

Empirical Analysis of the Contribution of the Aviation Industry to the Nigerian Economy

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Doi:10.5901/mjss.2014.v5n3p115

Abstract

The study revealed the contribution of the Nigerian Aviation Industry to the National GDP of Nigeria. To this end we determined the performance of the aviation workers with regards to contribution to national GDP; determined the performance of the Nigerian labour force's contribution to the GDP and did compared the contribution per head of aviation workers to the aviation industry's revenue of aggregated product; we ascertained the aviation industry's percentage contribution to the National GDP and did forecasted the growth of the GDP, aviation industry and its workers' contribution to GDP. To achieve what we did we used secondary data obtained from the National Bureau of Statistics from 1985 to 2012 for National GDP; aviation industry's contribution to the GDP; the annual estimates of Nigerian labour force; the annual estimates of labours employed in the aviation industry; the annual throughput and revenue in the industry. We were able to determine that an average aviation industry worker is more productive than an average member of the Nigerian Labour force as a whole. We found that the aviation industry's contribution to National GDP is very small, but noted that it contributes a lot towards ensuring the smooth flow of foreign direct investment (FDI) into Nigeria. We were able to forecast that the industry will grow at about 25.4% rate on annual basis. We also discovered that in the contribution of the Transport Sector as a whole to National GDP, aviation industry made the least contribution, while road transport made the most. Road transport could even make more if all the informal sectors of the road transport mode are accounted for. Aviation industry is great and serves as a great face-lift for the nation, however, it serves less than 10% of the population and contributes less than expected, judging from the capital investment involves in the sector. We therefore suggest that land based transportation and their associated systems should be upgraded and more attention should be paid to them.

Keywords: Aviation industry, Contribution, Development, Economy,

1. Introduction

For many decades, the aviation industry has played a significant role in developing economies around the globe. It is reported that there are over two thousand (2,000) airlines operating more than twenty-three thousand (23,000) aircraft that serves about three thousand seven hundred (3,700) airports around the world (Aerospace Global Report, 2011). This makes the industry the gateway to any economy aspiring to develop, enabling globalization, trade facilitation and tourism development. It is very crucial in the promotion of foreign direct investment (FDI) (Ladele, 2012). One can therefore say that the industry is crucial to the growth of the economy and national development. Ladele (2012) in her

study of FDI, noted that as the emerging economies grow, their demand for air transportation will grow as their citizens becomes more financially empowered with increased disposable income. Development of air transport infrastructures in these emerging economies will further fuel the growth of the industry. However, Stephens (2011) noted that even with the growth, less than 10% of the population will still be able to afford air travel as the gap between the rich and the poor is rapidly expanding, which prompted him to call for more investment in the land-based transportation.

Stephens (2009) forecasted that the Nigerian Civil Aviation industry will keep growing at an average of 15% domestic traffic so that by 2019 an estimated 12,461,043 million passenger will be carried domestically. An industry with this growth rate should be of great interest. Moreover, it is expected to be a crucial industry in general economic growth promotion for any nation. Therefore, the level of the importance of this industry is best appreciated if its contribution to the gross domestic product (GDP) is measured. The analysis will be more meaningful if the industry's labour force contribution is measured and its significance is assessed in relation to those of other industry in the economy.

2. Objectives of the Study

The aim of the study is to evaluate the roles of local aviation industry in the Nigeria economy. In view of this, the study will also attain the following specific objectives:

- Determine the performance of aviation workers with regards to contribution to national GDP.
- To determine the performance of the Nigerian labour force's unitary contribution to the GDP and compare if the aviation industry had a better contribution per head when referenced against the labour force.
- To ascertain aviation industry percentage contribution to the national GDP.
- To forecast the growth of the traffic throughput and GDP, aviation industry and aviation workers' contribution to GDP and their performance within the industry.
- To conduct a reverse regression into the past to enable us compares the actual values of the past and the predicted values that could have happened in the past.

3. Research Questions

To make the objectives of the research realisable, and its objectives visible, certain questions arose. The questions which are tilted towards attaining the objectives of this research are as follows:

- What is the contribution per head of the aviation workers to the aviation industry's revenue and to the national GDP?
- What is the contribution per head of an average Nigerian worker to the national GDP?
- What is the aviation industry's contribution to the national GDP?
- What will be the future growth of the GDP, aviation industry and the aviation workers' contribution to GDP and their performance within their industry?

4. Research Hypotheses

In order to facilitate data collection so as to arrive at the correct conclusion, the following hypotheses will be used to guide this study:

4.1 Hypothesis One

- H₀: The Aviation Industry is a major force towards the build-up of the national GDP.
- H₁: The Aviation Industry is not a major force towards the build-up of the national GDP.

4.2 Hypothesis Two

- H₀: The Nigeria airline business environment will improve even without liberalization being embraced.
- H₁: The Nigeria airline business environment will not improve except the policy of liberalization is embraced

4.3 Hypothesis Three

- Ho: Workers of the aviation industry are more productive than their counterparts in the Nigeria Labour Force put together.
- Hi: Workers of the aviation industry are not more productive than their counterparts in the Nigeria Labour Force put together.

5. Significance of the Study

The study will be of benefit to all stakeholders in the Aviation sector particularly the Airline Operators, the travelling public and the Governments of Nigeria. The need to ensure adequate infrastructural development and control over air safety by following the ICAO Standards and Recommended Practices strictly in order to ensure the sustainability of local airlines contribution to economy development will be the focus of this study. The gradual approach to liberalisation in the form of intra and extra regional co-operation will be highlighted with a view to assisting the Government via the regulator to develop the political will to implement and sustain the provisions of the Yamoussoukro decisions.

The Airlines will find the study useful as they may find sense in mergers and acquisition in order to compete favourably with the big airlines in the advanced economies of the world and join the "global alliance" groupings. Also the study will help to enhance the contemporary issue of billing, aviation fuel price and business models of airlines as it affect airlines role in their contribution to their primary economy.

6. Research Methodology and Design of the Study

The study is designed to reveal the contribution of The Nigerian Aviation industry to the National GDP of Nigeria with a view to:

- Determine the performance of aviation workers with regards to contribution to national GDP.
- To determine the performance of the Nigerian labour force's unitary contribution to the GDP and compare if the aviation industry had a better contribution per head when referenced against the labour force.
- To ascertain aviation industry percentage contribution to the national GDP.
- To forecast the growth of the GDP, aviation industry and the aviation workers' contribution to GDP and their performance within their industry.

6.1 Area of Study

The area under study is the Nigerian Aviation Industry as aggregated data on all the airlines and airports in Nigeria were collected for the research. Data on the Nigerian Labour Force was also collected.

6.2 Samples

The period covered by this study was between January 1985 – December 2012 being the period covered by data collected for aggregated industry's output and the national GDP.

6.3 Method of Data Collection

Research data were sourced from the National Bureau of Statistics annual publications, which were obtained from their website. The data collected span the period of 28 years from 1985 to 2012 and extracts for 2013 were also collected. Data collected were revenue/GDP contribution for the aviation industry; the aviation industry's throughput; national GDP of Nigeria and labour force records.

6.4 Data Analytical Tools

To analyse the data generated the MegaStat program was used to perform the regression analysis which was to forecast future levels of traffic throughput and GDP, aviation industry revenue/contribution to GDP and the traffic throughput in the aviation industry. Simple analytical tools like percentage and ratio was used to determine contributions and performance

of the aviation workers, Nigerian Labour force, and the Aviation Industry as an integral part of the national GDP.

6.5 Regression Analysis

A Durbin-Watson Statistic output was sourced all at 95% Confidence Level using throughput as the Y variable and revenues and GDP as the X variables. This simply means that with the knowledge of the aviation industry's revenue and throughput one can determine the future levels of national GDP.

6.6 Limits and limitations

The research work is limited to the domestic aviation industry, aggregating revenue of airlines and the airports. More extensive work could have been done but time is a limiting factor.

7. Theoretical Framework, Result and Discussion

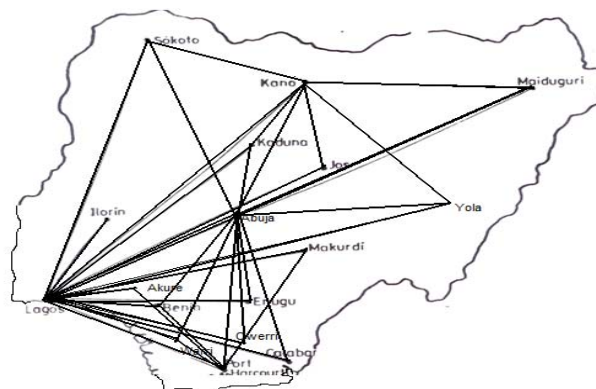
The data presentation will follow a pattern that will present data collected and analyse same in the manner that the objectives of the study and research questions were presented and asked in the introduction (chapter one) of this research work.

7.1 Aviation Workers Performance

The domestic air network structure in Nigeria has so far linked only the state capitals, though not all state capitals are connected by air at this moment (Stephens, 2009). State capitals without air links are Abakaliki, Abeokuta, Ado-Ekiti, Awka, Bauchi, Birnin-Kebbi, Ebonyi, Gombe, Katsina, Lafia, Lokoja, Oshogbo, Umuahia, Uyo, Yenogoa, Yobe and Zamfara. Reasons for their lack of airports range from proximity to capitals with large airports to lack of market potentials. The number of routes that link each airport varies depending on the level of demand. Stephens (2009) used this to classify the airports into two categories, namely those with total number of routes less than the average number of eight (8) routes (low hierarchy) and those with above average number of routes (high hierarchy). These are shown in figures 1 and 2.

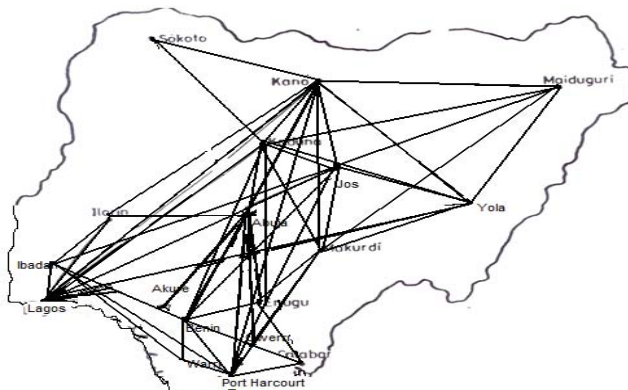
From figure 1, which shows the sixty-three (63) routes that make up the major routes, it is obvious that Lagos airport is the main air hub in Nigeria which is reflected by the clustered air routes. Abuja, Kano and Port Harcourt airports are other sub-hubs. Lagos, Abuja, Kano, Port Harcourt and Calabar airports are all international airports. It is no coincidence that Lagos, which is the commercial hub and Abuja, capital of Nigeria, Kano and Port Harcourt cities are strong centres of administrative, commercial and industrial activities in Nigeria. Figure 2, shows the network of 51 minor routes that are mostly served by helicopters and small aeroplanes. These routes also serve as feeder routes to the major routes and help buttress the importance of the aviation industry in the Nigerian economy.

Figure 1: Major domestic air routes in Nigeria



Source: Stephens (2009)

Figure 2: Minor domestic air routes in Nigeria



Source: Stephens (2009)

The domestic air transport industry is fast growing when we measure demand for its services. The growth can be attributed to the increased living standard of a few Nigerians as against the general deterioration of an average Nigerian's standard of living. Table 1 showed the revenue generated in the aviation industry as well as the volume of throughput and the National GDP of Nigeria. It further showed the contribution in percentage of GDP. It was discovered that the industry has been making very little impact in terms of contribution to GDP at an average of 0.009011876 %, which is what the industry contributes to the GDP. However, one can argue that morally the industry contributes more than that as the influx of Foreign Direct Investment (FDI) has been on the rise with time, of which the investors uses air transport to come around when they do inspections of likely areas of investment choice. Zhang (2001) was of the opinion that FDI contributes to growth of an economy. Amongst other things, availability of a strong air transportation system is a key determinant to the flow of FDI (Wilhelms, 1998).

Table 1: Aviation industry contribution to National GDP

year	Revenue in Million of Naira	Throughput in passengers	GDP in Million of Naira	Industry's Share in percentage of GDP
1985	95	344,208	2,937,037.52	0.003234552
1986	187	193,649	4,353,503.43	0.004295391
1987	174	152,877	5,769,969.34	0.003015614
1988	146	112,105	7,186,435.25	0.002031605
1989	106	713,336	8,602,901.16	0.001232142
1990	78	305,617	10,019,367.07	0.000778492
1991	57	102,101	11,435,832.98	0.000498433
1992	26	509,819	12,852,298.89	0.000202298
1993	104	917,538	14,268,764.80	0.000727463
1994	484	1,325,256	15,685,230.71	0.003088255
1995	803	1,732,974	17,101,696.62	0.004696025
1996	996	2,140,692	18,518,162.53	0.005377963
1997	1338	2,548,411	19,934,628.44	0.006710434
1998	1657	2,956,129	21,351,094.35	0.0077626
1999	2072	3,363,847	22,767,560.26	0.009101546
2000	2398	3,384,262	24,184,026.17	0.009914395
2001	2817	4,399,333	25,600,492.08	0.011003304
2002	3304	4,831,525	27,016,957.99	0.012230467
2003	3747	5,573,101	28,433,423.90	0.013178153
2004	4268	6,464,545	29,849,889.81	0.01429955
2005	4817	2,744,888	31,266,355.72	0.015406337

2006	5101	7,016,780	32,682,821.63	0.015606976
2007	5481	7,174,200	34,099,287.54	0.016073063
2008	5988	7,033,311	35,515,753.45	0.016859842
2009	6668	7,441,030	36,932,219.36	0.018053342
2010	7410	7,848,748	38,348,685.27	0.019322696
2011	7532	8,256,466	39,765,151.18	0.018941208
2012	7697	8,664,184	41,181,617.09	0.018690378

Source: Nigerian Bureau of Statistics (2013).

7.2 Comparing the Performance of the Nigerian labour force's unitary contribution to the GDP as against the aviation industry

When compared on average worker's contribution to the revenue drive of the industry, one can conveniently say that an average aviation industry worker is doing well and their performance has improved with time from the period the study started to till 2012.

They have been having a significant increase in their level of contribution to the industry's revenue. This can be seen on Table 2. It should be noted too that number of industry-wide employees have been decreasing with time yet the revenue has been on the increase.

Table 2: Workers' performance

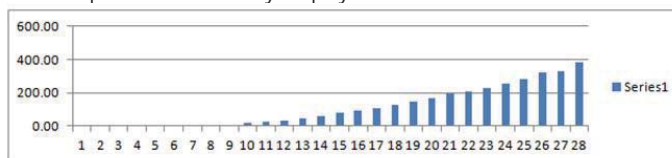
Year	Aviation Employees	Contribution/employee	Nigerian Labour Force	Contribution/employee
1985	30,222	3.14	30,002,921	0.10
1986	32,111	5.82	29,887,332	0.15
1987	30,122	5.78	29,000,883	0.20
1988	29,165	5.01	28,773,625	0.25
1989	30,123	3.52	28,776,333	0.30
1990	29,405	2.65	29,746,464	0.34
1991	29,091	1.96	35,666,625	0.32
1992	28,777	0.90	39,928,822	0.32
1993	28,462	3.65	29,888,873	0.48
1994	28,148	17.21	35,555,525	0.44
1995	27,833	28.85	37,661,224	0.45
1996	27,519	36.19	37,666,522	0.49
1997	27,205	49.17	33,372,622	0.60
1998	26,890	61.64	35,244,411	0.61
1999	26,576	77.97	36,545,242	0.62
2000	26,261	91.30	39,888,762	0.61
2001	25,947	108.56	46,376,219	0.55
2002	25,633	128.91	46,598,855	0.58
2003	25,318	148.00	48,983,733	0.58
2004	25,004	170.71	49,877,733	0.60
2005	24,689	195.10	49,746,353	0.63
2006	24,375	209.26	48,973,522	0.67
2007	24,061	227.79	48,725,222	0.70
2008	23,746	252.16	46,583,632	0.76
2009	23,432	284.55	45,873,532	0.81
2010	23,117	320.54	44,576,968	0.86
2011	22,803	330.31	45,326,211	0.88
2012	20,177	381.47	45,988,887	0.90

Source: Field work (2013)

This is due to the industry's deregulations and the influx of private sector into the industry. With reforms and the withdrawal of the state in the carriage of traffic, many workers previously employed by the state-owned airline were laid-

off and some absorbed into the privately owned airlines.

Figure 3: Revenue Contribution per Aviation Industry Employee since 1985-2012



Note that on the X axis in figure 4.3, numbers 1 to 28 represents years 1985 to 2012.

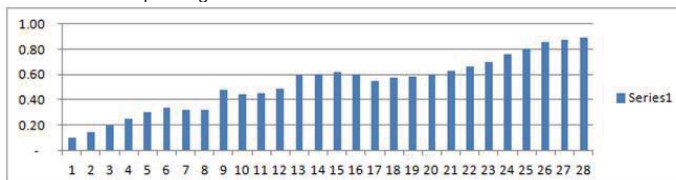
Source: Field Work (2013)

Table 3: Revenue per Throughput.

year	Revenue/Throughput
1985	0.275996
1986	0.965665
1987	1.13817
1988	1.30235
1989	0.148598
1990	0.255221
1991	0.558271
1992	0.050998
1993	0.113129
1994	0.365514
1995	0.463423
1996	0.465223
1997	0.524915
1998	0.560666
1999	0.616021
2000	0.708485
2001	0.640302
2002	0.683904
2003	0.672337
2004	0.660278
2005	1.754899
2006	0.726943
2007	0.76396
2008	0.851363
2009	0.896045
2010	0.9441
2011	0.912255
2012	0.88837

Source: Field Work (2013)

Figure 4: Revenue/GDP Contribution per Nigerian Labour Force since 1985-2012



Note that on the X axis in figure 4.4, numbers 1 to 28 represents years 1985 to 2012.

Source: Field Work (2013)

On the average one can conveniently say an average aviation worker is more productive than an average member of the Nigerian Labour Force (see figures 4.3 and 4.4). However, some will argue that the reason for the large average contribution is because of the luxury nature of air transport and the resultant attached valuation.

7.3 Growth of the GDP, Aviation Industry and the Workers' contribution

The fact that air travel is still the safest means of travelling (BBC News, 2000) will continue to make it attractive. Stephens (2009) forecasted that the aviation industry will keep growing at an average of 15% domestic traffic volume so that by 2019 an estimated 12,461,043 million passengers will be carried domestically. This prediction means that one should expect demand to grow. We tried to verify this by making our own predictions but this time using the aviation industry's revenue and the national GDP as in table 1 to predict into the future the throughput. Then later we used the equation obtained from the regression to do a reverse prediction of what could have happened.

The results are shown for tables 3, 4 and 5 below.

$$Y = c + b_1(X_1) + b_2(X_2) + e$$

Where Y is the throughput

c is the intercept

b₁ is the coefficient of X₁

X₁ is revenue of the aviation industry

b₂ is the coefficient of X₂

X₂ is the national GDP

e captures other conditions

The regression equation is therefore:

$$Y = 10306851.68 + 2148.985955(X_1) + 1.780119591(X_2) + e \dots\dots\dots \text{Equation 1}$$

Table 3: Regression Analysis

Regression Statistics	
Multiple R	0.971545568
R Square	0.943900791
Adjusted R Square	0.939225857
Standard Error	2771633.637
Observations	27

ANOVA					
	Df	SS	MS	F	Significance F
Regression	2	3.10208E+15	1.55104E+15	201.9067596	9.71585E-16
Residual	24	1.84367E+14	7.68195E+12		
Total	26	3.28644E+15			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	10306851.68	892889.4367	11.54325638	2.77886E-11	8464018.459	12149684.91
X ₁	2148.985955	722.88773	2.972779681	0.006619747	657.0190089	3640.952901
X ₂	1.780119591	0.655754799	2.714611611	0.01209425	0.426708205	3.133530977

Source: Field Work (2013)

Table 4: Predicted Values for Future Throughput

Residual Output		
Observation	Predicted 2937037.5200001	Residuals
2013	11053430.44	-6699927.005
2014	10952914.58	-5182945.242
2015	10820163.94	-3633728.689
2016	11804466.78	-3201565.618
2017	11018507.91	-999140.8353
2018	10611095.83	824737.1494
2019	11270264.53	1582034.358

2020	12163242.9	2105521.895
2021	13706934.22	1978296.485
2022	15117603.31	1984093.306
2023	16257715.07	2260447.458
2024	17718025.74	2216602.703
2025	19130843.81	2220250.537
2026	20748030.45	2019529.808
2027	21483866.39	2700159.775
2028	24191669.08	1408822.999
2029	26008438.28	1008519.708
2030	28279888.33	153535.5704
2031	30987246.54	-1137356.725
2032	25544745.93	5721609.787
2033	33759106.79	-1076285.157
2034	34855947.88	-756660.3356
2035	35694900.15	-179146.6973
2036	37881138.27	-948918.908
2037	40202547.61	-1853862.335
2038	41190511.16	-1425359.977
2039	42270881.11	-1089264.016

Source: Field Work (2013)

From the forecast, our prediction was in agreement, to an extent with Stephens' work in 2009. He predicted that by 2019 an estimated 12,461,043 million passengers will be carried domestically whereas our estimate is that 11,270,265 million passengers will be carried by that year. The variation could be due to the fact that ours had better R-Square and adjusted R-Square than his.

Table 5: Predicted Values for Reverse Regression of Throughput

Year	Prediction	Residuals
1977	8159409.6	-54798679
1978	8237580.3	-53460384
1979	8315751	-52122089
1980	8393921.7	-50783793
1981	8472092.5	-49445498
1982	8550263.2	-48107203
1983	8628433.9	-46768908
1984	8706604.6	-45430613
1985	8784775.3	-44092317
1986	8862946	-42754022
1987	8941116.7	-41415727
1988	9019287.5	-40077432
1989	9097458.2	-38739137
1990	9175628.9	-37400841
1991	9253799.6	-36062546
1992	9331970.3	-34724251
1993	9410141	-33385956
1994	9488311.7	-32047661
1995	9566482.5	-30709365
1996	9644653.2	-29371070
1997	9722823.9	-28032775
1998	9800994.6	-26694480
1999	9879165.3	-25356185
2000	9957336	-24017889
2001	10035507	-22679594
2002	10113677	-21341299

2003	10191848	-20003004
2004	10270019	-18664709
2005	10348190	-17326413
2006	10426360	-15988118
2007	10504531	-14649823
2008	10582702	-13311528
2009	10660872	-11973233
2010	10739043	-10634937
2011	10817214	-9296642.3
2012	10895385	-7958347.1

Source: Field Work (2013)

The result of reverse regression into the past showed that a large gap existed between the actual past values of throughput and the reverse regression (predicted) values of past throughput. This is not unexpected as the reverse regression values were subjected to the conditions used in the predictions of the future values which might not really represent what actually happened in the past. It can only give a window into what could have happened if the conditions used in the future predictions were available then.

Nigerian airlines could make more revenue by doing more international flights thereby improving the overall GDP of the nation and their own productivity and profitability. The case is further made to be important due to the domination of foreign airlines in some very lucrative routes like Lagos-London, Lagos-Paris and Lagos-Frankfurt of which our flag bearers have very limited presence. Stephens et al (2012) and Nze (2011) stressed the need to encourage local operators to compete on the international scene as a means of boosting growth in the transport sector of the Nigerian economy.

8. Conclusion

This study has considered the issue of performance of the aviation workers with regards to their contribution to the National GDP; compare the performance of aviation industry workers with those of the general labour force; ascertain the aviation industry's contribution to the national GDP and did a forecast of the future throughput or demand in the aviation industry. Based on the aforementioned the following summary and finding could be made:

- The industry's contribution to the GDP is very small.
- An average aviation worker contributes per head to the revenue of the industry than an average member of the labour force does to the national revenue or GDP.
- The number of employees engaged in the aviation industry is reducing but the industry is witnessing a boost in productivity of its workers.
- It was also discovered that (though not in the scope of this study) road transport industry contributes more than all the other modes of transport to the GDP.

The present results agreed with the study of Stephens (2009) that the industry will keep experiencing growth of throughput and increased contribution to GDP. Before now it has been a general belief that air transport contributes significantly to the GDP, however, this has been shown to be less than expected and even smaller than the contribution of the road transport industry. In addition we were able to demonstrate that with good understanding of mathematics we can use nearly anything to make good prediction in as much as we can make a regression equation for it, as we used revenue of the aviation industry and the national GDP to predict future demand for air transportation.

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