Net profitability of airline alliances, an empirical study

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Abstract. *This study examines the net return for airlines before and after joining an alliance. The research database was compiled from ICAOData, and comprised 15 international airlines as subjects and their net financial results for a period of 11 years as primary research variables. Two variables, the averages of five and three years net performance before joining an alliance, were tested against another variable, the average net performance five years after joining the alliance. Results show a deterioration of net profits after joining an alliance, although this trend was only significant when comparing performance over the short-term. However, the performance of American airlines accounted for most of this trend, which may have being partly affected by the consequences of September 11 2001.*

Introduction

The airline industry is one of several industries that have adopted the strategic alliance model in their operations. Nowadays, three global strategic alliance groups - Star Alliance, One World and SkyTeam - account for around 60% of the overall air transportation market.

A few studies have assessed the benefits and costs of airline strategic alliances. Research on alliances can be grouped into two broad streams: a stream focusing on alliances, and a stream focusing on alliances' members. The former stream attempts to assess the factors contributing to the success and/or failures of alliances. These studies use measurements such as alliance stability/instability and mortality/longevity to determine alliance success (for example, Kogut, 1989; Hamel, 1991; Blodgett, 1992; and Li, 2000). The latter stream assesses the impact of alliances on member airlines. They employ airline performance variables such as market share, market value, revenue, profitability, and productivity, to evaluate the impact of alliances on airline performance (Park and Cho, 1997; Chan, Kensinger, Keown and Martin, 1997; Das and Teng, 1998; Anand and Khanna, 2000; and Oum, Park, Kim and Yu, 2004).

The research to date has a number of limitations, though. Most studies have focussed on bilateral airline cooperation, and lesser attention has been given to the growth of global strategic alliance groups. Also, there is little empirical literature on this topic. Of the few studies on airline alliance groups, Iatrou and Alamdari (2005), based on a survey of airline alliance management departments, reported that the impact of an alliance on airline traffic performance is a function of the type of collaboration agreement (frequent flyer programmes, code share, strategic alliance with and without antitrust immunity) and the type of route (short haul, long haul, hub-hub, hub-non-hub and non-hub-non-hub). Another study, by Gudmundsson and Lechener (2006), focused on the structural holes and network closure in multilateral airline alliances, and found that highly distributed multi-member multilateral alliances are better positioned to exploit opportunities than alliances with fewer members and higher density, such as SkyTeam and Oneworld. And one of the rare empirical studies existent to date, by Oum et al. (2004), assessing the benefits brought by intra-alliance cooperation, found that airlines did not gain significant performance improvements after joining the alliance.

The primary focus of this study is to explore the benefits or otherwise of joining global strategic alliance groups. More specifically, the study aims to provide empirical

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evidence of the effects of joining an alliance on the net results of airline members in recent times.

Methodology

The main source of data for this research was the financial database compiled by ICAO (ICAOData), a cooperative venture between the International Civil Aviation Organization (ICAO) and Air Transport Intelligence (ATI)[1]. The database contains data for two main aviation groups: air carriers and airports. The air carriers' data, which is what this research is concerned with, include information on financial, traffic, personnel, fleet, and on-flight origin and destination data since 1973 and up to 2009. However, airlines report to ICAOData on a voluntary basis, thus data are often missing for particular airlines, variables and years.

The primary data for this research were the yearly net results per airline. From this primary data, a sample of airlines was selected for further analysis. The first criterion for selecting the sample was to identify airlines which had provided enough financial information in consecutive years to ICAOData. We estimated that 11 consecutive years of data reporting, including the five years prior to joining an alliance, the year of joining the alliance, and the five years after joining the alliance would suffix the research purposes.

Following above procedure, a total of 15 airlines were retained for further analysis. Of these, 14 airlines had all necessary data on ICAOData. The fifteenth airline had the 1999 financial result missing in the database. However, the missing information was achieved by locating and consulting the airline's 1999 Annual report on the internet. After cross-checking the data for 1998 reported in the annual report and that reported in ICAOData, and finding it accurate after adjusting for the different currency at the exchange rate at the time, the 1999 net profit was used for substituting the missing data (again, after adjusting for the different currency at the exchange rate in 1999).

The database for this research thus consisted of 15 airlines as subjects and 11 variables as main research data. The data in the 11 variables were the net results (in thousands of US dollars) for the year each airline joined their alliance, as well as the net results for the five years immediately before and the five years immediately after they joined the alliance. Because airlines joined their alliance at different times, these net results did not necessarily match a particular calendar year.

Three new variables were also created and added to the database. These variables were averages of the 11 original variables. One of the variables averaged the 5 years after airlines joined their alliance, and the other two variables averaged 3 and 5 years before the airlines joined their alliance.

The reasons for using the average 5 years after joining an alliance was twofold: firstly, taking the averages of a number of years would reflect more "normalized" performance than that of a particular year (which may have being especially good or bad because of reasons foreign to the airline); secondly, all airlines in our database would have been in an alliance when September 11 2001 struck, thus the net results reported for either 2001 or 2002, or both, may have being negatively affected by this. In both cases, a five year period seemed to offer an opportunity to smooth out these effects when using it as a short-term performance measure (meanwhile, a medium or long-term performance measure was not possible because of missing data for most airlines). The

[1] ICAO is a specialized agency of the United Nations, which was created in 1944 to promote air safety and the orderly development of international civil aviation throughout the world. ATI provides the service that delivers a unique combination of air transport news and data.

need to smooth out net results over a few years prior to joining the alliance also seemed a prudent option, although, as no particularly critical event seemed to have occurred in the past, the use of three and five year averages prior to joining the alliance was simply a convenient manner of comparing performance against the short and medium term.

Before proceeding with the data analysis, we screened the research variables to check whether they were suitable for using parametric tests or not. We found that 6 out of the initial 11 variables had significant non-normal skewness, and 5 out of the 11 variables also had significantly no-normal kurtosis. As per the three created variables, the two averages that reported net performance before joining the alliance were normal but not so the average that reported net performance after joining the alliance. Because the latter was deemed to be a critical variable in the research, and it made little sense to transform it, we decided to use non-parametric statistical tests instead of parametric ones.

Results

Wilcoxon signed rank test for paired samples showed a negative significant difference between the short-term period before and after airlines joined their alliance ($Z = -2.385$, $p = 0.017$). For the overall sample, short-term net results after joining an alliance[2] (mean = \$-140,666,000) have been significantly worse than net results before joining the alliance (mean = \$314,790,000). When comparing results against a longer term in the past, the short-term results after joining an alliance were lower than the medium-term results prior to joining the alliance (mean = \$210,604,000) but not significantly so ($Z = -1.293$, $p = 0.196$).

Illustration 1. Net results for the overall sample

Net results	Mean (S.D.)*
Medium-term, Pre 5 years	210,604 (287,532)
Short-term, Pre 3 years	314,790 (314,790)
Short-term, Post 5 years	-140,666 (482,630)

*Values in thousands of US dollars.

A Kruskal-Wallis H tests for several independent samples only showed a significant difference in net results after joining an alliance among airlines grouped according to geographical domicile ($\chi^2_{(df\ 2)} = 9.075$, $p = 0.11$). Further Mann-Whitney U tests for two independent samples showed that the main differences were found between American (mean = \$-104,560,000) and European airlines (mean = \$315,204,000; $U = 0.0$, $p = 0.007$), and between American and Asian airlines (mean = \$140,804,000; $U = 0.0$, $p = 0.034$).

Illustration 2 is a graphic representation of net profit per year per airline. Indeed, the three American airlines in the sample seem to account for the most negative results after joining an alliance. The distinctive negative results by American Airlines and United Airlines coincided with the years 2001 and 2002, while the distinctive negative results for Delta coincided with the years 2001, 2002, 2004 and 2005. When American airlines

[2] Short-term results refer to the 3 years prior to joining an alliance and the 5 years after joining the alliance. The latter is so in order to account for performance in 2001 and 2002, i.e. after September 11th 2001. Medium-term results refer to the 5 years prior to joining the alliance but, as there are no medium-term results after joining the alliance, the 5 years after joining the alliance will be used, instead.

were controlled for in the sample, a Wilcoxon signed rank test for paired samples showed no significant difference in net results before and after joining an alliance.

Illustration 2. Graph of net results per airline along 11 years, distributed around the joining year

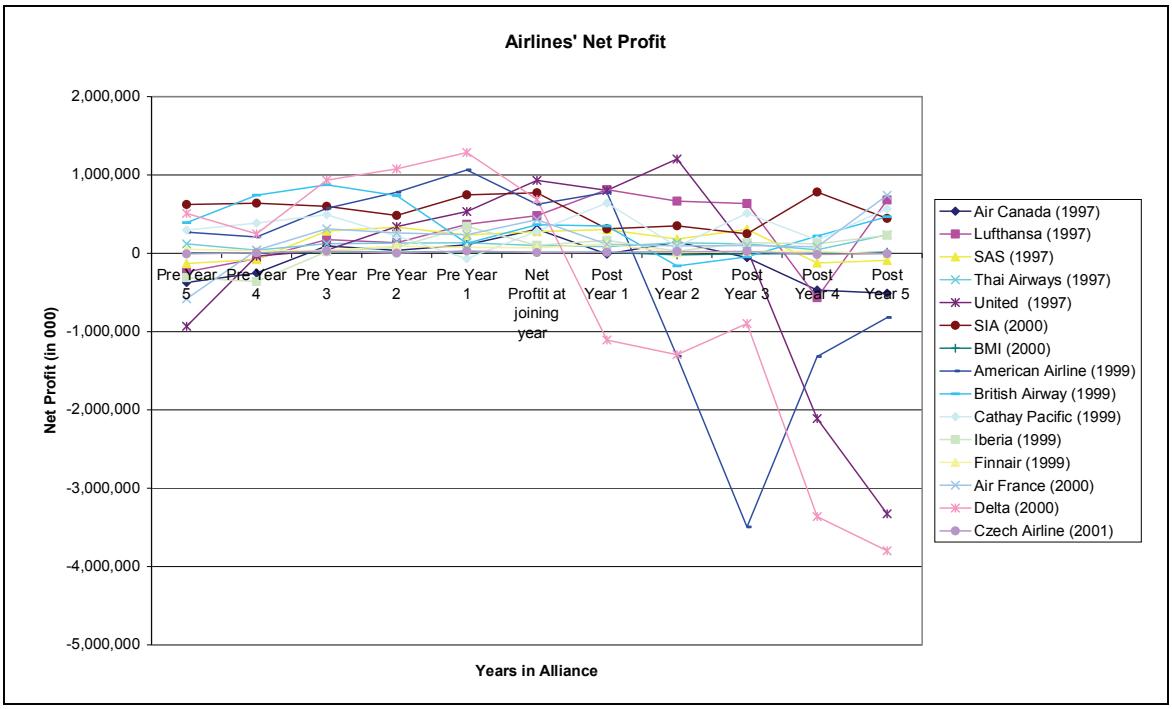

Illustration 3 shows a breakdown of net performance according to the year airlines joined their alliance. Three groups were possible: those airlines which joined an alliance in 1997 (5 airlines), those which did so in 1999 (5 airlines), and those which did so in 2000 (4 airlines)[3]. As suggested earlier, no significant differences were found among these groups.

Illustration 3. Breakdown of net results according to year airlines joined an alliance

Mean (S.D.)*	Joined in 1997 (n=5)	Joined in 1999 (n=5)	Joined in 2000 (n=4)
Medium-term, Pre 5 years	44,970 (86,632)	285,552 (287,989)	373,758 (401,778)
Short-term, Pre 3 years	204,930 (97,418)	97,418 (315,788)	498,871 (468,032)
Short-term, Post 5 years	-34,420 (421,187)	-101,199 (647,327)	-359,734 (116,772)

*Values in thousands of dollars.

Illustration 4 shows a breakdown of net performance according to the geographic domicile of the airlines. The three groups were: American airlines (4 airlines), Asian airlines (3 airlines), and European airlines (8 airlines). As reported earlier, significant differences were found between the performance of American airlines and the performance of European and Asian airlines after joining their alliances.

[3] The remaining airline joined in 2001 and, thus, was not included in this analysis.

Illustration 4. Breakdown of net results according to airlines' geographic domicile

Mean (S.D.)*	America (n=4)	Asia (n=3)	Europe (n=8)
Medium-term, Pre 5 years	325,501 (437,871)	330,737 (260,553)	108,106 (195,057)
Short-term, Pre 3 years	572,457 (463,881)	317,569 (256,554)	201,362 (186,216)
Short-term, Post 5 years	-104,560 (819,557)	315,204 (166,574)	140,848 (146,804)

*Values in thousands of US dollars.

Illustration 5 shows a breakdown of performance according to alliance: OneWorld (5 airlines), Star Alliance (7 airlines), and SkyTeam (3 airlines). As suggested earlier, no significant differences were found among these groups.

Illustration 5. Breakdown of net results according to alliance

Mean (S.D.)*	OneWorld (n=5)	Star (n=7)	SkyTeam (n=3)
Medium-term, Pre 5 years	285,552 (287,989)	122,147 (230,126)	292,090 (450,094)
Short-term, Pre 3 years	362,716 (315,788)	235,939 (195,949)	462,759 (565,021)
Short-term, Post 5 years	-101,199 (647,327)	36,257 (384,935)	-619,264 (127,969)

*Values in thousands of US dollars.

Discussion and conclusions

Our research has found some interesting results. Firstly, the short-term net profit reported by airlines has not increased significantly after joining an alliance. These results are partly consistent with results reported by Oum et al. (2004), who suggested that strategic alliances have no significant overall impact on airlines' profitability over the years.

Our results, however, go a step further and suggest that the impact on profitability may even be significantly negative. However, such interpretation needs to be taken with caution. Overall, it seems that American airlines are the ones which account for most of the negative performance in the sample. Indeed, illustration 4 shows that European and Asian airlines have done slightly worst after joining an alliance, but not significantly so. In contrast, American airlines have done significantly worst than Asian and European airlines in the same period. The events of September 11th 2001 may be there to account for the drop in performance, at least partly. That is, they may also be conveniently there, as a reason for airlines to use in order to justify poor performance due to other variables. We do not yet have evidence to test the real role that September 11 played on the performance reported by airlines, nor a way to ascertain whether the same events did not affect European or Asian airlines in the same manner than they affected American airlines. In any case, it appears that pertaining to an alliance has not helped buffer the potential negative effects of these events on, at least, American airlines' performance.

This research is but a first step in tackling the benefits or otherwise of joining an alliance from an empirical perspective. Most articles dealing with such issue to date are theoretical rather than empirical, and the main empirical research done in this regard (that of Oum et al., 2004) only analyses performance up to 1995. Although we are

confident in the results achieved, the main contribution of this research has been in raising questions for further study. Also, until we had explored other performance-related variables more thoroughly, the results here presented need to be interpreted cautiously. Variables of interest for future study are those usable to continue comparing performance before and after joining an alliance, variables such as operational costs, number of passengers transported, etc. New research goals will, thus, explore the effect of alliances on those variables in the coming future.

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