



Constraints to Air Cargo Operations in Nigeria

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Abstract

Air cargo handling at airports serves as means of revenue generation in addition to passenger operations. Efficiency of airports with cargo operations requires that cargo traffic flows seamlessly. Inefficient cargo operations abound at airports when the traffic flow is constrained with myriads of factors. This study examines the level of relationships that exist among some factors that serve as constraints to the development of air cargo operations in Nigeria. Using random sampling technique, 337 respondents who were majorly cargo agents and customs officers were sampled at Lagos airport, Nigeria. The study employed questionnaire administration to collect data. The questionnaire provided respondents with items in Likert scale to rank in order of significance as each serve to influence the development of air cargo operations in Nigeria. Spearman's rank correlation analysis was carried out to examine the relationships between the selected variables from literature. The effect of corruption, poverty, exchange rate, customs operations, security, cargo and airline traffic were found to have high positive and linear correlation, while cargo traffic correlates negatively with inefficient customs operations. The study provides the need for policy instrument that gives attention to efficient operations for increasing air cargo traffic by means of trade and exchanges in Nigeria.

Keywords: air cargo; supply chain; corruption; poverty; exchange rate

Introduction

The requirement for speedy delivery of air cargo through efficient handling at airports demands that cargo operations be conducted without constraints. This implies that various organs responsible for the transshipment of cargo need to work efficiently for a seamless operation. However, the achievement of seamless cargo operations at airports seems difficult because of the myriad of factors serving as constraints to the flow of cargo. The rate at which these constraints persist at any airport weakens the system of cargo operations due to the intertwine nature of the influencing factors in cargo operations. Apart from seamless delivery, cargo operations are carried out at airport to generate revenue for

airport management, airlines, handling companies and others alike. Notwithstanding, the drive for revenue generation with cargo handling at airports may be jeopardised in the face of constraints to efficient operations. To this end, this paper aims at examining the level of relationships that exist between various factors serving as constraints to the distribution of cargo at airports in Nigeria.

Research interest in air cargo traffic and operations has gained substantial ground in recent time. Various dimensions of air cargo operations had been studied with focus on specific countries and airports. In Thailand, Suwanwong *et al* (2018) evaluated air cargo connectivity at

Suvarnabhumi airport. Their study assessed the impact of air cargo operation deficiency factors on the airport and airlines performance by developing a model extended from the NetCargo model. The potential factors for the growth of air cargo logistics at Zaragoza airport in Spain was the focus of the study by Larrode *et al* (2018), who applied Analytical Hierarchy Process (AHP) model, and identified eleven (11) factors which require the attention of the management of Zaragoza airport. Issues about airport classification based on cargo characteristics formed the focus of the study by Mayer (2016) who grouped 114 airports of the world according to their cargo business characteristics, and applied hierarchical cluster analysis to identify eight distinct clusters with clear differences in the characteristics of their cargo activities. Lakew and Tok (2014) examined the determinants of air cargo traffic by estimating the socioeconomic determinants of air cargo tonnage at airports in California. The study showed that the shares of manufacturing and government-related employment have a strong impact on outbound air cargo traffic. Outbound cargo traffic was also found to be proportionate to city size while the corresponding inbound traffic increases less than proportionally to population. Income and service-related jobs were found to play a substantial role in determining both outbound and inbound air cargo movement. Gong *et al* (2017) identified the key drivers for China's international trade delivered by air with an augmented gravity model, and investigated the country's air freight network using complex network analysis. They found that for China's international trade by air, the composition of economy is a more important driver than the size of economy.

Zhang (2003) carried out an analysis of international air cargo hub using Hong Kong as case study. The study presented a discussion of Hong Kong air cargo by descriptive analysis of data to show the major competitors and competitive factors for air cargo in Hong Kong, and highlighted the importance of the interactions between Hong Kong and Mainland China in their international aviation policies. Hwang and Shiao (2011) analysed air cargo flows on international routes at Taiwan Taoyuan International Airport. The study developed a gravity model of air cargo

flows by incorporating more factors that might influence international air cargo flows of an airport. The model is developed based on a panel data of air cargo services on scheduled routes at Taiwan Taoyuan International Airport during the years 2004–2007. Airport choice for cargo routing by cargo agents was the focus of the study of Adenigbo (2016) in Nigeria. The work of Kasarda and Green (2005) was on air cargo as an economic development engine. Asch, Dewulf, Kupfer and Meersman looked at the competition that may exist between air cargo and the airport. The major focus of literature reviewed is on the various determinants of air cargo traffic. These determinants are categorised as economic, social, operational, technological and legal (Larrode *et al*, 2018). The extent of the relationship between the air cargo determining factors needs to be studied. This study therefore fills this knowledge gap by examining the relationships that exist among the factors with the aim of looking at their capability to serve as constraints to the development of air cargo distribution in Nigeria.

Method

The research reported was carried out at the Lagos international airport in Nigeria. Lagos airport is the largest and busiest in Nigeria. There are four major international airports in Nigeria. These airports are located in Abuja, Kano, Lagos and Port-Harcourt. Lagos airport alone handled a total of 2,721,540 tonnes of cargo over a period of 30 years from the year 1987 – 2017 according to the Federal Airport Authority of Nigeria (FAAN, 2017). This indicates an average of 90,718 Tonnes of cargo per year. Over the same period, Kano airport handled a total of 148,387 tonnes while Abuja and Port-Harcourt airports handled 79,010 Tonnes and 116,457 Tonnes respectively. The other airports handled less significant volume of cargo traffic in comparison with the total volume handled by Lagos airport from the year 1987 - 2017 (See Figure 1). This shows the dominance of Lagos airport in the handling of cargo traffic in Nigeria. It is admissible that an examination of the issues about air cargo operations at Lagos airport is capable of representing the whole scenario of Nigeria air cargo industry because of the volume of cargo transshipment activities that take place at the airport.

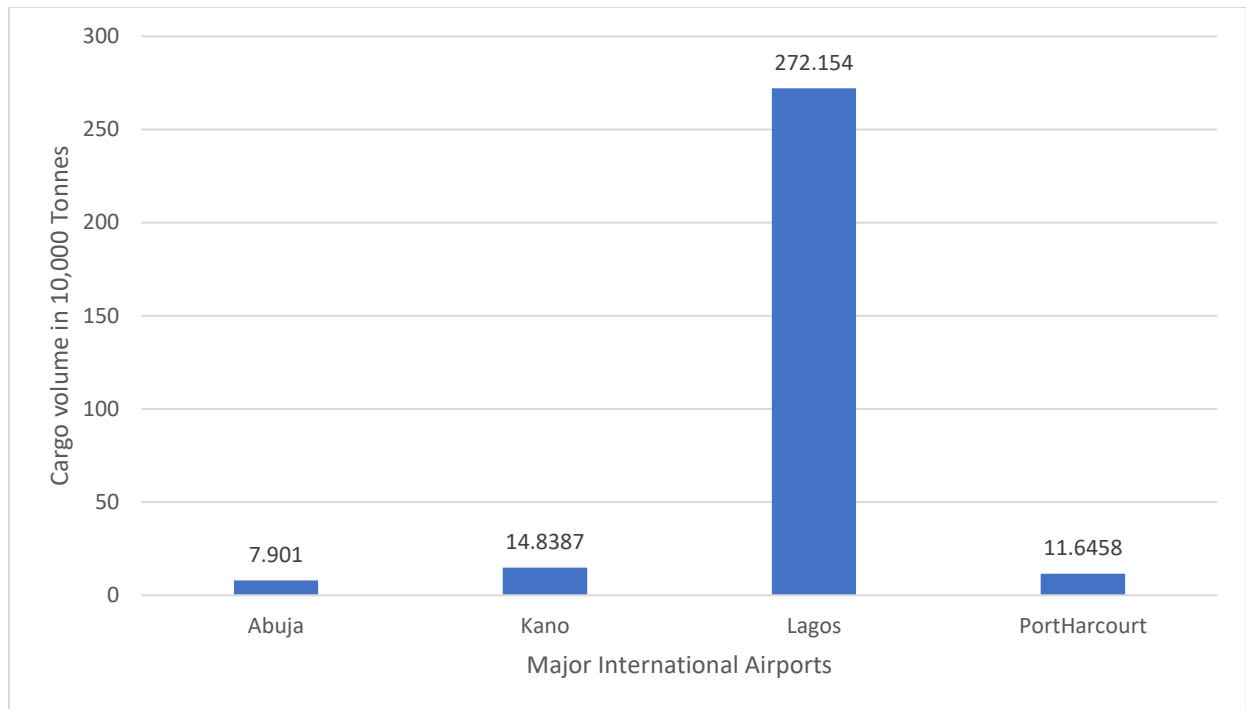


Figure 1: Total Cargo Traffic handled at the major international airports in Nigeria 1987 - 2017
Source: FAAN, 2017

The data for the study was collected by random sampling of respondents who were majorly cargo agents and customs officers with the use of questionnaire administration at Lagos airport. Other respondents were staff of airlines, airport authority and cargo handling companies. In all, a total of 337 out of 457 respondents who completed the survey instrument formed the sample size for the study. This represents 73.4 percent response rate. The sampling technique ensures that the respondents had equal chance of being surveyed. The various factors serving as constraints to air cargo operations for seamless supply chain system were presented to the respondents with 5-point Likert scale. The scale is to enable the respondents assign weight in ranks from 1 – “Not Significant” to 5 – “Highly Significant”. The purpose of the 5-point scale is to provide the respondents with a wide degree of measurement for the rate at which individual factor presented is viewed to be serving as constraint to air cargo operations in Nigeria. The questionnaire presented thirteen (13) items for the respondents to rank according to how they perceive each item to be serving as constraint to

the development of air cargo operations in Nigeria. The variables were drawn and modified from literature such as Adenigbo (2016), Ubogu (2013) and Ohashi *et al* (2005). The variables were gathered and coded as presented in Table 1. Spearman’s rank correlation analysis was employed to analyse data for the study. This is with the aim of assessing the level of association between the variables serving as constraints to the operational development of air cargo traffic in Nigeria. The use of Spearman’s rank is necessitated upon the fact that the data for the study were not available in absolute values, but only in ranked form using Likert scale.

Table 1: Name of variables and Codes

S/N	Variable Name	Code
1.	Poverty Level	POVLEV
2.	Corruption	CORUPTN
3.	Infrastructure Provision	INFRAPRO
4.	Airline Traffic	AIRTRAF
5.	Customs Operations;	CUSOPS
6.	Security Level	SECLEV
7.	Cargo Traffic;	CARTRAF
8.	Oil Prices	OILPRIC
9.	Foreign Exchange Rates	FOREX
10.	Business Funding	BUSFUND
11.	Handling Facilities/Equipment	HANDFA
12.	Clearing Fee	CLEFEE
13.	Import Dominated Flow.	IMPOTFLO

Source: Author's Compilation, 2021

Results

Constraints to Cargo Operations at Airport in Nigeria

The descriptive statistics of the variables serving as constraints to the development of air cargo operations in Nigeria as presented in Table 2

shows the sample size (N), the mean and standard deviation for the data. The implication of the statistics is to present the distribution of the data, and the degree at which the standard deviation and variance revolve around the mean.

Table 2: Descriptive Statistics of Variables

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Poverty Level	337	1	5	3.82	1.148	1.317
Corruption	337	1	5	3.93	1.197	1.432
Infrastructure Provision	337	1	5	3.84	1.068	1.141
Airlines Traffic	337	1	5	3.31	1.188	1.412
Customs Operations	337	1	5	4.20	1.024	1.048
Security Level	337	1	5	3.43	1.269	1.609
Cargo Traffic	337	1	5	3.23	1.127	1.269
Oil Prices	337	1	5	4.04	1.157	1.338
Foreign Exchange Rates	337	1	5	4.52	.870	.756
Business Funding	337	1	5	4.04	.977	.954
Handling Facilities/Equipment	337	1	5	3.82	1.025	1.052
Clearing Fees	337	1	5	3.89	.991	.983
Import Dominated Flow	337	1	5	3.82	1.139	1.297
Valid N (listwise)	337					

Source: SPSS Computation, 2021

Table 3 provides the Chi square statistics of the view of the respondents about their agreement that there are factors serving as constraints to the operational development of air cargo traffic in Nigeria. The result in the Table 3 shows that the difference in the response is significant at $p =$

0.000 having chi-square value of 294.436 with 1 degree of freedom. This implies that there exist a number of factors that serve as constraints to the operational development of air cargo traffic in Nigeria.

Table 3: Constraints to Cargo traffic Operational Development in Nigeria

	Observed N	Expected N	Residual	Test Statistics	
Yes	326	168.5	157.5	Chi-Square	294.436 ^a
No	11	168.5	-157.5	Df	1
Total	337			Asymp. Sig.	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 168.5.

Source: Author's Computation, 2021

Relationship among constraints to air cargo operations

The degree of independence of the independent variables serving as constraints to the operational development of air cargo in Nigeria was assessed using Spearman's rank correlation. The relationship among the variables is shown as coefficient matrix in Table 4. It is observed from the Table 4 that the variables have significant relationships at 0.01 and 0.05 respectively, while the test for their relationships was done at 2-

tailed. Relationship at 2 – tailed indicates that the test is directional, that is, hypothesis was tested to look at the relationship between two variables correspondingly. This implies that the relationship between the variables that serve as constraints to the operational development of air cargo traffic in Nigeria is at both ends. Further to be noted from Table 4, is the fact that more of the relationships between the variables were significant at 0.01.

Table 4: Spearman's rho Correlation Analysis of Constraints to Operational Development of Air cargo Traffic in Nigeria

	Porlev	Coruptn	Infrapro	Airtraf	Cosops	Seclev	Cartraf	Oilpric	Forex	Busfund	Handfa	Clefee	Importflo
Porlev	1.000												
Coruptn	.461**	1.000											
Infrapro	.145**	.260**	1.000										
Airtraf	.119*	.075	.054	1.000									
Cosops	-.071	.017	.143**	.031	1.000								
Seclev	.153**	.229**	-.016	.138*	.155**	1.000							
Cartraf	.162**	.258**	.055	.360**	-.164**	.351**	1.000						
Oilpric	.192**	.355**	-.005	.026	.093	.203**	.196**	1.000					
Forex	-.097	-.078	.152**	-.007	.360**	.081	-.075	.149**	1.000				
Busfund	.070	.157**	.276**	.107*	.153**	.049	.101	.073	.163**	1.000			
Handfa	-.031	.105	.282**	.106	.184**	.089	.023	.122*	.057	.265**	1.000		
Clefee	.037	.070	.113*	.186**	.275**	.011	.098	.082	.211**	.132*	.279**	1.000	
Importflo	.102	.075	-.065	.173**	.272**	.142**	.168**	.060	.140*	.067	.154**	.251**	1.000

** Correlation is significant at the 0.01 level (2 – tailed)

* Correlation is significant at the 0.05 level (2 – tailed)

Source: Author's Computation, 2021

The coefficient matrix in Table 4 shows five highest r values with strong relationships between variables. These are $r = 0.461$ for corruption and poverty level; $r = 0.360$ for cargo traffic and airline traffic, and foreign exchange and customs operations; $r = 0.355$ for oil price and corruption, then $r = 0.351$ for cargo traffic and security level. Other significant variables have correlation values lesser than 0.300. That the correlation values are not high suggests that there is no need to suspect collinearity in the result. The relationship between poverty level having $r = 0.461$ with corruption being the strongest and

most direct linear relationship implies that the higher the rate of poverty in Nigeria, the more corruption will grow. At the same time, increasing level of corruption in Nigeria will continue to promote poverty rate. This relationship presents major factors that serve as constraints to the overall development of Nigeria without limited focus on air cargo operations at airports. The relationship that exists between cargo traffic and airline traffic ($r = 0.360$) portends the fact that the frequency of airline flights in a country will contribute to the operational development of air cargo traffic. On

the other hand, cargo traffic operations will not be significant at any airport with less frequency of airline flights while airlines flight frequency will tend to reduce at airports with less cargo traffic.

The relationship between foreign exchange rates and customs operations is also significant with $r = 0.360$. This indicates the charges on goods brought into Nigeria. Customs charge a certain percentage as fee on every good shipped into Nigeria. The charge is normally paid in Naira equivalent of the total value of goods bought in foreign currency. This implies that the higher the exchange rate the more customs charges to be paid on examination and clearance of goods. The issue about the exchange rates also apply to the relationship between customs operations and clearing fee with $r = 0.275$. The agents or freight forwarders also charge their fees based on the value of goods, which are determined by the prevailing exchange rates. The relationship between oil price and foreign exchange rates ($r = 0.149$) predicts that higher rates favour Nigeria in the exportation of crude oil. However, its effect is demeaning at the time Nigeria imports refined petroleum products at higher exchange rates. This will in no small measure affect the development of air cargo operations and traffic growth since air cargo business involve import and export of goods between Nigeria and other countries. It is a common knowledge that increasing foreign exchange will affect the ease of funding business in any country. This accounted for a correlation of $r = 0.163$ between foreign exchange rate and business funding. The rates of exchange of Naira to other major currencies will influence the total amount of fees payable to clear cargo in Nigeria. This issue accounted for $r = 0.211$ between foreign exchange rates and clearing fees. It should be noted that a continuous fall in the value of Naira will have direct and indirect influence on economic activities of the country. This is particular because Nigeria economic production activities are import dominated. This implies from the fact that most equipment for production purposes in Nigeria are imported. Hence, the value of Nigeria Naira against major currencies of the world is crucial to determine the prosperity of Nigeria.

Another major significant relationship of $r = 0.355$ is between oil price and corruption. The fact that corruption is related with oil price in the discussion of constraints to air cargo operational development in Nigeria is germane as crude oil remains the major source of revenue for the country. It is imperative to note that major corrupt activities are those with revenue and expenditure of a country. The manner with which oil price is handled in Nigeria has effect on the price of petroleum products, with its consequence on the transportation cost and prices of goods and services. The strong relationship between cargo traffic and security level ($r = 0.351$) implies that as cargo traffic increases, security level needs to increase. Otherwise, insecurity at any airport becomes a constraint to cargo operations. Furthermore, the fact that corruption also correlates with infrastructure provision (with $r = 0.145$) signifies that corrupt activities will continue to hamper on the level of infrastructure provision, and even the quality of airport infrastructure provided. The relationship between infrastructure provision and customs operations ($r = 0.143$) indicates that customs operations will not be efficient in the face of inadequate infrastructure in terms of facilities and equipment to process cargo for proper examination and timely clearance. The provision of necessary infrastructure for efficient cargo operations in Nigeria will be dependent on the rate of exchange of Naira with other currencies like Dollars, pounds and euros. This is indicative from Table 3 showing a significant relationship between infrastructure provision and foreign exchange rate with $r = 0.152$. The correlation of $r = 0.282$ between infrastructure provision and handling facilities and equipment depicts that the level of infrastructure provided in an airport will dictate the pace for the acquisition of facilities and equipment. This is so, because, the overall airport infrastructure is complementary to handling facilities and equipment that can be provided.

Another important relationship among the variables is the negative relationship between cargo traffic and customs operations with $r = -0.164$. This implies a serious negative situation with strong capability to cause a severe constraint to the development of air cargo operations in Nigeria. Inefficient customs operations is majorly

characterised by high charges and cumbersome processing. A country noted for high customs charges and delay with cargo clearance procedures occasioned by customs operations will experience low cargo traffic. Operational development of air cargo becomes difficult with customs inefficiency and low cargo traffic.

Discussions

The importance of air cargo operations at any airport cannot be overemphasised because of the additional revenue it generates to the airport as well as airlines, and its contribution to the economic development of nations. The importance accounted for the reason why Nigeria airport management dedicates a section of Nigeria major international airports to cargo handling and processing. The airport management did this in line with global airport practices. This is done to ensure efficient handling, processing and delivery of cargo at airports. Notwithstanding, the policy for dedicated cargo terminal at Nigeria airports, there are generalised factors serving as constraints to air cargo operations. The fact that corruption has a high correlation with poverty and oil prices implies that corruption has significant impact on the rate of the development of air cargo operations at airports in Nigeria. This finding is in support of the work of Kasarda and Green (2005) which found that reducing corruption is among the three major factors that can enhance air cargo's positive impact. The other factors are air service liberalisation and improving customs quality. The issue about poverty as found by this study is also in support of different studies such as Button and Yuan (2013) on the causality relationship between air cargo and economic development where employment and income of metropolitan areas were measured. This study's result about air cargo volume and airline traffic asserts the general finding that air cargo traffic is dependent on airlines flights because most cargo volumes are carried in the belly of airlines' passengers' aircrafts. This more assertive because airlines consider air cargo as a by-product of their services (Asch, Dewulf, Kupfer & Meersman, 2019). The efficiency of customs operations for cargo clearance at airports also serves as a major factor that influence the choice of cargo agents' operations at airport (Adenigbo, 2016). This

supports the fact that customs operations may serve as constrain factors to cargo distribution at airports as found in this study.

Policy Implication and Conclusion

It is unarguable that seamless supply chain operations for air cargo delivery are important for a nation's economic development. As a result, there is need for the government of Nigeria to develop policies that mitigate increase in poverty rate. This should be done by addressing the menace of corruption that is prospering in all sectors of the Nigeria economy. Poverty and corruption breed one another, and result into major ills denying the country of development in the air cargo industry. This emphasises the need to strengthen economic policy for poverty and corruption eradication in Nigeria. Policies on how to increase airline traffic, which will result into increase in cargo traffic at airports in Nigeria must, of a necessity be enacted to address the constraints to seamless and efficient air cargo distribution at airports in Nigeria. The fluctuations in foreign exchange rates play significant roles in influencing cargo traffic and airline flight frequency in any country. High and increasing exchange rate of Naira to other currency, which implies continuous devaluation of Naira will reduce the traffic of both airlines and cargo in the country. The paper therefore calls for a policy for the creation of favourable business environment for airlines and cargo operations through increasing value of the Nigeria currency. Another justification for a policy on conducive environment for air cargo operations stems from the need for efficient customs operations and security level. The efficiency of customs operations coupled with assurances of cargo security both at the airport and in transit will provide seamless air cargo operations in Nigeria. On the other hand, the level of inefficiency in customs operations and low perception of security of cargo will generate broken supply chain system that is not cost effective. This implies that efficient customs operations coupled with adequate security is paramount to air cargo operational development in Nigeria.

This study has identified some salient factors that are serving as constraints to the distribution of cargo at airports in Nigeria with a focus on Lagos

airport being the busiest airport in Nigeria. The objective of the study was achieved by establishing that significant relationships exist among the factors considered capable of serving as constraints to air cargo distribution at airports in Nigeria. The issue about the effect of corruption to serve as constraint to the distribution of air cargo operations in Nigeria was highlighted. The strongest relationship exists between corruption and poverty. Other factors with high relationships include oil price, cargo traffic, foreign exchange, airline traffic customs operations and security level. It is also significant that negative relationship exists between cargo traffic and customs operations. It is the contribution of this study that inefficient distribution of air cargo in Nigeria is compounded by the complex relationships that exist among several factors serving as constraints to air cargo supply chain system. There is therefore the need for a policy instrument that gives attention to air cargo distribution with its increasing traffic at airports by means of improved trade and exchanges.

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