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A COMPARATIVE ANALYSIS OF PRODUCTIVITY AND FARE VARIATIONS OF NIGERIAN AIRLINES

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ABSTRACT
This paper examined productivity variations occurring among different airlines In the study, quantitative techniques such as The pair-wise t-test was utilized in the analysis of the available seat kilometrage (ASK) performed by the various airlines within the study period. The study shows that, there were significant relationships between aircraft utilization, passengers operation and airline productivity, at 0.05 level. The relationship between fare and productivity was statistically insignificant at 0.05 level. There were also productivity variations occurring between different airlines selected for the study. We recommend that efforts should be made to quicken the time spent on the ground by aircrafts of various airlines operating in Nigeria, as less time spent by aircraft on the ground enhances aircraft utilization, which will in the main, boast productivity.

INTRODUCTION
The output of a passenger airline can be represented in a variety of ways including the number of flight departures operated and number of seats flown (Belobaba et al, 2009). The most common measure of output of an airline is the "Available seat kilometer or available seat mile. In the main, generating output, the airlines incurs a variety of operating expenses. The average operating expenses per unit of ASK, per unit of output, is the "unit" cost of the airline – which is an important measure of cost efficiency, both over time, across airlines. Unit cost is defined as the local operating expenses divided by the ASK or ASM produced by the airline, for a route, region or total network under consideration. Output in the airline industry is comprised of passenger services, as measured by passenger miles, and cargo services, as measured by ton-miles, as earlier describe above. Passenger miles are by far the largest component, making up more than 90 percent of total revenue, with the remainder attributable to ton miles (Khalil and Mukhlar, 2011). Although the output measure does not account for changes in service quality such as flight delays and route circuitry, some recent studies seem to indicate that such changes did not significantly affect output and productivity.

Real output in the air transportation industry, in the United State, for instance, almost quadrupled over the 1972 – 2001 period, an average annual gain of 4.8 percent, compared with a 3.4 percent average annual increase in the private business sector, in the United States (Duke and Torres, 2005). Output in the airline industry exhibited a cyclical pattern, although it also has been influenced by factors other than the business cycle. Under deregulation – which allowed changes in routes and fares, and the formation of new airlines – price competition, route restructuring, and new airline formation became driving forces in the reduction of operator costs (Duke and Torres, 2005). Airlines made changes to increase the efficiency of their operations. For example, under government regulation, airlines were forced to fly directly to remote or small markets, often with nearly empty flights. Although convenient for the few who lived in those areas, this proved to be very inefficient for the carriers, given that the cost to fly a plane is about the same whether it is empty or full.

Therefore, deregulation led to the development of widespread hub-and spoke networks. This allowed the airlines to serve many more markets than they otherwise could, with the same number of planes, if they offered only point-to-point flights. Under regulation, with price competition restricted, airlines often engaged in completion based on the level and quality of service. This resulted in overuse of labor and materials inputs. With the new hub-and-spoke networks, the airlines could achieve higher load factors in the smaller markets, which could result in lower operating costs and lower fares. Prior to September 11, average domestic airfares had already fallen sharply in response to the weakening economy, reduced business travel, and an increasing proportion of low-margin leisure travelers. The September 11, 2001, terrorist attacks further exacerbated a weakened air transportation industry by forcing it to briefly shut down it operations. The airlines cut capacity over the last 4 months of 2001, although the month to month reductions in capacity slowed from a high of 19 percent in September to 10 percent in December. Output for 2002 as a whole declined slightly, by 0.8 percent, from 2001 (Ekeugo, 2015).

Productivity refers to metrics and measures of output from production processes, per unit of input. Labor productivity, for example, is typically measured as a ratio of output per labor –hour, an input. Productivity may be conceived of as a metrics of the technical or engineering efficiency of production. As such quantitative metrics of input, and sometimes output, are emphasized. Productivity is distinct from metrics of allocative efficiency, which take into account both the value of what is produced and the cost of inputs used, and also distinct from metrics of productivity, which address the difference between the revenues obtained from output and the expense associated with consumption of inputs. (Courbois and Temple, 1975; Gollop 1979; Kurosawa 1975; Pineda 1990; Saari 2006). Khalil and Mukhtar (2011) on comparative analysis of three Asian airline productivity, namely, Pakistan international Airlines (PIA), Singapore international Airlines (SQ), and Airlanka, from 1995 – 2009 to exemplify the behavior of productivity variables, such as average employee. Productivity, Average stage length and unit cost, under labor (employee) productivity (partial productivity).

This paper ascertains the productivity variation occurring among airline operating at the airports in Nigeria by comparing the productivity variables among airlines. It also studies the impact of fare variation (price) on the productivity levels of airline industries.

METHODOLOGY

Nigeria domestic market in this paper is divided into 117 origin-destination (OD) pairs due to data compilation needs. Markets are specified as directional OD pairs such that from route 1 to route 2 is a different market with from route 2 to route 1. Air travel choices include multiple products which are unique combinations of airport (there can be multiple airports in a zone. e.g. Warri in Delta States has two airports QRW (Osubi) and ASA (Asaba)), carrier (see Table 1 for the airlines examined in the study), ticket class (first, business, full, premium coach, and discount coach), and connection (non-stop flight and connecting flight). Pels, Nijkamp and Ritveld (2000, 2001) suggest that air travelers may prefer particular airports, or treat airline-airport combinations as a travel choice.

Our specification captures these important service attributes of air services. Recent studies such as Li, Hensher and Rose (2010), Hensher, Greene and Li (2011), Hensher and Li (2012), Chorus and Dellaert (2012) point out that it is also important to incorporate travel time reliability/variability in model specification (hence the need to include on-time performance of flights in the model). In sum, our data consist of 117 directional O-D markets and the total number of travel products on the 117 markets is 3341.

TABLE 1
SUMMARY OF STUDY DATA

Variables	**Mean**	**Std. Deviation**	**Kurtosis**	**Std. Error of Kurtosis**	**Number of Observations**
Frequency (flights per quarter)	105.62	126.00	6.92	0.08	3341
Fare (in Naira)	25979.04	7471.23	1.61	0.08	3341
Route Distance (Kilometres)	485.85	212.38	2.08	0.08	3341
Number of Passengers (per quarter)	7357.94	11291.55	10.70	0.08	3341
Passenger kilometers (per quarter)	3550467.16	5591888.48	11.91	0.08	3341

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RESULTS AND DISCUSSION

A measure of aircraft productivity is that of ASK generated per aircraft per day, calculated as the product of the number of departures per day per aircraft, the average stage length of these departures and the number of seats on the aircraft: ASK per aircraft day = No. of departures × Average stage length × No. of seats. Below shows the computed available seat kilometres of various airlines in Nigeria surveyed under the study.

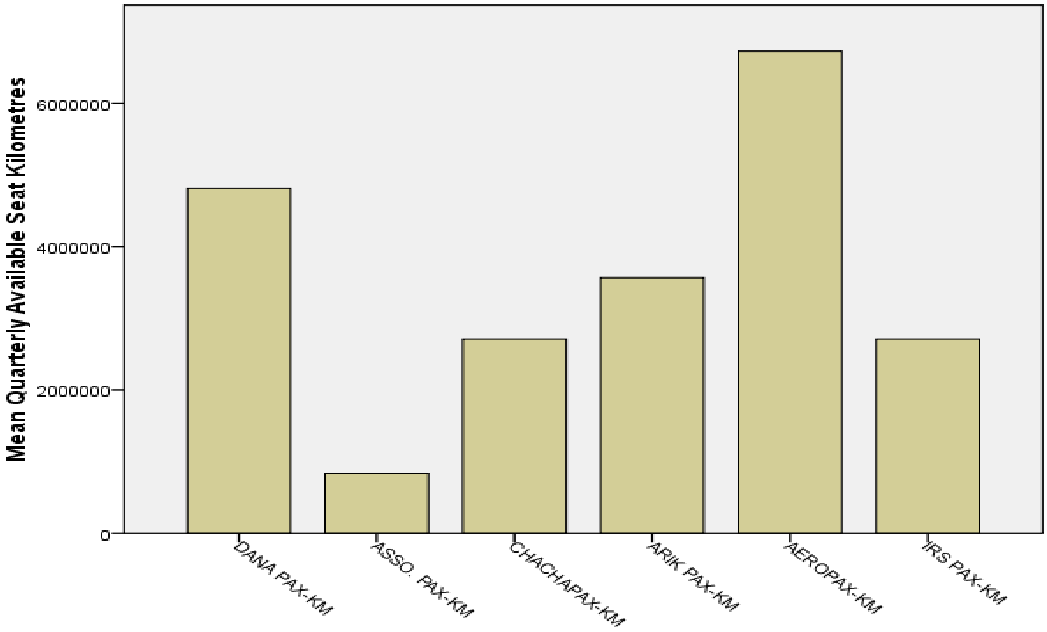

Figure 1: Mean Quarterly Available Seat Kilometres of Selected Nigeria Airlines from 2009-2013

However, in Nigeria, Arik Air is leading in terms of number of flights (see Table 2) but Aero Contractors however leads in terms of the productivity indicator of ASK. Increased average stage length for the Aero aircraft fleet, by choosing to fly longer-distance routes and reducing the number of flights operated on short-haul routes, however accounted for the productivity performance of the airline.

TABLE 2
SUMMARY OF AIRLINES FLIGHT DATA PER QUARTER 2009-2013

Airline	**Number of Observations**	**Percentage of quarterly route share**
AERO	**526**	**15.74**
AFRIJET	**18**	**0.54**
AIR NIGERIA	**245**	**7.33**
ARIK	**1231**	**36.85**
ASSOCIATED	**273**	**8.17**
BELLVIEW	**18**	**0.54**
CAPITAL	**17**	**0.51**
CHANCHANGI	**138**	**4.13**
DANA AIR	**211**	**6.32**
FIRST NATION	**15**	**0.45**
IRS	**345**	**10.33**
MEDVIEW	**43**	**1.29**
OVERLAND	261	**7.81**
Total	**3341**	**100**

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Each of these strategies for increasing aircraft productivity is reflected in the comparisons shown in Figure 1. The differences in aircraft productivity are dramatic – Aero in 2009-2013 was able to generate 31.4%, more than Arik air with 16.7%. Aero aircraft operated more departures per day, on a longer average stage length, with more seats than the other airlines shown. The much higher productivity of Aero airline is a major reason for its low-cost carrier status (see Table 3)

TABLE 3
PRODUCTIVITY SHARE OF NIGERIAN AIRLINES IN TERMS OF ASK

AIRLINE	% of Total Productivity (ASK)
DANA	22.5
ASSOCIATED	3.9
CHANCHANGI	12.6
ARIK	16.7
AERO	31.4
IRS	12.7

Moreover, the two airlines- Arik and Aero were used as benchmark to assess productivity variations with respect to other airlines examined in the study. The pair-wise t-test was utilized in the analysis.

TABLE 4
AVAILABLE SEAT KILOMETRES (ASK) VARIATIONS OF ARIK AND OTHER AIRLINES

	Paired Differences						df	Sig.
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t		
ARIK-DANA	-1243515.297	8981129.425	764524.508	-2755309.921	268279.327	-1.627	137	.106
ARIK-ASSO.	2731747.920	4864853.466	414123.828	1912846.536	3550649.304	6.596	137	.000
ARIK-CHANCHANGI	857301.833	5734045.980	488114.409	-107910.834	1822514.501	1.756	137	.081
ARIK-AERO	-3159373.622	7361386.642	626642.845	-4398516.743	-1920230.500	-5.042	137	.000
ARIK-IRS	858125.486	5064057.240	431081.180	5692.106	1710558.865	1.991	137	.049

TABLE 5
AVAILABLE SEAT KILOMETRES (ASK) VARIATIONS OF AERO AND OTHER AIRLINES

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig.
AERO-DANA	1915858.325	9799593.125	834196.765	266291.605	3565425.044	2.297	137	.023
AERO-ASSO.	5891121.542	8470911.510	721091.874	4465211.963	7317031.122	8.170	137	.000
AERO-CHANCHANGI	4016675.455	8029019.430	683475.523	2665149.624	5368201.286	5.877	137	.000
AERO- IRS	4017499.107	8447024.581	719058.484	2595610.418	5439387.797	5.587	137	.000
AERO-ARIK	3159373.622	7361386.642	626642.845	1920230.500	4398516.743	5.042	137	.000

As seen above there were significant productivity variations between Arik airline and Associated, Aero, IRS airlines. In addition, there were significant productivity variations between Aero airline and other airlines. Thus, there is significant variations among airline productivity in Nigeria.

ANALYSIS OF EFFECT OF FARES ON AIRLINES PRODUCTIVITY

Air fare is a crucial determinant for air transport demand. Previous researches show that deregulation have generally positive effect on air transport demand by enabling lower cost and stronger competition in the market. Thus, passenger demand for air transportation has a tendency to increase. Dargay and Hanly (2001) argue that for the UK leisure market fares are the most salient factor prompting an increase of air travel while growth of incomes has the biggest impact on the business travel market. Referring to the outcome of the mentioned research, leisure travelers are more sensitive to price changes, however, for business travelers - prices are considerably less salient attribute. However, especially for the last decade overall inflation rates are more likely to have positive relation with demand rather than negative. Liberalization trend (or deregulations) and consequent emergence of LCC made a declining impact on airfares, which affect significance and sign of the inflation coefficient conversely.

TABLE 6
CORRELATIONS ANALYSIS OF AVAILABLE SEAT KILOMETRES (ASK) AND FARE

		PAX-KM	PAX	FARE	FREQ
PAX-KM	Pearson Correlation	1	.982**	-.012	.934**
	Sig. (2-tailed)		.000	.485	.000
PAX	Pearson Correlation	.982**	1	-.106**	.955**
	Sig. (2-tailed)	.000		.000	.000
FARE	Pearson Correlation	-.012	-.106**	1	-.094**
	Sig. (2-tailed)	.485	.000		.000
FREQ	Pearson Correlation	.934**	.955**	-.094**	1
	Sig. (2-tailed)	.000	.000	.000	

The correlation coefficient of fare in the presented above is -0.012, which implies that fare has a negative effect on airline productivity. A 100% decrease in the fare of air transport led to 1.2 % increase in airline productivity. The findings indicate that, the relationship between airline productivity and fare is statistically insignificant at 5% level of confidence. Since the relationship between fare and airline productivity is statistically insignificant at 0.05 level using Pearson correlations, we assert that the null hypothesis should be accepted. Therefore, it means that fares affect the level of productivity, this is in line with one the laws of demand which states that, the highly the price (fare), the less, the demand of a particular product or service.

CONCLUSION

Fare rate variations for inputs and freight charges have significant impact on productivity levels. This could be seen in the result of correlation analysis of available seat kilometer (ASK) and fare, which is - 0.012, which implies that fare has a negative effect on airline productivity. Good capacity utilization leads to high productivity ratios. An underutilized facility bears the full expense of amortization, maintenance and operation (full input) while producing limited outputs. As facilities are fixed and the work to be processed often changes both in nature and volume, those facilities tend to be a factor in limiting productivity, machine and equipment as well as raw materials, frequently productivity. The ability of an Airline to achieve a certain level of aircraft utilization depends on the characteristics of its network, its schedule, and the efficiency in turning an aircraft around on the ground between are arrival and the next departure. The longer the turn-times, the less time there is for increasing block hours given a limited number of feasible operating hours during the course of the day. Finally, with all else equal, than the theoretical expectation is that airlines flying the largest aircraft over the longest average stage length should report the lowest unit cost per ASK (Average Seat Kilometer). This expectation underlies the world-wide trend towards airline mergers and consolidation. And one of the primary objectives of most airline mergers is the desire to achieve a lower unit cost with larger scale of operation. The type of technologies employed as well as capacity utilization in terms of aircraft, will determine the effectiveness, efficiency and productivity of airlines, so efforts should be made to employing current technologies (in relation to wide body aircraft capable of undertaken long-distance journey, as this makes for easy turn time at the departing airport, which will lead to proper capacity utilization), and practices. Indigenous Airlines should be encouraged to participate more in the carriage of Nigeria's airborne trade. For this will encourage more entrants into the industry.

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