

## **A Comparative Analysis of Productivity of Airline Industry: Evidence from Selected Asian Airlines**

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### **Abstract**

*Higher productivity of airline industry is the key to faster economic growth of an economy. In this backdrop, this study estimates and compares average employee productivity (i.e. partial productivity) of three Asian airlines: Pakistan International Airline; Singapore International Airline; and Air Lanka over the period 1995-2009. According to results of this study, Singapore performed the best in terms of average employee productivity and average stage length. Air Lanka performed the best in terms of unit cost. Pakistan International Airline performed poorly in terms of all the three measures. Pakistan International Air line can improve in all the three fields, Singapore can improve in unit cost terms and Sri Lanka can improve in average employee productivity and average stage length.*

**Key words:** Average Employee Productivity; Average Stage Length; Unit Cost; PIA; SIA; Air Lanka.

### **1. Introduction**

The airline industry being the fastest means of transportation plays a vital role in the economy in multifaceted dimensions. First, it enhances globalization and increases economic cooperation among nations. Second, it facilitates international movement of goods, services and factors of production. Third, it creates its impact by directly providing job opportunities and indirectly by creation of opportunities for travel and hospitality sector of an economy. "Jobs in hotels, resorts, restaurants and car rental agencies, just to mention one small part of the economy, depend to differing degrees on the health of the airline industry" (Jacobson 2004, p. 1). Last but not the least, airline industry impacts other industries such as manufacturing and tourism.

However, the airline industry is different from other industries in many ways as stated below:

- Diversity in airlines' air and ground operations
- High Public Service Obligation (High safety and regulatory standards)
- Differential in production processes and inputs
- Inconsistency in unit production costs because of difference in factor costs and distribution overheads in different markets
- Strict Safety Regulations
- Strategic Cooperation among Different Airlines (Alliances Doctrine)
- Sensitivity to Economic/Political Upheavals
- Government Financial Assistance (As the case of PIA)
- Use of High Technology Equipment & Systems
- High Factor Cost (Fuel/HR)
- Strict Functional Specializations (Lease utilization of cross-functional skills)
- Fast Changing Distribution Mix (as from manual ticketing to computers to web-based to self-ticketing to virtual activity....)
- Close State Controls and Regulations
- Doctrine of Sovereign National Airspace
- Principle of Cabot aging

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- Public Ownership of National Flag Carrier (Symbol of National Pride)
- Multilateral Cooperation on Technical & Logistical Issues

Productivity of airline industry is of utmost importance for the overall growth of the economy. This is evident from the fact that “the annual growth in air travel has been about twice the annual growth in GDP. Even with relatively conservative expectations of economic growth over the next 10-15 years, a continued 4-5% annual growth in global air travel will lead to a doubling of total air travel during this period”.<sup>2</sup>

However, the airlines for quite a long have been the state-regulated public service providers worldwide (Holloway, Stephen 2001). Still to a considerable extent various governments like in Pakistan, India, Bangla Desh, Sri Lanka and many others have strong controls over their operational scope and their pricing mechanism. As in case of Pakistan the government directions are quite visible in many areas like route/market selection, aircraft procurement, managerial recruitment, fare fixation, competition facing etc. The practice of regulation is clearly against the spirit of competition with governmental controls as the so-called principle device for assuring good performance. Seemingly the goal of state control is to maximize the economic efficiency by providing adequate, safe and economic service to the public with reduced production cost (Baiada, R. Michael 2005) but actually this is not true in every case. The more strict controls are applied by the state, the more inefficiency is the result. But at the same time the unrestricted and rampant competition could also lead to excess output and heavy losses for carriers and in many cases under utilization of assets as we witness in the case of PIA which is recording the daily utilization factor of 8 hours against the industry standard of 11-12 hours a day (WATS 2010). This study compares productivity of three Asian airlines, namely, Pakistan International Airline (PK), Singapore Airline (SQ) and Sri Lankan Airline i.e. Air Lanka (UL).

## 2. METHODOLOGY

This study uses descriptive methods for explaining the main various concepts related to airline productivity. The analysis is enhanced with the help of tables and figures wherever needed. This will greatly help the reader quickly comprehending the main findings of the study.

### 2.1 PRODUCTIVE EFFICIENCY

The airlines today are quite different to the ones operating before the deregulatory regimes enacted in the United States during the late seventies. Today the haunting issue with them has been their resource productivity like that of aircraft which now due to technological advancements has become more versatile and efficient, predominantly in terms of its operating economics. The understanding of airline productivity requires familiarization with its basics which have been subjectively signified in this paper. The ‘productivity’ variable is of immense importance in the operating performance model of any airline.

### 2.2 OPERATING PERFORMANCE MODEL

The equation for operating profit may be written as:

$$\Pi = YD \left( \sum R_{PK} \right) - UC \left( \sum A_{SK} \right)$$

where  $\Pi$  shows the operating profit

$$YD = \frac{\sum R_o}{\sum R_{pk}} \quad \Sigma R_o \text{ total operating revenue and } \Sigma R_{pk} \text{ is aggregate traffic}$$

$$= \text{Seats sold} \times \text{AL (Average Stage Length)}$$

$$UC = \frac{\sum E_o}{\sum A_{sk}} \quad \Sigma E_o \text{ total operating expenses and } \Sigma A_{sk} \text{ is aggregate productivity}$$

$$= \text{Seats produced} \times \text{AL}$$

For making a route more productive in unit perspective, getting the full benefits of economies of scale, scope and density is now indispensable as the aircraft capacity cannot be changed in short run because of many constraints. Like PIA cannot trim down the seating capacity of any aircraft in short run to its desired level to avoid output spoilage as after pushback the empty payload goes perished. At the very outset it is vital to differentiate between capacity and productivity clearly which in airlines is synonymously taken as same quite often (Holloway, Stephen 2001). The capacity relates to inherent capability of factors of production (FOPs) to give any particular level of output as we can say that the B777-200LR can fly up to 10,500 NM with full permissible payload on GE engines (Boeing Report 2009).

<sup>2</sup> Global Airline Industry Program, [http://web.mit.edu/airlines/analysis/analysis\\_airline\\_industry.html](http://web.mit.edu/airlines/analysis/analysis_airline_industry.html).

On the other hand the productivity is the actual output (ASKs/ATKs) which an airline produces over a defined time frame. An efficient carrier is very close to a minimum gap between the two. Their peculiar cost behavior requires complete understanding to remain profitable and how the payload-range figure can be used while selecting the market and developing the related services. But the threat of substitute is also looming over the heads where business and other high revenue traffic are opting for travel substitute and avoiding the air travel (Cobb, Richard, 2005) and the coming time will pose more tough challenges. Factually the airline productivity is a study of how airline managers manage their factors of production (FOPs) like aircraft, people and other tangible and intangible resources to dish out the services (product line). In fact the airlines are highly capital-intensive, cash-flow driven, and competitively uncertain which are strongly affected by the world's economy and at the same time by the political upheavals and global uncertainties like the ones witnessed after 9/11, Iraq War I & II, economic recessions, Afghan Crisis, SARS, Tsunami, security situations, ash plummet, global political crises etc.

### 3. Data Sources

For reaching the stochastic observations, the longitudinal data of secondary nature over the period 1995 to 2009 is used in this paper and has been mined from the following sources:

- Airline Business by AB Reed Business Information UK
- Air Transport World ATW, Air Transport World ATW USA
- Airlines IATA Publications Geneva Switzerland Montreal Canada
- World Air Transport Statistics (WATS) IATA Publications Geneva Switzerland and Montreal Canada
- Annual Reports of PIA Pakistan, SIA-Singapore and Sri Lankan)
- ATA Publications Air Transport Association ATA USA

### 4. Analysis and Description of Airline Productivity

#### 4.1 Average Employee Productivity

The airline productivity is defined as the number of ATKs/ASKs produced in a year, which is one ton payload or one seat respectively carried over a stage length of one kilometer and the factor productivity is taken as total ATKs divided by the resource/employees of the concerned airline which is the productive efficiency of an airline i.e. employee/resource productivity or average labour/resource product.

Average Employee Productivity (AE) is calculated with the help of following formula:

$$AE = \frac{\sum A_k}{\sum E}$$

Where E = total number of employees.

We are comparing the labor productivity of three Asian Airlines, PIA (PK), SIA (SQ) and Sri Lankan (UL) to exemplify the behavior of productivity variables. Table 1 and Figure 1 contain average employee productivity of the three airline companies under study for the period 1995 to 2009.

The figures in Table 1 show that Singapore airline has performed the best both in terms of ATKs and average employee productivity. The PIA better performance than Air Lanka in terms of ATKs and but performed worse in terms of AE. In terms of variability of average employee productivity PIA performed the best with lowest value of coefficient of variation (0.13) as compared with 0.18 for Singapore airline and 0.29 of Air Lanka. A look of Figure 1 also reveals that Singapore airline not only had initial higher productivity as compared to PIA and Air Lanka it also accelerated it during the period under review. On the other hand, in the beginning, Air Lanka had only marginal edge over PIA but toward the end of period under analysis the formed left the latter far behind. A look at graph of productivity of PIA tells us that PIA consistently improved its performance and had gone under very smaller fluctuations as compared with the other two airline companies under study. A final remark is that all the three airline companies suffered from world financial crisis that initiated in 2007.

**Insert Table (1) about here**

**Insert Figure (1) about here**

#### Figure 1: Company-Employee Productivity Trends

#### 4.2. Average Stage Length (AL) comparisons

The aircraft speed significantly contributes its hourly output as it is the product of its cruising speed and its payload capacity. The high density equipment with more comparative speed cannot always be preferred over the slow and smaller aircraft because the aircraft are designed for a particular type of stage length and the traffic mix on board. The one of the vital parameters affecting the airline's operating economies has been its average stage length (AL).

The average stage length is measured by the following formula:

$$AL = \frac{\sum AC_k}{\sum AC_d}$$

As the average stage length increases, the speed of aircraft increases, which is calculated on the basis of its block time which is taken from engine-on to engine-off including dead time at runway, taxiway, apron, etc. The increase in average stage length by reducing average cost raises average employee productivity of airline companies. Table 2 reveals that Singapore airline had the highest and PIA the lowest average stage length during the study period. That is why Singapore airline had the highest productivity and PIA the lowest one as noted from Table 1 and Figure 1. Further, Singapore had the minimum coefficient of variation in its average stage length and PIA the highest value of CV which shows much less consistency in its performance over time.

**Insert Table (2) about here**

A look at Figure 2 reflects that Singapore airline and PIA had significantly increased their average stage length while Air Lanka could not improve it. The latter also underwent larger fluctuations over time. In the recent world financial crisis the Singapore airline was most affected and PIA was least affected. On the other hand Air Lanka marginally improved during this crisis.

**Insert Figure (2) about here**

Figure 2: Average Stage Length (AL) Comparisons

### 4.3. Unit Cost (UC) Comparison

The route cost of airport operations like reservation, ticketing, and general handling come down in comparison when AL increases like five passengers traveling by PIA on 1000 km journey and one passenger traveling on 5000km journey. This all leads to lower unit cost with longer AL as the fixed costs will cover more output and the variable costs do not increase in proportion to increase in trip distance. The formula for unit cost calculation is as:

$$UC = \frac{\sum E_o}{\sum ASK_s}$$

Where  $\sum E_o$  = total expenses of an airline,  $\sum ASK_s$  is the total number of seats/kilo meters carried and  $UC$  is the unit cost.

Table 3 shows unit cost trends of the three airline companies under study. One can note from the table that Singapore airline had the highest and Air Lanka the lowest unit cost both in the beginning year 1995 and in the terminal year 2009. This situation is also preserved by average figures for the three airline companies. The Singapore airline showed highest level of consistency and PIA the lowest level of consistency in their unit costs. Many costs like sales, ticketing, reservation, passenger handling are linked to number of travelers not to distance: A single traveler by PIA to Katmandu will incur less cost than three travelers to Lahore as in both cases the distance will be almost same. But here this should also be borne in mind that short haul passengers give high yield as yields start diluting with higher stage length as fares increase less proportionately.

**Insert Table (3) about here**

**Insert Figure (3) about here**

Figure 3: Unit Cost Comparisons of Selected Airline Companies

The airlines can take advantage of the cost savings and efficiencies of increased airplane utilization by educating their workforce about the positive gains of reducing turn-times. The turn time is the time between aircraft arrival and takeoff for next flight. An airline with 10 minute saving in its turn time can have 20,000 minutes a year if they operate 2000 trips a year. This will give additional 333 hours which can be translated into more flights mean more paying passengers and, ultimately, more revenue. The decrease in unit cost also leads to increased average employee productivity. Figure 3 reflects trends in unit costs of three airline companies under study. It can be noted from Figure 3 that Air Lanka had the lowest unit cost through most of the period. In 2003-04 it had higher unit cost as compared to PIA and Singapore airline. However, from 2005 it regained its cost competitiveness over the other two airlines. Another notable point about unit costs is that all the three airlines reduced their unit costs upto the year 2001 after which their costs showed an overall rising trend.

### 5. Conclusion

The airline industry is the fastest means of transportation. A developed and efficient airline industry in a country is the key to faster growth of the economy.

However, the airlines operate in a highly regulated and controlled environment with least dissimilarities among the competing carriers on any particular route. The tangible FOPs like aircraft, its subsystems, procedures, HR specifications, etc. are almost same as the regulatory bodies cannot allow any deviation from their SOPs. This study estimated and compared average productivity of employees for three Asian airlines, namely, Singapore airline (SQ), Pakistan International airline (PK) and Air Lanka (UL) for the period 1995 to 2009. According to our estimates, SQ performed the best in terms of employee productivity. The poorest performance in terms of employee productivity was shown by PK. Air Lanka showed moderate performance in terms of average employee productivity.

Increased average stage length by increasing average speed enhances average employee productivity. The SQ had the highest average length of 4111 KM whereas PK had the lowest average stage length of only 1369 KM against 2535 of UL. Unit cost is another measure of productivity of an airline company. With respect to unit cost UL had the lowest average unit cost of 4.49 against 4.99 of PK and 5.46 of SQ. The ongoing discussion leads us to recommend that PIA needs improvement in terms of average employee productivity, average stage length and unit cost. The Singapore airline needs improvement in its unit cost. Finally, the Air Lanka can improve in average employee productivity and average stage length. Finally we would remark on the measurement of productivity. This study has employed partial productivity which has limited scope due to its narrow coverage of inputs. If sufficient reliable data on other essential inputs such as capital stock and material input(s) were available the study can be replicated for better results by employing the measure of total factor productivity or multifactor productivity.

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### Tables

**Table 1: Company-Employee Productivity Trends (Millions of Kilo meters)**

YEAR	PK		SQ		UL	
	ATK	AE	ATK	AE	ATK	AE
1995	2452.5	0.12	12481.3	0.96	755.329	0.17
1996	2525.9	0.12	13501.1	1.02	772.27	0.16
1997	2648.84	0.12	14533.9	1.08	746.78	0.15
1998	3694.66	0.20	15651.8	1.14	757.42	0.16
1999	2559.74	0.14	16917.2	1.23	832.69	0.17
2000	2631.39	0.15	18034.0	1.27	1088.38	0.21
2001	2540.55	0.15	18305.1	1.29	1454.79	0.28
2002	2242.16	0.13	19773.7	1.37	1148.73	0.28
2003	2475.9	0.13	18873.8	1.35	1121.89	0.27
2004	2973.44	0.15	21882.5	1.61	1289.94	0.27
2005	3102.81	0.16	23208.0	1.69	1484.02	0.29
2006	3369.29	0.18	24407.0	1.67	1590.55	0.29
2007	3125.56	0.17	24082.3	1.59	1695.91	0.32
2008	2934.63	0.16	24362.9	1.70	1741.10	0.34
2009	2933.25	0.16	21286.1	1.50	1477.00	0.31
<b>Minimum</b>	<b>2242.16</b>	<b>0.12</b>	<b>12481.3</b>	<b>0.96</b>	<b>746.78</b>	<b>0.15</b>
<b>Maximum</b>	<b>3694.66</b>	<b>0.18</b>	<b>24407</b>	<b>1.70</b>	<b>1741.10</b>	<b>0.34</b>
<b>Average</b>	<b>2814.04</b>	<b>0.15</b>	<b>19153.4</b>	<b>1.36</b>	<b>1197.12</b>	<b>0.24</b>
<b>S.D.</b>	<b>394.03</b>	<b>0.02</b>	<b>4008.67</b>	<b>0.25</b>	<b>364.46</b>	<b>0.07</b>
<b>C.V.</b>	<b>0.14</b>	<b>0.13</b>	<b>0.21</b>	<b>0.18</b>	<b>0.30</b>	<b>0.29</b>

Source: Various Annual reports of PIA, SIA Air Lanka.

**Table 2: Average Stage Length, AL (Millions of Kilo Meters)**

Year	PK	SQ	UL
1995	1047	3503	2484
1996	1039	3536	2363
1997	1075	3674	2448
1998	1084	3880	2482
1999	1162	3969	2690
2000	1193	3987	3270
2001	1336	3976	2981
2002	1438	4112	2586
2003	1501	4381	2746
2004	1565	4449	2467
2005	1744	4540	2086
2006	1700	4670	2467
2007	1592	3941	2242
2008	1525	4926	2279
2009	1535	4114	2431
<b>Minimum</b>	<b>1039</b>	<b>3503</b>	<b>2086</b>
<b>Maximum</b>	<b>1744</b>	<b>4926</b>	<b>3270</b>
<b>Average</b>	<b>1369</b>	<b>4111</b>	<b>2535</b>
<b>S.D.</b>	<b>248.94</b>	<b>411.89</b>	<b>295.91</b>
<b>C.V.</b>	<b>0.18</b>	<b>0.10</b>	<b>0.12</b>

Source: Various Annual reports of PIA, SIA Air Lanka.

**Table 3: UNIT COST COMPARISONS OF SELECTED AIRLINE INDUSTRIES**

Year	PK	SQ	UL
1995	4.91	5.85	4.1
1996	4.66	5.74	4.2
1997	4.61	5.69	4.3
1998	4.25	4.84	4.00
1999	3.95	4.96	3.6
2000	3.86	5.13	3.7
2001	4.06	4.27	3.2
2002	4.13	4.39	3.8
2003	4.29	4.70	5.00
2004	4.60	4.67	5.00
2005	5.39	5.27	4.82
2006	5.95	5.80	4.91
2007	6.20	6.63	5.14
2008	7.90	7.36	5.98
2009	6.12	6.65	5.67
<b>Minimum</b>	<b>3.86</b>	<b>4.27</b>	<b>3.20</b>
<b>Maximum</b>	<b>7.90</b>	<b>7.36</b>	<b>5.98</b>
<b>Average</b>	<b>4.99</b>	<b>5.46</b>	<b>4.49</b>
<b>S.D.</b>	<b>1.12</b>	<b>0.90</b>	<b>0.80</b>
<b>C.V.</b>	<b>0.22</b>	<b>0.16</b>	<b>0.18</b>

Source: Various Annual reports of PIA, SIA Air Lanka.

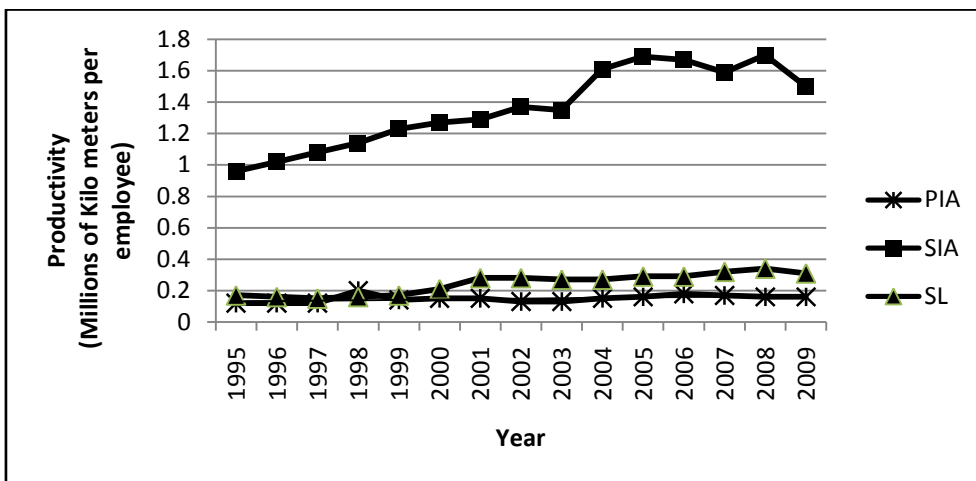


Figure 1

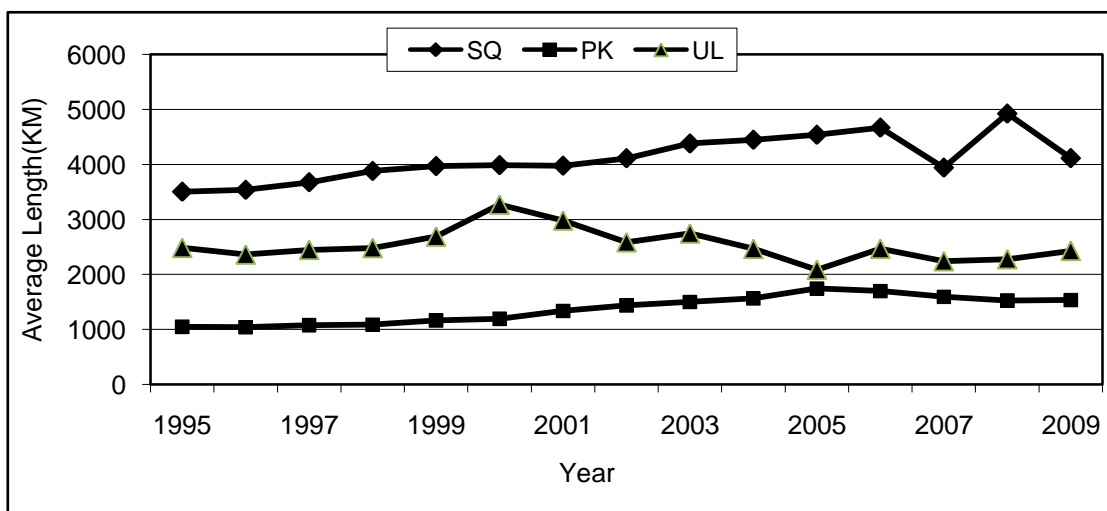


Figure 2

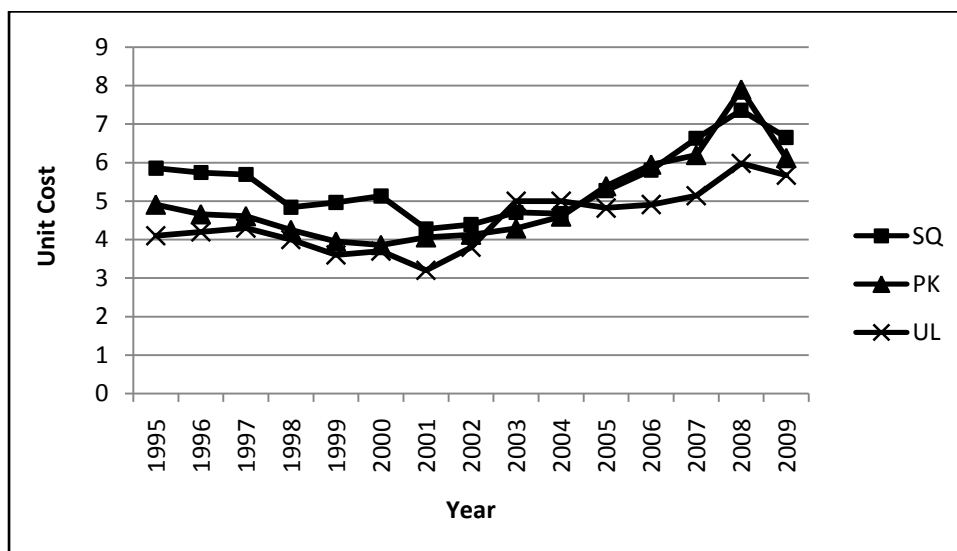


Figure 3