

APPENDICES

Appendix 1 The Impact of Mergers in the U.S. Airline Industry

Authors	Impact of Mergers	Mergers Examined	Time Period Before and After Mergers	Level of Analysis	Method	Main Findings
Bilotkach 2011	Flight frequency	America West-US in 2005	Two years before and two years after	Carrier-airport	GLS and 2SLS	Flight frequency decreased at a diminishing rate following mergers.
Bilotkach et al. 2013	Flight frequency	Delta-Northwest in 2009	Two years before and two years after	Route	Difference-in-difference	Flight frequency increased in some hubs but decreased in others.
Borenstein 1990	Fare	Northwest–Republic and Trans World–Ozark in 1986	One year before and one year after	Route	ANOVA	Price increases for the Northwest–Republic merger of about 10% in total. Largely insignificant results for the Trans World–Ozark merger.
Carlton et al. 1980	Consumer welfare	North Central–Southern in 1976	1976 the merger year	City-carrier	Logit regression	Consumer welfare gains following mergers in terms of shorter travelling time.
Carlton et al. 2019	Fare	Delta-Northwest in 2009; American-US in 2013; United-Continental in 2010	Two years before and two years after	Route	Difference-in-difference	Mergers did not increase fares.
Flouris and Swidler 2004	Stock market response	American–Trans World in 2001	10 occasions before and after the announcement date	Carrier	Event study	Equity value declined more than 30% following the merger.
Gong and Firth 2006	Stock market response	15 mergers between 1985 and 2001	5 days centered on the announcement event.	Carrier	Event study	Marginally positive abnormal return for bidders and highly positive abnormal return for target around the 1st public announcement of the merger.
Hüschelrath and Müllera 2014	Fare	America West-US in 2005	Two years before and two years after	Route-airport and Route-carrier	Difference-in-difference	Average prices increased substantially following mergers.
Hüschelrath and Müllera 2015	Fare	Delta-Northwest in 2009	15 years before and two years after	Route	Panel Data Fixed effects	Short-term price increases of about 11% on overlapping routes and about 10% on non-overlapping routes. Downward trend in price increase of about 3% on the affected routes in the long run.
Jain 2015	Fare	7 recent mergers	One year before and one year after	Route	Panel Data Fixed effects	The merger wave has increased overall prices by 2.3-5.9%
Jordan 1988	Operating expenses and profit; flight frequency	24 mergers between 1985 and 1987	Eight years before and one to two years after	Carrier	Descriptive statistics	Operating expenses of the merged carriers increased which had an adverse effects on profits. Flight frequency of the merged firms either declined or grew more slowly compared with non-merging firms.
Kim and Singal 1993	Fare	14 mergers between 1985 and 1988	One quarter before and one quarter	Route	Difference-in-difference	Relative fares on the merging firms' routes rose by about 9.4%.
Knapp 1990	Market power	9 mergers in 1986	20 days prior and 10 days after announcement	Carrier	Event study	Abnormal return movement of rival and merging firms predicts increased firm control over fares, supporting the market power hypothesis about mergers.
Kwoka and Shumikina 2010	Fare	US Air-Piedmont in 1987	One year before and one year after	Route	Difference-in-difference	Prices rose by 5.0 to 6.0 per cent on routes that one carrier served and the other was a potential entrant. Price rose by 9.1 to 10.2 percent where the two carriers had been direct competitors.
Lichtenberg and Kim 1989	Unit cost; Price	5 mergers between 1970 and 1984	2.5 years before and after	Carrier	Difference-in-difference	Mergers were associated with reductions in unit cost and increase in fares.

Luo 2014	Fare	Delta-Northwest in 2009	2008Q1 as before and 2010Q2 as after	Airport-route	OLS	The merger only generated a small fare increase.
Morrison 1996	Fare and competition	Northwest–Republic and Trans World–Ozark in 1986; US Air-Piedmont in 1987	Eight to nine years before and after	Route	OLS	2.5% increase for the Northwest-Republic merger and 15.3% decreases for the Trans World-Ozark merger. The US-Piedmont merger had long-run fare increases averaging nearly 23%.
Morrison and Winston 1989	Consumer welfare	6 mergers between 1986-1987	1983 as the pre-merger period; fitted values for post-merger	Route	Logit regression	Half of the mergers increases consumer welfare (i.e., more cities served, more frequent flier mileage, and fare loss). Half of the mergers reduced consumer welfare (i.e., fare increase).
Moss and Mitchell 2012	Fare	Delta-Northwest in 2009; United-Continental in 2010	One year before and 2011 as after	Route	Descriptive statistics	Fare increases more than 10% over the pre- to post-merger period.
Peters 2006	Fare	5 mergers between 1986 to 1987	One year before and one year after	Route	Simulation and 2SLS	Fare increased following mergers.
Prince and Simon 2017	On time performance	5 recent mergers	Three years before and up to five years after	Carrier-route	Difference-in-difference	In the short run, very limited evidence of worsened OTP; in the long run, travel time does not worsen, and even appears to improve relative to pre-merger levels.
Rupp and Tan 2019	On time performance	4 recent mergers	Four quarters before and four quarter after	Carrier-route	Difference-in-difference	Shorter travel times following mergers.
Ryerson and Kim 2014	Fuel consumption	Delta-Northwest in 2009; United-Continental in 2010	Feb 2004 and Feb 2012	Aircraft	Hierarchical Cluster Analysis	Fuel savings achieved by both merged airline networks, ranging from 25% to 28%.
Schossler and Wittmer 2015	Cost synergy and revenue synergy	6 large international mergers between 2003 and 2012, including two U.S. mergers (Delta-Northwest 2009; United-Continental 2010)	First five years post mergers.	Carrier	Case study	North American airlines expect more revenue synergies than cost synergies from airline mergers.
Shaw and Ivy 1994	Network structure	15 simulated mergers	1990Q4	City-carrier level	Network analysis	Three network patterns (single carrier dominant, overlapping, and complementary) are identified in the study.
Shen 2017	Market competition and fare	United-Continental in 2010	4 years before and 3 years after	Route	Difference-in-difference	Price increased by 7.8% following the merger.
Singal 1996a	Interaction between multimarket contact and fare	14 mergers between 1985 and 1988.	One quarter before and one quarter after	Route	Difference-in-difference	Airfares rise in proportion to rise in multimarket contact. Changes in concentration also contributes to rise in fares.
Singal 1996b	Stock market response and fare	14 mergers between 1985 and 1988	Four different event periods are used for estimation: - 1 to 0, - 1 to + 1, - 3 to + 1, and - 5 to + 1, relative to the merger announcement date.	Route	Event study	Enhancement of market power by airline mergers is supported both by stock prices and product prices.

Steven et al. 2016	On time performance; Lost bags; Involuntary denied boarding	Northwest-Delta in 2009; United-Continental in 2010; Southwest-Air Tran in 2011	2004 - 2013: 5-7 years before and 2-4 years after	Route	Difference-in-difference	1. Service deterioration in the immediate years following the mergers. However, these service deterioration fades away for both flight cancellations and mishandled bags after the sixth quarter following the merger. 2. Deteriorations in both OTP and involuntary boarding denials persist well into the third year after mergers.
Vaze et al. 2017	Fare; flight frequency	5 recent mergers	One year before and one year after for three mergers. One year before and 2 quarters after for the other two mergers.	Carrier-route	Difference-in-difference	Consumer welfare gains in regions dominated by the larger carrier in the merger, and welfare losses in highly concentrated markets following legacy mergers.
Werden et al. 1991	Fare	Northwest–Republic and Trans World–Ozark in 1986	One year before and one year after	Route-city	OLS	Substantial increases in market power (i.e., fare increases) following mergers.

* Notes: All mergers in this table are U.S. airline mergers.

Appendix 2 Sources for Determining Merger Announcement Dates and Completion Dates

US Airways/America West (2005)

On May 19, 2005, America West Holdings Corporation announced it would acquire the Arlington, Virginia-based US Airways Group.

The merger was completed on September 27, 2005.

<https://www.flightglobal.com/america-west-us-airways-complete-merger/62936.article>

WIKI: Sep 27 2005

Delta/Northwest (2009)

April 14, 2008, both Delta and Northwest Airlines announced that they would merge to create the world's largest airline under the Delta name

Ten years after final approval of the Delta-Northwest merger on Oct. 29, 2008,

<https://news.delta.com/one-great-airline-10-years-later-merger-set-stage-deltas-climb-industry-heights#:~:text=Ten%20years%20after%20final%20approval,transition%20as%20Northwest's%20last%20CEO.>

Delta and Northwest's operating certificates were merged on December 31, 2009 (WIKI)

Ground operations and reservations systems were combined on January 31, 2010 (WIKI)

Frontier/Midwest (2010)

The owner of both airlines, Republic Airways Holdings (RJET), announced Tuesday (April 13, 2010) that it will unite the two regional carriers under the Frontier brand and expand its Denver and Milwaukee hubs.

<https://money.cnn.com/2010/04/13/news/companies/frontier/index.htm?postversion=2010041313>

On going

<https://archive.jsonline.com/business/94936499.html/>

<https://www.travelersunited.org/one-airline-two-airfares-the-not-quite-yet-merger-of-midwest-and-frontier/>

Completed on Oct 1, 2010

<https://archive.jsonline.com/business/104153729.html/>

United/Continental (2010)

UAL Corp.'s United Airlines announced on Monday (May 3, 2010) it will merge with Continental Airlines

https://money.cnn.com/2010/05/03/news/companies/United_Continental_merge/

Completed on Oct 1, 2010

<https://www.sec.gov/Archives/edgar/data/100517/000119312510222185/dex991.htm>

ExpressJet/Atlantic Southeast (2011)

Atlantic Southeast parent SkyWest Inc. announced the deal Wednesday (Aug 4, 2010)

<https://www.ajc.com/business/atlantic-southeast-airlines-combine-with-expressjet/UdLeHNROkhlik0lrptYEI/>

The merger is expected to be completed by December 31, 2011

Effective Dec. 31, 2011, the combined airline will operate solely as ExpressJet Airlines

<https://www.stgeorgeutah.com/news/archive/2011/11/19/skywest-subsiary-atlantic-southeast-airlines-granted-approval-to-create-worlds-largest-regional-airline/#.YiEi3rMK3A>

Southwest/Air Tran (2011)

Southwest Airlines, the nation's biggest low-cost carrier, said in a surprise announcement on Monday (Sep 27, 2010) that it had agreed to buy its smaller rival AirTran Airways for \$1.4 billion

<https://www.nytimes.com/2010/09/28/business/28air.html>

On May 2, 2011, Southwest Airlines closed on its purchase of all of the outstanding common stock of AirTran Holdings, Inc. (NYSE: AAI)

<https://www.southwestairlinesinvestorrelations.com/stock-information/airtran-acquisition>

American/US Airways (2013)

The February 14 2013 (an appropriate date) announcement that American Airlines and US Airways intend to merge had been expected

<https://www.usnews.com/opinion/blogs/economic-intelligence/2013/03/01/whats-behind-the-american-airlines-us-airways-merger>

Completed on Dec 9, 2013

<https://www.theguardian.com/business/2013/dec/09/american-us-airways-merge-worlds-biggest-airlines#:~:text=American%20and%20US%20Airways%20officially%20merge%20to%20create%20world's%20biggest%20airline,-This%20article%20is&text=The%20world's%20biggest%20airline%20was,government%2C%20rivals%20and%20consumer%20groups.>

Alaska/Virgin America (2016)

Alaska Air Group and Virgin America today (April 4, 2016) announced that their boards of directors have unanimously approved a definitive merger agreement

<https://investor.alaskaair.com/news-releases/news-release-details/alaska-air-group-acquire-virgin-america-creating-west-coasts>

Alaska Air Group Inc. (NYSE: ALK) today (Dec 14 2016) announced it has closed its acquisition of Virgin America

<https://newsroom.alaskaair.com/2016-12-14-Alaska-Air-Group-closes-acquisition-of-Virgin-America-becomes-the-5th-largest-U-S-airline>