IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 26, Issue 10, Series 3 (October. 2021) 10-15
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Determinants of Demand for Air Transport in Nigeria

Eyitayo Olaleye*and Jacob Oluwoye, PhD**
**Center for Urban and Rural Research,*
***Center for Urban and Rural Research,*
Dept of Community & Regional Planning,Dept of Community & Regional Planning,
Alabama A&M University, Normal, AL 35762,Alabama A&M University, Normal, AL35762,
U.S.AU.S.A.

ABSTRACT
The literature establishes that factors accounting for variation in demand for air transport range from macroeconomic variables (gross domestic product, inflation, foreign direct investment, etc) to perception-related variables (safety, comfort, convenience, etc). Studies on these determinants predominantly use data from advanced countries, with limited research on developing countries. This study therefore investigates the impact of macroeconomic variables on the number of air passengers in Nigeria. The dependent variable is the total air passengers (domestic and international) and the independent variables are economic growth, population, foreign direct investment and inflation. A multiple regression model is specified and estimated using the ordinary least squares. The results show that changes in both economic growth and inflation have a negative impact on total air passengers, while movements in population and foreign direct investment have a positive impact. Of the independent variables, only the estimated coefficient of foreign direct investment is not statistically significant. The study concludes that propensity to fly is a volatile variable that is responsive to macroeconomic changes in Nigeria.

KEYWORDS: Demand, air transport, Nigeria, OLS

Date of Submission: 29-09-2021 Date of Acceptance: 13-10-2021

I. INTRODUCTION

In 2018, the total number of passengers who passed through Nigerian airports reached over 17.2 million, up from 14.4 million in 2017 (National Bureau of Statistics, 2019). Of this 2018 figure, international passengers were about 4.4 million (26%) compared to 4.1 million (28%) in 2017 while domestic passengers were close to 12.8 million (74%) compared to 10.4 million (72%) in 2017. While there is overall growth in the Nigeria's air transportation traffic from 2017 to 2018, demand for domestic flights was clearly on the increase while patronage for international flights was facing south. In sum, domestic flights are about thrice as large as international flights at Nigerian airports.

These stylized facts suggest that while demand for air transportation in general is prone to fluctuations, domestic air transportation is clearly more attractive to passengers in Nigeria.The motivation for this researchis a by-product of these facts. The primary objective of the research is to investigate factors determining air passenger traffic in Nigeria. The determinants are analyzed with respect to macroeconomic variables such as GDP, population, FDI, inflation and trade.

The reminder of this paper is organized as follows. Section 2 reviews relevant literature on factors determining air passengers traffic. Section 3 contains model specification and sources of data. Results and discussion of findings are the subject matter of Section 4. Finally, Section 5 concludes the research and Section 6 contains implications for future research.

II. REVIEW OF LITERATURE

There has been educated curiosity to investigate what determines movements in air transport traffic around the world. Various studies (such as Button and Taylor, 2000; Lakshmanan, 2011; Mukkala and Tervo, 2013; Tolcha et al., 2020) have explored the impact of economic development on demand for air transport. Although findings from these studies have some variations, they skew to the conclusion that developed countries have more air transport traffic because of their level of development. In contrast, economic and human development has not matured enough in less developed countries to give room for large patronage for air transport.

Using the multiple regression model of demand, Aderamo (2010) looked into microeconomic and macroeconomic factors capable to influence air passenger flows. The microeconomic factors include agricultural production, manufacturing production, energy consumption and electricity usage. The macroeconomic factors include the consumer price index, gross domestic product and federal government expenditure. His findings reveal that agricultural production, manufacturing production, gross domestic product, inflationary rate and consumer price index are important in the explanation of the demand for air transport in Nigeria. Aderamo (2010) justified the inclusion of these variables using earlier findings of Jimoh (2004) and Adeyemi (2001).

Previously, Osayimvese and Filani (1974) submitted that the major factors determining passengers' patronage for a mode of transport are income level of passengers, speed and safety of the transport mode. In addition, Cole (1998) and Banister (1998) obtained that these determinants extend to comfort and reliability of the transport mode.

Boonekamp et al. (2018) quantified demand and supply determinants of air transport traffic. The demand factors include GDP, population, tourism, disposable incomes and leisure time. These factors were considered to determine the passengers' preference for air travels. The supply factors include low-cost carrier activity, public service obligations, availability of airlines, weather conditions and technical change. These factors determine whether demanders of air transport will be satisfied or disappointed. Using the two-stage least squares technique, the authors showed that these factors are significant correlates of air travel demand.

A particular determinant of air transport traffic that has received wide attention among researchers is economic growth. The candidate explanation for this, which had been argued by Ishutkina (2009), is that expansion of economic activity translates into growth in incomes for the general population. This in turn leads people to shift their preferred means of transportation to air mode because of its high speed.

Chi and Baek (2013) analyzed the relationship between economic growth and air transport demand in the United States using autoregressive distributed lag (ARDL) to cointegration approach. They found that over the long run, both air passenger and freight services are responsive to economic growth but only air passenger services are influenced by economic growth in the short run. With the aid of simple correlation and regression, Ba-Fail et al. (2000) and Karlaftis (2008) have also empirically indicated positive relationships between air transport demand and economic growth in Saudi Arabia and Greece, respectively.

Similarly, Chang and Chang (2009) employed the Granger causality approach to examine the nexus between air cargo services and economic growth in Taiwan. They found a significant causal relationship. Marazzoet al. (2010) extended findings of Chang and Chang (2009) using the data from Brazil. By applying both Granger casualty and impulse response, Marazzo (2010) demonstrated both short run and long run mechanisms. However, empirical implications of findings of Chang and Chang (2009) and Marazzo et al. (2010) could not show the adjustment process remarkably.

III. MODEL SPECIFICATION AND DATA SOURCES

The following model is specified to capture determinants of total air passengers in Nigeria.

$$TAP_t = \lambda_0 + \lambda_1 RGG_t + \lambda_2 POP_t + \lambda_3 FDI_t + \lambda_4 INF_t + \lambda_5 TRV_t + e_t$$

where:

TAP is total air passengers

RGG is real GDP growth

POP is population

FDI is foreign direct investment

INF is inflation

TRV is trade volume

e is theresidual term

$\lambda's$ are parameters of the model

The six variables in the model are all time series. TAP is the dependent variable or regressand while the rest (RGG, POP, FDI, INF, TRV) are independent variables or regressors. RGG proxies economic growth. While the literature agrees that RGG, POP and INF are popular determinants of air transport, an innovation in this study is the inclusion of FDI and TRV as determinants of air passenger traffic. These two variables did not interest previous researchers. FDI is included because its inflows or outflows require physical presence of firms in foreign countries, necessitating patronage for air transport. TRV is included because trade activities remarkably bolster the propensity to use air transport.

The secondary data used to proxy all the variables were extracted from two sources. Data on air passengers carried, GDP growth and inflation rate were sourced from the World Development Indicators of the World Bank. Data on population, trade volume and foreign direct investment flows are as provided by the statistics of the United Nations Conference on Trade and Development (UNCTAD). The data span from 1970-2019.

The multiple regression model specified above is estimated using the Ordinary Least Squares (OLS). The use of OLS is in part on the premise that neither the regressors nor their error terms correlate, implying absence of multicollinearity and autocorrelation. In addition, the data sets are sufficient enough to produce non-spurious results which can explain the long run relationship between air transport traffic and its determinants.

IV. EMPIRICAL RESULTS

This section presents descriptive statistics, correlation coefficients, stationarity tests and regression results.

4.1 Descriptive statistics

Presented in Table 1 is the brief descriptive statistics of the variables in the model. In the period 1970-2019, the average number of air passengers in Nigeria is about 1.81 million**.** This is low compared to the maximum value (7.79 million), but it is far above the minimum value (0.173 million). This suggests that high demand for air transport is a recent phenomenon in Nigeria. The average growth rate of output is positive at 3.94%, but its high standard deviation (6.36%) shows that economic growth is prone to large variations in Nigeria.

The mean population in the period covered is about 113.9 million. The positive maximum and minimum values of population indicate an upward trend in the size of Nigeria's population. The mean value of 2477.1 and standard deviation of 2789.6 of foreign direct investment show that flows of FDI are very volatile. Another variable characterised by frequent changes is the inflation rate. The inflation rate is 18.27%± 15.63%. This is telling that the Central Bank of Nigeria is far from achieving single-digit low inflation.

The trade volume is alsosusceptible to fluctuations as its standard deviation (2788.6) is more than its mean value (2495.4). Of the six variables in the model, RGG is the most volatile because its standard deviation almost doubles its mean value.Three variables (TAP, POP and INF) exhibit positive trends while three values (RGG, FDI and TRV) have their values alternating between positive and negative values. All variables exhibit median values that are below their mean values, except the real GDP growth (RGG).

Table 1*: Descriptive statistics of the variables*

	TAP ('000)	*RGG (%)*	*POP ('000)*	*FDI (Millions of USD)*	*INF (%)*	*TRV (Millions of USD)*
Mean	1807	3.94	113878.5	2477.09	18.27	2495.36
Median	1044	4.44	106621.0	1439.95	12.78	1476.39
Maximum	7786	25.01	200963.6	10191.55	72.84	10203.13
Minimum	173	-13.13	55982.14	-734.32	3.46	-722.61
Std. Dev.	1806	6.36	42463.96	2789.61	15.63	2788.58

Source: Author's computations

4.2 Correlation coefficients

Table 2 shows the level of relationship among the variables. TAP is positively related to all other variables except RGG and INF. RGG is positively correlated with other variables except TAP and INF. POP has positive association with other variables except INF. FDI has positive relationship with all variables except INF. TRV has positive link with all variables except INF

It is telling that all variables have negative relationship with INF. However, this is not a big surprise. Higher inflation reduces real disposable incomes. This implies that there is less money to patronise air transport and there is less incentive to produce output (fall in economic growth). In addition, peopleleave the country due to unbearable inflation (fall in population). International corporations do not see prospects in taking FDI to inflation-ravaged country (fall in FDI). Finally, because inflation makes domestic goods less internationally competitive, trade volumes drop.

It is also interesting that TAP has negative correlation with RGG. A candidate explanation for this is that when the economy is booming, there may be less need to travel across or between countries. Thus, demand for air airport may be less popular during economic booms but is on increasing trend during economic slumps.

Particularly important is that the correlation between TRV and FDI is near perfect. This denotes presence of multicollinearity. If the two variables are in the regression equation, not only would their coefficients be biased, they will be inconsistent and inefficient. As a result, one of the two variables suffices to appear as regressor since one can exactly explains the other. Hence, TRV is dropped in the estimated model. I

chose FDI because modern advancements in communication and transportation may limit flying of people for trade activities, but flows of FDI often require use of air transport.

Table 2: *Correlation coefficients between the variables*

	TAP	*RGG*	*POP*	*FDI*	*INF*	*TRV*
TAP	1.000000					
RGG	-0.190592	1.000000				
POP	0.701286	0.026278	1.000000			
FDI	0.438343	0.167155	0.710718	1.000000		
INF	-0.238926	-0.062743	-0.147797	-0.068831	1.000000	
TRV	0.437166	0.166865	0.710153	0.999984	-0.063252	1.000000

Source: Author's computations

4.3 Stationarity tests

It is ascertained whether mean reversion is characteristic of each variable using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. This is conducted using constant only and constant and trend specifications on levels and first differences of the series. Comparing the ADF and PP test statistics with the critical values, it is found that all the variables are non-stationary on levels but stationary on first differences. This follows that the variables have constant means, constant variances and constant covariances. Table 3 shows these results.

Table 3*: ADF and PP Unit Root Test Results*

Variables	Form of test	Constant		Constant and Linear Trend		Order of Integration
		Levels	First Differences	Levels	First Differences	
TAP	ADF	-0.8865	-7.0880	-1.0662	-7.0314	I(1)
	PP	-0.7054	-7.0511	-1.8831	-7.0159	I(1)
RGG	ADF	-1.1176	-6.1160	-1.5469	-6.1291	I(1)
	PP	-1.0938	-6.1353	-1.7042	-6.1329	I(1)
POP	ADF	-0.4591	-6.4631	-2.7033	-6.3628	I(1)
	PP	-0.3171	-7.3301	-2.7033	-7.2652	I(1)
FDI	ADF	-1.6343	-6.2601	-2.0877	-6.6141	I(1)
	PP	-1.3690	-8.5218	-1.9872	-9.4695	I(1)
INF	ADF	0.4409	-6.0088	-4.5873	-6.0315	I(1)
	PP	0.4569	-10.6261	-4.6065	-11.0603	I(1)
Asymptotic Critical Values:						
1%	ADF	-3.6463	-3.6463	-4.2528	-4.2627	
	PP	-3.6394	-3.6463	-4.2529	-4.2627	
5%	ADF	-2.9540	-2.9540	-3.5485	-3.5530	
	PP	-2.9511	-2.9540	-3.5485	-3.5530	
10%	ADF	-2.6158	-2.6158	-3.2071	-3.2096	
	PP	-2.6143	-2.6158	-3.2071	-3.2096	

Source: Author's computations

4.4 Regression results

In table 4, the estimated coefficients are presented with their standard errors, t-statistics and p-values. TAP decreases by close to 72,000 when there is 1% expansion in economic activity. An increase in population by 1000 increases the demand for air transport by 22. This tells that demand for air transport in Nigeria can be given as 22 per 1000 population. When net FDI flows to Nigeria increase by $1 million, the patronage for air transport increases by 36. Finally, a 1% increase in inflation rate reduces the air passengers by more than 25,000.

The p-values in table 4 indicate that the coefficients are statistically significant at 5% except the FDI. This tells that while there is high confidence that economic growth, population and inflation determine changes in passengers at Nigerian airports, the impact of FDI cannot be concluded with assurance.

As found in this study,the impact of population, FDI and inflation on air passengers traffic supports what is established in existing literature such asBoonekamp et al. (2018) and Aderamo (2010). However, the explanatory effect of economic growth takes a difference. Previous studies (e.g. Chi and Baek, 2013; Chang and Chang, 2009) submitted that increase in economic activity leads to increase in demand for air transport, but this study reports a negative relationship between the two variables. This novelty can be argued as follows.

Economic growth suggests period of boom. There ishigher disposable income. There is increase in employment prospects. People have increased means to consume and invest. This can signal a sort of peace of mind, distracting people from travelling far from the booming area of the country. If people are satisfied with where they are and have low propensity to move long distance, demand for air transport is bound to decrease during economic booms. The converse is true during economic slumps.

Table 4: *Estimated coefficients*

regressor	coefficient	standard error	t-statistic	p-value
RGG	-71955.94	28256.52	-2.546525	0.0143
POP	22.32746	3.137985	7.115224	0.0000
FDI	36.14326	84.43874	0.428041	0.6706
INF	-25632.28	10467.50	-2.448750	0.0182

Source: Author's computations

V. CONCLUSIONS

The literature is awash with factors determining air passengers traffic. These determinants range from microeconomic, macroeconomic, institutional to technical variables. While these factors have been investigated in many advanced and emerging economies, researches on their explanatory link with demand for air transport is sketchy at best in Nigeria. This forms the motivation for this study.Estimating a multiple regression model reveals that economic growth, population, FDI and inflation all determine variations in demand for air transport in Nigeria. Of these variables, population is the most significant, followed by economic growth and then inflation rate. FDI is not found to be statistically significant to influence people's propensity to fly.

Population and FDI demonstrate positive relationship with preference to travel by air while economic growth and inflation have negative relationship with variation in total air passengers. The results are somewhat straightforward to explain. Higher population is likely to increase number of people willing to fly. Also, higher FDI flows will require switching residences, implying flying abroad. Higher inflation reduces disposable incomes and thus reduces affordability of air transport. However, it is an interesting finding that higher economic growth will likely reduce demand for air transport.

VI. IMPLICATIONS FOR FUTURE RESEARCH

This research was carried out using secondary macroeconomic data spanning 1970-2019. Demand for air transport is proxied by total air passengers used as the dependent variable. The data was analysed with OLS on the specified multiple regression model. From these, there are issues worthy of further research.

First, it will be interesting if the total air passengers can be decomposed into domestic air passengers and international air passengers and determinants of each are explored. Second, the data set starts from 1970 because there are missing data for some variables in earlier years. And it ends in 2019 because that is the latest year for which data on total air passengers are available. Interested researchers can extend this data set forward and backward and inquire if more information can change the results particularly the impact of economic growth. Third, this research essentially includes only the macro data. Future researchers can see into the impact of more individual variables such as fares, safety, comfort, affordability, etc.

REFERENCES

[1]. Aderamo, A.J. (2010) "Demand for Air Transport in Nigeria," Journal of Economics, 1(1): 23-31
[2]. Adeyemi, O. (2001) Moving Nigeria Forward: The Development Planning Approach. Ibadan: Ibadan University Press
[3]. Ba-Fail, A., Abed, S. and Jasimuddin, S. (2000) "The Determinants of Domestic Air Travel Demand in the Kingdom of Saudi Arabia," Journal of Air Transportation World Wide, Vol. 5(2): 72-86
[4]. Banister, D. (1998) Transport Policy and the Environment. London: Routledge
[5]. Boonekamp, T., Zuidberg, J., and Burghouwt, G. (2018) "Determinants of Air Travel Demand: The Role of Low-cost Carriers, Ethnic Links and Aviation-dependent Employment," Transportation Research Part A: Policy and Practice, 112 (Issue C): 18–28
[6]. Button, K.J. and Taylor, S.Y. (2000) "International Air Transportation and Economic Development," 40th Congress of the European Regional Science Association: "European Monetary Union and Regional Policy," Barcelona, Spain, August 29 - September 1

[7]. Chang,Y. H. and Chang,Y.W. (2009) "Air Cargo Expansion and Economic Growth: Finding the Empirical Link," Journal of Air Transport Management, 15 (5): 264–265
[8]. Chi, J., and Baek, J. (2013) "Dynamic Relationship between Air Transport Demand and Economic Growth in the United States: A New Look" Transport Policy, 29: 257–260
[9]. Cole, S. (1998) Applied Transport Economics. London: Kegan Page Ltd
[10]. Ishutkina, M.A. (2009) "Analysis of the Interaction between Air Transportation and Economic Activity: A Worldwide Perspective" Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, USA
[11]. Jimoh, A. (2004) "Public Expenditure in Transport in Nigeria." In: Vandu-Chikolo, I. Ogunsanya, A.A. and Sumaila, A.G. (Eds.): Perspective on Urban Transportation in Nigeria. Zaria: NITT, pp. 332 – 360
[12]. Karlaftis, M. (2008) "Demand Forecasting in Regional Airports: Dynamic Tobit Models with GARCH Errors" Department of Transportation Planning and Engineering, National Technical University of Athens, Greece
[13]. Lakshmanan, T. R. (2011) "The Broader Economic Consequences of Transport Infrastructure Investments," Journal of Transport Geography, 19(1), 1–12
[14]. Marazzo, M., Scherre, R. and Fernandes, E. (2010) "Air Transport Demand and Economic Growth in Brazil: A time series analysis," Transportation Research Part E: Logistics and Transportation Review, vol. 46(2): 261-269
[15]. Mukkala, K. and Tervo, H. (2013) "Air Transportation and Regional Growth: Which Way Does the Causality Run?" Environment and Planning A, 45(6), 1508–1520
[16]. National Bureau of Statistics (2019) Air Transportation Data for 2018. Released April 2019
[17]. Osayimvese, I. and Filani, M.O. (1973) "Economics of Air Transport" Workshop on the Third National Development Plan (1975-80), the Transport Sector Planning, University of Ibadan, Nigeria
[18]. Tolcha, T. D., Bråthen, S., and Holmgren, J. (2020) "Air Transport Demand and Economic Development in sub-Saharan Africa: Direction of Causality," Journal of Transport Geography, 86, 102771

Eyitayo Olaleye, et. al. "Determinants of Demand for Air Transport in Nigeria." *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 26(10), 2021, pp. 10-15.