

A Merger Effect on Different Airline Groups : Empirical Study on the Delta-Northwest Merger in 2008.

Sora Park*

ABSTRACT

The airline industry has performed inconsistently over the past decades since deregulation in 1978. Primarily, there has been a significant profit discrepancy between legacy airlines and low-cost carriers. Starting from the early 2000s, four of the largest legacy airlines chose to consolidate with one another with an effort to increase efficiency and profitability. In particular, Delta Air Lines and Northwest Airlines have consolidated in 2008, becoming the largest commercial airline in the world. This paper examined the motivation behind this merger as well as the anticompetitiveness concerns arising from this merger. It also analyzed the merger effect on the airfares on top 1,000 U.S. domestic city-pair routes in relation to the number of passengers, the distance, and the market share. All airlines were categorized into three groups – Legacy Airlines, Delta-Northwest, and Low-Cost Carriers – and the interactions between the airfares and the variables were examined within each airline group and across different airline groups. It was found that the airfares of legacy airlines and Delta-Northwest decreased at a faster rate than the low-cost carriers while their market shares increased simultaneously irrespective of whether they offered the lowest prices or had the largest market share on each route.

INTRODUCTION

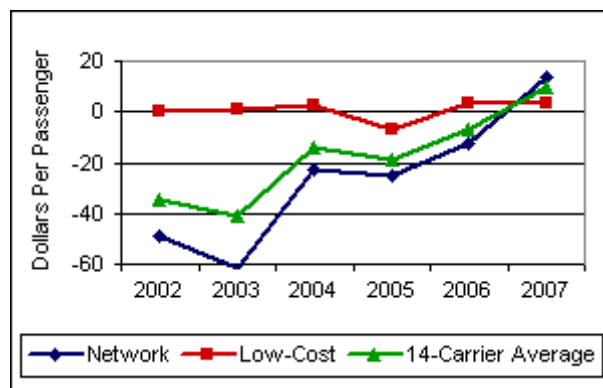
The U.S. domestic airline industry can be largely divided into two different groups; one is legacy airlines and the other one is Low-Cost Carriers (LCCs). In general, legacy airlines refer to those carriers who existed before the Airline Deregulation Act of 1978. As they operate on almost any domestic and international routes, they provide first and business class, airport lounges, and other high-level of services with various types of aircrafts. On the other hand, LCCs entered the market after deregulation and operate under the low cost structure that maximizes their profit by primarily serving direct flights on the denser routes at lower prices with fewer services.

The distinct difference in those two groups of airlines can also be found in the profit gap between them. Since deregulation in 1978, the airline industry has been volatile in terms of its financial stability, while the demand for air travel has steadily increased. There have been over 160 airline bankruptcies since 1978, yet particularly, the largest airline bankruptcies took place in the early 2000's; US Airways and United Airlines entered Chapter 11 bankruptcy in 2002, Delta Airlines and Northwest Airlines in 2005. Besides bankruptcies, the legacy airlines alone incurred nearly \$25 billion in operating losses from 2000 to 2003, while LCCs gained \$1.3 billion in profit during the same time period (US GAO, 2004). Figure 1

* University at Buffalo- the State University of New York, Buffalo, NY 14260.

shows the operating loss per originating passenger was more than \$60 for legacy airline in 2003, whereas the operating profit per passenger was positive for LCCs at the same time.¹ In the meantime, mergers and acquisitions in the airline industry have increased considerably. Starting with the American Airline's acquisition of TWA in 2001, America West acquired US Airways in 2005, Delta Air Lines acquired Northwest Airline in 2008, and United Airline consolidated with Continental Airline as a way to increase their profitability through consolidation. Excluding the merger between America West and US Airways in which US airways announced to become a low-cost carrier from a legacy airline, the rest of mergers were between legacy airlines. Then the question arises as to whether legacy airlines could be able to turn around its financial difficulty by recent merger trends. In fact, Figure 1 shows that the profit gap between the legacy airlines and the LCCs became narrower since 2005.² The operating loss eventually turned to a positive profit for legacy airlines by the beginning of 2007 and it surpassed the operating profit of the LCCs, confirming the positive effects from the mergers.

Figure 1: Performance Measure in the Airline Industry: System Operating Profit or Loss per Originating Passenger



The merger and acquisition was considered inevitable to minimize asset devaluation in order prevent any domino effect in the airline industry as most airlines at issue were “too big to fail” and because the industry itself was widely vertically-integrated and interdependent to each other. However, the flood of horizontal merger could impose a threat to the incumbents and consumers due to the likelihood that the integration of major airlines with long-established networks may dominate the market and less the competitiveness of the airline industry. Nonetheless, the United States Department of Justice granted immunity from antitrust issues for most airline mergers in the 2000's, and four of the largest legacy airlines chose to consolidate with one another while the efficiency and competitive effects of mergers remained controversial.³

As the airline industry has undergone several transformations by eliminating inefficient operators and has consolidated its excess capacity by mergers and acquisitions, it was imperative to evaluate the merger effect on the merged airlines and the non-merger airlines. Although there have been extensive studies about price effects after mergers in the 1980s, there have not been enough studies about the

recent mergers and the corresponding changes in the performance of merging firms in relations to those of other legacy airlines and low-cost carriers. Thus, the empirical results on the current merger will provide an opportunity to find the changes within each airline and across different airlines as well as the general outcomes of the consolidation in the airline industry.

This paper examined the empirical evidence on the merger effect of Delta-Northwest. The Delta-Northwest merger in 2008 was an unprecedented event where two of the largest legacy airlines consolidated with antitrust immunity, although the probability of potential anticompetitive effects remained high. The significance of this event arose not only from the fact that the merging firm could harm the other airlines and consumers significantly through its combined market power, but also from the speculations on merger benefits. By categorizing the U.S. domestic airlines into three different groups and comparing their performances two quarters before and after merger in the course of four years, this paper analyzed the merger effect on airfares in terms of the changes in the number of passenger, flight distances, and market shares on top 1,000 U.S. domestic city-pair routes. In addition, this paper investigated the antitrust issue associated with the potential anticompetitiveness of the proposed merger between Delta and Northwest.

LITERATURE REVIEW

There have been numerous studies devoted to analyze the effects of mergers by using panel data. Lichtenberg and Kim (1989) compared the performance of merged airlines by analyzing load factor, flight duration, and other input prices from five different mergers that occurred in the 1970's and the 1980's. Morrison (1996) specifically looked at the two different mergers between Northwest Airlines and Republic Airlines in 1986 and between US Air and Piedmont Aviation in 1987 and found that fares on those routes affected by the mergers jumped as high as 30 percent. Peters (2003) predicted substantial increase in post-merger prices on overlap routes of merged airlines and compared them to actual post-merger prices from six major airline mergers in the 1980's. Berry and Jia (2009) found that the air travel demand became more price sensitive in 2006 than that of the 1990's. Also, they found that travelers put more emphasis on direct flights than hub airports, which explained the legacy airline's consistent losses over the past decade. Overall, there has been extensive analysis supporting the price increase after the merger.

On the other hand, Ito and Lee (2003) identified the market characteristics of low cost carriers. LCCs typically competed in the markets where passenger density was high enough for them to exploit their competitive advantage by providing the quick-return point-to-point service. In particular, when LCC's networks were not large enough to generate more capacity in the late 1990's and the early 2000's, they had no choice but to choose denser markets in which they serve non-stop routes for local passengers. Looking at Ito and Lee's data on the number of the largest 1,000 domestic city-pair markets in 1990, low-cost carriers only served 78 city-pairs whereas they now serve 613 city-pairs on the latest data in the third quarter of 2010. As LCCs' networks expanded throughout the U.S. domestic market, Tan (2011) found that legacy airlines lowered their fares before and after LCC's entry while LCCs did not change their

fares. Although LCCs could be disadvantageous upon entering the market due to entry barriers such as legacy airlines' dominance at airport gates and landing/take-off slot controls, LCC's low cost structure enabled them to charge lower fares. Once highly concentrated markets by legacy airlines faced the threat of price competition, and the market competitiveness has been improved where low-cost carriers successfully competed against legacy airlines.

In summary, there were two different evidences at work; mergers made airfares to increase and LCCs' presence made legacy airlines to lower their fares. If those two factors are present, how will the merger between legacy airlines affect LCCs? On the other hand, will legacy airlines have to alter their pricing strategy when they face competition from LCCs?

BACKGROUND

(I) WHY DO AIRLINE GO INTO THE M&A PROCESS?

The primary purpose of mergers and acquisition is to enable airlines to eliminate duplicative operating costs, therefore reducing their total costs on labor, service, and operations. It also enables the merging firms to integrate their financial assets, facility, and technology. As a result, airlines look for mergers and acquisitions in pursuit of both reducing operating costs and maximizing revenue. For example, if two airlines with the most market overlap merge to one firm, the cost saving from eliminating the duplicate operations would generate a significant cost saving effect. Especially when the market demand is at the low, the need for mergers and acquisitions tends to increase. Experts say that the motivation behind industry mergers and acquisition is largely based on the airlines' need for the combined market share at the integrating airlines' major hubs, because it can maximize revenue (US GAO, 2010). While the presence of low-cost airlines may bring down airfares in the market, a dominance of merging firms through integration could lock in their profit against cost competition. Furthermore, airlines also seek to merge with one another as a means to expand their networks. As a way to compete with legacy airlines in the wider markets, LCCs now expand to the international market through strategic alliance, code sharing, or even through a merger with other LCCs.

In the U.S. domestic market after deregulation in 1978, price dispersions and excessive competition over capacity intensified, and it led to many airlines' financial failures; the largest five legacy airlines filed Chapter 11 bankruptcy and only 9 of the 23 legacy airlines served the U.S. domestic market by 2007. (Borenstein and Rose, 2007) Besides, legacy airlines lost nearly \$33 billion from 2001 to 2005, whereas LCCs remained profitable regardless of increasing cost of fuel. In accordance with the changes in the market structure followed by financial reorganization and exit, mergers and acquisitions increased ever more since the early 1980's until today. Specifically from the beginning of 2001, American Airline acquired Trans World Airlines, US Airways acquired America West in 2005, Delta merged with Northwest in 2008, and Continental merged with United in 2010.

(ii) Delta-Northwest Merger

On April 14, 2008, Delta and Northwest Airlines announced a \$17.6 billion merger, which would make them to be the largest commercial airline in the world. Both of them were legacy carriers which existed prior to the 1978 Deregulation Act. Also, they operated under the hub-and-spoke system in which passengers have to go through a hub airport in order to transfer to other connecting flights. In 2006, Delta was the second largest airline in the top 5,000 markets in terms of the number of markets served and the number of passengers. Northwest was the fourth largest, while Southwest being in the first place and American Airline in the third. On September 26, 2008, two airlines' shareholders approved the merger and Antitrust Division at the Justice Department approved the merger on October 29, 2008. As of December 2009, Northwest's aircrafts have operated under Delta, and Northwest's hubs have been fully consolidated with Delta's brand.

(iii) Antitrust and Anticompetitiveness Issues

As discussed above, airlines merge or acquire other airlines to reduce costs on duplicate operations and consolidate their financial stability, but the proposed merger and acquisition needs to be approved by the US Department of Justice (DOJ) as required by the Hart-Scott-Rodino Act. This act requires an acquisition of assets be reported to the DOJ and its Antitrust Division examines and determines whether the merger is likely to have an adverse effect on consumers by following their analytical framework called *Horizontal Merger Guidelines*. Under these guidelines, the US DOJ defines the relevant product market and geographic market where the merging firms operate and determines the likelihood of increased concentration ratio in these relevant markets.

Defining a relevant geographic market could be ambiguous depending on the industry, products, and geographic areas. Generally, a relevant market indicates products and their geographic area where they are produced and sold by a monopolist. The monopolist in this market is likely to have the power to increase his price above the competitive price due to the market conditions such as the inelastic demand or in substitutability of the product. In the airline industry, each city-pair market is recognized as a separate geographic market and the nonstop flights can be considered as separate products because they are an equivalent substitute for connecting flights (Goetz, 2002). For antitrust purposes, a relevant market is defined as nonstop service in a city-pair market (Klein and et al, 1999). Thus, a relevant market in reviewing a potential merger constitutes an aggregate of each city-pair market in which the merging firms operate. The next stage of evaluating the potential merger is to quantify the market power and the concentration ratio of merging firms and their likelihood of potential anticompetitive effects in the market. Market power is measured by market share, and airlines with the larger market share in the relevant market is likely to extract fare premiums because they have established dominance over airport gate assignment, inelastic demand in their city-pair routes, and such. The higher the market share a firm has, the more the market is concentrated. Thus the relevant market is likely to be shared by only few firms, and it gives them an incentive to engage in anticompetitive conduct and fully exploit their monopoly

power. According to the US GAO, a concentrated market is where a single airline accounts for at least 60% of the passenger enplanement or two airlines with 85% (US GAO, 1993). They found that average fares tend to be higher in the concentrated markets. The US DOT also identified a concentrated market with a single firm accounts for 70% of the market (US DOT, 1990). The Herfindahl Hirschman Index (HHI) is considered as a good measure for concentration ratio as well for evaluating horizontal mergers, which will be discussed later in this paper.

Following the *Horizontal Merger Guidelines*, the US DOJ analyzes other anticompetitive effects on competition in the corresponding industry and the likelihood of failure of merger proposing firms in the absence of a merger, which is weighed against the potential consumer benefits from expanded service of the merged firm. The recent cases of the Delta-Northwest merger in 2008 and the United-Continental merger in 2010, the US DOJ has granted full approval, deciding that the potential benefits for consumers will outweigh the potential anticompetitive effects in the airline industry. According to the public announcement from DOJ on October 28, 2010 in closing their investigation in the proposed merger of Delta and Northwest, they stated that "...the merger likely will result in efficiencies such as cost savings in airport operations, information technology, supply chain economics...consumers are also likely to benefit from improved service...by combining under single ownership..."⁴

The financial viability of the airline industry has been a significant issue for the industry itself as much as its potential negative impacts on consumers and the government in the forms of increased airfares, unemployment, and federal financial assistance. While the airline industry went through numerous bankruptcies and mergers since deregulation, new airlines and existing airlines continued to increase their capacity, only to exacerbate reduce their revenues. Past mergers and acquisition were intended to reduce this excess capacity in effort to improve their profitability, yet the reduction in industry capacity was temporary due to the expansion of existing and new airlines. Thus the rationale behind the merger approval is to enable the larger airlines to combine their duplicative operations on overlapping routes so as to reduce excess capacity, achieve cost savings, and ultimately generate more revenues. Besides the fact that the integration of computer systems, airline fleets, facilities, and human capital of two different airlines is not an easy task, the integration process may face challenges from the consumer side. Capacity reduction poses a potential price increase issue in certain markets after a merger.

The major difference between low-cost carrier's operations and legacy airlines' operations is the network structure. Legacy airlines use hub-and-spoke networks where passengers fly through a hub in order to get to their final destination, while LCCs use a point-to-point system where they serve non-stop flights between denser airports. LCCs enjoy their profitability by focusing on economies of scale from traffic density and they have less motivation to enter the market with the lower passenger traffic. On the other hand, legacy airlines expand their networks due to their cost advantage on economics of scope and they are likely to have more incentives to serve the markets where they do not face a competition from LCCs. In fact, some studies showed that airfares increased on some markets after mergers and acquisition in the 1980s (Morrison, 1996). A few other studies showed that dominant airline at an airport

charged higher fares due to the barriers to entry (Borenstein, 2005). In addition, a recent study found that Legacy Airlines reduced their fares upon the entry of LCCS in the market, whereas the LCCs did not alter their pricing. *Overall, cost reduction could provide the merging Legacy Airlines an increased revenue flow at the expense of consumers.

The U.S. airline industry has undergone many changes since the deregulation. While the airlines took the freedom of adopting their most efficient pricing without the previous restrictions on their operations on specific routes or airports, it essentially led to them to engage in predatory pricing in a way to expand their travelers, some airlines charged higher fares for business passengers while this profit was subsidized for the loss from heavily discounted fares. Many studies acknowledged this fare dispersion and found that smaller routes with less competitive alternatives tend to have higher rates compared to larger routes or airports (US GAO, 1996a).

Along with the pricing dynamics, complaints of predatory pricing indicated aggressive competition that has been persistent in the U.S. airline industry. There have been several allegations that legacy airlines were involved in predatory pricing behavior in which they sharply reduce their fares and increase their capacity in an effort to eliminate the new entrants with an expectation of recouping the losses by charging consumers with supra-competitive prices once the entrants were driven out of the market. In fact, the U.S. DOT received 32 complaints alleging anticompetitive conduct such as unfair pricing, capacity responses, and barriers to entry from 1993 to 1999 (Transportation Research Board, 1999). Nonetheless, U.S. District Court ruled in favor of American Airlines and Northwest Airlines against Vanguard Airlines and Reno Airlines respectively, reasoning that the actions taken by those legacy airlines were proper alternative response with sufficient justification (US GAO, 2008).

The US DOJ in 2008 published a report on the potential effects of mergers and acquisition in the US domestic airline industry, illuminating on the inevitability of financial consolidation amongst the airlines and evaluating the concerns with the Delta-Northwest merger (US GAO, 2008). They examines the extent of efficiencies arising from the route expansion and cost saving from the merger, which was weighed against the financial standing of merging firms as the potential failure of one of the merging firms would substantially depreciate its assets and harm the industry. They also evaluated the probability of merger partners facilitating its enhanced market power after the proposed merger. Additionally, they accentuated the changes in the airline market structure due to the entry of LCCs in recent years, and proposed that competition would not subside simply by consolidation of legacy airlines as opposed to the entry of a new carrier. They looked at several studies on how the presence of LCCs on routes mitigated the dominance of legacy airlines and spurred the pricing competition. They found that the hub dominance was not correlated to a gain in market power (Borenstein, 2005). To determine the competitiveness of the U.S. airline industry and its resilience to the proposed merger, US DOJ also examined the possible changes in passenger traffic, market share, and the number of competitors on routes where merger partners operate as well as financial conditions of the merger partners.

(IV) MERGER ANALYSIS

As previously discussed, the U.S. domestic airline industry had a history of new entry and consolidation. The four-firm ratio was 46% from 1978 and 69% from 1985 to 1991, while it was 56% in 2000 (Goetz, 2002). Using the data from the Bureau of Transportation Statistics (BTS), the four-firm ratio was 41% in 2006 with a slight increase at 46% in 2010.⁵ While the concentration ratio has decreased consistently from the late 1980's, it has shown an increase during the Delta-Northwest merger period although a subsequent study is needed in the future to see whether this is a temporary effect from the merger or the permanent integration in the U.S. market.

In evaluating horizontal mergers, the HHI index of market concentration was calculated by adding the squares of the market shares of each firm in the relevant market. These merger partners' hub airports were chosen for the HHI calculation in order to analyze any changes in market share and concentration ratio during the merger period from 2008 to 2010. If the HHI is below 1000, the market was unconcentrated, while HHI above 1800 indicated a high level of concentration. As shown in Table 1, both airlines' hub airports had the HHI greater than 1800 with the market share as high as 66%, indicating the already established high concentration. Atlanta airports showed an increase in both the market share and the HHI, implying the merger enhanced the merger partners' market power. On the other hand, Detroit and Minneapolis showed a significant reduction in the market share from approximately 61% to 49% and 66% to 53% respectively. The HHI at those airports dropped simultaneously, while the numbers are still well above the threshold for the high level of concentration. To the contrary, New York J.F.K airport seemed to have an ambiguous effect from the merger; the market share increased while the HHI decreased substantially. This could imply that the merger had a positive effect on the market share of the merger partner, whereas it subsequently lowered the other airlines' relatively large market share at the same airport.

Table 1

	2006		2007		2009		2010	
Delta-Northwest Hub Airport	market shares	HHI Index	market shares	HHI Index	market shares	HHI Index	market shares	HHI Index
Atlanta (ATL)	52.76%	3825	58.06%	3681	53.42%	3641	56.85%	3945
Detroit (DTW)	60.98%	4128	59.32%	3974	49.94%	3219	48.90%	3157
New York (JFK)	14.91%	3090	15.33%	2990	19.81%	2572	21.65%	2601
Minneapolis- St.Paul (MSP)	66.17%	4711	65.89%	4684	52.93%	3562	52.89%	3680
Salt Lake City (SLT)	40.48%	2690	39.79%	2884	38.85%	2895	40.70%	2940

In comparison to individual airport markets, city-pair markets weigh more importance, because the city-pair routes are defined as relevant markets with regard to the antitrust issues. Before analyzing the relationship between the air fare and the market share in the regression analysis later in this paper, the changes in Delta-Northwest's market share on several top 1,000 U.S. domestic city-pair routes were summarized in Table 2. The sample city-pair routes where Delta-Northwest had the largest market share were selected and compared between the pre-merger and the post-merger time period. The numbers in parentheses presented the airlines and their market which provided the lowest fare on the corresponding routes where Delta-Northwest had the largest market share. Interestingly, Delta-Northwest's market share had not changed from 2006 to 2010 in the New York-Washington D.C city pair market, yet there was a quite change in airfare. Before merger, Delta had the largest market share on this route while it also provided the lowest fare. However, United Airline replaced Delta's place after the merger, providing the lowest fare on the route. On the other hand, the Atlanta-Salt Lake City city-pair market showed an increase in Delta-Northwest's market share from 67 to 76 percent while the market share of the lowest fare provider, Continental Airlines, decreased substantially from 3 to 1.5 percent. This could imply that the merger enabled Delta and Northwest to expand their market share on this route and probably engage in price competition against Continental Airlines.

Several studies showed a significant increase in the HHI on the city-pair routes. For the routes between the cities with large populations, merger partners tended to dominate on these routes after consolidation. Combining the existent market share alone gave much more market power for the merger firms, and the actual data in the late 1990's showed that the combined concentration was increased to 70 percent of nonstop traffic on the corresponding routes (Goetz, 2002). Nevertheless, antitrust scrutiny involves a multilateral analysis that assesses the effects of the proposed merger at the national level, the individual airport level, and the city-pair routes although this may give contrasting results depending on the definition of the relevant market.

There are several studies on how airlines have influenced the fares of the other airlines by exercising increased market power through mergers and acquisitions. Some found that merger-affected routes showed a significant price increase while this increase was correlated with a gain in concentration (Kim and Singal, 1993). The enhanced market power could appear in the form of predatory pricing in which the merging firm enjoys economies of scale and drove out its competitors by reducing their airfares below the competitor's prices. On the contrary, the merging firm could utilize its enhanced market share against the non-merger competitors and increase its price, taking advantage of its network expansion and the corresponding consumers' preference. Particularly if the merging firms had solid market share at smaller airports and on unpopulated city-pair routes even before the merger, the integration process between the merging partners was likely to give them dominance in these markets. Furthermore, as the merging firms had a control over the airfares on these markets, the merger may led to a tacit collusion between the merging firms and non-merger firms in which they implicitly agreed or followed the pricing behavior of the leading firm, primarily in the form of higher prices.

DATA AND METHODOLOGY

The purpose of this paper was to analyze the merging airline's pricing behavior compared to other airlines during pre- and post-merger periods, especially on whether this merger had altered the market structure and to what extent the merger affected different airline. To examine the presence of these merger impacts, the changes in operations of legacy airlines and LCCs were compared to that of Delta-Northwest along with the changes in the consumer demand which was measured by the daily non-stop passenger traffic. A potential change may include an aggressive pricing strategy of the merging firm which would coincide with a gain in its market power in the corresponding city-pair routes. While legacy airlines in general were unprofitable in contrast to the LCC's lower operating cost structure, a merger between the large legacy airlines could have enabled them to sufficiently reduce their fares through economies of scale from the merger. On the other hand, the merger between these two largest legacy airlines could have disincentivized other airlines' competitive pricing due to the reduced number of competitors in the same market, thus it could have led to higher fares after the merger. While many studies have found the significant correlation between a price increase and an airline merger, specifically on the routes or in the airport markets where the merging airline directly faced competition from other airlines, this paper examined the comprehensive merger effect and its trend in the market regardless of whether or not the merging firm operated in the corresponding market. In other words, this paper investigated the general influence of the Delta-Northwest merger in the U.S. domestic airline market, rather than comparing the Delta-Northwest operating routes only.

The top 1,000 largest U.S. domestic city-pair markets have been collected to analyze the Delta-Northwest merger effect on the major, dense domestic routes. The data was available from the Office of Aviation Analysis under the Department of Transportation (U.S. DOT). The Department of Transportation releases an Air Travel Consumer Report each month to inform consumers about service quality of each airline. As part of this effort, the Office of Aviation Analysis publishes a quarterly report to provide average fare information in the 1,000 largest domestic city-pair markets, which accounts for 75 percent of total passengers in the 48 contiguous states and 70 percent of total domestic passengers. This report includes the origin city, the destination city, the number of one-way passenger per day on each city-pair route, the non-stop distance, the average market fare per mile, the airlines with the largest market share on each route and their fares, and the airlines with the lowest airfare and their market share.⁶ The extended version of top 1,000 city-pair routes was available only on the U.S. DOT website, which listed all city-pair routes with average at least 10 passengers each day where either the origin city or destination city is a hub and has more than one airport. To minimize the different characteristics of each city-pair routes, only duplicate routes were selected across 2006, 2007, 2009, and 2010. Thus, the same routes across different years were compared, and this eliminates the variations across the selected routes and enables a direct comparison between other variables such as airfares and the consumer demand. In order to provide a direct test on merger effects without the deterrence from the trending and seasonality issues, the third quarter of each year is compared for the merger period. Since the Delta merger took place in

April 2008 and it has completed in October 2008, two quarters before and after the third quarter of 2008 have been gathered for data analysis. The third quarter of 2006 and 2007 are recognized as a “before-merger” period and 3rd quarter of 2009 and 2010 as “after-merger” period.

The effect of merger could lead to different results owing to the different operating structure of each airline. To compare the Delta-Northwest merger to non-merger legacy airlines and LCCs, airlines were categorized into three different groups.⁷ The first group was low-cost Carriers, the second was a group of three legacy airlines which did not merge or acquire during the Delta-Northwest merger.⁸ Last group consists of Delta and Northwest. If Northwest was identified on quarterly reports prior to the merger, it is grouped under Delta Airline. Price dispersion amongst different airlines was extensive depending on the extent of competition, market power, and the size of the market. Therefore, the average fares might severely distort the true information on fares. Instead, the lowest fares were compared to see whether they had a significant relationship with each airline group in the post-merger period. In addition, the fares of the largest carrier on each route were weighted against other market variables so as to analyze the connection between market power and the changes in fares. Table 3 descriptive statistics summarized the data. The total of 4002 city-pair routes was collected during the 2006-2007 and 2009-2010. The mean fare of the airlines with the largest market share was \$180.93, implying that these airlines with market power charged a higher price than the average at \$178.56 whereas the mean of the lowest fare was \$156.24. On the other hand, the mean of the largest market share was 60.14 percent while the mean market share of the lowest fare is 37.14. In the market with the lowest fare, LCCs accounts for 74 percent, while Delta contributed only 11 percent. In the market with the largest market share, LCCs still accounted the majority at 57 percent, while legacy served 24 percent of the market and Delta-Northwest served 18 percent of the market.

Table 3 descriptive statistics: Descriptive Statistics on the airlines with the largest market share on top 5,000 U.S. domestic markets (n=4002)

	Minimum	Maximum	Mean	Standard Deviation
Distance	129	2724	1081.80	653.292
Daily passenger	199	9910	771.79	854.279
Fare of airlines with largest market share	70.96	452.58	180.93	63
LCC dummy	0	1	.57	.496
Legacy dummy	0	1	.24	.427
Delta dummy	0	1	.18	.381
Merger dummy	0	1	.50	.500
Average fare	76.04	426.11	178.56	55.540
Largest market share on the route	16.64	100	60.14	19.70

Table 4: Descriptive Statistics on the airlines with the lowest fare on top 5,000 U.S. domestic markets (n=4002)

	Minimum	Maximum	Mean	Standard Deviation
Distance	129	2724	1081.80	653.30
Daily passenger	199	9910	771.79	854.28
Average fare	76.04	426.11	178.56	55.54
Market share of lowest-fare airlines	1.02	100	37.14	27.98
LCC dummy	0	11	.74	.470
Legacy dummy	0	1	.15	.356
Delta dummy	0	1	.11	.318
Merger dummy	0	1	.50	.50
Lowest fare	66.48	380.27	156.24	47

The dataset available at U.S. DOT was organized in two different categories⁹; one with the airlines with the lowest fares and the corresponding number of passenger, the distance, and the market share; another one was the same information on the airlines with the highest market share on each city-pair routes. As discussed before, the average fares were disregarded due to the high level of price dispersion in the airline industry. To identify changes on the airfares in relation to the changes in other available variables, the following expression was used for each group.

$$(1) \text{Fare}_{\text{low}} = \alpha_0 + \beta_1 \text{distance} + \gamma_1 \text{pax} + \delta_1 \text{mksh} + D_m + \varepsilon$$

$$(2) \text{Fare}_{\text{high}} = \alpha_1 + \beta_2 \text{distance} + \gamma_2 \text{pax} + \delta_2 \text{mksh} + D_m + \varepsilon$$

The variable Fare_{low} was the lowest fare in the first dataset, while $\text{Fare}_{\text{high}}$ was the fare of the airlines with the highest market share in the second dataset. The regressor *distance* was the distance between the two different cities of each city-pair routes, *pax* was the number of average daily passengers on each route, *mksh* was the market share of each corresponding airlines on each route. The last variable D_m was a dummy variable that takes the value 1 for the post-merger period from 2009 to 2010, while it was 0 for the pre-merger period from 2006 to 2007. The expressions above examines whether or not the Delta-Northwest merger led to a change in airfares of non-merging airline groups relative to that of Delta-Northwest.

While the above expressions examined the merger effect within each airline group, another term was added to analyze the aggregate merger effect among different airline groups.

$$(1) \text{Fare}_{\text{low}} = \alpha_0 + \beta_1 \text{distance} + \beta_2 \text{pax} + \beta_3 \text{mksh} + \delta_{\text{delm}} D_{\text{delm}} + \delta_{\text{ccm}} D_{\text{ccm}} + \delta_{\text{legm}} D_{\text{legm}} + \gamma_1 (\text{mksh} * D_{\text{delm}}) + \gamma_2 (\text{mksh} * D_{\text{ccm}}) + \gamma_3 (\text{mksh} * D_{\text{legm}}) + \varepsilon$$

$$(2) \text{Fare}_{\text{high}} = \alpha_1 + \beta_4 \text{distance} + \beta_5 \text{pax} + \beta_6 \text{mksh} + \delta_{\text{delm}} D_{\text{delm}} + \delta_{\text{ccm}} D_{\text{ccm}} + \delta_{\text{legm}} D_{\text{legm}} + \gamma_4 (\text{mksh} * D_{\text{delm}}) + \gamma_5 (\text{mksh} * D_{\text{ccm}}) + \gamma_6 (\text{mksh} * D_{\text{legm}}) + \varepsilon$$

Again, the same term was applied to two different sets of data; one organized by the lowest fare and another one organized by the largest market share. Here the total population of three airline groups was classified into six groups: before merger low-cost carrier, after merger low-cost carrier, before merger legacy airlines, after merger legacy airline, before merger Delta-Northwest, after merger Delta-Northwest. The corresponding dummy variables were taken for each groups: D_{delm} took the value of 1 if the data is for Delta-Northwest after merger or 0 for before merger, D_{legm} took 1 for post-merger legacy airlines or 0 for pre-merger legacy airlines, D_{ccm} took 1 for post-merger low-cost carriers or 0 for pre-merger low-cost carriers. Consequently, α_0 was the intercept for the base case for Delta-Northwest in the markets with the lowest fare. In addition, the interaction terms were added to test the change in each airline group's market share conditional on the existence of merger and whether it could be related to the change in the airfare. An increase in the fare with the effect of low-cost carriers after merger was likely to imply that the airfares of non-merging firms are positively affected by the Delta-Northwest merger. Likewise, if a decrease in the fare corresponded with a decrease in the market share of legacy airlines after merger, it will indicate that the airfares and the market share of the non-merging firms are negatively affected by the merger. Thus, this test will examine Delta-Northwest's own price change after its merger as well as whether its merger influenced the airfares of non-merging firms in terms of the distance, the number of passengers, and the market share.

RESULTS

Table 5 shows the changes in airfare for each airline group in relation to the changes of the distance, the market share, the daily passengers, and the merger dummy when the airlines provided the lowest fares on each city-pair routes and when the fares on the routes where each airline group had the largest market share respectively. For the lowest fare, low-cost carriers' fare increased by 3.3 percent after merger while their market share and the number of passengers were negatively related with the fare. That is, the market share and the passenger volume for low-cost carriers were negatively related with the airfare at the statistically significant level over the period of four years regardless of whether or not the merger took place, while the price of flight ticket increased by 3.3 percent after the Delta-Northwest merger. However, the same regression led to different results for legacy airlines; the merger did not affect the fare of the low-cost carriers. Similarly, the fare of Delta-Northwest did not change after its merger while the distance and the market share were positively related with its fare. An increase in the lowest fare was positively related with an increase in distance for all airline groups, except for LCCs. On the other hand, the airfare was negatively related with the number of passengers in general while only the change in passenger volume for LCCs was not statistically significant. The airfare was negatively related with LCC's passenger volume at the 90% significance, yet it showed more significance to that of Delta-Northwest. The change in market share did not seem to affect the airfare, except for that of LCCs which

showed a statistically significant negative relationship between its market share and the lowest fares. In summary for all the city-pair markets where airlines offered the lowest fares, only low-cost carriers' fare increased after merger, while the merger did not affect the fare of the other two groups.

Table 5

Models:						
	(1) $Fare_{low} = \alpha_0 + \beta_1 distance + \gamma_1 pax + \delta_1 mksh + D_m + \varepsilon$					
	(2) $Fare_{high} = \alpha_1 + \beta_2 distance + \gamma_2 pax + \delta_2 mksh + D_m + \varepsilon$					
Variables	Coefficient	Standard Error	t-value	Prob> t	R ² _{adj}	Sample Size
<i>Low-Cost Carriers:</i>						
Model (1)						
Constant	3.34886	0.06583	50.87	<.0001	0.4612	2938
Distance	0.29677	0.00671	44.22	<.0001	0.4612	2938
Passenger	-0.05696	0.00547	-10.41	<.0001	0.4612	2938
Market Share	-0.01321	0.00445	-2.97	0.0030	0.4612	2938
Merger Dummy	0.03347	0.00800	4.18	<.0001	0.4612	2938
Model (2)						
Constant	3.96690	0.12768	31.07	<.0001	0.4540	2288
Distance	0.27043	0.00846	31.95	<.0001	0.4540	2288
Passenger	-0.06782	0.00725	-9.35	<.0001	0.4540	2288
Market Share	-0.09248	0.01629	-5.68	0.0030	0.4540	2288
Merger Dummy	0.04885	0.00973	5.02	<.0001	0.4540	2288
<i>Legacy Airlines:</i>						
Model (1)						
Constant	3.83013	0.13823	27.71	<.0001	0.2820	602
Distance	0.19483	0.01349	14.45	<.0001	0.2820	602
Passenger	-0.02236	0.01369	-1.63	0.1030	0.2820	602
Market Share	0.05292	0.00926	5.72	<.0001	0.2820	602
Merger Dummy	-0.02919	0.01866	-1.56	0.1182	0.2820	602
Model (2)						
Constant	3.19570	0.14749	21.67	<.0001	0.3695	969
Distance	0.28869	0.01277	22.60	<.0001	0.3695	969
Passenger	-0.00229	0.00790	-0.29	<.0001	0.3695	969
Market Share	0.03659	0.01984	1.84	0.0654	0.3695	969
Merger Dummy	0.03822	0.01334	2.87	0.0043	0.3695	969
<i>Delta-Northwest:</i>						
Model (1)						
Constant	3.76352	0.12605	29.86	<.0001	0.3015	483
Distance	0.18534	0.01402	13.22	<.0001	0.3015	483
Passenger	-0.01556	0.01149	-1.35	0.1761	0.3015	483
Market Share	0.05147	0.00879	5.86	<.0001	0.3015	483
Merger Dummy	0.03106	0.01761	1.76	0.0784	0.3015	483
Model (2)						
Constant	3.43002	0.20279	16.91	<.0001	0.3028	772
Distance	0.21968	0.01507	14.58	<.0001	0.3028	772
Passenger	-0.07812	0.01181	-6.62	<.0001	0.3028	772
Market Share	0.22565	0.02822	8.00	0.0030	0.3028	772
Merger Dummy	-0.08454	0.01746	-4.84	<.0001	0.3028	772

For the markets where each airline group had the most market power, the fare of low-cost carriers increased by 4.8 percent after merger while the fare of legacy airlines increased by 3.8 percent. On the contrary, the fare of Delta-Northwest indicated a significant reduction of its fare by 8.4 percent after merger. In fact, the positive relationship between the market share and its fare demonstrated that Delta-Northwest's fare has been reduced after its merger while its market share has increased in the markets where the merging firm was already dominant relative to the other two groups. This is also confirmed by the fact that the market shares of two other airline groups did not have a strong relationship with their fares; low-cost carriers' market share was actually negatively related with fare while legacy airlines' market share did not have any significance to the fare.

The merger effect on the lowest fare was analyzed in Table 6. Legacy airlines fare showed a largest reduction in this market while their market share rose by the greatest among three airline groups. Likewise, the merger dummy for Delta-Northwest reflected its reduced airfare during the post-merger period and placed the merged firm right behind legacy airlines. The difference of the fare reduction between legacy airlines and Delta-Northwest was only 0.7 percent. While the change in the market share of legacy airlines accounted for a price increase by 9.5 percent and 7.6 percent for Delta-Northwest, the market share of LCCs only represented a price increase by 1.5 percent. Since the greater number of LCCs already offered the lowest fare in this market, the least price drop seemed reasonable. However, it was found that legacy and Delta-Northwest were quickly catching up with the low-cost carriers; both of their fares decreased almost two folds than LCCs whereas their market shares increased significantly during the post-merger period.

In comparison, the interaction terms for the market with the largest market share indicated that each airline's market share positively affected their airfare after merger, with Delta-Northwest's gain being the greatest. Delta-Northwest's market share after merger increased its fare by 29 percent while that of low-cost carriers' only increased their fare by 6.6 percent. On the other hand, the merger dummy suggested that the reduction in airfare was the greatest for Delta-Northwest. While both merger dummy variables for legacy and LCCs are negatively related with their fares, the intensity of fare reduction was almost three times greater for Delta. In summary, Delta-Northwest showed the greatest gain in its market share on the city-pair routes where they already had the largest market share while it had the biggest reduction in airfare after merger compared to its counterparts. LCCs, to the contrary showed the least reduction in their fare. Overall, the distance and the number of daily passenger were found to be consistent throughout all the regression results; the distance was positively related with fares while the passenger volume was negatively related. These were expected results, because airfares are generally higher for the long-haul flights while higher load factor decreases operating costs per passenger.

Table 6

Model: (1) $Fare_{low} = \alpha_0 + \beta_1 distance + \beta_2 pax + \beta_3 mksh + \delta_{delm} D_{delm} + \delta_{ccm} D_{ccm} + \delta_{legm} D_{legm} + \gamma_1 (mksh * D_{delm}) + \gamma_2 (mksh * D_{ccm}) + \gamma_3 (mksh * D_{legm}) + \varepsilon$

N=4002; R ² =0.4395				
Variables	Coefficient	Standard Error	t-value	Prob> t
Constant	3.5865	0.0571	62.8000	< 0.0001
Distance	0.2694	0.0057	46.9055	< 0.0001
Passenger	-0.0556	0.0048	-11.4990	< 0.0001
Market Share	-0.0202	0.0051	-3.9568	0.0001
After Merger LCC	-0.0580	0.0272	-2.1313	0.0331
After Merger Legacy	-0.1747	0.0420	-4.1560	< 0.0001
After Merger Delta	-0.1488	0.0468	-3.1786	0.0015
Mksh* After Merger LCC	0.0152	0.0079	1.9381	0.0527
Mksh* After Merger Legacy	0.0954	0.0138	6.9175	< 0.0001
Mksh* After Merger Delta	0.0765	0.0156	4.9206	< 0.0001

In comparison, the interaction terms for the market with the largest market share indicated that each airline's market share positively affected their airfare after merger, with Delta-Northwest's gain being the greatest. Delta-Northwest's market share after merger increased its fare by 29 percent while that of low-cost carriers' only increased their fare by 6.6 percent. On the other hand, the merger dummy suggested that the reduction in airfare was the greatest for Delta-Northwest. While both merger dummy variables for legacy and LCCs are negatively related with their fares, the intensity of fare reduction was almost three times greater for Delta. In summary, Delta-Northwest showed the greatest gain in its market share on the city-pair routes where they already had the largest market share while it had the biggest reduction in airfare after merger compared to its counterparts. LCCs, to the contrary showed the least reduction in their fare. Overall, the distance and the number of daily passenger were found to be consistent throughout all the regression results; the distance was positively related with fares while the passenger volume was negatively related. These were expected results, because airfares are generally higher for the long-haul flights while higher load factor decreases operating costs per passenger.

Model:

$$(2) \text{Fare}_{\text{high}} = \alpha_1 + \beta_4 \text{distance} + \beta_5 \text{pax} + \beta_6 \text{mksh} + \delta_{\text{delm}} D_{\text{delm}} + \delta_{\text{ccm}} D_{\text{ccm}} + \delta_{\text{legm}} D_{\text{legm}} + \gamma_4 (\text{mksh} * D_{\text{delm}}) + \gamma_5 (\text{mksh} * D_{\text{ccm}}) + \gamma_6 (\text{mksh} * D_{\text{legm}}) + \varepsilon$$

$$N=4002; R^2=0.4617$$

Variables	Coefficient	Standard Error	t-value	Prob> t
<i>Constant</i>	3.7773	0.1084	34.8569	< 0.0001
<i>Distance</i>	0.2944	0.0071	41.7444	< 0.0001
<i>Passenger</i>	-0.0444	0.0055	-8.0446	< 0.0001
<i>Market Share</i>	-0.0888	0.0171	-531971	< 0.0001
<i>After Merger LCC</i>	-0.3528	0.1090	-3.2352	0.0012
<i>After Merger Legacy</i>	-0.3652	0.1477	-2.4730	0.0134
<i>After Merger Delta</i>	-1.0589	0.1835	-5.7699	< 0.0001
<i>Mksh* After Merger LCC</i>	0.0656	0.0267	2.4584	0.0140
<i>Mksh* After Merger Legacy</i>	0.1373	0.0376	3.6484	0.0003
<i>Mksh* After Merger Delta</i>	0.2904	0.0454	6.3942	< 0.0001

CONCLUSION

This paper examined the Delta-Northwest merger in 2008 and its merger effect on different airline groups in the U.S. domestic market. Two different markets were introduced where the first market consisted of information on the airlines that offered the lowest fare on top 1,000 city-pair routes while the second market was comprised of the airlines with the largest market share on the same routes. These two different markets were compared within each group with the merger dummy showing the changes in the airfare in the post-merger period. In the markets where low-cost carriers offered the lowest price, the Delta-Northwest merger positively affected the LCC's fare. Yet, in the markets where each airline group held the largest market share, only Delta-Northwest's fare fell significantly while the other two airline groups' fares increased. In another regression results with the interaction term between the market share and the merger dummy, it was found that the airfares of legacy airlines and Delta-Northwest decreased at a faster rate than the low-cost carriers. One noticeable fact is that fares of legacy and Delta-Northwest decreased while their market shares increased simultaneously, irrespective of whether the airlines offered the lowest prices or had the largest market share on each route.

As the empirical results showed, the merged firm altered its pricing behavior through its merger while this affected the performance of non-merger airlines as well. As Delta-Northwest aggressively lowered its fares through consolidation, non-merging airlines may face an increased level of competition directly and indirectly. The US DOJ approved the merger between Delta and Northwest Airlines based on the reasoning that potential anticompetitive effects from the proposed merger would not outweigh the potential benefits for consumers. While there were speculations over potential anticompetitiveness effects with regard to the Delta-Northwest merger due to both airlines' pre-existing market power in the U.S. domestic market, the merged firm was actually found to facilitate price competition. Indeed, the regression results in this paper confirmed the reduction in airfares on 1,000 most popular domestic routes in the U.S. after the Delta-Northwest merger in 2008. Legacy airlines and Delta-Northwest reduced their

fares while increasing their market share at a faster rate than low-cost carriers, which suggested more heightened competition across those airline groups at the benefits for consumers, although more studies need to follow in subsequent years for the long-term effects.

ENDNOTES

1. *Performance Measures in the Airline Industry* available at http://www.bts.gov/programs/airline_information/performance_measures_in_the_airline_industry/
2. US DOT Research and Innovative Technology Administration (RITA) Website: http://www.bts.gov/programs/airline_information/performance_measures_in_the_airline_industry/
3. Among the mergers by legacy airlines in the 2000s, United Airlines made an announcement to acquire US Airways, but it soon withdrew the offer just before the DOJ barred the potential merger based on antitrust issues. The rest of the mergers were approved by the DOJ; American Airlines acquired Trans World Airlines (TWA) in 2001, US Airways bought out by America West Airlines, Delta Air lines merged with Northwest Airlines in 2008, United Airlines merged with Continental Airlines in 2010.
4. Statement of the Department of Justice's Antitrust Division released on October 29, 2008, available at http://www.justice.gov/atr/public/press_releases/2008/238849.htm
5. The four-firm ration was measured by the top four airlines' total number of domestic passengers proportional to the total number of domestic passenger in each given year.
6. This is a slightly different approach than using the DB1B data or T100 data that are widely used in studies on the airline industry. DB1B is a 10 percent random sampling of tickets on the directional airport-pair markets, yet smaller LCCs with less frequency is often omitted from the sample.
7. Since the regional airlines normally operate either by code sharing or alliance with larger airlines, the performance of regional airlines have been disregarded for simplicity.
8. The group of Low-Cost Carriers includes Allegiant Air, Alaska Airlines, AirTran Airways, America West Airlines, Frontier Airlines, JetBlue Airways, Midwest Express Airlines, Spirit Air Lines, USA 3000 Airlines, US Airways, and Southwestern Airlines. The group of legacy airline consists of American Airlines, Continental, and United Airlines. Although Continental and United announced a merger agreement in 2010, their final agreement was not announced until 2011 and the integration process will be finalized in 2012. Since their integration has not started until 2011, they are considered as legacy airlines without merger and are sorted out as a control group.
9. Data is available at http://ostpxweb.dot.gov/aviation/x-50%20Role_files/consumerairfarereport.htm. See table 1A for 3rd quarter of each year from 2006 to 2010.

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