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# THE IMPACT OF LIBERALIZATION ON THE PERFORMANCE OF NIGERIA AVIATION SECTOR

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## ABSTRACT

Liberalizing air transport services with the aim of enhancing the performance of the aviation sector have occupied a central place in both developed and developing countries of the world. In Nigeria, particularly, liberalization of the Nigerian aviation sector was hoped to significantly improve the performance of the sector. Thus, we modeled bilateral passenger flow from Nigeria to randomly selected African countries and vice versa through the usage of gravity model in order to examine the impact of liberalization policy on Nigerian aviation sector. We also employed Airline liberalization index computed by the world Trade Organization as one of the significant explanatory parameter (variable) in our model. We find robust evidence of a positive and significant relationship between the volumes of bilateral passenger traffic and the degree of liberalization of the aviation market. An increase in the degree of liberalization was noted to impact about 26.6 percent increase in total rate of passenger's flow. Other variables in the gravity model like the rate of openness and the economic size of the countries involve were found to be statistically significant in determining bilateral passenger flow. Based on our findings that air transport liberalization will benefit both consumers and the aviation industry in Nigeria and in view of frequent problems of the sector, we recommend increasing open skies policies that permit increasing passenger carriers and competition as Necessary Avenue for optimizing aviation sector liberalization policy.

**Keywords:** Liberalization, aviation, transportation, Gravity Model, Nigeria.

## 1.0 INTRODUCTION

The importance of Air transportation in economic growth and development of any nation of the world cannot be overemphasized. Air transport facilitates quick movement of goods and passengers across nations of the world within the domestic and international economies. International air transport specifically which tends to facilitate trade and travels across continents

  

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operates within the framework of the 1944 Chicago Convention, under which airlines' commercial rights on international routes are governed by bilateral air services agreements (ASAs) between each country-pair. These ASAs regulate a wide range of conditions related to the provision of international air services, including air freedoms, capacity limitations, tariff approval and airline designation etc.

Aviation sector of various countries of the world, in the last three decades witnessed some degree of deregulation and liberalization in consonance with worldwide trends in aviation sector liberalization. Numerous studies have shown that deregulation and liberalization have brought significant welfare gains and economic growth in these economies. Notable examples include Encanoua (1991), Dresner and Tretheway (1992), Pedro (1995), Mawson (1997), Dresner and Oum (1998), Oum (1998), Graham (1998), Dresner and Oum (2001), Clougherty et al. (2001), Zhang and Chen (2003), Fu et al. (2010).

With particular reference to Nigeria, various studies on liberalization and performance of the aviation sector have concentrated on the benefits without weighting it against the cost (Oluwakoya, 2011; Adeniji, 2000). No doubt the deregulation of the aviation sector has tremendously affected the sector in many positive ways. One of these positive impacts is the increasing number of new entrants (operators) into the sector who have consequently injected fresh capital into the sector. Oluwakoya (2011), reported that total amount of fund injected into the Nigeria aviation sector is estimated for about US $5 billion in the last three years.

In the history of Nigeria's economy, there was a core infrastructure needed to establish a thriving economy. The organization of the infrastructure focused on the ability of commerce to manage the ebb and flow of products. For Nigeria, particularly during its colonial period, the country's flow of products and natural resources became heavily dependent upon its transportation system to support its products. Apart from Nigeria's rich and abundant crude oil resources and its centralized and favorable geographical location, transportation is perhaps the other factor contributing to Nigeria's economic rise and decline. Also, transportation affects and dictates many socio-economic variants.

Thus, there is no doubt that the development of a safe, efficient and reliable air transport system is essential for overall economic development in Nigeria and for African integration While aviation has the tremendous potentials for liberating the economy of Nigeria from her constraining geographic boundaries, the air infrastructures must be developed to enable air transport performs this role.

All the problems faced by the foregoing lead to the emergence of air transportation in Nigeria. The air transport industry has remained one of the most deregulated and restricted industries in

  

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international trade. Domestic deregulation and liberalization have been progressing at an uneven pace across countries and liberalization of the international markets has yet to overcome numerous obstacles, (Wolf 2006). It has been long recognized that improvement in the means of transportation is a viable strategy for rapid economic growth especially in this contemporary time where the wave of globalization has swept and is still sweeping across the global continent. Thus, the interest of Nigerian Government to liberalize the aviation sector is to put it on a higher gear in order to make it contribute more to national development.

This paper, therefore, brings to bear some of the peculiar characteristics of some stylized facts and background analysis of the recent development in the Nigerian Aviation sector.

**1.1 The historical background of the Nigerian Aviation Sector**

The history of aviation industry is dated back to 1920s in Nigeria and the earliest commercial aviation is credited to Mr. Bud Carpenter, who frequently undertook high-risk flight between Kano and Lagos, using the rail tracks as his guide (Deba et al.,2005). An enterprising pilot carried a few fare-paying passengers in a sea-plane between Lagos and Warri in 1930. In 1935, the Imperial Airways later known as the British Overseas Airways Corporation (BOAC), commenced operations with flights from London to Nigeria. As a result of this development in the aviation industry, the need for more aerodromes necessary to handle the aviation enterprises is required. By the end of 1940, Lagos had been converted into a strategic base from where aircraft were being ferried to Middle East and India as part of the war effort. In 1946, the King of England issued an edict establishing the West African Air Transport Authority (WAATA), as well as the formation of the West Airways Corporation (WAAC). Ghana withdrew from the company in 1957 after her independence and Nigeria government in collaboration with BOAC and Elder Dempster lines formed the West African Airways Corporation (Nigeria) Limited which later changed to Nigeria Airways. Nigeria Aviation

The aviation industry is divided into three namely; Nigerian Airspace Management Agency (NAMA), Nigerian Civil Aviation Authority (NCAA), and Federal Airport Authority of Nigeria (FAAN). The development of air transport (Aviation) started in Nigeria at the end of the Second World War in 1946 with the defunct West African Airway Corporation (WAAC) with headquarters in Lagos Filani,(1975). In another perspective, Ajulo, (2002) has it that a riotous situation resulting from a feud between the British colonial administration and the people of Kano City in 1925, forced a British Royal Air Force (RAF) fighter to land on a polo ground in Kano. This was the first flight in Nigeria. The mission of the crew was to carry out a surveillance of the riot, which broke out of protests by some Kano indigenes after the maiden flight, the RAF began yearly flight to Kano and Maiduguri from the Sudan, relying solely on available

  

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intelligence reports and navigational aids on the aircraft. However, commercial aviation did not start until Imperial airlines started regular flights between UK and Nigeria in 1935.

The development of one of the infrastructure, aerodromes, was boosted with the advent of the Second World War. By 1940, all the airports planned for Nigeria had been completed. At the end of the Second World War, the RAF returned, but with much improved equipment, and a different mandate. Using aircrafts chartered from the British Overseas Airways Corporation, they operated passenger and mail services between Lagos, Port Harcourt, Enugu and Jos. With the establishment of the West African Airways Corporation (WAAC) on May 15th 1946, commercial air transport became part of the reality of West African life. At the end of the war, the British Overseas Airways Corporation (BOAC) replaced the Imperial Airlines to serve the British West African Colonies. Consequently, the West African Airways Corporation broke up in 1957 when Ghana gained independence and formed its own airline. Consequently, the assets of WAAC were shared and Nigeria inherited some aircrafts and landed properties which were eventually transferred to the newly formed company, called the West African Airways Corporation (Nig.) Limited. The new company was incorporated by the Federal Government in partnership with BOAC and elder Dempster Limited on 23rd August 1958, with the Certificate of Incorporation No.1740.

In 1961, WAAC was re-registered and renamed Nigeria Airways Limited (NAL), following Nigerian government's acquisition of the combined interest of BOAC and Elder Dempster Lines. This was born out of the need to have a truly National flag carrier on attainment of independence in October 1960. Airline operations was then carried out by Nigeria Airways, which had the monopoly of operating scheduled services, and a number of private companies that later obtained licenses to operate charter services. NAL, being the National flag carrier, operated scheduled passenger services on the domestic routes whether they were profitable or not. Furthermore, considerable efforts were made to develop aeronautical infrastructure to support viable air transport operation. Prior to 1970, Nigeria could only boast of two International airports.

The Kano International airport commissioned in 1956 followed by the refurbished Lagos Airport. Ilorin Airport which was to serve as alternate to both Lagos and Kano paved the way for massive airport development which this country witnessed in the seventies. Hitherto, little better than landing trips were turned into modern aerodromes with capacity for B737 or heavier aircrafts. The days of Public Works Department (PWD) maintaining runways and other facilities were suddenly over. This gave birth to the Nigerian Airport Authority, (NAA) in 1978 with 14 airports under her care.

Derivable income of many of them is not enough to sustain the huge maintenance cost. Many hitherto viable airports are losing patronage on account of the development of inter-city dual

  

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carriageways, unreliability of scheduled services, excessive delays at airports and prohibitive flying cost. Air navigation and safety services were also upgraded in Lagos and Kano. The Kano flight Information Center was providing information as far North as Latitude 22N where traffic was handed over to Malta, and up to 1,000 miles South of Kano.

The Kano area operation covered the major routes across the Sahara Desert, the equatorial rain forests and part of the South Atlantic. Air transportation has long been the life-blood of trade, commerce, and tourism. It plays a vital role in the economies of individual, nations and of the world, and provides employment for large portions of the world labor force, both directly and indirectly. The often referred to "globalization" of world trade can be attributed to many sectors of the world economy, but few play a more significant role than air transport. As aircraft become more technologically sophisticated, and as the range of flight is extended to distances, societies, economies, and peoples become more closely bound together. Moreover, the technological advances in aircraft have also brought improving economics to commercial air transport, thus opening air travel to more and more of the world population.

**1.2 Conceptual Review**

The concept of deregulation and globalization that induce competition regime in the market was only recently applied in aviation sector. Wensveen (2009), identified three phases that characterized the level of airlines services and responsiveness of consumers prior to and after liberalization of the industry. These three phases are production, sales and consumer oriented period. The contextual argument for transition reliably holds in emergence of changing and dynamics of services and market structure of airline services to attract market share in a competitive regime.

Deregulation as defined by Ore (2001), means a change in regulation away from the present system." He went further to state that deregulating the transport industry "further implies free exit and free entry for any operator with the addition of freedom to also set fares and pick which routes they will fly." It follows from this definition that deregulated or Liberalized aviation market has the same distinguished features as follows:

- Free entry into the market of new airlines;
- Free exit from the market of weak airlines;
- Low competitive airfares;
- Better and improved services;
- Likelihood of a better management team;
- Airlines concentrate on routes where they have competitive advantage;
- Larger Global Carriers ply long and high density routes;

  

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- Airlines form strategic alliances for improved performance;
- Equipment rationalization by Carriers;
- Product differentiation etc.

On the other hand, liberalization according to Dias (2003) may be viewed in relation to the aero-political environment or in relation to the infrastructural supplies and product distribution. He further exprsesses Liberalization aviation sector to implies:

(a) Freedom for airlines to provide services on desired routes on an economic and commercially viable scale; Access new resources and join forces with other airlines; and

(b) Freedom for passengers to choose among alternative services.

In relation to Infrastructural Suppliers and product distribution, he sees liberalization as "Freedom for carriers to choose how and with whom best to do business; and secure adequate correlation between service level and price to be paid." The benefits derivable from liberalization of the aviation sector determine its relevance to an economy. Corroborating this, Kotaite (2003), sees, "Liberalization as a process and a methodology rather than an objective, it must be judged by its consequences and its benefits, and not by its theoretical underpinnings." This is important because, it is base on the methodological framework of liberalization policy that performance of the aviation sector could be assessed.

Cooke (2001), provided the difference between deregulation and Liberalization. To him, "Liberalization generally removes the operating restrictions on an industry, but it is different from deregulation, which simply changes the rules." It is important to note also that a privatized and liberalized aviation market will still have some form of regulation because of safety requirements. "This is especially true of the transport industries where safety and security are vital issues."

### 1.3 Theoretical Review

The level of awareness of the immense importance of transportation system generally, and air transport in particular in facilitating globalization trend has spurred many theoretical and empirical literatures on the issue. In the economic assessment models of the impact of liberalization on aviation sector, two distinct theories have been used to explain the linkages; these are the contestability theory and oligopoly theory. These two theories position the aviation sector in between two extreme theoretical market structures, which are the perfect and monopoly market. The duos are extensively examined below.

### 1.4 Contestability Theory

  

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This theory was proposed by Baumol (1982), Bailey (1982) and Baumol and Willig (1986) to provide a theoretical justification behind USA's deregulation of domestic air transport industry in the late 1970s. A contestable market structure is one where entry is free and exit is costless (no sunk cost). Potential entrants to a particular industry are also assumed to have free access to technology. Incumbents in such a market behave in welfare maximizing manner due to the threat posed by the potential entrants which are capable of entering markets where super normal profit is earned (Baumol 1982). The theory shows that pure profits may be eliminated even though the industry contains only a few firms and experiences no actual entry. Potential entry can do the job just as well as actual entry, as long as two conditions are fulfilled. First, entry must be easy to accomplish; and, second existing firms must take potential entry into account when making price and output decisions. The implication is that in the contestable markets the existence of abnormal profits, even if they are due to transitory causes, will attract entry. Firms will enter to gain a share of these profits and will exist when the transitory situation has changed.

A deregulated airline industry is cited as a practical approximation of contestable market hypothesis due to the relative ease of entry to the market and presence of equal access to technology (Bailey, 1982). Moreover, relatively, cost can be easily recapitalized upon exit from airline markets compared to other industries. If incumbent airlines on a given route are suspected of charging higher prices, other airlines which can serve the route will start operation in the route until price decreases to a competitive level. Therefore, the threat posed by potential entrants to the route disciplines the conduct of the incumbents to operate as if in a competitive environment. In principle, the message of contestability theory is that policy intervention in market processes is unnecessary, if entry and exit are free and easy. In this case, potential competition as well as actual competition will influence market performance. This position the theory closer to perfect competitive theory and as such suggested that liberalization of the aviation sector will yield maximum social surplus.

### 1.5 Oligopoly Theory

Due to the apparent incapability of the contestability hypothesis to explain conduct of firms in the airline industry, the degree of competition in the air transport market is usually assessed in the framework of oligopoly theory. Fisher and Kamerschen (2003), Oum et al (1993) and Brander and Zhang (1990) were the pioneer in this theory. Theoretical underpinning on this theory was to analyze the market conduct of duopoly airline routes in the USA. Schipper et al (2002), Marin (1995) and Nero (1998) also employed a similar framework to analyze the level of competition in European interstate routes. In their study, the focus is on the relevance of this theory to predict how airlines strategically interact in a regulated market and their reaction as more market oriented policies are introduced in the context of international air transport services.

  

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According to its proponents (Fisher and Kamerschen; 2003, and Brander and Zhang; 1990) bilateral arrangement between countries on policies and regulation, which allow for single designation, result in a duopolistic market provided that each country has a capable and willing airline to operate the routes specified in the agreement. In situations where one of the bilateral parties has no such airline to operate international services, the market will end up being a monopoly, whereas, if the policy allows multiple designation or airlines from third countries, the number of airlines operating in a given route can be more than two. Furthermore, under such policies pricing and capacity decisions (i.e. type of aircraft and number of weekly frequencies) of airlines are restricted and subject to the approval of aviation authorities. Consequently, the airlines tend to engage in collusive practice and jointly maximize profit.

However, as more and more competition are introduced (as a result of domestic market deregulation or liberalization) the airlines tend to go from collusive to non- cooperative pricing decision. The relative ease of restriction on pricing, capacity, and designation and traffic rights forces the airlines to compete aggressively to provide efficient service to consumers. The resulting conduct in the market will have a reducing effect on equilibrium prices and improve service quality (Marin, 1995, Dresner and Tretheway, 1992).

### 1.6 Bertrand Oligopoly Market Competition

Bertrand competition is a model of competition used in analyzing the nature of strategic interaction in aviation sector. It was named after Joseph Louis François Bertrand. It describes interactions among firms (sellers) that set prices and their customers (buyers) choose quantities to consume at the prices set. Bertrand argued that if firms chose prices rather than quantities, then the competitive outcome would occur with price equal to marginal cost, thus, the liberalization resulted into maximization of social welfare. The model rests on very specific assumptions; existence of at least two firms producing a homogeneous (undifferentiated) product and cannot cooperate in any way, firms compete by setting prices simultaneously and consumers want to buy everything from a firm with a lower price (since the product is homogeneous and there are no consumer search costs). A crucial assumption about the technology is that both firms have the same constant unit cost of production, so that marginal and average costs are the same and equal to the competitive price. This means that as long as the price it sets is above unit cost, the firm is willing to supply any amount that is demanded (it earns profit on each unit sold). If price is equal to unit cost, then it is indifferent to how much it sells, since it earns no profit). Obviously, the firm will never want to set a price below unit cost, but if it did it would not want to sell anything since it would lose money on each unit sold.

### 1.7 Cournot Oligopoly Market Competition

  

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Cournot competition describe the behavior of firms in an industry structure in which firms compete on the amount of output they will produce, which they decide on independently of each other and at the same time. It is named after Antoine Augustin Cournot. It rest on the following critical assumptions; there is more than one firm and all firms produce a homogeneous product, i.e. there is no product differentiation, firms do not cooperate, i.e. there is no collusion, firms have market power, i.e. each firm's output decision affects the good's price, the number of firms is fixed, firms compete in quantities, and choose quantities simultaneously, the firms are economically rational and act strategically, usually seeking to maximize profit given their competitors' decisions.

Furthermore, all firms know the total number of firms in the market, and take the output of the others as given. The market price is set at a level such that demand equals the total quantity produced by all firms. Each firm takes the quantity set by its competitors as a given, evaluates its residual demand, and then behaves as monopoly. The implications of Cournot type strategic interaction for firms is as follows; i.) Output is greater with Cournot duopoly than monopoly, but lower than perfect competition, ii.) Price is lower with Cournot duopoly than monopoly, but not as low as with perfect competition, iii.) According to this model the firms have an incentive to form a cartel, effectively turning the Cournot model into a Monopoly. Cartels are usually illegal, so firms might instead tacitly colluded using self-imposing strategies to reduce output which, *ceteris paribus* will raise the price and thus increase profits for all firms involved.

## 2.0 EMPIRICAL REVIEW

For decades, the airline industry remained one of the most regulated industries. The Airline Deregulation Act of 1978 in the United States challenged the age old dogma that commercial aviation should be tightly regulated and monitored by the government. The act was followed by a wave of liberalization in other part of the world. The outcome in terms of cost and benefits emanating out of liberalization policy has been the focus of copious research. The first set of evidence comes from the developing countries where the liberalization policy developed. Recent, however, developing countries in Southern American, Asia and Africa have also adopted various policies to enshrine deregulation and privatization of aviation sector. The review of previous findings, thus, revolved around the evidence from the developed as well as developing countries. This division is in part due to differences in the technological and economic development between these two economies, thus, factors responsible for growth in a clime can be properly accounted through a disaggregated analysis.

### 2.1 The Impact of Deregulation and Liberalization on Nigerian Air Transport

  

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Prior to deregulation, the Nigeria airline services are characterized of irregular and ineffective services and were generally shymbolic in nature (Ogunkoya, 2008). The consumer was left with Hobson's choice as alternatives do not exist there were limited participant and no options offered irrespective of the quality of services rendered (Adeniji, 2000). These were the prevalent features which characterized the airline services in Nigeria prior to deregulation.

However, after deregulation, the airline services in Nigerian witnessed a new era of growth and advancement. The deregulation regime offered an increased interest and investment in the more dormant Nigerian aviation industry. As more airlines entered the market, an enhanced investment in fleets of aircraft to retire the old and risky fleet also to imbue confidence in the market. The services offered witnessed a turnaround as market driven innovations came to bear to attract more passengers. The corollary of this is the emergent of varieties of services to suit all categories of air travelers which were never a feature of the industry.

According to Oluwakoya (2011) the deregulation of the aviation sector leads to. The Boeing Company reported that Nigerian airline, namely Arik Air, has ordered 15 new planes with least price of $1.8 billion (Allafrica,2008). It is worth mentioning that the impact of deregulation of air transport in Nigeria caused the establishment of MMA II, which is a good example of Public Private Partnership. The MMA II was an arrangement between the Bi – Courtney and entry of new operators, which injected fresh capital into the sector. The total amount of fund injected is estimated for about US $5 billion in the last three years the government to build, operate and transfer infrastructure in Nigerian airports.

The aftermath of deregulation saw the domestic passenger volume for the Lagos airport reached 1.6 million Odunlani, (2008). Similarly, the Afrijet Airlines invested in the construction of private hanger operation in order to be used by the domestic and foreign airline operators in Nigeria. The investment amount was above US $1.5 million and has significantly contributed to the airline operations in Nigeria.

In addition to the positive impact of deregulation, the Nigerian Civil Aviation Authority gave license to small operators outside the regular schedule service in the domestic and regional operations, to private companies with many fixed wings aircraft and helicopters servicing the oil fields as well as an increasing number of corporate and private aircraft (Idrisu, 2004). He went further to stress that some multinational oil companies have constructed their own airport to enhance the movement of both materials and workers in their onshore and offshore operations. An example is the Osubi Airport in Warri, Nigeria, owned and managed by Shell Petroleum Development Company.

  

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## 3.0 METHODOLOGICAL REVIEW

In the literature several methodological approaches can be found and have employed in examining liberalization and aviation sector performance, Button and Drexler (2006) divide these approaches into three basic groups which are; survey approach, input-output approach and econometric approach. The review according centered on these approaches has found in the literature.

The first which is the survey techniques is a non-experimental, descriptive research method. Surveys can be useful when a researcher wants to collect data on phenomena that cannot be directly observed. It is done through questioning people involved in air transportation, including professionals and passengers. As compared to other methods (direct observation, experimentation) survey yield a broader range of information. Surveys are effective to produce information on socio-economic characteristics, attitudes, opinions, motives etc and to gather information for planning, advertising media, sales promotion, channels of distribution and other variables. Although this method often uncovers trends in behavior of market participants, its main problem is high level of subjectivity of the responses obtained. It can become a basis for lobbying rather than one of analysis if due caution is not taken. This study has been extensively in Nigeria (Oluwakoya, 2011; Adeniji, 2000)

Another approach that is preferred to the survey technique is the input/output analysis; it uses the Keynesian multiplier techniques. Done through tracing local expenditure on air transportation either in aggregate (multipliers) or by sectors (input-output analysis). The approach also assesses liberalization as an input inform of better management techniques and adoption of modern techniques, then estimates the multiplier effect of liberation policy on aviation sector and the economy. As against the survey approach, this input/output techniques uses data on that measured liberalization rather than perception.

The biggest issue of this approach is to correctly choose the time frame to consider in the analysis. Also, the values of the multipliers might be difficult to estimate. The delay between the time a market change occurs and the time its impacts start to be evident is difficult to predict. Flight plans are published twice a year only and airlines usually prepare them a couple years in advance. Therefore, today's regulatory changes in air transportation markets will show their full impacts with a month to years-long delay. The biggest problem is to predict the length of this delay. The last approach based on Button and Drexler (2006) classification is the econometric approach. This approach has been used by Shipper et al (2002). Both single equation and simultaneous equation techniques have been adopted based on the modeling techniques used and the co linearity between the variables included in the model. OLS, VAR, GMM and SUR have been used to estimate the resulting equation. The dependent variable is usually an index of

  

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liberalization. Two basic indexes were widely used in empirical analysis. The first is Air Liberalization Index (ALI) constructed by the WTO Secretariat (WTO, 2006) which is an expert based index. The weights assigned to the different provisions of air agreements were defined in consultation with a group of experts on aviation industry with the view to capture the relative importance of each provision in liberalizing the sector. The ALI ranges between 0 and 50, where 0 is associated with the most restrictive agreement and 50 denotes the most liberal agreement.

The other index is factor analysis technique introduced by Nicoletti et al. (1999). The factor analysis involved several steps, firstly, one need to define the database, the second step of factor analysis consists of extraction of the factors, that is, in this step we identify the number of latent factors needed to represent the database. The third step consists in the "rotation" of these factors. This transformation is targeted to reduce the number of significant components (those with a loading larger than 0.5) in each factor, in order to allow for an interpretation of the factors.

The econometric approach involves building of complex mathematical and statistical models. Their main advantage consists in high ability to isolate the effects of changes in air transportation policy on local development (and thus approach the *ceteris paribus* rule). However, there is a risk of choosing inappropriate econometric model. Moreover, the methods are highly data intensive.

### 3.1 Model Specification

From the reviewed literatures and the theoretical frameworks, especially the econometric approach and gravity model, this study adopts GM to analyze the determinants of bilateral passenger flow between Nigeria as the country of origin and a randomly sampled of 31 African countries. The GM assumes that bilateral passenger flows is proportional to the product of their respective countries' economic size (GDP) and diminishes with distance (see Krugman and Obstfeld 2009). Thus, the flow of people, ideas or commodities between two locations is positively related to the economic sizes of the partner countries and negatively related to the distance (see Ghosh and Yamarik 2004).

Equation (1) shows the standard GM:

$$PM_{ij} = A\frac{GDP_i^{b_1}GDP_j^{b_2}}{D_{ij}^{b_3}} \qquad (1)$$

Where $PM_{ij}$ is the number of bilateral trade between countries $i$ and $j$; $GDP_i$ and $GDP_j$ are the national incomes or outputs of countries $i$ and $j$ and they are usually used as proxies to measure

  

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the economic size; $D_{ij}$ captures the bilateral distance between the two countries and $A$ is a constant term. By taking the natural log of equation (1), the transformed model can be expressed in a cross sectional or panel data framework as expressed below:

$$\ln PM_{ijt} = \alpha + b_1 \ln GDP_{it} + b_2 \ln GDP_{jt} + b_3 lnD_{ij} + v_{ijt} \quad (2)$$

where $t$ represents the time period, $\alpha = \ln A$, and $\alpha$, $b_1$, $b_2$ and $b_3$ are the regression coefficients. The disturbance term-$v_{ij}$ captures shocks that may affect bilateral passenger movement between the two countries.

This gravity model claims that higher income tends to support Passenger flow by leading to more production, higher exports and also higher demand for imports (see Jugurnath et al, 2007 for a related review). Furthermore, larger distances between countries are expected to reduce bilateral passenger flows by leading to higher transportation costs and some other difficulties to trade such as information asymmetry (see Salisu and Ademuyiwa, 2012; and Abidin,et.al, 2016 for a review). The inclusion of the core variables in the model i.e income and distance in a trade equation is justified by many trade theories, especially imperfect competition and the Hecksher – Ohlin model (see Ghosh and Yamarik, 2004).

Equation (2) is the traditional gravity model and the underlying apriori expectation is that bilateral passenger movement is positively related with economic size and negatively related with distance. Theoretically, as income and output increase, there would be both greater demand for goods and services and increased production thereby increasing bilateral movement of passengers through airlines; therefore,$b_1, b_2 > 0$ (positive). Also, the farther the bilateral distance between the two trading partners' capital city, the higher the transportation costs and all other things being equal, the lower the magnitude of passenger carriers and volume of trade transactions; therefore,

$b_3 < 0$ (negative).

Aside from the basic traditional gravity model variables, several additional variables have been adduced and included in the GM equation by many researchers to control for differences in geographic factors, historical ties, socio-economic and political factors. In particular, we include common Language (Commlang), Total Land Area (*AREA*) exchange rate (see Bacchetta and van Wincoop, 2000; Lane and Milesi-Ferretti, 2002; Jugurnath *et al.*, 2007 and Afolabi et.al, 2016), and degree of openness of the countries. Specifically, the rate of country's openness is included

  

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in the model to reflect the rate of the interregional connectedness of African countries and Liberalization index[1]. Given the foregoing, equation (2) is modified as follows:

$$\ln PM_{ijt} = \alpha + b_1 \ln GDP_{it} + b_2 \ln GDP_{jt} + b_3 \ln D_{ij} + b_4 \ln POP_{it} + b_5 \ln POP_{jt} + b_6 COMLANG_{ijt} + b_7 EXR_{it} + b_8 EXR_{jt} + b_9 \ln AREA_{it} + b_{10} \ln AREA_{jt} + b_{11} \ln \text{OPENSS}_{it} + b_{12} \ln \text{OPENSS}_{jt} + b_{13} \ln \text{AIRLINDEX}_{ijt} + v_{ijt}$$

In addition to the earlier definitions of variables, $PM_{ijt}$ are bilateral Passenger flow between $i$ (the source countries-Nigeria) and $j$ (the reporting countries-Any other African country). The Dummy variables are used for some passenger flow impedance factors or constrain. For instance, $Comlang_{ij} = 1$ if countries $i$ and $j$ share a common official language and 0 (zero) if otherwise. It is expected that countries with larger populations will record high volume of passenger movement and vice versa, thus, $b_4, b_5 > 0$ (positive)**.** We also expect that trading countries that share a common language will trade more due to easy accessibility and therefore lower cost of transportation and vice versa, thus, $b_6 > 0$. Similarly, the variable *AREA* denotes the country's total land area, including areas under inland bodies of water and some coastal waterways (see Jugurnath *et al.*, 2007). It is expected that larger countries will record high passenger flow therefore, $b_9, b_{10} > 0$. It is possible however that relative size may also be important for comparative advantage reasons. Thus, if this scenario is the case, the sign on the coefficient of *AREA* may also be indeterminate (see Jugurnath *et al.*, 2007).

The sign of the coefficient of exchange rate is basically indeterminate (Bacchetta and van Wincoop, 2000; Lane and Milesi-Ferretti, 2002). However, it is expected that higher exchange rate worsens the purchasing power of the local currency. Therefore, we expect that $b_7, b_8 < 0$. Also, we anticipate that the sign of coefficients on openness will be positive as well as Air liberalization index. This reasoning is underscored by the fact that the more open a country is, the more passenger movement is facilitated. We therefore expect $b_{11}$, $b_{10} < 0$.

### 3.2 Data Issues

The data collected for the analysis are secondary in nature and covered a cross sectional period of 2003 for 32 African countries. The detail of the list and data for the selected countries is attached as an appendix. The choice of the period of the study is basically underscored by the availability of readily retrievable data on bilateral passenger flow in Nigeria which is obtainable from the Nigerian Civil Aviation Statistics for the year 2003. Data on GDP, Population figures, and exchange rate were obtainable from the World Development Indicator database. Bilateral

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distances, Common (official) language, and Total land area of the selected countries were obtained from CEPII Distance database (http://www.cepii.fr/anglaisgraph/bdd/distances.htm). Data on openness from Pen World Table (PWT) http//www.penworld, and lastly, data on the informed index of air transport liberalization, the ALI, is from the QUASAR database (WTO, 2006 and 2007b).

### 3.3 Gravity Model Estimation Results

Generally, the tenet of the basic bilateral Air transport GM in its Newtonian form expresses bilateral passengers' movement between two or more countries as a positive function of the economic size of the countries in question, proxy by each country's Gross Domestic Products (GDP) or the population and a negative function of the bilateral distance between the partners. To confirm this basic tenet of the model, we estimate the augmented GM for the Nigeria bilateral passenger movement to and from some selected African countries.

The estimated results show that the explanatory variables jointly explained total variation in the rate of passenger movement between the selected partners' countries for about 60.8 percent. This is judged from the value of the coefficient of the determination of the estimated model. This implies that it is only 30.2 percent of the total variation in the value of the dependent variable that is explained outside the explanatory power of the regressors. Again, the adjusted coefficients of the determination of the model (Adjusted R-squared) shows that after taking care of possible lost in the degree of freedom, the explanatory variables (gravity model variables and the liberalization index) still explain about 56.3 percent of the total variation in the level or the magnitude of passenger movement from Nigeria Airports to and from other African countries. Thus, the model has goodness of fit. See table 5.1 below for the summary of the model estimation.

**Table 1: Nigerian-African Bilateral Passenger Movement Gravity Model**

| | *Coefficient* | *t-ratio* | *p-value* | Remark |
|---|---|---|---|---|
| Const | -3.9125506 | -1.8357 | 0.08396 | * |
| lnGDP_S | 16.472 | 2.3217 | 0.03163 | ** |
| lnGDP_R | 66.7962 | 0.1143 | 0.01033 | ** |
| EXR_S | -9.6077405 | -0.7716 | 0.06596 | * |
| EXR_R | 30347.2 | 0.7257 | 0.47791 | |
| lnOpnss_S | 31.9861 | 1.8228 | 0.08598 | * |
| lnOpnss_R | -4741.01 | -1.6672 | 0.11380 | |
| lnPop_S | 148102 | 2.1169 | 0.04932 | ** |
| lnPop_R | 0.0164039 | -2.1253 | 0.04852 | ** |
| lnArea_S | -0.0577758 | 1.1496 | 0.26623 | |

  

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| | | | | |
|---|---|---|---|---|
| lnArea_R | 2.00403 | -2.2476 | 0.03816 | ** |
| CommlangComlang. | 0.582119 | 3.2362 | 0.06987 | * |
| LnAirLindex | 26.61370 | 1.5594 | 0.01373 | ** |
| lnDist | -1.9492306 | -1.4773 | 0.15787 | |
| R-squared | 0.608440 | Adjusted R-squared | | 0.562946 |
| F(14, 18) | 1.761072 | P-value(F) | | 0.000958 |

*Note: * and ** represent 10%, 5% and 1% levels of statistical significance.*

**Source: Author's computation 2017**

In terms of the statistical and econometric performance of the individual regressors in the model, we found that if all things being equal, a one percent increase in the income elasticity of the host or source country (Nigeria) country will on the average lead to approximately 16.5 percent change (increase) in total number of passenger movement to and from Nigerian airports to the selected African countries. Similarly, a unit increase in the income elasticity of the receiving country (foreign) will lead to about 67 percent increase in the number of passenger inflow of passengers from Nigerian airports to the foreign countries. The implication of this finding/results is that economic size of partner's countries leads to move inflow of passengers to such countries. Thus, in the tradition gravity model of bilateral transport and trade, income of the two countries determine the force of attraction or gravity for pulling both domestic and foreign passengers. This parameter is significant for both the home and the destination country at 5 % level of significance.

For the distance, the coefficient of the variable signed correctly in conformity to the theoretical expectation that is a unit increase in the distance could lead to approximately 5 percent decrease in total number of the bilateral passenger movement to and from Nigeria through the airlines.

On the part of the population as a determinant of passenger bilateral flow between the selected countries in this study, our estimated results show that the population of the source countries (Nigeria in this case) and the receiving countries (other African countries) are both significant at 5 % in determining the rate of passenger bilateral flow. By implication, a 1 % increase in the elasticity of Nigerian population will turns out about 14.8 % increase in total bilateral passenger flight across the African countries. On the other hand, the population of the destination country, though significant but does not show high magnitude of impacts in determining the level of passenger movement across the countries.

Furthermore, another important geographical variable in our augmented bilateral passenger movement gravity model for Nigeria-Africa is the landmass or the area of the partner countries These variables explains the extent of the vegetation coverage that inhabits all the natural and man-made resources that could help in production and subsequent increase in the number of

  

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passenger travels Our results shows that a 1 % increase in land mass or the area of Nigeria will leads to 0.56 percent decrease in total passenger flows which is not in conformity with the a priori expectations in the model. It should be noted that the coefficients of this variable is significant for the reporting countries, at 5 percent level of significance. Although, this is correctly signed in conformity with a prior expectation.

It is also important to comment on the coefficient of openness as a socio-economic determinant of bilateral passenger flow. It was expected on the a priori ground that the more open an economy is, the more the level of trade. From our empirical results, we found that the coefficient of the elasticity of openness for Nigeria is correctly signed, while that of the destination country is not significant. For exchange rate as well the result shows that the level of exchange rate volatility affects the extent of passenger flows. For instance, a unit increase in the real exchange rate of the country of origin, Nigeria will lead to about 9.61 percent reduction in the numerical numbers of passenger flows. The variable is not significant for the other countries.

Also, from the table, we found that sharing of common official language by the partners' countries is theoretically expected to result into positive increase in total passenger flow between them. In conformity with this, the result of the coefficient of the variable on common language indicates that a 1 % increase in the sharing of common official language will increase mutual passenger flow to and from the partner's countries of 0.58 %. This is significant at 1 % level of significance as reported in our estimated GM.

## 4.0 DISCUSSION OF THE MAJOR FINDINGS

The major findings from the empirical analysis revealed that almost all the explanatory variables are significant as the determinants of passenger flow, particularly the liberalization index. The study finds that the level of economic growth which measures the economic size of the respective countries are significant variable that influence the rate at which passengers move across countries to and from Nigeria. This finding corroborates with most empirical studies on gravity model (See Oyejide et al, 2007, Bamidele, 2011, Salisu and Ademuyiwa, 2012, De Grauwe, 2012 for more revealing findings).

The population of trading partners enhances trade. But the low magnitude of the coefficient of population of the destination country in this study may not be unconnected with the claim of Aitken (1973), who noted that an increasing population of the trading partner could mean an expansion of the domestic market as well as increase in trade potentials which could lead to reduction intra-regional trade and passenger flight in general.

It is instructive to note that as we found the coefficient openness for the destination country is insignificant, it is evidence to verify the social reality that low level of a country's trade openness

  

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will limit trade and development. In relation with other studies, Zahra *et al* (2011) found the coefficient of openness in his study on the analysis of bilateral trade through passenger flight among the D8 Islamic countries to be 1.02 %. This is the contrast of our own finding. However, we submit that the more open a particular country is, the higher will be the inflow of passengers and other exportable goods to such countries. For instance, Ghosh and Yamarik (2004), found the coefficient of common language to be 0.02 which is less than our result. Also, De Grauwe (2012) included common language in his gravity model for China-African Bilateral trade but did not estimate the coefficient of the variable (See Longo and Sekkat (2004) for more results) and their findings, especially Piermartini and Rousova (2008) all revealed that common language is a significant influence on passenger flight across countries of the world.

Lastly, liberalization index which is central to this study shows significant impacts on the performance of the aviation sector through increase in the number of passenger and this finding corroborates with the findings of Piermartini and Rousova (2008) who employed the aviation sector liberalization index developed by the World Trade Organization (WTO). Therefore, we conclude that liberalizing aviation sector significantly impacts positively on the performance of the sector.

## 5.0 CONCLUSION

In view of the above scenarios and the empirical findings, particularly as the model results shows, we can conclude that liberalization policy of the aviation sector will benefit both consumers (passengers) and airlines operators in the Nigeria and the rest of the African Countries. In fact with the advent of aviation sector liberalization, much of the welfare gains are derived from higher frequency of increasing passenger flows and other trade carried out through the airlines. Also service quality and entrance of more operators were reckoned consequent to liberalization.

### 5.1 Policy Recommendation

Notwithstanding these benefits among others, the incidence of accidents and air fare hike or rise in air fare prices are to be minimized if the benefits of liberalizing the sector would be realized. We therefore recommend that quality services that will enhance consumer utility. Also, opening the skies will lead to greater competition, even higher frequency and substantially lower prices so that national and international travels will be enhanced and made more attractive. Airport expansion and maintenance is highly recommendable in Nigeria to facilitate effective service delivery and ensuring higher safety nets for passengers' lives and properties. Finally, to achieve optimal maximization of liberalization policy, Nigerian Government and aviation regulators in

  

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general should formulate an effective aviation liberalization policy framework and airport slot allocation policies.

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