					Nigeria
15	18	10	9	21	7	13	12	11	7					Togo

Source : Onyemechi,C(2003)

Table 2 Cluster Analysis of Observations: on West Africa's Coacoa Export
Standardized Variables, Euclidean Distance, Single Linkage Amalgamation Steps

				Number		
				of obs.		
New Step	Number of clusters	in new level	Similarity		Distance joined	Clusters cluster cluster
1 2	4		82.5477	1.44460 3	4	3
2 3	3		81.4915	1.53202	3	1
3 4	2		78.5738	1.7735 1	5	1
4 5	1		44.2855	4.61171	2	1

The result from our cluster analysis reveals a similarity level of 3 clusters with the cut off set at 65%.Objects 3 and 4 are found to form clusters after the first updating with a minimum distance of 1.44460. Objects 3 and 4 here represents Ghana and Nigeria.
After the second updating,the minimum distance becomes 1.53202.Again a cluter is found between objects I and 3 representing Cameroun and Ghana.The third updating sets the minimum distance to 1.77353 creating clusters in objects 1 and 5 that is Cameroun and
Togo.Finally with the minimum distance set at 1.461171 a cluster is formed between objects 1 and 2 representing Cameroun and Cote D'Ivoire.

Table 3:Principal Component Analysis: on West Africa's Export Trade
Eigenanalysis of the Correlation Matrix

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Eigenanalysis of the Correlation Matrix

Eigenvalue	9.6197	0.2159	0.1511	0.0132	0.0000	0.0000	0.0000
0.0000							
Proportion	0.962	0.022	0.015	0.001	0.000	0.000	0.000
0.000							
Cumulative	0.962	0.984	0.999	1.000	1.000	1.000	1.000
1.000							

Eigenvalue	-0.0000	-0.0000
Proportion	-0.000	-0.000
Cumulative	1.000	1.000

Variable	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
C1	0.316	-0.187	-0.450	-0.427	0.049	0.050	-0.378	0.188	
0.195									
C2	0.320	-0.137	0.235	0.339	-0.128	0.461	-0.138	0.364	0.525
C3	0.313	-0.135	-0.573	0.480	-0.151	-0.097	0.034	-0.516	0.076
C4	0.303	-0.686	0.287	0.061	0.423	0.036	0.268	-0.089	-
0.262									
C5	0.317	0.224	0.401	0.093	0.270	-0.566	-0.449	-0.199	0.213
C6	0.319	0.309	0.121	0.024	-0.040	0.512	-0.368	-0.201	-
0.590									
C7	0.321	0.115	0.194	0.191	-0.594	-0.265	0.308	0.222	-
0.158									
C8	0.316	0.411	0.058	-0.326	0.198	0.233	0.546	-0.321	
0.345									
C9	0.320	-0.224	0.058	-0.549	-0.394	-0.180	0.000	-0.032	-
0.096									
C10	0.317	0.281	-0.333	0.121	0.397	-0.186	0.187	0.569	-
0.255									
Eigenvalue	9.6197	0.2159	0.1511	0.0132	0.0000	0.0000	0.0000	0.0000	
Proportion	0.962	0.022	0.015	0.001	0.000	0.000	0.000	0.000	
Cumulative	0.962	0.984	0.999	1.000	1.000	1.000	1.000	1.000	

Eigenvalue	-0.0000	-0.0000
Proportion	-0.000	-0.000
Cumulative	1.000	1.000

The above analysis reveals the principal exporters of cocoa from West Africa based on export trade performance in the decade of the eighties. Choosing the countries with performance score above 5.000 as the principal contributors we observe as follows.PC2C4 representing Nigeria had a principal score of -0.686 thus making a significant impact in cocoa export from the region in the period under review. The next in the line is PC3C3 representing Cote D'Ivoire with a component score of -0.573.The next is C9PC4 representing Ghana with a significant score of -0.549. PC5C7 with a principal score of -0.594 also represents Cote D'Ivoire.PC7C8 represents Ghana with a score of 0.546 which is significant.PC8C3 also represents Ghana with a significant score of -0.516.Last are PC9C3representing Cote D'Ivoire with a significant score of 0.525 and Cameroun with the score of -0.590.

Table 4: Merchandise Transport machinery imports of Sub Saharan African countries

1965	1980	1987	Country
23	*	*	Chad
33	32	37	Zaire
*	*	*	Guinea Bissau
19	29	34	Burkina Faso
23	39	44	Mali
19	19	10	Gambia
21	27	31	Niger
31	20	28	Togo
30	18	20	Sierra Leone
17	21	16	Benin
29	34	39	Central Africa
34	33	36	Nigeria
33	30	36	Ghana
56	36	35	Mauritania
34	28	29	Liberia
*	*	*	Equit.Guinea
*	*	*	Guinea
*	*	*	Cape Verde
15	23	16	Senegal
31	30	36	Zimbabwe
28	28	28	Cote D'Ivoire
34	23	27	Congo
28	34	36	Cameroun
38	37	38	Gabon

Table 5: Principal Component Analysis: on transport machinery import by Sub Sahara Africa
Eigenanalysis of the Correlation Matrix
19 cases used, 5 cases contain missing values
The above figure analyzed trade activities on transport machinery in sub Saharan African nations across the three periods of 1965,1980, and 1987.Result shows a decrease in the sector's share of overall import in the 1980's with a correlation score diving down from
$Y = 0.462x1 + 0.625x2 + 0.629x3$
To $Y = -0.887x1 + 0.341x2 + 0.313x3$
There was however a substantial increase in 1987 showing an improved importation on the share of the sector within the subregion.This was reflected by the improved equation in that period in the range
$Y = -0.019x1 - 0.702x2 + 0.712x3$

5.0 CONCLUSION

The work analyzed trade activities in West and Central Africa with a view to establishing trade hubs for the sub region making use of volume of trade. The topmost position is undoubtedly held by Nigeria. The hub position was thus awarded to her. Two alternative hub ports were also suggested to be sited in Nigeria servicing Nigeria and Cameroun, Benin and Togo while the other is suggested to be located in Ghana servicing countries north and West of Ghana.

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