The Effects of Airline Alliances on Airfares, Revenue Passenger Miles, and Available Seat Utilization

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The Effects of Airline Alliances

Introduction

Over approximately the past decade, cooperation and mergers have become major trends in the airlines industry. Cooperation between airlines takes place through such arrangements as alliances and codeshare agreements. The three major airline alliances are Star Alliance, Sky Team, and Oneworld. These alliances currently represent more than 70% of international airline traffic and include both large and small airlines (IATA). These cooperative arrangements and mergers could lead to benefits for the involved airlines through lower production costs from economies of scale and consolidation of facilities as well as increased flight traffic, routes, and market share. Codeshare agreements in alliances also allow airlines to sell tickets for flights operated by other airlines, thus theoretically increasing airline revenue. With codesharing agreements, airlines can also combine connecting flights to form new flight itineraries. With airline alliances, passengers can also enjoy an increase in departures and destinations, lower fares, and shorter travel and layover times through more effective coordination of connecting flights.

However, there is concern that cooperation can also lead to higher fares through decreased competition. With fewer distinct airlines in a market, prices may be increased because the decrease in competition reduces the downward pressure on prices. This paper will study the effects of airline alliances on the economic welfare of passengers and airlines by studying how membership in an airline alliance affects ticket price, revenue passenger miles, and available seat utilization. Revenue passenger miles represent the number of paying passengers aboard the flight multiplied by the distance traveled in air miles and available seat utilization represents the proportion of available seats filled by paying passengers.

Background

The Airline Deregulation Act of 1978 halted the US government's control over fares, routes, and market entry in the airlines industry. This act paved the way for a more liberal, deregulated airlines industry in the US. As a result, airlines began taking more control over their operations and a few trends began to emerge. The 1980's brought hub-and-spoke networks as well as frequent flier programs. Through a hub-and-spoke system, airlines can offer more departures to additional destinations through a well-coordinated hub system. Figure 1 shows how a flight from point A can reach point B through the hub, H. In the late 1990's, a new trend of airline alliances was developing. Airlines began to work together in mutually beneficial agreements. The Star Alliance was formed in 1997 with the Oneworld alliance following in 1999 and the Sky Team alliance in 2000. These three alliances combine to represent more than 70% of the international scheduled traffic (IATA). The main purpose of these alliances is to reduce costs by integrating certain activities, such as promotion and purchase of fuel as well as linking the airlines' networks while avoiding large capital expenditures, such as new aircraft and hubs. Allied airlines also split the revenue from interline flights. Figure 1 explains how an airline operating route AB can combine with an airline operating route DE. Passengers can now fly from point A to point E by passing through the hubs H and K. These alliance agreements are especially useful when done internationally because it saves the member airlines from having to build additional hubs abroad (Brueckner 2001).

Allied airlines also reap the benefits of better coordination of connecting flights through codesharing, a major part of these alliances. Through codesharing, different airlines can sell tickets for the same flight. The operating carrier runs the flight, while the marketing carrier can sell space on it through various arrangements, such as a block sale. By listing flights carried by another airline, airlines can extend their networks of service, reduce their marketing costs, and increase their demand. Codesharing also helps with connections and layovers because two connecting flights from different airlines can be billed as the same route.

In addition to this trend of alliances, the airlines industry has also experienced major mergers in the past decade. This past summer, British Airways merged with Iberia Air. In March of 2005, Lufthansa, the flagship airline of Germany, acquired Swiss Air, the national airline of Switzerland. In September of 2003, France's national airlines, Air France, and the Netherland's KLM Royal Dutch Airlines merged. In 2001, Japan Airlines merged with Japan Air systems and in 2000 Air Canada acquired Canadian Airlines. In the US domestic market, large recent mergers include Continental's merger with United in 2010, Southwest's acquisition of AirTran in 2010, and Delta's Acquisition of Northwest in 2008. Looking forward to the near future, Jet Blue is rumored to be looking for a merger and Ryanair has historically tried to take over Aer Lingus. The main point of these mergers is to take advantage of synergies and economies of scale, gain market share, and increase flight routes.

Alliances and mergers also help airlines bypass the bilateral or multilateral air transport agreements needed to operate international flights between two countries. An example of a bilateral agreement is the EU-US Open Skies Agreement in effect since 2008 that allows any US airline to fly into EU and vice versa. By forming alliances, airlines can gain flight access into foreign markets through codesharing agreements with an airline currently involved in a bilateral or multilateral agreement with the target country of destination (Brueckner 2001).

Finally, these alliances and mergers between major airlines have spurred antitrust concerns. If two major airlines merge or enter an alliance, competition could be reduced. Reduced competition could lead to lower quality of service, higher prices, higher barriers to entry, and even predatory pricing to harm competitors. Mergers and alliances could give airlines a monopoly in certain markets, especially in surrounding areas of a major hub airport. However, in a time when members of airline alliances account for 70% of the market, mergers and alliances between major airlines might be the only way to remain competitive in the industry. In addition, it is important to understand how an airline alliance affects customers as well as the airlines themselves. To measure these effects, this paper will focus on how membership in an alliance affects ticket prices, revenue passenger miles, and available seat utilization. This paper will attempt to determine if membership in an alliance lowers ticket prices, a favorable outcome for customers, and increases revenue passenger miles and available seat utilization, which are favorable outcomes for airlines.

Literature Review

Because airlines play such a large role in the transportation industry, much has been said about mergers and alliances between airlines. Many researchers have studied the benefits of airline mergers, alliances, and codesharing agreements. Most of these studies focus on price, competition, demand, and passenger traffic. The question of whether alliances or full mergers are more beneficial has also been explored. However, the variables and data used in this paper will bring an updated look at the effects of airline alliances, a question that has not been explored heavily since the late 1990's and early 2000's when airline alliances were a relatively new concept in the airline industry.

Jan K. Brueckner, a professor of economics at The University of California, Irvine, has carried out a substantial amount of research into airline alliances and mergers. He has concluded that airline alliances might lead to higher fares and lower traffic between airline hubs on a single airline due to decreased competition, but lower fares and higher traffic on city-pairs that utilize flights from both airlines. The interline fares charged are determined to be 25% lower than the fares charged by non-alliance airlines (Brueckner 2003). Brueckner also determines that codesharing between international airlines reduces fares on international interline flights by 8-17%. He finds these results through a multiple regression using airfare as the dependent variable with independent variables including flight distance, the average of the endpoint city's populations, regional, codeshare, alliance, and anti-trust dummies, as well as market competition variables (Brueckner 2003). It would seem that airline alliances therefore are beneficial for passengers. However, in a paper published in conjunction with Eric Pels, Brueckner determines that in European airline mergers involving joining of alliances, such as Air France and KLM's merger, the airlines benefit from higher profits, while consumers are harmed by the anticompetitive effects of the consolidation. These types of mergers that include the merging of alliances lead to lower traffic and higher fares in all city-pair markets because of the reduction of competition involved. A reduction of competition allows airlines to raise prices and fees (Brueckner and Pels).

Volodymyr Bilotkach has also delved into the study of codesharing and agrees with Brueckner on some points, but refutes his findings in other areas. Similar to Brueckner, Bilotkach determines that codesharing agreements decreases interline fares by up to 22.5% and alliance membership decreases fares by up to 10%. He uses a multiple regression based on variables such as distance, economy seats, country of flight origin, alliance, antitrust immunity, number of competitors on route, and market size. However, unlike Brueckner, Bilotkach contends that antitrust immunity is not a major source of increased fares on nonstop routes between allied airline's hubs (Bilotkach).

Waleed Youssef and Mark Hansen study the consequences of alliances between international airlines, with a case focus on Swiss Air and SAS. The alliance is evaluated based on quality, market concentration, and fares. Since the alliance's inception, the number of flights between the airlines' hubs increased and the layover time between connected flights decreased. However, fares for direct flights between the airlines' hubs increased due to drastically reduced competition along this route. The paper also determined that competition between the hubs of the member alliances is eliminated. The benefits to intra-alliance passengers on connecting flights arrive at the expense of intra-alliance direct flight passengers (Youssef and Hansen). Jong Hun Park's study shows how airline alliances are beneficial when market demand is high, but decrease consumer welfare when market demand is low and economies of density are high. In addition, parallel alliances between airlines operating the same routes pre-alliance lead to lower consumer welfare, while complementary alliances between airlines operating different routes, lead to higher consumer welfare (Park 1997).

Finally, Philippe Barla and Christos Constantatos have explored the decision between undertaking a full merger or strategic alliance between airlines. Using a model market composed of three competitors, or a Cournot triopoly, they determine that a two-firm merger is successful in raising prices, but decreases the profits of the two firms in the merger. This decrease in profits is not as substantial under an alliance because the allied firms still compete with one another. However, Barla and Constantatos contend that the cooperating airlines in a strategic alliance will still make less profit than if they remained separate, unless large synergies and cost reductions are achieved. Barla and Constantatos do not consider the effects of synergies in their research and suggest that there may be cases where a full merger could lead to an increase in profits. Either way, a strategic alliance is preferable to a full merger overall (Barla and Constantatos).

Research Question

There is no deficiency of literature involving consolidation and alliances in the airlines industry. However, the research into airline alliances has slowed down in recent years. Many of these studies focus on different effects from an airline alliance, such as fares, competition, and quality of service. Some studies are case based, some are based on a hypothetical model, and some take into account a large range of statistical data. Some studies focus on domestic airlines, while others focus on international airline agreements, but there has not been much significant work involving airline alliances in recent years. In addition, no study has focused on airfares, revenue passenger miles, and available seat utilization as measures of the effects of airline alliances.

Since international airlines are not required to report to the US Department of Transportation, I will be focusing on domestic airlines and how membership in alliances affects such variables as airfare and the amount of revenue passenger miles and available seats utilized per flight on both domestic and international trips. I have decided to limit the research to airline alliances rather than include mergers because many post-merger companies submit financial reports as one entity and do not separate reports between the merged companies. It would be interesting as well to compare the effects of alliances between domestic and foreign airlines, specifically flagship carriers, but this international data is not readily available. Since the data in this report involves solely domestic airlines, I expect that membership in alliances will be more favorable to airlines than consumers by yielding both higher fares and higher utilization of available seats. The decreased competition among these domestic and international routes will allow airlines to raise prices, while codesharing will allow allied airlines to have higher revenue passenger miles and increased available seat utilization. The following section will explain the methodology behind this study.

Methodology and Data

My methodology for this research will consist mostly of a multiple regression analysis. I will be analyzing the data reported by the Research and Innovative Technology Administration (RITA) and more specifically from the Bureau of Transportation Statistics. The three reports I will be focusing on are the DB1BTicket Report, the T-100 International Segment Report, and the T1: US Air Carrier Traffic and Capacity Summary by Service Class.

The DB1BTicket Report is part of the airline Origin and Destination Survey, which is a 10% sample of airline tickets from reporting carriers. The table contains summary characteristics of the reported flights, including the reporting carrier, itinerary fare, number of passengers, roundtrip indicator, and miles flown. I used the data from the third quarter of 2009 in order to analyze the most recent, complete data during a peak travel season. The 8 million reported flights were narrowed down to 1.5 million by removing flights that were not round trip, included more than 5 coupons, or included less than 3 coupons. Itineraries with less than 3 coupons were deleted as a means of focusing on trips with at least one connecting flight. Itineraries with more than 5 coupons were deleted because these complex itineraries are likely to have more than one destination with connecting flights part of a longer itinerary. The itinerary fare was set as the dependent variable and the independent variables were set as passengers, distance, miles flown, and number of coupons. The passenger variable designates the number of passengers on the flight, the distance variable includes the full distance traveled including ground transportation, the miles flown variable states the number of miles flown from the origin to the destination, and the coupons variable designates the number of coupons in the itinerary, which corresponds to the number of itinerary segments or connecting flights involved. Dummy variables were set for routes that included more than a single carrier (codesharing) and airlines that are part of one of the three major global alliances. The Single Carrier variable equals 1 if no codeshare agreement is present and the Alliance variable equals 1 if the airline is part of an alliance. The Model Summary, ANOVA, and Correlation tables for this dataset are reported in Exhibit 1, with the coefficient output table reported below for convenient reference:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	249.458	1.844		135.313	.000
	SINGLE_CARRIER	-21.746	.504	-.040	-43.186	.000
	Distance	.070	.002	.439	36.818	.000
	MilesFlown	-.031	.002	-.198	-16.561	.000
	ALLIANCE	27.800	.538	.047	51.713	.000
	Coupons	7.566	.459	.014	16.479	.000
	Passengers	-24.529	.257	-.078	-95.480	.000

a. Dependent Variable: ItinFare

According to the correlation coefficient in Exhibit 1, over 73% of the variability in the airfare can be determined by this regression equation at a significance level of 0.000, meaning this regression is a good fit. In addition, all variables have significance levels less than 0.05, making all of them statistically significant. According to the output, an increase in the distance traveled and the number of coupon segments raises prices, which is a logical outcome because longer flights should cost more money. However, an increase in passengers decreases ticket prices, perhaps due to the ability to spread costs over more customers. The data also supports the hypothesis that codeshare agreements and alliances lead to increased airfares. The Single Carrier output coefficient of -21.746 means a lack of codesharing lowers the ticket price by that amount.

The presence of an alliance also raises ticket prices by the coefficient of 27.8. The Pearson Correlation output in Exhibit 1 further solidifies the statistically significant correlation between these variables. On these routes flown by US carriers, alliances and codeshare agreements allow airlines to raise prices, suggesting that airline alliances are not beneficial to consumers. However, since international data is not readily available, this conclusion can only be applied to US carriers.

My analysis of this research questions continues with the T-100 International Segment Report provided by the US Department of Transportation. This report contains non-stop segment data reported by US carriers with at least one part of the flight in the US. This data set complements the previous one because it includes domestic carriers, but looks at both international and domestic flights as well as strictly non-stop flights. The data set includes origin, destination, passengers, seats, ramp to ramp time, air time, distance between airports and departures performed. I added in a dummy variable to denote membership in an alliance as well as a utilization variable to represent the utilization of available seats. Utilization is determined by the number of passengers on the flight divided by the number of available seats. I narrowed down the data to approximately 19,500 flights by focusing on flights in 2009 with over 50 passengers and routes that were flown over ten times in the year. I analyzed the data using a linear regression model with utilization as the dependent variable and independent variables including: departures performed, number of seats, number of passengers, distance between airports, and air time. I used dummy variables to designate if the airline is in an alliance, if the flight is international, and the flight region. The Model Summary, ANOVA, and Correlation tables for this dataset are reported in Exhibit 2, with the coefficient output table reported below for convenient reference:

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.692	.002		360.531	.000
	ALLIANCE	.011	.002	.031	6.707	.000
	Atlantic	-.017	.002	-.048	-7.294	.000
	Pacific	-.045	.003	-.083	-14.461	.000
	AIR_TIME	-4.247E-6	.000	-.214	-18.064	.000
	International	-.002	.006	-.002	-.387	.699
	DISTANCE	2.103E-5	.000	.268	25.162	.000
	PASSENGER	.000	.000	2.984	169.707	.000
	SEATS	-9.903E-5	.000	-2.614	-140.207	.000
	DEPARTURES_PERFORMED	.000	.000	.062	9.799	.000

a. Dependent Variable: UTILIZATION

According to the correlation coefficient in Exhibit 2, over 64% of the variability in seat utilization can be determined by the regression model constructed above at a significance level of 0.000, meaning this regression is statistically significant with moderate correlation. In addition, all variables have significance levels less than 0.05, meaning each variable is significant, including the dummy variable for membership in an alliance. The Pearson Correlation also reports significance levels of less than 0.05 for all variable interactions, making their correlations statistically significant as well. The alliance variable has a positive coefficient of 0.011, meaning alliance membership is positively tied to an increase in the utilization of available seats. This result is to be expected, since airlines would not enter alliances if it did not benefit them in some way. Though the coefficient of 0.011 seems small, it is more significant in the context of the small intercept of 0.692. The codeshare agreements that are part of alliances also allow multiple airlines to sell seats on a given flight, making it more likely that more seats will be filled. A wider network through which tickets can be sold should logically result in increased sales and greater seat utilization. Passengers, seats, and departures performed have coefficients of zero, meaning they have no additional effect on seat utilization other than their magnitude. This is to be expected because passengers and seats are the two components of seat utilization and the departures performed variable designates the number of departures of the specific flight itinerary in 2009. The output of the regional and international dummy variables is interesting with all but the Pacific region having positive effects on utilization. The main conclusion from this data however is that membership in an alliance appears to have a positive relationship with seat utilization. These results support the hypothesis that airline alliances benefit member airlines, keeping in mind the data is from domestic airline reports.

The final data set regarded in this study will be the T1: Us Air Carrier Traffic and Capacity Summary by Service Class reported by the US Department of Transportation. This report contains air traffic data reported by US carriers in both domestic and international markets. I used the 2009 data in order to have the most recent fully complete data. This table is useful in this analysis because it includes available seat miles, revenue passenger miles, revenue air hours, revenue miles flown, and revenue departures performed. The initial pool of flights was narrowed down to nearly 6,000 flights. These flights were chosen on the basis that there were at least 100 available seat miles and route departures were performed at least once per month. Freight tons were not considered and freight-only flights were removed from the data in order to focus specifically on passenger flights. I also included useful dummy variables to complete the analysis. These dummy variables include one to determine whether or not the airline is part of an alliance as well as multiple regional dummy variables. The regional dummy variables determine whether the flight is operated in the Pacific region, Atlantic region, or Latin America.

It is important to take flight regions into account as certain regions might have an effect on airline traffic. I will be focusing on revenue passenger miles with this data instead of a utilization variable to determine how being in an alliance affects the amount of passengers on a flight. A regression with the revenue passenger miles as the dependent variable is the most appropriate way to investigate the affects of these different variables. The independent variables used include revenue aircraft hours airborne, revenue aircraft miles flown, revenue aircraft departures performed, and available seat miles. The dummy variables include the regional variables, a variable to determine if the airline is in an alliance, and a variable to determine if the flight is international or not. This dataset complements the other two because it includes both international and domestic flights, but covers the entire 2009 year to give a wider view of these flight routes. The Model Summary, ANOVA, and Correlation tables for this dataset are reported in Exhibit 3, with the coefficient output table reported below:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3153194.395	1247228.168		2.528	.011
	Atlantic	-6.186E7	5049688.971	-.013	-12.250	.000
	Pacific	-3.597E7	4945252.754	-.007	-7.275	.000
	International	-3.189E7	4697389.977	-.006	-6.788	.000
	Alliance	1.260E7	2352793.021	.006	5.356	.000
	REV_ACRFT_HRS_AIRBORNE_610	-12623.043	2382.448	-.238	-5.298	.000
	REV_ACRFT_MILES_FLOWN_410	43.473	4.840	.353	8.982	.000
	REV_ACRFT_DEP_PERF_510	-5459.954	865.835	-.059	-6.306	.000
	AVL_SEAT_MILES_320	.757	.006	.928	135.676	.000

a. Dependent Variable: REV_PAX_MILES_140

According to the correlation coefficient reported in Exhibit 3, over 99% of the variability in revenue passenger miles can be explained by the regression equation using the included variables. In addition to this high correlation, the significance level of less than 0.000 means this regression equation is statistically significant. In addition, all variables have significance levels less than 0.05, meaning each variable is statistically significant, including the dummy variable for membership in an alliance. The Pearson Correlation also reports significance levels of less than 0.05 for all variable interactions, making their correlations statistically significant as well. The alliance dummy variable has a positive coefficient of 1.260E7, meaning membership in an alliance is positively tied to revenue passenger miles. This result is logical because membership in an alliance helps the airline through codesharing, joint frequent flier programs, and other promotional benefits, which would lead to increased passenger miles. As has been stated above, codesharing exposes flights to a larger market of consumers and should therefore lead to more passengers. In addition, 34% of the variability in revenue passenger miles is directly explained by whether or not the carrier airline is in an alliance. The positive coefficients of available seat miles flown and revenue passenger miles flown is to be expected because revenue passenger miles are part of available seat miles and the longer the distance of the flight, the more passengers that are likely to be on it. A shuttle flight between two closely proximate cities is likely to have fewer passengers than a flight with a longer distance because shuttle flights can operate more frequently and will have a higher demand, but also have to compete with alternative train and bus routes. This same idea also explains why the departures performed variable has a negative relationship with revenue passenger miles, since smaller shuttle flights will have more departures, even as frequently as every hour. Both regional dummy variables are negative, meaning both Atlantic and Pacific flights have negative effects on revenue passenger miles, while Latin American flights have a positive effect. The main conclusion from this data is that membership in an alliance appears to have a positive relationship with revenue passenger miles, again supporting the hypothesis that airline alliances benefit member airlines. This dataset in conjunction with the two previously analyzed datasets can lead to interesting conclusions about memberships in airline alliances.

Conclusion

There have been many essays published on airline alliances, but this issue has not been visited in quite some time. In addition, no study has evaluated the effects of airline alliances on both consumers and airlines by focusing on ticket fares, available seat utilization, and revenue passenger miles. The overall conclusion from this data is that membership in an airline alliance benefits the airlines more than the consumers. While airlines can enjoy higher revenue, passenger miles flown, and available seat utilization from being in an alliance, consumers are adversely affected from the higher fares alliances seem to establish. Using the output from the DB1B ticket report, both the general alliances and more specifically, codesharing, have statistically significant positive effects on airfares. This dataset is important because it includes trips with up to at least 3 route segments, highlighting specifically the effects of codesharing in an alliance. The results of the T-100 International Segment dataset suggest that there is a statistically significant positive relationship between alliance membership and available seat utilization, or the proportion of available seats filled by revenue paying passengers. The results from the T1: Us Air Carrier Traffic and Capacity Summary by Service Class dataset corroborate these results by concluding that there is a positive relationship between membership in an alliance and revenue passenger miles flown.

The concluding results of this study might differ from the general results of other, more expansive studies published about airline alliances, but this study's results are in line with other studies involving domestic airlines and similar datasets. As discussed in the literary review, Brueckner and Bilotkach agree that alliances lead to lower airfares in general, but their data consisted of more international flights from datasets that are not readily available to the public. In addition, Brueckner agrees that alliances lead to larger airfares in certain domestic routes, including routes that involve an airline's major hub (Brueckner 2003). Waleed Youssef and Mark Hansen reported similar findings involving an increase in airfares in hub to hub routes (Youssef and Hansen). Since the routes examined in this paper are domestic, these results reflect those of Brueckner, Youssef, and Hansen. Finally, Jong Hun Park's study shows how airline alliances are beneficial when market demand is high, but decrease consumer welfare when market demand is low (Park 1998). The advent of video conferencing as well as the recent economic downturn have adversely affected demand in the airlines industry and could be a factor in why the results in this paper suggest that airline alliances negatively affect consumers.

The results in this paper suggest that more antitrust investigations should be taking place regarding airline alliances and mergers. In 2001, the US Department of Justice announced it would block the proposed merger between US Airways and United Airlines. The concerns were that the two airways would create a monopoly in the Washington D.C. and Philadelphia markets. The US Department of Justice also concluded that the merger would have lessened competition in the transatlantic markets. Less competition could lead to an increase in fares and a negative impact on general consumer welfare (McDonald). The research in this paper echoes the US Department of Justice's concerns and suggests that more investigations should be made into airline alliances. Other investigations could be made to determine how alliances affect the amount of airline alliances and the length of layover times. An increase in departures and a decrease in layover times due to alliances would make passengers more likely to book through alliances in the future.

Since the data in this research study concerns solely domestic carriers on domestic and international routes, no conclusions can be made regarding the affects of airline alliances on foreign carriers or flight routes with both origins and destinations in foreign countries. However, this study remains significant as not much research has been done into airline alliances in recent years. According to the data in this paper, airline alliances lead to higher fares on domestic routes as well as greater passenger revenue miles and available seat utilization.

Works Cited

"Alliances." *International Air Transport Association.* http://www.iata.org/pressroom/airlines-international/june-2010/Pages/10e.aspx. June 2010

Barla, Philippe, and Christos Constantatos. "On the Choice Between Strategic Alliance and Merger in the Airline Sector: The Role of Strategic Effects." *Journal of Transportation Economics and Policy.* Vol 40: 409-416. 2006.

Bilotkach, Volodymyr. "Price Effects of Airline Consolidation: Evidence from a Sample of Transatlantic Markets." *Empirical Economics.* 33rd ed: 427-448. 2005.

Brueckner, Jan K. "The Economics of International Codesharing: An Analysis of Airline Alliances." *International Journal of Industrial Organization.* Vol 19: 1475-1498. 2001.

Brueckner, Jan K. "International Airfares in the Age of Alliances: The Effects of Codesharing and Antitrust Immunity." *Review of Economics and Statistics.* Vol 85: 105-118. 2003.

Brueckner, Jan K, and Eric Pels. "European Airline Mergers, Alliance Consolidation, and Economic Welfare." *Journal of Air Transport Management.* Vol 11: 27-41. 2005.

Brueckner, Jan K, and W. Tom Whalen. "Price Effects of International Airline Alliances." *The Journal of Law & Economics.* 43rd ed. October 2000.

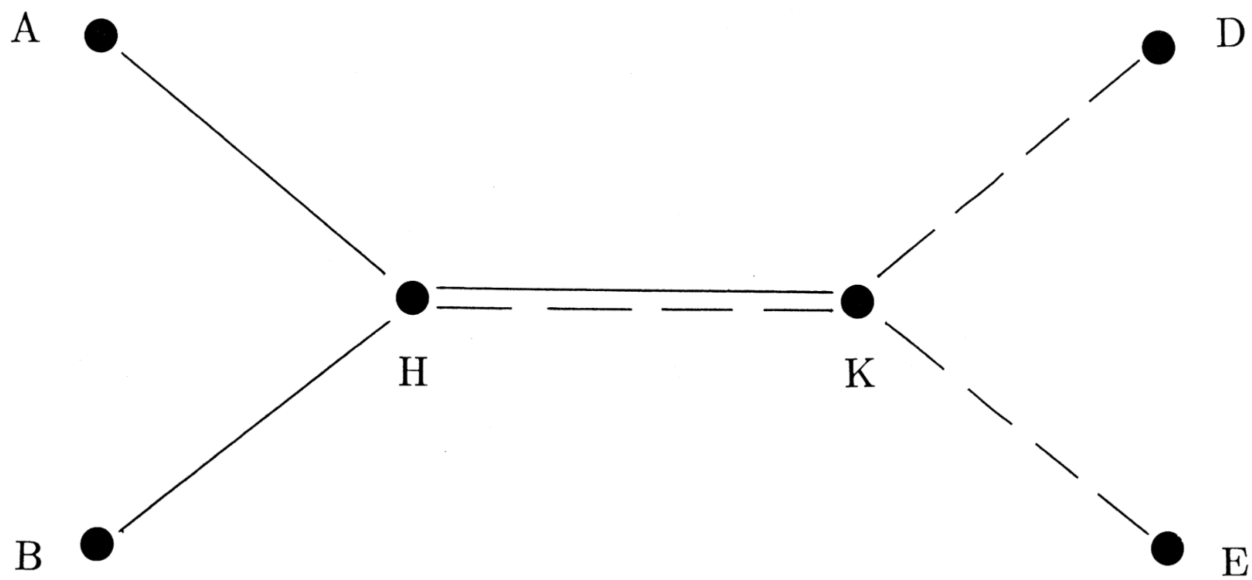
McDonald, J. Bruce. "Antitrust for Airlines." *Department of Justice.* 3 November 2005.

Park, Jong-Hun. "The Effects of Airline Alliances on Markets and Economic Welfare." *Transportation Research and Transportation Review.* Vol 33: 181-195. 1997.

Park, Jong-Hun, and Anming Zhang. "An Empirical Analysis of Global Airline Alliances: Cases in North Atlantic Markets." *Review of Industrial Organization.* Vol 16: 367-383. 2000.

Youssef, Waleed, and Mark Hansen. "Consequences of Strategic Alliances between International Airlines: The Case of Swiss Air and SAS." *Transportation Research and Transportation Review.* Vol 28: 415-431. 1994.

Figure 1.



Brueckner 2001

Exhibit 1: DB1B Ticket Report

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.271[a]	.073	.073	246.29206

a. Predictors: (Constant), Passengers, Distance, ALLIANCE, Coupons, SINGLE_CARRIER, MilesFlown

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.677E9	6	1.113E9	18345.891	.000[a]
	Residual	8.451E10	1393205	60659.781		
	Total	9.119E10	1393211			

a. Predictors: (Constant), Passengers, Distance, ALLIANCE, Coupons, SINGLE_CARRIER, MilesFlown

b. Dependent Variable: ItinFare

Correlations

		Coupons	SINGLE_ CARRIER	Passengers	ItinFare	Distance	MilesFlown	ALLIANCE
Coupons	Pearson Correlation	1	-.204**	-.040**	.074**	.165**	.164**	.185**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	1393212	1393212	1393212	1393212	1393212	1393212	1393212
SINGLE_CARRIER	Pearson Correlation	-.204**	1	.120**	-.049**	.099**	.108**	-.412**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	1393212	1393212	1393212	1393212	1393212	1393212	1393212
Passengers	Pearson Correlation	-.040**	.120**	1	-.085**	.008**	.009**	-.062**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	1393212	1393212	1393212	1393212	1393212	1393212	1393212
ItinFare	Pearson Correlation	.074**	-.049**	-.085**	1	.244**	.241**	.092**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	1393212	1393212	1393212	1393212	1393212	1393212	1393212
Distance	Pearson Correlation	.165**	.099**	.008**	.244**	1	.998**	.084**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	1393212	1393212	1393212	1393212	1393212	1393212	1393212
MilesFlown	Pearson Correlation	.164**	.108**	.009**	.241**	.998**	1	.082**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	1393212	1393212	1393212	1393212	1393212	1393212	1393212
ALLIANCE	Pearson Correlation	.185**	-.412**	-.062**	.092**	.084**	.082**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	1393212	1393212	1393212	1393212	1393212	1393212	1393212

**. Correlation is significant at the 0.01 level (2-tailed).

Exhibit 2: T-100 International Segment Report

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.800[a]	.641	.640	.08743

a. Predictors: (Constant), DEPARTURES_PERFORMED, International, Pacific, Atlantic, ALLIANCE, PASSENGER, DISTANCE, AIR_TIME, SEATS

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	264.409	9	29.379	3843.344	.000[a]
	Residual	148.325	19404	.008		
	Total	412.734	19413			

a. Predictors: (Constant), DEPARTURES_PERFORMED, International, Pacific, Atlantic, ALLIANCE, PASSENGER, DISTANCE, AIR_TIME, SEATS

b. Dependent Variable: UTILIZATION

Correlations

		DEPARTURES_PERFORMED	SEATS	PASSENGER	DISTANCE	UTILIZATION	ALLIANCE	Atlantic	Pacific	International
DEPARTURES_PERFORMED	Pearson Correlation	1	.500**	.434**	-.234**	-.064**	-.080**	-.118**	-.077**	-.066**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414
SEATS	Pearson Correlation	.500**	1	.967**	.353**	.208**	.080**	.241**	.196**	-.063**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414
PASSENGER	Pearson Correlation	.434**	.967**	1	.385**	.395**	.082**	.267**	.192**	-.062**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414
DISTANCE	Pearson Correlation	-.234**	.353**	.385**	1	.265**	.204**	.613**	.398**	-.014*
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.046
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414
UTILIZATION	Pearson Correlation	-.064**	.208**	.395**	.265**	1	.078**	.186**	.025**	-.014
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000	.050
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414
ALLIANCE	Pearson Correlation	-.080**	.080**	.082**	.204**	.078**	1	.200**	-.045**	-.201**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414
Atlantic	Pearson Correlation	-.118**	.241**	.267**	.613**	.186**	.200**	1	-.152**	-.058**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414
Pacific	Pearson Correlation	-.077**	.196**	.192**	.398**	.025**	-.045**	-.152**	1	-.031**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		.000
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414
International	Pearson Correlation	-.066**	-.063**	-.062**	-.014*	-.014	-.201**	-.058**	-.031**	1
	Sig. (2-tailed)	.000	.000	.000	.046	.050	.000	.000	.000	
	N	19414	19414	19414	19414	19414	19414	19414	19414	19414

**. Correlation is significant at the 0.01 level (2-tailed).

Exhibit 3: T1: Us Air Carrier Traffic and Capacity Summary by Service Class

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.998[a]	.995	.995	7.156E7

a. Predictors: (Constant), AVL_SEAT_MILES_320, Pacific, International, Atlantic, Alliance, REV_ACRFT_DEP_PERF_510, REV_ACRFT_MILES_FLOWN_410, REV_ACRFT_HRS_AIRBORNE_610

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.244E21	8	7.805E20	152416.776	.000[a]
	Residual	3.014E19	5887	5.121E15		
	Total	6.274E21	5895			

a. Predictors: (Constant), AVL_SEAT_MILES_320, Pacific, International, Atlantic, Alliance, REV_ACRFT_DEP_PERF_510, REV_ACRFT_MILES_FLOWN_410, REV_ACRFT_HRS_AIRBORNE_610

b. Dependent Variable: REV_PAX_MILES_140

Correlations

		Atlantic	Pacific	International	Alliance	REV_ACRFT_HRS_AIRBORNE_610	REV_ACRFT_MILES_FLOWN_410	REV_ACRFT_DEP_PERF_510	AVL_SEAT_MILES_320	REV_PAX_MILES_140
Atlantic	Pearson Correlation	1	-.050**	-.047**	.256**	.045**	.075**	-.068**	.169**	.166**
	Sig. (2-tailed)		.000	.000	.000	.001	.000	.000	.000	.000
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896
Pacific	Pearson Correlation	-.050**	1	-.047**	.257**	-.040**	-.025	-.085**	.043**	.041**
	Sig. (2-tailed)	.000		.000	.000	.002	.050	.000	.001	.002
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896
International	Pearson Correlation	-.047**	-.047**	1	-.148**	-.079**	-.075**	-.088**	-.061**	-.065**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896
Alliance	Pearson Correlation	.256**	.257**	-.148**	1	.327**	.336**	.264**	.338**	.340**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896
REV_ACRFT_HRS_AIRBORNE_610	Pearson Correlation	.045**	-.040**	-.079**	.327**	1	.997**	.943**	.937**	.929**
	Sig. (2-tailed)	.001	.002	.000	.000		.000	.000	.000	.000
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896
REV_ACRFT_MILES_FLOWN_410	Pearson Correlation	.075**	-.025	-.075**	.336**	.997**	1	.913**	.960**	.954**
	Sig. (2-tailed)	.000	.050	.000	.000	.000		.000	.000	.000
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896
REV_ACRFT_DEP_PERF_510	Pearson Correlation	-.068**	-.085**	-.088**	.264**	.943**	.913**	1	.778**	.764**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896
AVL_SEAT_MILES_320	Pearson Correlation	.169**	.043**	-.061**	.338**	.937**	.960**	.778**	1	.997**
	Sig. (2-tailed)	.000	.001	.000	.000	.000	.000	.000		.000
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896
REV_PAX_MILES_140	Pearson Correlation	.166**	.041**	-.065**	.340**	.929**	.954**	.764**	.997**	1
	Sig. (2-tailed)	.000	.002	.000	.000	.000	.000	.000	.000	
	N	5896	5896	5896	5896	5896	5896	5896	5896	5896