The elusive low cost carrier effect in the trans-Atlantic airline market

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ABSTRACT

In the US domestic airline industry, it has been shown that low cost carriers cause a reduction in airfares offered by full service carriers. However, this phenomenon could not be identified in an analysis of trans-Atlantic airfares, and in fact, there is evidence that the presence of a low cost carrier may actually be associated with higher fares being offered by full service airlines. The concept of institutional isomorphism serves as a possible explanation of why a more heterogeneous mix of competitors could lead to homogeneity of airfares.

Keywords: airfare, airline, trans-Atlantic, low fare carrier, institutional theory, isomorphism

INTRODUCTION

While competition within domestic markets and the intra-European market has been intensively studied, competitive effects in intercontinental air travel have not been scrutinized to the same extent. The trans-Atlantic market is particularly interesting as an example of airline competition because it combines high traffic volumes with a long history of deregulation, in contrast to Asian markets where there is still some hesitance to expose flag carriers to international competition (Forsyth, King, & Rodolfo, 2006). The current study addresses whether low cost carriers, including charter carriers, have an impact on fares offered by full service carriers on trans-Atlantic routes.

The airline industry has intriguing characteristics as an example of market competition, characterized by low barriers to entry to specific locales as an airline adds or drops destinations from its schedule. Yet on the other hand, other features of the airline industry such as the "fortress hub" phenomenon mitigate against the normal operation of market forces.

Deregulation, which is still an ongoing process in international markets, has had a traumatic impact on the industry, forcing some well-established airlines out of business and causing surviving carriers to reinvent their business models. Before deregulation, there was little incentive to become efficient as long as routes were allocated through bilateral treaties and fares were regulated through the International Air Transport Association (IATA). Where deregulation has occurred, some flag carriers have struggled to survive, while others, such as Sabena (Belgium) and Swissair, have ceased operations altogether. Meanwhile certain charter carriers, such as Condor (Germany) or Sun Country (US), have adopted some of the characteristics of scheduled carriers such as on-line booking. Williams (2001) has documented the evolution of European charter carriers into “no-frills” scheduled carriers, and a similar evolution seems to be occurring charter carriers based in North America.

CONSEQUENCES OF DOMESTIC DEREGULATION

The first efforts to deregulate the airline industry occurred in domestic markets, such as the Airline Deregulation Act of 1978 in the US, the National Transportation Act of 1987 in Canada, and the Airline Agreement Termination Act of 1990 in Australia (Williams, 1994). The discount carrier strategy, in which low fares are coupled with reduced amenities and minimal administrative overhead, tends to be most compatible with short haul routes. Deregulation brought forth a variety of domestic discount carriers, of which Southwest (US) and WestJet (Canada) are the most successful survivors.

As shown in studies of the US and Canadian domestic markets, it is simplistic to say that deregulation reduces airfares. Full service carriers do not necessarily reduce their fares when another full service carrier competes on the same route. Due to the phenomenon known in the industry as the “golden rule,” airlines are reluctant to begin price wars, even on routes where they have a competitive advantage, for fear that the competitor will retaliate by instigating price wars on routes where the competitor has the advantage (Evans & Kessides, 1994). Also, the industry’s yield management approach constitutes an effective system of price discrimination in which carriers distinguish between discretionary customers, who pay a relatively low fare if they buy in advance, and nondiscretionary customers who pay very high fares for last-minute purchases. This practice of segmenting the market by urgency mutes the impact of competition, and has few counterparts in the pricing practices of other industries. Another factor that limits

competitive effects is the "fortress hub" phenomenon, in which an airline enjoys quasi-monopolistic control over a city where it controls most connecting flights, such as Delta's dominance of Atlanta or United's dominance of Denver.

Yet competition can have an enormous impact on airfares in certain circumstances. One situation in which competition affects airfares has been labeled the "Southwest Effect," although the phrase "low cost carrier effect" would be a broader, more suitable label. When Southwest Airlines enters a market, competing airlines drop their fares dramatically, a phenomenon that does not occur if a full service carrier competes against another full service carrier (Anderson, Gong, & Lakshmanan, 2005; Bennett & Craun, 1993; Morrison, 2001; Windle & Dresner, 1995). ValuJet, another US discount carrier, has a similar impact (Windle & Dresner, 1999).

A pattern similar to the Southwest effect has been identified in the Canadian domestic market. WestJet, a low cost carrier, caused full service carriers to reduce their fares when entering a market. On the other hand, full service carriers did not lower their fares in response to the entrance of charter-type low cost carriers (Mentzer, 2000).

CONSEQUENCES OF INTERNATIONAL DEREGULATION

Where international flights are concerned, deregulation has been a gradual, ongoing process (Hedlund, 1994; Schless, 1994). The International Air Transport Association (IATA) has performed a fare-setting function since its founding in 1946, coupled with numerous bilateral treaties dictating which routes an airline could serve and what limits on capacity would be imposed. The United States' first efforts at deregulating international air travel were liberal bilateral treaties with the Netherlands, Belgium, West Germany, Israel, and Singapore, all in 1978 (Dresner and Windle, 1992). While deregulation would be expected to lead to lower international fares, this effect occurred only for discounted fares, not full fares, due to the airlines' use of price discrimination in separating discretionary passengers from nondiscretionary passengers, who pay full fare for last-minute purchases (Dresner and Tretheway, 1992). While these earlier treaties were an important step in liberalizing previous restrictions on air travel, they fell short of the broader deregulation codified in later, "open skies" treaties, such as the 1992 US-Netherlands agreement.

Multinational treaties to liberalize air transport, although slower in developing than bilateral treaties, have constituted a new level of deregulation. In the European Union, airline deregulation of intra-EU flights began in 1997, spurring the creation of Ryanair, EasyJet, and similar carriers offering a bare-bones level of amenities and extremely low fares. While the discount carrier strategy has been successful on both sides of the Atlantic, Ryanair and a few other carriers have pushed the strategy of minimal amenities to a point not seen in North America.

A multinational open skies treaty was signed in 2001 by the US, Chile, Singapore, New Zealand, and Brunei (MALIAT, 2011). In 2007, the EU-US Open Skies Agreement was signed (Button, 2009; Pitfield, 2009). In 2009, ten Asian nations approved the ASEAN Multilateral Agreement on Air Services, which will gradually deregulate air travel among the member countries (Forsyth, King, & Rodolfo, 2006).

Deregulation in domestic and intra-EU markets has led to the creation of discount carriers, but because the discount carrier strategy reaps greater economies for airlines on short haul routes, this phenomenon has been quite muted on longer routes. Nonetheless, discount

carriers have entered the trans-Atlantic market with varying degrees of success, such as Air Berlin, the Canada-based Zoom Airlines (now defunct), and Iceland Express.

In the trans-Atlantic market, low cost carriers often serve relatively obscure routes, such as Iceland Express serving Reykjavik-Winnipeg, that other carriers have judged as not meriting service. There are several reasons why a carrier would serve such a non-obvious route. In the case of Reykjavik-Winnipeg, Iceland Express hopes to attract passengers who will make connections in Reykjavik for other European destinations, and also, the Winnipeg area has a substantial Icelandic community. In other cases, such as Frankfurt-Whitehorse or Frankfurt-Fairbanks, both served by Condor, the target audience is Germans who see Yukon or Alaska as a vacation destination. Tickets may be purchased for journeys originating at either end, although the number of trans-Atlantic passengers originating from Whitehorse (population 20,460) or Fairbanks (population 33,132) would be infinitesimal. In other situations, low cost carriers will regard traffic between two large cities as profitable, often with a less-than-daily schedule, in contrast to full service carriers which have decided the traffic does not warrant the operating costs that a full service airline would incur. Examples of this last category would include Berlin-Los Angeles (Air Berlin) and Montreal-Marseilles (Air Transat); neither city-pair is served by full service airlines.

The current study is limited to city-pairs served by full service carriers, with or without competition from LCCs, and therefore city-pairs served only by LCCs were excluded from the analysis. If a city-pair is served only by a low cost carrier, it becomes impossible to ascertain the low cost carrier's impact on full service carriers if there are no full service carriers serving that route. Hence, Montreal-Paris is included in this data set, while Montreal-Marseilles is not included because it is served only by a low cost carrier.

DATA

Airlines can be arrayed along a spectrum, with full service carriers, sometimes called “legacy carriers,” at one end of the scale (e.g., United, Delta, Air Canada, British Airways), and low cost carriers at the other end of the scale. While there is admittedly a subjective element in categorization, the current study treats the trans-Atlantic airline market as consisting of two types of airlines: full service carriers versus low cost carriers, the latter group including discount and charter carriers. Historically, a charter airline is one whose seats could be purchased only through travel agents, usually as part of a vacation package, with less-than-daily service. Examples would be Sun Country Airlines (US) and Condor (Germany). Charter airlines were usually not governed by route assignment clauses in bilateral air transport treaties, thus enjoying less intense regulation than full service carriers. However, as some charter carriers sell tickets directly to consumers over the internet, the boundary between charter carriers and other low cost carriers has become less clear; therefore, charter carriers were treated as being low cost carriers in this study. The term “full service carriers” is something of a misnomer as airlines reduce amenities, but for lack of a better label, the term is used in this study to include all airlines which are not low cost carriers.

The industry reference book, *JP Airline-Fleets International* (Reed, 2010), was relied upon in categorizing airlines, following the practice of Williams’ 2001 study of intra-European carriers. An airline with a code-share arrangement was counted as a separate airline, since code-sharing airlines often have a fare-setting strategy distinct from that of the operating airline. In this study, the following were defined as low cost carriers: Air Atlanta Icelandic for Canada

Extra, Air Berlin, Air Transat, Condor, Monarch, Sun Country, Thomas Cook Airlines, Thomson, and XL Airways.

To be included in the data set, a city-pair must have had nonstop service by a full service carrier during summer of 2011. If the only nonstop service between a city pair was by a low cost carrier, that city pair was excluded from the data set, because the focus of the analysis is the impact of low cost carriers on fares charged by legacy carriers,

Airfare data were obtained from Expedia.com in US dollars for flights originating in North America, and from Expedia.co.uk in British pounds for flights originating in Europe, although these figures were converted to US dollars prior to the statistical analysis. Expedia and its main competitor, Travelocity, present fares as inclusive of taxes and fees, and do not provide a breakdown until late in the purchase process. Although fares exclusive of taxes would provide a more direct measure of how airlines respond to competitive pressures, the use of tax-inclusive fares in this study replicates the information that a consumer would see and which forms the basis of a consumer's purchase decision. To take into account the variation among countries in taxes and costs, the countries of origin and destination were included in the regression analyses as a series of dichotomous control variables.

The data set includes fares offered by full service carriers but not fares offered by low cost carriers. This is because the intent of the study is to assess how the presence of a low cost carrier affects full service fares. In other words, fares of low cost carriers were not collected, because a key variable was the presence of a low cost carrier on a route, not the fares it charged.

In this study, the unit of analysis was the city-pair served by a trans-Atlantic route; examples would be New York-London or Toronto-Frankfurt. On the North American side, the analysis was limited to the US and Canada. There were exactly 100 of these (coincidentally a round number). Multiple regression was applied. It was anticipated that the more low cost carriers serving a city-pair, the lower the fares that would be offered by full service carriers.

Following the approach of Williams (2001), the analysis was limited to three countries on the European side: France, Germany, and the UK. Inclusion of other countries would have increased the size of the data set, but as the number of countries in the study increases, it becomes less practical to control statistically for effects that are idiosyncratic to each country – for example, varying taxation policies or cultural characteristics that affect the propensity to engage in trans-Atlantic tourism. As well, a large number of countries would have made it problematic to separate city effects from country effects. For example, if Amsterdam or Reykjavik had been included, it would have been difficult to disaggregate the characteristics of those cities from the policies of the Dutch or Icelandic governments.

DEPENDENT VARIABLES

The dependent variable was the lowest round trip fare, including taxes, offered by a full service carrier (*not* a low cost carrier) for a given trans-Atlantic city-pair. Two different Saturday-to-Saturday itineraries were chosen from the summer 2011 season. Non-business travelers tend to travel to and from Europe on the weekends because it coincides with the beginning and end of the workweek, and low cost carriers often operate on weekends to cater to that clientele. When flights are operated on a less-than-daily basis, they are more likely to operate on Saturday than any other day of the week. Hence, it is on the weekends that full service carriers are most likely to feel the competitive pressure of low cost carriers draining away price-sensitive customers and those who are planning discretionary travel.

In assembling the airfare data for this study, two hypothetical trips were considered (all dates 2011 unless otherwise stated): Leaving July 9 and returning July 16, and leaving August 13 and returning August 20. All four of these days are Saturdays, and were chosen from the middle of the month to avoid the statutory holidays of the US and Canada (Labor Day, 4th of July, Canada Day, and others). For each pair of dates, round-trip fare data were collected both for trips originating in North America as well as for trips originating in Europe.

Thus, for a given city pair, four round-trip fares were collected for analysis: (a) July 9-16 originating in North America, (b) July 9-16 originating in Europe, (c) August 13-20 originating in North America, and (d) August 13-20 originating in Europe. Fares originating in North America were expressed in US dollars, while fares originating in Europe were stated in British pounds. In this study, the dependent variable was the average of the four fares described above, after converting pound-denominated fares into US dollars. As described above, only nonstop flights were considered. These fares represent the high season of summer 2011 when full service carriers would feel the greatest competitive pressure from low cost carriers on trans-Atlantic routes.

Data were collected from Expedia on November 8, 2010, which was more than seven months in advance of travel, so that fare data would not be distorted by airlines' reducing or raising fares as the departure date became imminent. However, this could also be construed as a disadvantage, because the average fare paid may differ from the advance-purchase fare due to fare increases or decreases as the departure date nears. Some studies of domestic US airfares have used data from a random sample of actual tickets provided by the US Department of Transportation. This data source has the advantage of distinguishing between advertised fares and actual fares. However, as Pitfield (2009) has pointed out in discussing the methodological obstacles in international airline research, comparable data are not available for international fares. In the current study, the use of advertised fares is similar to Dresner and Tretheway's (1992) practice of obtaining international airfare data from reference books published for travel agents.

INDEPENDENT VARIABLES

The principal independent variables were (1) the number of airlines (both full service and low cost carriers) serving a given city-pair, (2) the number of low cost carriers serving a given city-pair, and (3) the number of full service carriers serving a given city-pair.

Control variables were used in an effort to take into account other factors which might affect the lowest fare offered by a full service carrier. One control variable was the distance between the two cities in a city-pair. Because fares are higher between small cities than large cities, the metropolitan area population of the two cities in each city-pair was another control variable, measured as the sum of the two cities' metropolitan population. Similarly, busier airports tend to have lower airfares than less-busy airports, and accordingly, the number of passengers handled per year was an additional control variable, measured as the sum of the two airports' number of passengers. If a metropolitan area had more than one airport with commercial service, the traffic of all airports was combined. For example, London's five airports were treated as a single airport for the purposes of this study. While city size might be expected to correlate strongly with airport size, the correlation was a relatively weak $r = .382$, suggesting that city size and airport size are separate constructs.

Because taxes, airport costs, and travel habits vary among countries, a series of three dichotomous variables were used to control for the various countries in each city-pair. On the North American side, the variable "Canada" was coded 1 if the city-pair included a Canadian city and 0 if it included a US city. Because all city-pairs reflected trans-Atlantic routes from/to Canada or the US, this variable covered all possibilities in the data set. On the European side, controlling for country is more difficult because three European countries were possible, and three-category nonscalar variables are incompatible with regression analysis. Therefore, the location of the European city in each city-pair was expressed as two dichotomous variables: The variable France (1 if the city-pair included a French city, otherwise 0), and the variable Germany (1 if the city-pair included a German city, otherwise 0). The third possibility, that the European city was in the United Kingdom, was not expressed as a dichotomous variable, but can be ascertained by the variables "France" and "Germany." This treatment of categories is standard practice in regression, because it is essential that no independent variable be entirely determinable through other variables in the equation. If two independent variables can be used to calculate a third independent variable, the mathematical integrity of the regression analysis would be violated.

RESULTS

Table 1 displays the correlation matrix and Table 2 presents the regression results (Appendix). Three regression models were calculated, corresponding to the three principal independent variables described above.

In Model #1, the key independent variable was the number of carriers (both low cost and full service) serving a given city-pair. As shown, this was not a significant predictor of the lowest airfare offered by a full service airline.

In Model #2, the key independent variable was the number of low cost carriers serving a given city pair. This was a significant predictor, but in the *opposite* direction hypothesized. Other things being held equal, the entry of one or more low cost carriers was associated with *higher* fares being offered by full service airlines. Fares offered by full service carriers were lowest on routes without low cost carriers and were highest on routes served by multiple low cost carriers. Instead of a Southwest-type effect, trans-Atlantic routes show evidence of the *reverse* of a “Southwest effect.”

In Model #3, the key independent variable was the number of full service carriers serving a given city pair. This was a significant predictor in the direction one might expect; fares were lowest where many full service carriers were in competition with each other.

DISCUSSION

These results were unexpected if one had assumed that low cost carriers cause full service carriers to reduce their fares. Perhaps the easiest way of considering these results is to use the metaphor of clothing stores. Research on US domestic airlines is comparable to a discount store coming to a town and causing the full service clothing stores to reduce their prices in order to compete. The results of this study are akin to a discount clothing store coming to town and causing full service retailers to maintain high prices, perhaps because those retailers believe it is futile to compete against the discount retailer on the basis of price.

In other words, the presence of a low cost carrier on trans-Atlantic routes may cause full service airlines to deemphasize price competition because they perceive it to be a lost cause. This possibility is supported by a study of US domestic competition, where full service carriers were most likely to compete on price where the new entrant had a similar cost structure, and least likely to compete on price where the new entrant had a fundamentally lower cost structure (Lin, Dresner, & Windle, 2001).

While transportation researchers have made much of Southwest Airlines' impact on other airlines' pricing practices in the domestic US airline industry, it is important to note that not all airlines have the same effect on full service airlines' fare-setting. In Canadian research on this topic, it was found that one low cost carrier, WestJet, had an impact similar to the "Southwest effect," but other low cost carriers – which had many of the characteristics of charter airlines – did not affect the fares of the full service carriers (Mentzer, 2000). WestJet, like Southwest Airlines, offered a level of service that was roughly similar to the full service airlines, whereas charter-type low cost carriers may have been perceived by consumers to offer a service so different from the full service airlines that one would not be regarded as a substitute for the other, and any competitive pressure would be lost.

A similar phenomenon might explain these counterintuitive results regarding trans-Atlantic fares. Trans-Atlantic flights offered by low cost carriers such as Air Transat, Condor, and Thomas Cook might be perceived by consumers as being so drastically different from full service carriers that competition does not occur across the boundary that divides low cost carriers from full service carriers. In short, the entry of a low cost carrier may cause the market to bifurcate into (at least) two watertight market segments, one consisting of full service carriers for price-inelastic customers and the other segment consisting of low cost carriers for price-elastic customers. In contrast, on routes where there is no low cost carrier, the full service carriers construct their pricing strategy to appeal to both price-inelastic and price-elastic customers.

Another possible explanation is that the cognitive process of those seeking cheap trans-Atlantic flights is radically different from the purchase process of those seeking cheap domestic US flights because the trans-Atlantic purchase is more costly, planned further in advance, and often part of a vacation package. A complicating factor is that the categories of airlines are not the discrete, watertight categories that they once were. As described earlier, some charter airlines now sell tickets directly over the web, and a few, such as Condor (Germany), Air Transat (Canada), and Sun Country (US), are even listed on Expedia alongside full service airlines. Full service carriers have been reducing their amenities, further blurring the distinction between low cost carriers and full service carriers, although this reduction of amenities is more pronounced on domestic routes than international routes.

The frequency of service offered by low cost carriers is another possible factor. Dresner, Lin, & Windle (1996), in their study of US domestic airlines, suggested that there will be no effect on competitors' airfares unless the low cost carrier has frequent service on a given route. Southwest Airlines offers frequent service on the routes it chooses to serve, which may explain why its impact is more pronounced than other low cost carriers.

One might expect deregulation to lead to a proliferation of airlines of widely differing levels of service, with carriers dispersing themselves along the continuum from full service to bare-bones discount carriers. Although counterintuitive, deregulation may have the opposite effect. The theory of institutional isomorphism (DiMaggio & Powell, 1983) suggests that the uncertainty, turbulence, and complexity associated with deregulation could cause airlines to converge. There is some evidence that this is already happening as full service carriers reduce

their level of amenities and low cost carriers increase their level of amenities, while airlines of all types shift to web-based ticket sales. Institutional theory posits that because everyone in the industry has similar technological and regulatory constraints, and because mimicking each other minimizes risk, the paradox arises that high uncertainty can actually increase the homogeneity of industry practices. Bare-bones low cost carriers such as Ryanair are a glaring exception, but they seem to flourish only in very short haul markets.

Whether a low cost carrier is present or absent on a route is a coarse measure of competitive pressure. It would have been more accurate to use the percent of passengers using low cost carriers on a given route or a Herfindahl-type measure of competition for each city-pair, although such data are not always available and policies regarding access to data vary among countries.

In any study using cross-sectional data, the possibility of reverse causation must be considered. It is conceivable that low cost carriers are attracted to routes where airfares are inordinately high, and that when this happens, their entrance does not pull down the fares of the full service carriers. While such a scenario cannot be disproven with this dataset, it seems more likely that airfares are affected by the mix of airlines serving a route, than that the mix of airlines serving a route are affected by fare levels.

The finding that the "Southwest effect" or low cost carrier effect occurs in some markets but not others suggests opportunities for future study. While there has been a substantial body of research investigating this phenomenon in the US, and to a lesser degree in Canada and Australia, there has been little investigation of whether this phenomenon exists in other markets. There has been research on how low cost carriers have affected the intra-European market, but these studies have examined passenger volumes, route patterns, and market share rather than the impact on ticket prices of full service airlines (e.g., Barbot, 2008; Dobruszkes, 2006; Mason, 2000, 2005; Williams, 2001). In their 1992 study, Dresner and Tretheway examined whether deregulation affected international airfares – in general terms, the answer was no – but did not specifically address whether the presence of low cost carriers affected other airlines' fare levels.

There is a need to identify whether there is a low cost carrier effect in other markets. Fare data from actual tickets are available for US domestic flights but not for international flights, and this data availability problem hampers research of markets outside the US. However, on-line sources provide a wealth of airfare data, and even though the quality of those data is imperfect, on-line sources could be used to analyze how competition impacts (or fails to impact) pricing levels in other markets.

Even if low cost carriers are associated with higher fares being offered by full service carriers on trans-Atlantic routes, it is nonetheless beneficial to have low cost carriers as part of the competitive mix. On busy routes, consumers benefit from a wider array of choices, and on less busy routes, low cost carriers are willing to serve city-pairs where the passenger volume is insufficient to justify daily service by a full service carrier. Regardless of whether low cost carriers affect other airlines' fare levels, the low cost carrier itself provides a substantial benefit by offering low prices for those consumers who are highly price elastic.

REFRENCES

Anderson, W. P., Gong, G., & Lakshmanan, T.R. (2005). Competition in a deregulated market for air travel: The U.S. domestic experience and lessons for global markets. *Research in Transportation Economics*, *13*, 3-25.

Barbot, C. (2007). Can low cost carriers deter or accommodate entry? *Transportation Research Part E*, *44*, 883-893.

Bennett, R. D., & Craun, J.M. (1993). The airline regulation evolution continues: The Southwest effect. US Department of Transportation, http://ostpxweb.dot.gov/aviation/reports.htm (Accessed 24 January 2011).

Button, K. (2009). The impact of US-EU 'open skies' agreement on airline market structures and airline networks. *Journal of Air Transport Management*, *15*, 59-71.

DiMaggio, P. J., & Powell, W.W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, *48*, 147-160.

Dobruszkes, F. (2006). An analysis of European low-cost airlines and their networks. *Journal of Transport Geography*, *14*, 249-264.

Dresner, M., Lin, J.-S. C., & Windle, R. (1996). The impact of low-cost carriers on airport and route competition. *Journal of Transport Economics and Policy*, *30* (3), 309-328.

Dresner, M., & Tretheway, M.W. (1992). Modelling and testing the effect of market structure on price: The case of international air transport. *Journal of Transport Economics and Policy*, *26* (2), 171-184.

Dresner, M., & Windle, R.J. (1992). The liberalization of U.S. international air policy: Impact on U.S. markets and carriers. *Journal of the Transportation Research Forum*, *32* (2), 273-285.

Evans, W. N., & Kessides, I.N. (1994). Living by the 'golden rule': Multimarket contact in the U.S. airline industry. *Quarterly Journal of Economics, 109* (2), 341-366.

Forsyth, P., King, J., & Rodolfo, C.L. (2006). Open skies in ASEAN. *Journal of Air Transport Management*, *12*, 143-152.

Hedlund, D. C. (1994). Toward open skies: Liberalizing trade in international airline services. *Minnesota Journal of Global Trade*, *3* (2), 259-299.

Lin, J.-S. C., Dresner, M., & Windle, R. (2001). Determinants of price reactions to entry in the U.S. airline industry. *Transportation Journal*, *41* (2 & 3), 5-22.

MALIAT: Multilateral agreement on the liberalization of international air transportation (2011). http://www.maliat.govt.nz. Accessed 20 January 2011. Site maintained by the government of New Zealand.

Mason, K. J. (2000). The propensity of business travellers to use low cost airlines. *Journal of Transport Geography*, *8*, 107-119.

Mason, K. J. (2005). Observations of fundamental changes in the demand for aviation services. *Journal of Air Transport Management*, *11*, 19-25.

Mentzer, M. S., (2000). The impact of discount airlines on fares in Canada. *Transportation Journal*, *39* (4), 35-42.

Morrison, S. (2001). Actual, adjacent, and potential competition: Estimating the full effect of Southwest Airlines. *Journal of Transport Economics and Policy*, *35*, 239-256.

Pitfield, D. E. (2009). The assessment of the EU-US open skies agreement: The counterfactual and other difficulties. *Journal of Air Transport Management*, *15*, 308-314.

Reed Business Information Ltd. (2010). *JP Airline-Fleets International*, 44th ed., Surrey, UK.

Schless, A. L. (1994). Open skies: Loosening the protectionist grip on international civil aviation. *Emory International Law Review*, *8* (1), 435-472.

Williams, G. (1994). *The Airline Industry and the Impact of Deregulation*. Aldershot, UK: Ashgate.

Williams, G. (2001). Will Europe's charter carriers be replaced by 'no-frills' scheduled airlines? *Journal of Air Transport Management*, *7*, 277-286.

Windle, R. J., & Dresner, M.E. (1995). The short and long run effects of entry on U.S. domestic air routes. *Transportation Journal*, *35* (2), 14-25.

Windle, R. J., & Dresner, M.E. (1999). Competitive responses to low cost carrier entry. *Transportation Research Part E*, *35*, 59-75.

APPENDIX

Table 1: Correlation Matrix

Variable	Mean	Std Dev	1	2	3	4	5	6	7	8	9	10
1. Lowest fare (full service)	1472.67	225.61	1.000									
2. Distance (kms)	6887.69	1170.14	.446	1.000								
3. Population (both cities)	13.70	5.54	-.167	-.102	1.000							
4. Airport size (both cities)	123.75	42.78	-.244	.110	.382	1.000						
5. Canada §	.18	.386	.226	-.297	-.257	-.240	1.000					
6. France §	.21	.41	.366	.048	.351	.097	-.114	1.000				
7. Germany §	.38	.49	.226	.248	-.101	-.552	.062	-.404	1.000			
8. # Total carriers	3.02	1.61	-.234	-.184	.404	.531	.157	.055	-.254	1.000		
9. # Low cost carriers	.30	.77	.130	-.176	-.123	.098	.529	-.105	-.198	.475	1.000	
10. # Full service carriers	2.72	1.42	-.337	-.114	.526	.550	-.110	.120	-.181	.877	-.006	1.000

§ = Dichotomous variable

Table 2: Multiple Regression Results
(Dependent variable is lowest fare offered by a full service carrier.)

Regression #	(1)	(2)	(3)
Constant	882.158 (116.267)	886.401 (114.275)	902.174 (111.891)
Distance (kms)	.079 (.017) β = .408 ***	.081 (.016) β = .418 ***	.071 (.016) β = .369 ***
Population (both cities, millions)	-6.615 (3.799) β = -.162	-8.242 (3.621) β = -.202 *	-4.942 (3.665) β = -.121
Airport size (both airports, millions of passengers)	.275 (.622) β = .052	-.229 (.546) β = -.043	.774 (.605) β = .147
Canada §	224.908 (46.027) β = .385 ***	136.475 (50.424) β = .234 **	206.900 (41.376) β = .354 ***
France §	317.031 (49.123) β = .575 ***	335.209 (48.898) β = .608 ***	331.263 (47.388) β = .601 ***
Germany §	143.867 (51.235) β = .311 **	160.426 (51.148) β = .347 **	172.664 (50.277) β = .373 **
# Total carriers	-18.781 (12.713) β = -.134		
# Low cost carriers		56.123 (23.952) β = .192 *	
# Full service carriers			-44.244 (13.917) β = -.277 **
R^2	.596	.609	.627
Adjusted R^2	.565	.580	.599
F	19.355	20.496	22.089
Significance of F	<.001	<.001	<.001
N	100	100	100

Note: For each variable, the first number is the unstandardized coefficient, the second is the standard error (in parentheses), and the third is the standardized coefficient (β).
Two-tailed significance as follows: * p < .05 ** p < .01 *** p < .001
§ = Dichotomous variable