Mergers and Organizational Disruption: Evidence from the US Airline Industry*

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Abstract

Merger-specific efficiencies alleviate anticompetitive concerns of horizontal mergers. However, organizational challenges inherent in mergers pose a threat to achieving these efficiencies and could negatively impact the merged firm's productivity and market outcomes. We separately measure the organizational and strategic effects of mergers on quality provision using administrative data from the US airline industry, leveraging an industry-specific regulation. We find that organizational challenges (e.g., combining workforces) cause a significant reduction in the quality supplied by a merged firm. In contrast, strategic effects (e.g., market strategy) have a minor impact on quality. Also, we find that a merger can reduce the performance of both merging firms. Our results suggest a merger's organizational challenges creates uncertain efficiency gains.

Keywords: Organizations, mergers, organizational consolidation, efficiencies, airlines

JEL classifications: L1, L22, L41, L93

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1 Introduction

Horizontal mergers in concentrated industries lessen competition and make consumers worse off unless merger-specific synergies create sufficiently large efficiency gains (Williamson, 1968; Farrell and Shapiro, 1990). Whether merging firms will achieve efficiency gains is ex ante uncertain, often due to *organizational* challenges: they must consolidate diverse work forces, labor contracts, physical capital, technology systems, and other factors affecting the merged firm's productivity and product offerings.[1]

Isolating the impact of merger-specific organizational challenges on productivity and performance is difficult because a merger simultaneously affects both strategic incentives and the organization (Rose and Sallet, 2019). Horizontal-merger regulations in the US airline industry, however, provide a unique opportunity to separate the merger effects that come from a change in strategic incentives from those that come from organizational disruption. Specifically, these regulations create a time gap (sometimes longer than one year) between the merger's approval date and the date when the merging firms can consolidate and operate as a single entity.[2] Airlines internalize *strategic* effects (e.g., changes in market structure) immediately after the merger approval date. Some months after this date, the merging airlines can consolidate as a single entity, at which point they experience *organizational disruption* effects.

We use administrative data from the US airline industry to evaluate firm quality based on the on-time performance of millions of flights over a decade. Specifically, we study three major airline mergers that took place in the last decade: US Airways–America West, Delta–Northwest, and United–Continental. Numerous statements in the popular media are consistent with post-merger difficulties.[3] In May 2011, Richard Anderson, Delta's former chief executive, commented on the challenges created by airline mergers, "Everybody had come to the conclusion that these things are too big, too complex and too unwieldy to man-

[1] Examples of failed mergers due to organizational challenges include New York Central and Pennsylvania Railroad (1968), AT&T and NCR (1991), HP and Compact (2001), Sprint and Nextel (2005), AOL and Time Warner (2007), and Daimler and Chrysler (See, e.g., Lys and Vincent, 1995; Badrtalei and Bates, 2007; Harrington, 2013). See, also, https://hbr.org/2018/10/one-reason-mergers-fail-the-two-cultures-arent-compatible.

[2] Any (new) air carrier in the US must first obtain authorization from the Department of Transportation (DOT) and the Federal Aviation Administration (FAA). https://www.transportation.gov/policy/aviation-policy/licensing/US-carriers

[3] Also, see Hansson et al. (2002) for a review of the complex process of merging airlines.

age."[4] In November 2012, nearly two years after the United and Continental merger was approved, Jeffery A. Smisek, United's former chief executive, commented, "The integration of two airlines takes years. It's very complex."[5] Darryl Jenkins, Chairman of the American Aviation Institute, said, "I have never seen an airline merger go smoothly." Firms also acknowledge difficulties and risk of integration in their annual financial reports, and spent millions of dollars on integration-related costs (see Online Appendix B). Specifically, the integration of the reservation system of both United–Continental and US Airways–America West caused a series of delays and cancellations[6], and differences in both labor contracts and work culture caused productivity disruptions following the US Airways–America West and Delta–Northwest mergers.[7] Reports also suggest an increase in consumer dissatisfaction following some of the recent airline mergers.[8]

To measure the impact of integration challenges on quality, our econometric analysis is based on a differences-in-differences design, where we compare the change in the merging airlines' on-time performance (treatment) with the change in the on-time performance of the rest of the industry (control). Our main finding is that challenges during the organizational consolidation can significantly lessen quality. Our estimates suggest an 20 percent increase in carrier delays (i.e., delays that could have been avoided by the carrier) after the merging firms begin to consolidate. Moreover, we find that strategic effects are modest relative to organizational effects.

We also explore how the organizational disruption effect unravels over time, finding that it peaks shortly after the merging firms begin their consolidation (a 100 percent increase in carrier delays) and fades over the course of approximately two years. However, we find that the post-merger organizational disruption can lessen quality for even longer than two years—e.g., the United-Continental merger.

Furthermore, we find that a merger does not always improve quality relative to the quality of the individual merging firms before the merger. In fact, in the United-Continental merger, Continental converged to United's relatively worse pre-merger on-time performance. These

[4] http://www.nytimes.com/2011/05/19/business/19air.html?_r=0

[5] http://www.nytimes.com/2012/11/29/business/united-is-struggling-two-years-after-its-merger-with-continental.html

[6] http://usatoday30.usatoday.com/travel/flights/2007-03-05-us-airways-monday-update_N.htm and http://www.economist.com/blogs/gulliver/2012/03/united-continental-merger

[7] Kole and Lehn (2000) and http://www.post-gazette.com/business/businessnews/2006/04/02/Cultures-actually-clash-in-US-Airways-America-West-merger/stories/200604020236

[8] See, for instance, http://www.nytimes.com/2015/09/15/business/despite-shake-up-at-top-united-faces-steep-climb.html

results suggest that a merger will not necessarily lead to the "best of both worlds" in terms of post-merger quality. A conservative back of the envelope calculation shows that carrier delays associated to organizational effects resulted in a $870 million dollars loss.[9]

Close to our work, Prince and Simon (2017) and Chen and Gayle (2019) study the impact of mergers on product quality. Chen and Gayle (2019) find that product quality can increase or decrease depending on the intensity of pre-merger competition between the carriers that merge. Prince and Simon (2017) find that airline mergers have a minimal negative impact on quality in the short run, with improvements in quality materializing three to five years after the merger. Our findings complement these results by unpacking the dynamic effects of mergers. A central difference is that we distinguish between the dates of merger approval and integration of operations to understand the causes of quality changes after the merger. Our results align with Prince and Simon (2017) in showing that in the short run, before the integration of operations, there is a minimal negative impact on quality. However, we document a short-lived period of a significant decrease in quality following the integration of operations. Furthermore, we show that the duration, intensity, and persistence of these organizational disruption effects are heterogeneous across airlines. When we aggregate all these effects across all mergers, after the period of integration, we again align with Prince and Simon (2017) in showing that average quality improves in the long run.

While our focus is on quality provision, other articles have investigated the impact of airline mergers on prices (Borenstein, 1990; Kim and Singal, 1993; Peters, 2006; Kwoka and Shumilkina, 2010). For instance, Kim and Singal (1993) find evidence of price increases in routes served by merging firms relative to a control group of routes unaffected by the merger, using data from fourteen airline mergers. Moreover, they show that these price increases took effect immediately after the merger, suggesting that strategic effects manifest immediately after the merger and before the merging airlines combine operations.

Our findings highlight the uncertain nature of efficiency gains, showing that mergers can result in poorly consolidated organizations (Ravenscraft and Scherer, 2011; Scherer, 2006). The theory of merger analysis assumes that merger-induced efficiencies are immediately in place after the merger, which is unlikely if the merging companies struggle consolidating their organizations.

If a rocky integration prevents efficiency gains from realizing altogether, or it delays their

[9]This estimation combines our estimates with delay costs estimates in Ball et al. (2010).

arrival by years, antitrust authorities could be overestimating the benefit of a merger by ignoring the possibility of organizational disruption. At a minimum, antitrust authorities should consider how likely are the firms to integrate successfully, and how long that will take.[10] Our analysis of the airline industry is one example of how complex integration can be. Additionally, the merging firms only partially internalize the consumer harm caused by organizational disruption. Since consumers choices are limited under imperfect competition, the consumer harm will only partially be reflected on prices.

Related Literature. Our work contributes to the literature studying the impact of mergers on market outcomes (see, e.g., Miller and Weinberg, 2017; Igami and Uetake, 2020; Miller et al., 2021; Prager and Schmitt, 2021). Merger-specific efficiencies (e.g., cost reduction, reorganization of production, scale economies) have been at the center of horizontal merger cases, and they have been estimated for mergers in many industries including cotton spinning (Braguinsky et al., 2015), beer (Heyer et al., 2009; Ashenfelter et al., 2015; Grieco et al., 2018), and freight railroads (Chen, 2021), among others.

The possibility of merger-specific *inefficiencies* that cannot be attributed to changes in market power has received less attention from economists. Along these lines, Eliason et al. (2020) document a post-merger decrease in product quality in the US dialysis industry that cannot be explained by changes in market power.

Regarding quality provision, Carlton et al. (1980) measure how mergers benefit consumers by increasing the number of city pair combinations with single-carrier service. Borenstein and Netz (1999) study how competition affects departure time differentiation both before and after deregulation. He et al. (2022) investigate how a change in the terms of service of one airline impact equilibrium prices. Mazzeo (2003) studies the relationship between competition and on-time performance, presenting evidence in favor of more frequent and longer delays on routes with only one airline providing direct service. Kim et al. (2023) show that product quality is higher on more competitive routes.

The effect of organization on firm performance is a longstanding question in the management and organizations literature. Stahl and Voight (2004) and King et al. (2004) perform a meta-analysis of the impact of cultural differences on post-merger performance. Industry-specific

[10] Also, antitrust authorities should be aware of manager's overconfidence on the likelihood of successful integration (Malmendier and Tate, 2008). Moreover, Leccese et al. (2022) develop a theory showing that when the merged firm is privately informed about the size of the efficiency, they may strategically choose not to pass the efficiency gain to consumers.

examples of this relationship include Lodorfos and Boateng (2006) (chemical industry), Saunders et al. (2009) (hotel industry), Buono et al. (1985) and Buono and Bowditch, 2003 (mutual savings banks). Given the prevalence of unsuccessful mergers, some researchers have investigated how to preempt post-integration difficulties (e.g, Graebner et al., 2016; Buono and Bowditch, 2003).

The rest of the paper is organized as follows. Section 2 describes the merger activity in the US airline industry and presents anecdotal evidence on the various mergers effects. Section 3 presents the data used for the empirical analysis, and Section 4 our econometric model. In Section 5, we present our results and we conclude in Section 6.

2 Mergers in the US Airline Industry

The US airline industry has gone through several mergers in recent decades. As a result, 11 of the biggest US airlines in 2004 (measured in terms of revenue) have consolidated into 6 airlines.[11] Our analysis focuses on three recent mergers: US Airways and America West, Delta and Northwest, and United and Continental.[12]

Regarding the US Airways–America West merger, the Antitrust Division of the US Department of Justice (DOJ) argued that the merger would not reduce competition and stated that "integration of airlines with complementary, end-to-end networks, like those of the merging firms, can achieve efficiencies that benefit consumers."[13] Regarding the Delta–Northwest merger, the DOJ stated that "the Division has determined that the proposed merger between Delta and Northwest is likely to produce substantial and credible efficiencies that will benefit US consumers and is not likely to substantially lessen competition."[14] Finally, United and Continental transferred "takeoff and landing rights (slots) and other assets at Newark Liberty Airport to Southwest Airlines Co." in response to the DOJ's competitive concerns.[15]

There are two key dates in the timeline of airline mergers, where the merging firms transition

[11] Over the last decade, the US airline industry has also experienced technological improvements, bankruptcies, and new regulations.

[12] Other recent deals, excluded from our analysis due to limited post-merger data, are the mergers between Southwest and AirTran (in 2011) and American and US Airways (in 2014).

[13] https://www.justice.gov/archive/atr/public/press_releases/2005/209709.htm

[14] https://www.justice.gov/archive/opa/pr/2008/October/08-at-963.html

[15] https://www.justice.gov/opa/pr/united-airlines-and-continental-airlines-transfer-assets-southwest-airlines-response

from separate entities to a single airline. The first date is the merger approval date (or merger date), which is when the merging airlines become jointly owned.[16] After this date, the airlines may coordinate their choices about pricing, network structure, infrastructure, and other strategic dimensions. The second is the date when industry regulators (i.e., DOT and FAA) issue the merging airlines authorization to consolidate operations as a single entity (see footnote 2). The time gap between these two dates can be longer than a year.

2.1 Organizational Disruption Effects

The operation of the airline industry relies heavily on the coordination of multiple technologies, including systems for communications, ticketing, flight scheduling, employees (pilots, flight attendants, suppliers) information, maintenance, weather forecast, air traffic control, security, etc. All of these systems must operate in unison for the airlines to be productive, and to provide a timely and reliable service to its customers. Consolidating two airlines requires harmonizing all of these systems, which is a major organizational challenge that may threaten firm performance. These challenges should only impact on-time performance after the date when industry regulators authorize the merging airlines to consolidate. We call these *organizational disruption* effects.

Despite taking preventive steps to avoid problems, all of the mergers we examine suffered the consequences of unforeseen issues during their integration processes. Information disclosed by the merging firm's in annual financial reports reveal that integration is a costly and risky endeavor. In Online Appendix B, we document the challenges reported for each merger. Below, we document which specific integration issue affected the merging parties.

US Airways and America West (2005)

The day-to-day management of the former US Airways and America West remained, for the most part, independent until 2006 when consolidation began. Almost three years after the approval of the merger, pilots originally working for US Airways unionized and confronted those who originally worked for America West. The newly formed airline could not settle on

[16] The term "merger approval" is used because most airline merger proposals are scrutinized by antitrust agencies due to potential competitive concerns before being approved.

contracts for all pilots due to disagreement over the new seniority system.[17]

Apart from these cultural differences, on March 4th, 2007, US Airways and America West combined their reservation systems. The airlines chose to implement the system used by America West (*EDS/SHARES*). The transition was not smooth; the interaction between the reservation system and the ticketing stations at the airports failed, creating chaos at the airports, long waiting lines, and passenger frustration.[18]

Delta and Northwest (2008)

After the merger approval in October 2008, the airlines' operations ran separately—i.e., each airline used its own flight-codes, reservation systems and crew—until they received a single operating certificate from the FAA on December 31st, 2009. Delta implemented the technological changes in stages and hired extra staff in anticipation to potential system crashes. The final Northwest flight took off in January 30, 2010. After this date, all flight reservations were managed by Delta's website.[19] By the end of the first quarter of 2010, Delta and Northwest's systems were fully consolidated.

Similar to what happened after the merger between US Airways and America West, two different work cultures clashed in the Delta–Northwest merger. Flight attendants belonging to Delta and Northwest continued working on separate contracts long after the merger. Delta's flight attendants did not want to unionize, unlike Northwest's flight attendants—as they had been unionized for 63 years before the merger took place.[20] After voting in July, 2010, flight attendants failed to unionize and their representatives accused the airline of "intimidation tactics." On the other hand, Delta and Northwest preempted potential problems by reaching an agreement with their pilots *before* the merger was approved. Initially, Northwest pilots opposed the merger because they were concerned about the change in seniority rankings after the merger. However, in August 2008, the airlines and their pilots reached a collective agreement, which provided more confidence about the prospects of the merger.

[17] http://www.phoenixnewtimes.com/news/warring-us-airways-and-america-west-pilots-have-the-merged-company-in-a-real-tailspin-6393697. See also http://cdn.ca9.uscourts.gov/datastore/opinions/2015/06/26/14-15757.pdf

[18] http://usatoday30.usatoday.com/travel/flights/2007-03-05-us-airways-monday-update_N.htm.

[19] http://aviationblog.dallasnews.com/2010/02/delta-reservation-systems-take.html/

[20] http://www.cbsnews.com/news/delta-flight-attendants-reject-unionization-following-northwest-merger/ and also see http://labornotes.org/blogs/2010/11/flight-attendants-lose-delta

United and Continental

The United–Continental merger showed more problems during the consolidation stage than the US Airways–America West and Delta–Northwest mergers. Most of the problems were caused by the integration of the computer systems. In February, 2011, United grounded 96 aircraft for maintenance checks causing a series of delays.[21] A few months later, on June 17, 2011, a computer system failure caused nation-wide delays, affecting thousands of travelers.[22] Perhaps to prevent further problems, on March 3, 2012, United adopted Continental's reservation and computer system, which according to some experts, was older and less efficient.[23] There were unforeseen issues in the integration of the reservation and computer system, which resulted in delays (e.g., days after the change, Chicago O'Hare's on-time performance dropped to 16%).[24] There were problems in kiosks and call centers, and the website collapsed.[25] As a consequence of this inefficient system, the booking and ticketing process was slow and a series of computer glitches continued causing flight delays long after the integration. On August 28, 2012, United experienced a network outage of over two hours, causing at least 200 delays and cancellations.[26] On November 15, 2012, a problem with the communication system caused hundred of delays across the country and several cancellations.[27]

In addition to problems with the computer systems, labor relations have been difficult after merger.[28] Up to this day, more than 5 years after the merger, flight attendants do not have a uniform contract. Flight attendants of former United and Continental work as separate groups, generating internal labor frictions. This lack of coordination creates challenges in scheduling crews and flights causing flight delays.[29]

[21] http://dailycaller.com/2011/02/15/united-temporarily-grounds-96-aircraft/

[22] http://www.nytimes.com/2011/06/18/us/18united.html

[23] The chosen system was called *SHARES*, which is claimed to be inferior to *FASTAIR*. http://upgrd.com/fozz/shares-vs-apollo-an-in-depth-look.html

[24] http://www.economist.com/blogs/gulliver/2012/03/united-continental-merger

[25] http://www.farecompare.com/news/united-airlines-asks-for-patience-with-ongoing-computer-glitches-weekend-flight-delays

[26] http://www.cnn.com/2012/08/28/travel/united-airlines-system-outage/

[27] http://articles.chicagotribune.com/2012-11-15/business/ct-biz-1116-united-outage-20121116_1_jeff-smisek-charlie-hobart-reservation-system

[28] http://www.denverpost.com/2013/09/06/united-airlines-is-one-big-company-but-not-yet-one-happy-family/

[29] http://www.nytimes.com/2016/06/17/business/years-after-united-merger-flight-attendants-work-for-two-airlines.html

2.2 Strategic Merger Effects

On-time performance is a product characteristic that customers value. Prior work has shown that prices fall in response to longer delays (Forbes, 2008) and consumers choose a different airline when delays increase (Suzuki, 2000). Mazzeo (2003) and Prince and Simon (2009) show that on-time performance is worse in more concentrated routes, suggesting that airlines take actions to improve on-time performance when constrained by competition. The literature discusses several ways in which an airline can invest to improve on-time performance: e.g., increasing the number of standby crew members to prevent delays due to unexpected employee absences, having unscheduled aircraft available, decreasing load factors (Mazzeo, 2003; Prince and Simon, 2017).

Mergers change strategic incentives along multiple dimensions: prices, on-time performance, network structure, capital accumulation, etc. The date when a merger is approved is the first date when these new incentives come into force, because common ownership aligns incentives regardless of whether the merging airlines have combined their operations. Along these lines, Kim and Singal (1993) analyze fourteen airlines mergers, and they show that airline mergers caused price increases in routes served by the merging airlines immediately after merger completion.

In Online Appendix C, we document a series of events that reveal a change in behavior among merging airlines immediately after the merger's approval date, and in advance of the date when airlines combined operations, which is consistent with the change in strategic incentives taking effect immediately. Specifically, we show the merging airlines' made changes to their stock of ground equipment, aircraft utilization, aircraft fleet, and employment immediately following the merger. As mentioned above, these changes have the potential of affecting on-time performance. These effects, although important on their own, are not the main focus of this paper. Rather, we take them as evidence that firms are responding to a change in strategic incentives as soon as the merger is approved, and they are not waiting for the integration of operations to make all the strategic decisions.

3 Data and Variables

We collected on-time performance data from the DOT's Bureau of Transportation Statistics (BTS). The data are available beginning in January 1995 and cover scheduled-service non-stop domestic flights in the US by major air carriers.[30] The DOT requires that these carriers report on operations to and from the 29 US airports that account for at least 1% of the country's total domestic scheduled-service passenger boardings; however, all reporting airlines voluntarily provide data for their entire domestic systems.

The data contain general information for each flight—flight number, date and time, carrier, aircraft (tail number), origin airport, destination airport, and distance—as well as information on the timing of each flight—scheduled departure time, actual departure time, scheduled arrival time, actual arrival time, among other variables. The data also contain a number of on-time performance measures, such as departure and arrival delays and cancellation information. The departure delay is calculated as the difference between the scheduled departure time and the actual departure time and, likewise, the arrival delay is calculated as the difference between the scheduled arrival time and the actual arrival time.

Since June 2003, carriers are also required to report the reason for a flight delay or cancellation. The reasons for delays or cancellations are classified into five categories: air carrier, extreme weather, National Aviation System, late-arriving aircraft, and security. For delayed flights, airlines report the number of minutes of the total arrival delay that are attributable to each category. The first category is the most relevant for our analysis, since it identifies circumstances within the airline's control that cause delays—e.g., maintenance or crew problems, aircraft cleaning, baggage loading, fueling, etc—and it reflects an organization's ability to provide quality.

We use the BTS on-time performance data from January 2004 to December 2013, which cover all flights starting two years before the US Airways–America West merger until two years after the United–Continental merger (see Table 1). The data for this period contain information on 66,153,753 flights. We assign a flight-code to each flight—which is a unique combination of an airline, origin, destination, day of the week, and hour of the day—and restrict the sample to flight-codes that appear at least 10 times in the sample period to be able to control for flight-code fixed effects in our econometric models. This restriction reduces our sample size

[30] Carriers required to report on-time performance to the BTS are those that have at least 1% of the total domestic scheduled-service passenger revenues.

to 65,427,075 flights (98.9% of the original sample size), which are classified into 630,407 flight-codes.[31] Similarly, we drop date–destination airport combinations to be able to include date–destination airport fixed effects in our analysis, leaving us with 65,240,227 flights (98.6% of the original sample size).

[Table 1 about here]

Our variable of interest is the arrival delay *caused by the carrier* (which we call "carrier delay"). This variable is not reported for flights with total delay time shorter than 15 minutes, although the total delay time is reported for all flights.[32] We deal with this missing data problem for flights with delays shorter than 15 minutes in two ways. As a first alternative, we assume that no part of the delay was caused by the carrier, i.e., we assign a value of zero to the variable "carrier delay" for the flights with delays shorter than 15 minutes. We call this new variable the "minimum" carrier delay. As a second alternative, we attribute the full delay to the carrier, i.e., we assign a value total carrier delay to the variable "carrier delay." We call this new variable the "maximum" carrier delay. Note that since we observe the carrier delay for flights delayed by more than 15 minutes, we do not need to impute any information for these flights when defining the variables minimum and maximum carrier delay. We use minimum carrier delay as our main dependent variable, as it is more conservative. However, we show that our results are robust to using either of these two definitions of carrier delay.

We also consider alternative measures of on-time performance in our analysis. We construct the variable "travel time," which is the time elapsed between the scheduled departure time and the actual arrival time.[33] This measure has the virtue of being robust to airline manipulation, as it has been argued that airlines may manipulate scheduled flight times to minimize the risk of delays (Prince and Simon, 2017). Other on-time performance variables we consider are cancellations caused by the carrier ("carrier cancel") and delays caused by a late aircraft ("late aircraft"). Finally, we consider other measures of quality: the number of mishandled bags (from the BTS) and the number of consumer complaints (from the Aviation Consumer Protection Division, DOT), which are available at the airline–month–year level. As a robustness check, we repeat our analysis using these alternative measures of quality provision. Table 2 presents summary statistics for all the dependent variables used in our analysis.

[31] 146,231 observations have missing on-time performance data.
[32] BTS calls a flight "on-time" when the delay time is shorter than 15 minutes (Forbes et al., 2015).
[33] In our database, travel time is calculated as actual elapsed time plus departure delay.

[Table 2 about here]

Table 3 reports summary statistics for delays (measured as minimum carrier delay), the number of flights, and the number of routes (i.e., defined as an origin and destination combination). We report these statistics for the industry as a whole as well as for the merging airlines. For each of the mergers, we separately report these statistics for the period before the merger approval (Column 1), the period between the merger approval and the combining of operations (Column 2), and for the period after the merging firms combine operations (Column 3). We use the date when the merging airlines begin jointly reporting on-time performance data to BTS as a measure of the date when the merging airlines combine their operations (see Table 1). We choose this date because it marks the beginning of organizational consolidation.[34]

[Figure 1 about here]

Table 3 shows that for the first two mergers (US Airways–America West and Delta–Northwest), the share of delayed flights, the average delay, and the average delay of delayed flights decreased after the merger approval and then increased after the merging airlines combined operations. For United–Continental, the delayed flights and the average delay increased both after the merger approval and after the combining operations, although more abruptly after the latter event. Figure 1 adds to this analysis by showing the distribution of delays caused by the carrier both one year before the merger approval date and in the second year after the merger approval date—where the latter period captures both strategic and organizational disruption effects. The figure shows that the post-merger distributions first-order stochastically dominate the pre-merger distributions. These patterns in Table 3 and Figure 1 jointly suggest that the mergers had a negative impact on firm performance.

[Table 3 about here]

The data also provide us with an opportunity to describe the evolution of market structure. Using the distance of each flight, we construct airline market shares based on total distance

[34] In all mergers, the merging airlines start to jointly report on-time performance on the same day or before the date when the FAA approves the single operating certificate, and also before the airlines integrate their reservation systems. We consider an alternative measure for the date when the merging parties combine operations when discussing robustness in the results section.

covered in a year. Figure 2 shows a ranking of airlines by their market shares in 2004 (before the mergers) and in 2013 (after the mergers). The figure shows that the combined share of the four largest carriers increased from 2004 to 2013, which is consistent with industry consolidation. In terms of the impact of the mergers on route-level competition, the last two rows of Table 3 report the number of routes where the merging airlines had overlap before their mergers. Using two alternative criteria, we show that the merging airlines had little overlap before their mergers (i.e., in less than 4% of the routes served by the merging airlines), which is consistent with the DOJ claims on the competitive implications of these mergers.[35]

[Figure 2 about here]

4 Econometric Model

Our econometric analysis is based on a differences-in-differences design, where we compare the change in the merging airlines' on-time performance (treatment) with the change in the on-time performance of the airlines that were not involved in a merger during our sample period (control). The identification assumption is that the on-time performance of treated airlines would have followed the same trend as the on-time performance of the control airlines.

The simplest formulation of our econometric model is

$$\text{Delay}_{ardt} = \beta \cdot \text{after}_d \cdot \text{merged}_a + \phi \cdot \text{after}_d + \gamma \cdot \text{merged}_a + x'_{ardt}\mu + \epsilon_{ardt}, \tag{1}$$

where Delay_{ardt} is the carrier delay for the flight operated by airline a, covering route r (defined as an origin airport–destination airport combination), at date d, and time t. after_d is an indicator variable that takes the value 1 if the date of the flight is after the date of the merger, merged_a indicates whether the airline that operates the flight is one of the merging carriers, x_{ardt} is a vector of controls, and ϵ_{ardt} is an error term clustered at the route level. β is our main coefficient of interest, as it measures the change in on-time performance of the merging airlines after their merger.

[35] The first of these rows reports the number of routes where the merging airlines had overlap in every month prior to the merger, while the second reports the number of routes where the merging airlines had overlap in at least one month prior to the merger.

While the coefficient β in equation (1) measures the overall change in the merging airlines' on-time performance, it does not separate strategic effects (i.e., effects that take place after the merger approval) from organizational disruption effects (i.e., effects that take place only after the merging firms combine operations). As mentioned previously, we use the date when the merging airlines begin jointly reporting on-time performance to the BTS as our measure of the date of organizational consolidation, since it is the earliest in a series of integration milestones (see footnote 34). In Table 1 we show the merger approval dates, the date when the merging airlines start jointly reporting on-time performance data, and the integration of reservation systems dates for each of the three mergers. Given that the date of the combination of operations is later than the merger approval date, we can separately identify the strategic effects and organizational disruption effects using indicator variables for each of these dates with

$$\text{Delay}_{ardt} = \sum_{i=s,c} \beta_i \cdot \text{after}_d^i \cdot \text{merged}_a + \sum_{i=s,c} \phi_i \cdot \text{after}_d^i + \gamma \cdot \text{merged}_a + x'_{ardt}\mu + \epsilon_{ardt}, \qquad (2)$$

where s stands for merger approval date, and c for the date when firms combine operations. β_s and β_c are our coefficients of interest. β_s captures the change in on-time performance of the merging airlines after the merger approval date; β_c captures the incremental effect of on-time performance after the merging airlines have combined operations. We interpret β_s as the coefficient measuring strategic effects, and β_c as the coefficient measuring organizational disruption effects.

In the vector x_{ardt} we include flight-code and date–destination airport fixed effects, where a flight-code is defined as a carrier–origin–destination–day-of-week–hour-of-day combination (e.g., Monday 9AM flight from ORD to MIA operated by AA). The flight-code fixed effects measure systematic differences across flights in on-time performance. Controlling for flight-code fixed effects is key, as airlines modify their network of flights over time, which could make it difficult to measure the impact of a merger on quality. For instance, if two merging airlines dropped flight-codes with poor on-time performance after their merger, one would conclude from a simple before-and-after comparison that the merging airlines increased their on-time performance after the merger, with part of the effect driven by the airlines dropping poor-performing flight-codes. By including the flight-code fixed effects, we measure the impact of the merger on on-time performance at the flight-code level, which is robust to changes in the network of flights. Lastly, the date–destination airport fixed effects absorb idiosyncratic shocks specific to a destination airport on a given day, which may include weather, congestion,

or other factors affecting on-time performance.

We estimate these differences-in-differences models for each merger separately and also pooling all the mergers together. In the latter case, $\text{after}_d \cdot \text{merged}_a$ takes the value 1 for flights operated by any airline that has been part of one of the three mergers. For ease of notation, we label the mergers as *UA* (US Airways–America West), *DN* (Delta–Northwest), and *UC* (United–Continental). Our models then become

$$\text{Delay}_{ardt} = \beta_s^m \cdot \text{after}_d^{m,s} \cdot \text{merged}_a^m + \xi_{ark(d)h(t)} + \tau_{dest(r)d} + \epsilon_{ardt} \tag{3}$$

and

$$\text{Delay}_{ardt} = \beta_s^m \cdot \text{after}_d^{m,s} \cdot \text{merged}_a^m + \beta_c^m \cdot \text{after}_d^{m,c} \cdot \text{merged}_a^m + \xi_{ark(d)h(t)} + \tau_{dest(r)d} + \epsilon_{ardt}, \tag{4}$$

where $m \in \{UA, DN, UC, \{UA, DN, UC\}\}$, $\xi_{ark(d)h(t)}$ is a flight-code fixed effect (i.e., an effect specific to flights operated by airline a, in route r, in day of the week k, at hour of the day h), and $\tau_{dest(r)d}$ is a date–destination airport fixed effect. In these equations, we do not include the terms $\gamma \cdot \text{merged}_a$ and $\sum_m \phi_i^m \cdot \text{after}_d^{m,i}$ $(i \in \{s, c\})$ since these variables are absorbed by the fixed effects. We treat the merging airlines as a single airline throughout the period of study when defining the flight-codes.[36] When analyzing each merger separately $(m \in \{UA, DN, UC\})$, we restrict the sample to 5-year periods around each of the mergers (see Figure 3 for the exact dates). When pooling all the mergers, we drop all the observations of a merging airline that fall outside the 5-year period around its merger.

[Figure 3 about here]

Finally, we study the dynamics of the impact of these mergers on on-time performance. To analyze these patterns, we estimate the month–year level time-effects on carrier delay using the following equation

$$\text{Delay}_{ardt} = \sum_{i=-n_m}^{N_m} \beta_i^m \cdot \text{merged}_a^m \cdot 1\{my(d) = i\} + \xi_{ark(d)h(t)} + \tau_{dest(r)d} + \epsilon_{ardt}, \tag{5}$$

where $m \in \{UA, DN, UC, \{UA, DN, UC\}\}$. The coefficient β_i^m in equation (5) measures

[36] The term $\phi \cdot \text{after}_d$ is not necessarily absorbed by the month-year fixed effects because after_d is defined at the date (i.e., day) level.

the differential performance of the merging airlines with respect to the control carriers (i.e., those that did not merge during our sample period) in month–year i. We make use of the estimates for β_i^m to measure the length and magnitude of organizational disruption effects, as well as to argue that there are no pre-trends that may compromise the interpretation of our differences-in-differences results. We estimate this equation for each merger separately and also pooling all mergers.

5 Results

5.1 Measuring Post-merger Organizational Disruption

How do mergers impact the every-day business of the firm? Are these effects temporal or permanent?

Figure 4 shows estimates for equation (5), where we estimate the performance of the merging airlines relative to the control airlines (i.e., those that were not exposed to a merger during our sample period) over time, pooling all mergers. The figure shows that prior to merger approval, the treated airlines performed no differently than control airlines, suggesting no pre-trends, which provides support for our identification assumption. The figure also shows that the combination of operations following a merger (dashed vertical lines) lead to increases in delays due to the carrier of up to 2.5 minutes on average, which eventually disappear. This evidence is suggestive of merger-caused organization disruption, but because every merger has different integration dates, one cannot easily separate strategic and organization effects from this figure.

[Figure 4 about here]

Figure 5 repeats the exercise but provides estimates at the merger level. Except for the United–Continental merger, there are no noticeable on-time performance changes between the dates of the merger approval and the combining of operations. However, after the merging airlines combined operations, on-time performance worsened in all cases, suggesting a negative impact on the merging airlines' quality. At the peak of the effect, the average carrier delay was 2.5 to 4.5 minutes greater than that in the pre-merger period (i.e., about 100 percent of the industry average). The figure suggests that the organizational disruption effect

lasted between 1 to 2 years for these merging firms, after which most airlines returned to their pre-merger on-time performance levels. The exception is United, which experienced a decrease in its on-time performance through the end of our sample period.

[Figure 5 about here]

Table 4 summarizes our estimates in Figure 5 using a regression analysis with fewer parameters. Column 1 shows estimates for equation (3), where we measure the impact of mergers on on-time performance using a single post-merger indicator that takes a value of 1 starting from the merger approval date. This exercise provides a measure that combines both post-merger strategic and organizational disruption effects and can be interpreted as the overall effect of a merger on quality. When analyzing each merger separately, we find heterogeneous effects. After the US Airways–America West merger, the merging carriers improved their on-time performance by 0.4 minutes or 12 percent of the industry average, which suggests efficiency gains. The impact on quality for Delta–Northwest was negative, with an average increase in delays caused by the carrier of 0.2 minutes or 6 percent of the industry average. For the United–Continental merger, we find that the merging airlines on average reduced their on-time performance by 0.48 minutes or 15 percent of the industry average. When pooling data for all mergers, we estimate that the overall effect of a merger on delays caused by the airlines was 0.35 minutes or 11 percent of the industry average. That is, we find that on average a merger worsens on-time performance though the analysis does suggest heterogeneous effects across mergers.[37]

[Table 4 about here]

In Column 2 of Table 4, we show estimates for equation (4), where we include a post-merger approval indicator as well as an indicator that takes the value 1 after the merging airlines have combined operations. Including both of these indicators in the regressions allows us to distinguish between strategic and organizational disruption effects. The table shows that after US Airways–America West, Delta–Northwest, and United–Continental combined their operations, the delays caused by the carriers increased by 0.52, 0.37, and 1.05 minutes, respectively (or, 16, 11, and 34 percent of the industry average). The difference with the US

[37] The coefficients are small because they are averages over all flights, many of which experienced no delays. When one scales the coefficients by the share of delayed flights, the magnitudes roughly increase by a factor of 10.

Airways–America West merger relative to the others is that the organizational disruption effect partially reversed efficiency gains that the merging airlines realized after their merger approval. When pooling data for all mergers, the estimated increase in delays caused by post-merger organizational disruption was 0.65 minutes or 20 percent of the industry average. These results suggest that the organizational disruption effect—and not strategic choices by the merged airlines—explain the post-merger decrease in quality.

As discussed in the previous section, all of the specifications include flight-code fixed effects (i.e., carrier–origin–destination–day-of-week–hour-of-day combination fixed effects), which measure systematic on-time performance differences across flights. Controlling for flight-code fixed effects help us rule out that our results may be driven by a post-merger change in the composition of flights. That is, even if there is a change in the composition of flights, our estimates for post-merger effects would be zero unless the merging airlines change their on-time performance at the flight-code level. One may also worry that the mergers may have caused changes in market structure at the route level (i.e., entry or exit of other carriers) that may be affecting the interpretation of our results. Additionally, post-merger changes in aircraft utilization may be in part driving our results.

To address concerns raised by concurrent changes in both market structure and aircraft utilization, Table 5 replicates Table 4 (Panel D) with additional controls for the number of airlines serving each route in a given month–year combination (Column I) and the month–year utilization rate of the flight aircraft as well as aircraft model fixed effects (Column II). Column I shows a positive and significant organization disruption effect even after controlling for the number of airlines serving a route, suggesting that changes in market structure that are concurrent to the mergers are not driving our results. Column (I) also shows a negative coefficient on the number of airlines serving a route, which suggests that there are fewer avoidable delays in routes where there is more competition. As well, Column (I) shows positive interactions between the number of competitors and the post-merger approval and post-consolidation indicators, suggesting that organizational disruption is greater in routes that are more crowded. Column (II) shows that controlling for aircraft utilization and aircraft model fixed effects does not affect our results.

In Table 5 we explore differential merger effects by including specifications for whether a flight lands or departs from one of the carriers' hubs (Column III) and by whether a flight lands and departs in one of the 20 highest traffic airports (Column IV). The results suggest no differential organizational disruption effects in large or hub airports.

[Table 5 about here]

Table A.1 in the Online Appendix repeats our analysis separating routes between those that were served by both merging airlines prior to the merger (overlap) and those served by only one of the merging airlines (no overlap). This exercise is useful because we expect strategic effects to only manifest in routes with overlap. We do note however that there was very limited overlap in the three mergers that we study (i.e., merging airlines overlapped in no more than 4 percent of the routes they were operating prior to merging), providing limited power for this exercise. As expected, the table shows that the strategic effect is larger (i.e., more positive) in routes with overlap in all mergers, and the organizational disruption effect manifests regardless of whether there is overlap.

In summary, we find that mergers on average worsen quality and that the bulk of that effect is explained by post-merger organizational disruption. While the organizational disruption effect is temporal, it may last for more than two years after the merger approval date (e.g., United). We end the section by noting that there is anecdotal evidence suggesting that the merging airlines faced organizational challenges even before the date that serves as our measure of when the airlines combined operations. For instance, in June 2011, United experienced a computational problem that created widespread delays and flight cancellations, which, as shown in Figure 5, coincides with an increase of more than two years (a seemingly "permanent" increase) in average delays due to the carrier.[38] Similarly, Delta announced in August 2009 that it was going to cut management jobs and Northwest reported to the FAA a decrease in employees in September 2009, both of which coincide with an increase in average delays due to the carrier for these airlines.[39] While these anecdotes do not affect our overall measure of how these mergers impacted on-time performance, they bias our estimates for strategic and organizational disruption effects upwards and downwards, respectively. This further reinforces the importance of organizational disruption for understanding the impact of mergers on quality.

[38] See http://www.nytimes.com/2011/06/18/us/18united.html?_r=0

[39] See http://www.cleveland.com/business/index.ssf/2009/08/delta_air_lines_will_cut_more.html and Figure B.2 in the Online Appendix.

5.2 Do Firms Reinforce Each Other?

Are there post-merger organizational synergies? Does the new organization inherit the best (or worst) practices of each of the merging firms? We address these questions by using a similar approach to the previous subsection, but decomposing the merger effects by the identity of the airline that operated each flight before the merger. For instance, if prior to the merger Delta operated an Atlanta–Miami flight every Monday at 9AM and Northwest did not, we classify that flight as a "Delta" flight.[40] Distinguishing between airlines allows us to measure the evolution of the relative performance of flights operated (or formerly operated) by each of the merging airlines, study whether the on-time performance of the merging airlines converged, and whether the merged firm improved relative to the pre-merger performance of the merging firms.

[Figure 6 about here]

Figure 6 shows estimates for equation (5), where we estimate the equation separately for each of the merging airlines of a merger. For instance, America West and Delta were equally or more efficient (on average) than US Airways and Northwest before their mergers, suggesting room for organizational efficiencies. In terms of whether these organizational synergies were realized, we find mixed evidence. On the one hand, Continental seems to have converged to the (relatively worse) on-time performance of United after consolidation, suggesting that United kept the worst of both organizations after its merger and a *best of both worlds* scenario is not a given. On the other hand, we also see that former US Airways and Northwest flights improved their on-time performance after their consolidation, suggesting synergies.

Lastly, we examine the correlation of the time coefficients reported in Figure 6, before and after the merging airlines combined operations. The table suggests that after the combining of operations, the on-time performance of flights operated by each former airline became more synchronized, suggesting that they started experiencing similar performance shocks only after they consolidated operations. This evidence provides support for our identification strategy for measuring organizational disruption effects, as firm productivity only became highly correlated after organizational consolidation. Combined with Figure 6, the table also suggests that there are cultures within an organization that are better suited for handling the same performance shock (e.g., former Delta flights versus former Northwest flights).

[40] Since in these mergers there was limited route overlap between merging airlines, the classification of flights is mostly unambiguous.

[Table 6 about here]

5.3 Robustness

In a first set of robustness exercises, we repeat our analysis using alternative measures of on-time performance. Table 7 reports the results of our analysis when using the full set of on-time performance variables described in Section 3 as our dependent variables. Overall, we find the same patterns as in Table 4. When using the maximum carrier delay, we find no evidence of a strategic effect but do find an organizational disruption effect that lowers on-time performance by 16 percent of the industry average. When using travel time, we find a small positive strategic effect and an organizational disruption effect of almost 2 percent of the industry average. When using cancellations caused by the carrier, we find evidence in favor of efficiency gains immediately after the merger and then an increase in cancellations of 43 percent (of the industry average). Lastly, when using delays caused by late aircrafts, we find evidence of a small negative strategic effect and an organizational disruption effect of 21 percent of the industry average.

[Table 7 about here]

We also repeat our analysis using measures of quality other than on-time performance: customer complaints and mishandled bags. Both of these measures are reported at the airline–month level. Table A.3 in the Online Appendix reports the results of this analysis. When pooling all mergers, we find that a merger on average increases customer complaints and mishandled bags by 90 and 27 percent of the industry average, respectively. These results are in line with the previous findings, which show that mergers reduce quality levels. Interestingly, we find that the organizational disruption effect is less important for these alternative measures of quality, though it still is found to have an effect.

Lastly, Table A.4 in the Online Appendix repeats our analysis using different sets of fixed effects. In particular, we use the fixed effects used in Dai et al. (2014) and Prince and Simon (2017) in columns I and II, respectively. Our main conclusions do not change.

6 Discussion

Mergers disrupt organizations and this can lead to large efficiency losses. We quantify the losses created by the consolidation of organizations by analyzing three recent mergers in the US airline industry. We exploit the timing of the milestones that carriers must complete to become a single entity to separate between organizational effects—e.g., integration of systems or employees contracts— and strategic effects—e.g., pricing strategies, network of flights. Our main findings are two-fold. First, the organizational consolidation is a disruptive process (as expected) that can last for years. Second, the merged firm may not be able to preserve the pre-merger performance of the best performing firm.

Our results suggest that if integration plans are not well-thought-out, firms may have to unexpectedly spend a large amount of resources to deal with post-merger integration problems. Back of the envelope calculations show that the mergers we analyze generated losses of about $870 million dollars due to organizational inefficiencies, which is a conservative lower bound. Antitrust authorities should carefully assess how the post-merger organizational consolidation can affect the likelihood that efficiency gains are realized.

References

Ashenfelter, Orley C, Daniel S Hosken, and Matthew C Weinberg (2015) "Efficiencies brewed: pricing and consolidation in the US beer industry," *The RAND Journal of Economics*, Vol. 46, pp. 328–361.

Badrtalei, Jeff and Donald L Bates (2007) "Effect of organizational cultures on mergers and acquisitions: The case of DaimlerChrysler," *International Journal of Management*, Vol. 24, p. 303.

Ball, Michael, Cynthia Barnhart, Martin Dresner, Mark Hansen, Kevin Neels, Amedeo Odoni, Everett Peterson, Lance Sherry, Antonio Trani, Bo Zou et al. (2010) "Total delay impact study," in *NEXTOR Research Symposium, Washington DC. http://www. nextor. org.*

Borenstein, Severin (1990) "Airline mergers, airport dominance, and market power," *The American Economic Review*, Vol. 80, pp. 400–404.

Borenstein, Severin and Janet Netz (1999) "Why do all the flights leave at 8 am?: Competition and departure-time differentiation in airline markets," *International Journal of Industrial Organization*, Vol. 17, pp. 611–640.

Braguinsky, Serguey, Atsushi Ohyama, Tetsuji Okazaki, and Chad Syverson (2015) "Acquisitions, productivity, and profitability: evidence from the Japanese cotton spinning industry," *American Economic Review*, Vol. 105, pp. 2086–2119.

Buono, Anthony F and James L Bowditch (2003) *The human side of mergers and acquisitions: Managing collisions between people, cultures, and organizations*: Beard Books.

Buono, Anthony F, James L Bowditch, and John W Lewis III (1985) "When cultures collide: The anatomy of a merger," *Human relations*, Vol. 38, pp. 477–500.

Carlton, Dennis W, William M Landes, and Richard A Posner (1980) "Benefits and costs of airline mergers: A case study," *The Bell Journal of Economics*, pp. 65–83.

Chen, Yanyou (2021) "Network Structure and Efficiency Gains from Mergers: Evidence from US Freight Railroads,"Technical report, Working paper.

Chen, Yongmin and Philip G Gayle (2019) "Mergers and product quality: Evidence from the airline industry," *International Journal of Industrial Organization*, Vol. 62, pp. 96–135.

Dai, Mian, Qihong Liu, and Konstantinos Serfes (2014) "Is the effect of competition on price dispersion nonmonotonic? Evidence from the US airline industry," *Review of Economics and Statistics*, Vol. 96, pp. 161–170.

Eliason, Paul J, Benjamin Heebsh, Ryan C McDevitt, and James W Roberts (2020) "How acquisitions affect firm behavior and performance: Evidence from the dialysis industry," *The Quarterly Journal of Economics*, Vol. 135, pp. 221–267.

Farrell, Joseph and Carl Shapiro (1990) "Horizontal mergers: an equilibrium analysis," *The American Economic Review*, pp. 107–126.

Forbes, Silke J (2008) "The effect of air traffic delays on airline prices," *International journal of industrial organization*, Vol. 26, pp. 1218–1232.

Forbes, Silke J, Mara Lederman, and Trevor Tombe (2015) "Quality disclosure programs and internal organizational practices: Evidence from airline flight delays," *American Economic Journal: Microeconomics*, Vol. 7, pp. 1–26.

Graebner, Melissa, Koen Heimeriks, Quy Huy, and Eero Vaara (2016) "The process of post-merger integration: a review and agenda for future research," *Academy of Management Annals*, pp. annals–2014.

Grieco, Paul, Joris Pinkse, and Margaret Slade (2018) "Brewed in North America: Mergers, marginal costs, and efficiency," *International Journal of Industrial Organization*, Vol. 59, pp. 24–65.

Hansson, Tom, Gary Neilson, and Sören Belin (2002) "Airline merger integration," *Retrieved March*, Vol. 10, p. 2004.

Harrington, Roberta W (2013) "AOL & Time Warner: How the "Deal of a Century" Was Over in a Decade," Ph.D. dissertation, Drexel University.

He, Lei, Myongjin Kim, and Qihong Liu (2022) "Competitive response to unbundled services: An empirical look at Spirit Airlines," *Journal of Economics & Management Strategy*, Vol. 31, pp. 115–145.

Heyer, Ken, Carl Shapiro, and Jeffrey Wilder (2009) "The year in review: Economics at the antitrust division, 2008–2009," *Review of Industrial Organization*, Vol. 35, pp. 349–367.

Igami, Mitsuru and Kosuke Uetake (2020) "Mergers, innovation, and entry-exit dynamics: Consolidation of the hard disk drive industry, 1996–2016," *The Review of Economic Studies*, Vol. 87, pp. 2672–2702.

Kim, E Han and Vijay Singal (1993) "Mergers and market power: Evidence from the airline industry," *The American Economic Review*, pp. 549–569.

Kim, Myongjin, Qihong Liu, and Nicholas G Rupp (2023) "When do firms offer higher product quality? Evidence from the allocation of inflight amenities," *Review of Industrial Organization*, Vol. 62, pp. 149–177.

King, David R, Dan R Dalton, Catherine M Daily, and Jeffrey G Covin (2004) "Meta-analyses of post-acquisition performance: Indications of unidentified moderators," *Strategic management journal*, Vol. 25, pp. 187–200.

Kole, Stacey and Kenneth M Lehn (2000) "Workforce Integration and the Dissipation of Value in Mergers, The Case of USAir's Acquisition of Piedmont Aviation," in *Mergers and productivity*: University of Chicago Press, pp. 239–286.

Kwoka, John and Evgenia Shumilkina (2010) "The Price Effect of Eliminating Potential Competition: Evidence from an Airline Merger*," *The journal of industrial economics*, Vol. 58, pp. 767–793.

Leccese, Mario, Andrew Sweeting, Xuezhen Tao, and Xinlu Yao (2022) "Should We Expect Uncertain Merger Synergies To Be Passed Through to Consumers?".

Lodorfos, George and Agyenim Boateng (2006) "The role of culture in the merger and acquisition process: Evidence from the European chemical industry," *Management Decision*, Vol. 44, pp. 1405–1421.

Lys, Thomas and Linda Vincent (1995) "An analysis of value destruction in AT&T's acquisition of NCR," *Journal of Financial Economics*, Vol. 39, pp. 353–378.

Malmendier, Ulrike and Geoffrey Tate (2008) "Who makes acquisitions? CEO overconfidence and the market's reaction," *Journal of financial Economics*, Vol. 89, pp. 20–43.

Mazzeo, Michael J (2003) "Competition and service quality in the US airline industry," *Review of industrial Organization*, Vol. 22, pp. 275–296.

Miller, Nathan H, Gloria Sheu, and Matthew C Weinberg (2021) "Oligopolistic price leadership and mergers: The united states beer industry," *American Economic Review*, Vol. 111, pp. 3123–59.

Miller, Nathan H and Matthew C Weinberg (2017) "Understanding the price effects of the MillerCoors joint venture," *Econometrica*, Vol. 85, pp. 1763–1791.

Peters, Craig (2006) "Evaluating the Performance of Merger Simulation: Evidence form the US Airline Industry," *JL & Econ.*, Vol. 49, p. 627.

Prager, Elena and Matt Schmitt (2021) "Employer consolidation and wages: Evidence from hospitals," *American Economic Review*, Vol. 111, pp. 397–427.

Prince, Jeffrey T and Daniel H Simon (2009) "Multimarket contact and service quality: Evidence from on-time performance in the US airline industry," *Academy of Management Journal*, Vol. 52, pp. 336–354.

——— (2017) "The impact of mergers on quality provision: Evidence from the airline industry," *The Journal of Industrial Economics*, Vol. 65, pp. 336–362.

Ravenscraft, David J and Frederic M Scherer (2011) *Mergers, sell-offs, and economic efficiency*: Brookings Institution Press.

Rose, Nancy L and Jonathan Sallet (2019) "The dichotomous treatment of efficiencies in horizontal mergers: Too much? Too little? Getting it right," *U. Pa. L. Rev.*, Vol. 168, p. 1941.

Saunders, Mark NK, Levent Altinay, and Katharine Riordan (2009) "The management of post-merger cultural integration: implications from the hotel industry," *The Service Industries Journal*, Vol. 29, pp. 1359–1375.

Scherer, Frederic M (2006) "A new retrospective on mergers," *Review of Industrial Organization*, Vol. 28, pp. 327–341.

Stahl, Günter K and Andreas Voight (2004) "Meta-Analyses of the Performance Implications of Cultural Differences in Mergers and Acquisitions," in *Academy of Management Proceedings*, Vol. 2004, pp. I1–I5, Academy of Management.

Suzuki, Yoshinori (2000) "The relationship between on-time performance and airline market share: a new approach," *Transportation Research Part E: Logistics and Transportation Review*, Vol. 36, pp. 139–154.

Williamson, Oliver E (1968) "Economies as an antitrust defense: The welfare tradeoffs," *The American Economic Review*, Vol. 58, pp. 18–36.

Tables and Figures

Table 1: Dates for merger approval, jointly reporting and integration of reservation systems. The gap between these dates is what we exploit to separate the strategic and organizational effects.

Merger	Merger approval	Joint reporting	Integration of reserv. sys.
US Airways–America West	Sep 27, 2005	Jan 1, 2006*	Mar 4, 2007
Delta–Northwest	Oct 29, 2008	Jan 1, 2010	Feb 1, 2010
United–Continental	Oct 1, 2010	Jan 1, 2012	Mar 3, 2012

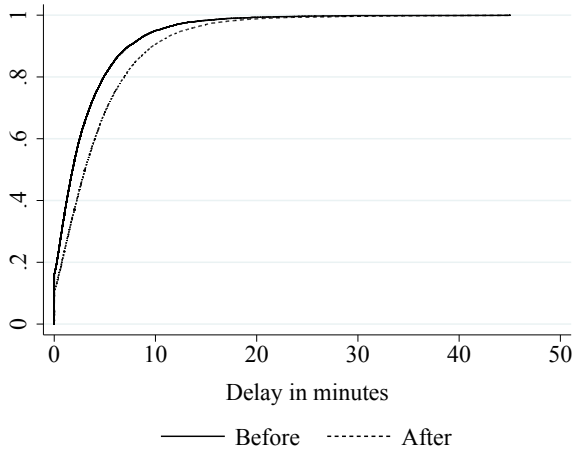
Note: US Airways and America West started to report combined on-time data in January 2006 and combined traffic and financial data in October 2007. We consider January 2006 as the relevant date since from then on all America West flights were branded as US Airways, along with most signage at airports and other printed material.

Table 2: Measures of quality, summary statistics.

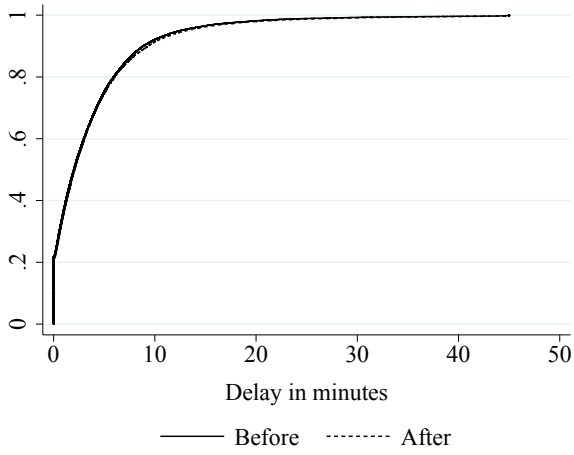
	Mean	St. Dev.	Min.	Max.
(Min.) Arrival delay due to the carrier (minutes)	3.219	19.085	0.00	2580.00
(Max.) Arrival delay due to the carrier (minutes)	4.556	19.120	0.00	2580.00
Travel time (minutes)	135.831	78.896	0.00	2916.00
Cancellations due to the carrier (1=canceled flight)	0.007	0.084	0.00	1.00
(Min.) Arrival delay due to late aircraft (minutes)	4.245	19.275	0.00	1391.00
Complaints (per 100,000 passengers)	0.982	0.845	0.00	13.52
Mishandled baggage (per 1,000 passengers)	5.424	3.262	0.11	28.16

Note: Authors' calculations based on BTS and Aviation Consumer Protection Division data, DOT.

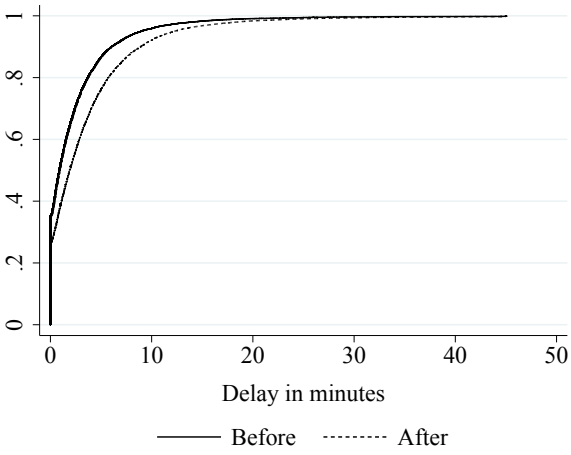
Figure 1: Distribution of delays before and after merger.



Panel A: US Airways & America West



Panel B: Delta & Northwest



Panel C: United & Continental

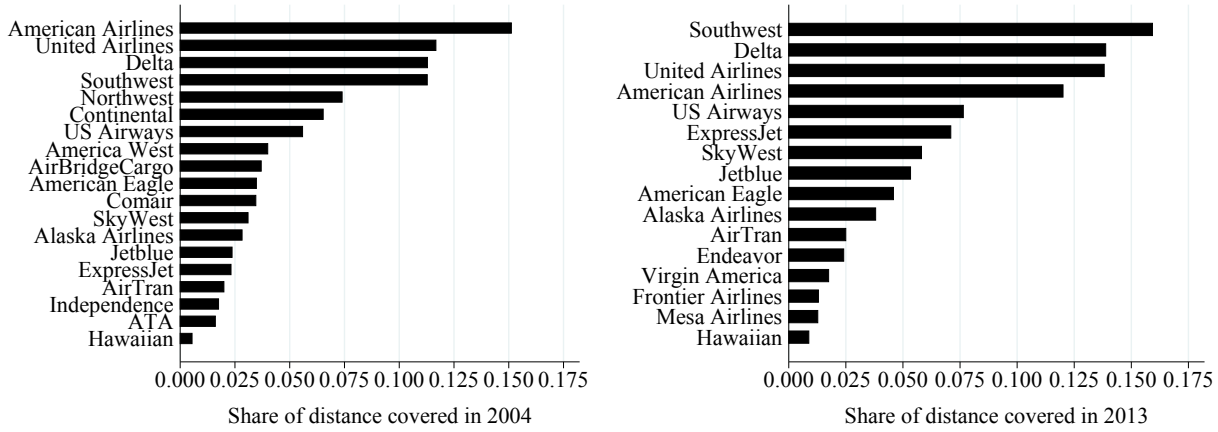
Note: The measure of delays is arrival delay due to the carrier (min.). The "before" curve plots the distribution of delays due to the carrier one year before the merger approval date. The "after" curve plots the distribution of delays due to the carrier in the second year after the merger approval date.

Table 3: Summary statistics before and after merger.

	All	US Airways & America West			Delta & Northwest			United Airlines & Continental		
		(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
% delayed flights	0.112	0.128	0.098	0.142	0.126	0.099	0.113	0.079	0.090	0.131
Avg delay	3.22	2.89	2.13	3.21	4.14	3.17	3.54	2.53	2.79	3.77
Avg delay of delayed	34.08	26.04	25.09	25.13	37.35	35.83	37.09	38.49	36.80	31.79
Avg monthly flights	554875	51964	47022	39975	71344	60233	60746	50910	46566	42793
Total routes	6168	604	520	544	942	807	846	589	582	605
Avg monthly routes	4093	511	478	416	776	629	611	499	499	481
Avg monthly flights from/to hubs	0.330	0.491	0.510	0.577	0.553	0.602	0.644	0.467	0.460	0.469
Routes always competed before	.	6	6	6	6	6	6	14	14	14
Routes competed at least once	.	8	8	8	16	16	16	18	18	18

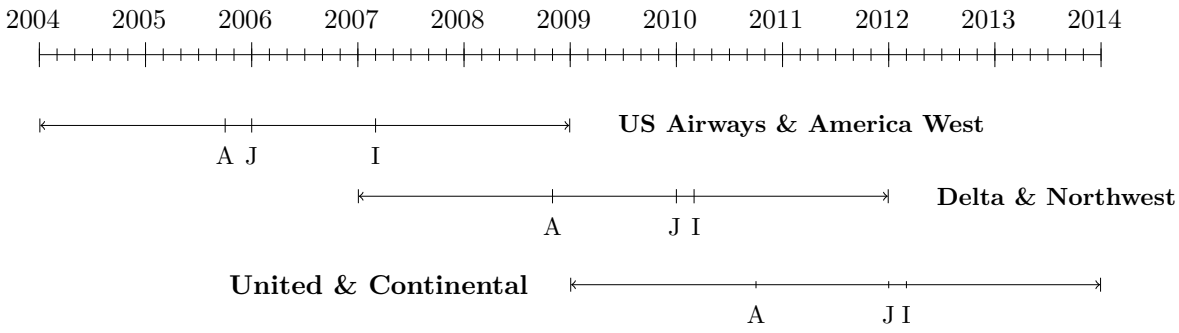
Note: The measure of delays is arrival delay due to the carrier (min.). The first column reports figures for all the airlines during the full period (2004-2013). For each of the mergers, Column (1) reports figures for the period before merger approval, Column (2) for the period between merger approval and the combination of operations, and Column (3) for the period after they combine operations, as presented in Figure 3. We use the date when the merging airlines start to jointly report on-time performance data to FAA as our measure of the date of the combination of operations. The last two lines refer to routes operated by both merging airlines (i.e., both had at least one flight) in every month before the merger or at least in one month before the merger approval, respectively.

Figure 2: Airlines ranked by total distance covered, 2004 and 2013.



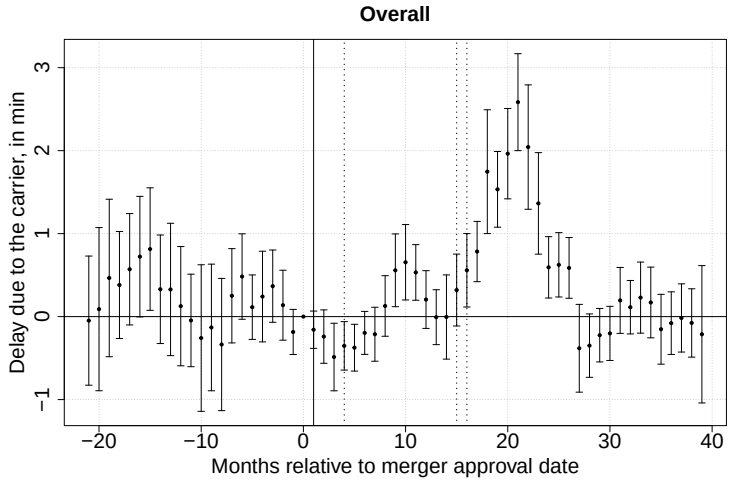
Notes:: Authors' calculations based on BTS data.

Figure 3: Regression ranges by merger.



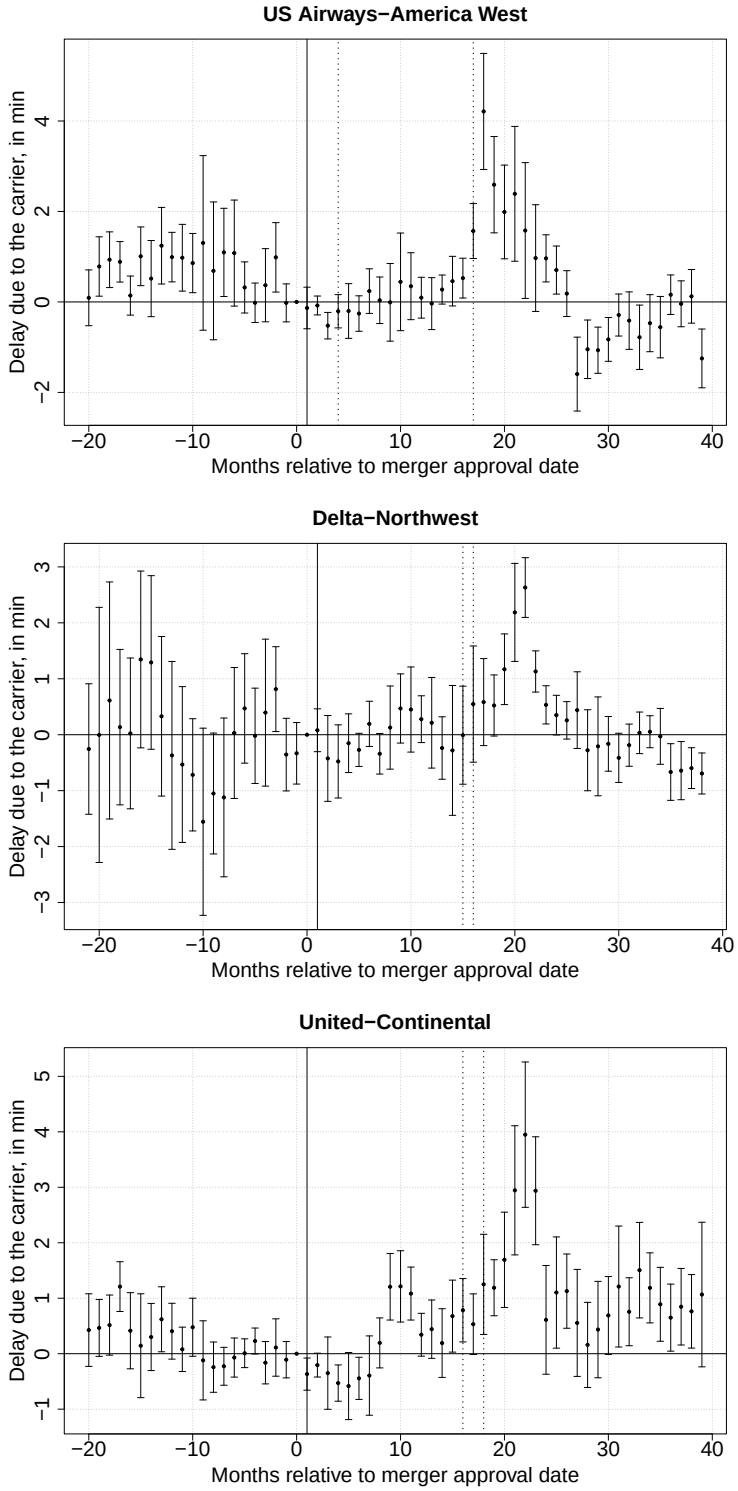
Note: Range of dates for each merger in our analysis. *A* stands for the approval date of the merger, *J* for the date from which airlines began jointly reporting, and I for the date used as the beginning of the integration of operations.

Figure 4: Monthly on-time performance and the effect of mergers.



Note: The graph plots coefficients β_i^m from equation 5 together with 95-percent confidence intervals using standard errors clustered at the route level, pooling all mergers. A unit of observation is an individual flight. All regressions include flight code and date–destination fixed effects, as defined in Section 4. Solid vertical line: merger approval date (month 1); dashed vertical lines: combination of operations dates for all mergers (relative to the corresponding merger approval date). See Table 1 for the exact dates.

Figure 5: Monthly on-time performance and the effect of mergers, by merger.



Note: The graph plots coefficients β_i^m from equation 5 together with 95-percent confidence intervals using standard errors clustered at the route level, for each merger. A unit of observation is an individual flight. All regressions include flight code and date–destination fixed effects, as defined in Section 4. Solid vertical line: merger approval date (month 1); first dashed vertical line: combination of operations date (relative to the merger approval date); second dashed vertical line: date when reservation systems were combined (relative to the merger approval date). See Table 1 for the exact dates.

Table 4: Effect of mergers on quality provision: difference-in-differences analysis.

	(I)	(II)
	Delay due to the carrier, in min.	
Panel A: US Airways & America West		
After date of merger approval * UA	-0.395***	-0.846***
	(0.066)	(0.076)
After date of combined operations * UA		0.521***
		(0.081)
R^2	0.0647	0.0647
Observations	26,066,737	26,066,737
$\bar{Y}$	3.303	3.303
Panel B: Delta & Northwest		
After date of merger approval * DN	0.197**	-0.006
	(0.087)	(0.085)
After date of combined operations * DN		0.372***
		(0.063)
R^2	0.0552	0.0552
Observations	27,056,202	27,056,202
$\bar{Y}$	3.390	3.390
Panel C: United Airlines & Continental		
After date of merger approval * UC	0.478***	-0.047
	(0.064)	(0.053)
After date of combined operations * UC		1.053***
		(0.077)
R^2	0.0530	0.0530
Observations	24,927,474	24,927,474
$\bar{Y}$	3.107	3.107
Panel D: All mergers		
After date of merger approval * merged	0.350***	-0.050
	(0.044)	(0.042)
After date of combined operations * merged		0.645***
		(0.045)
R^2	0.0498	0.0498
Observations	54,803,940	54,803,940
$\bar{Y}$	3.241	3.241

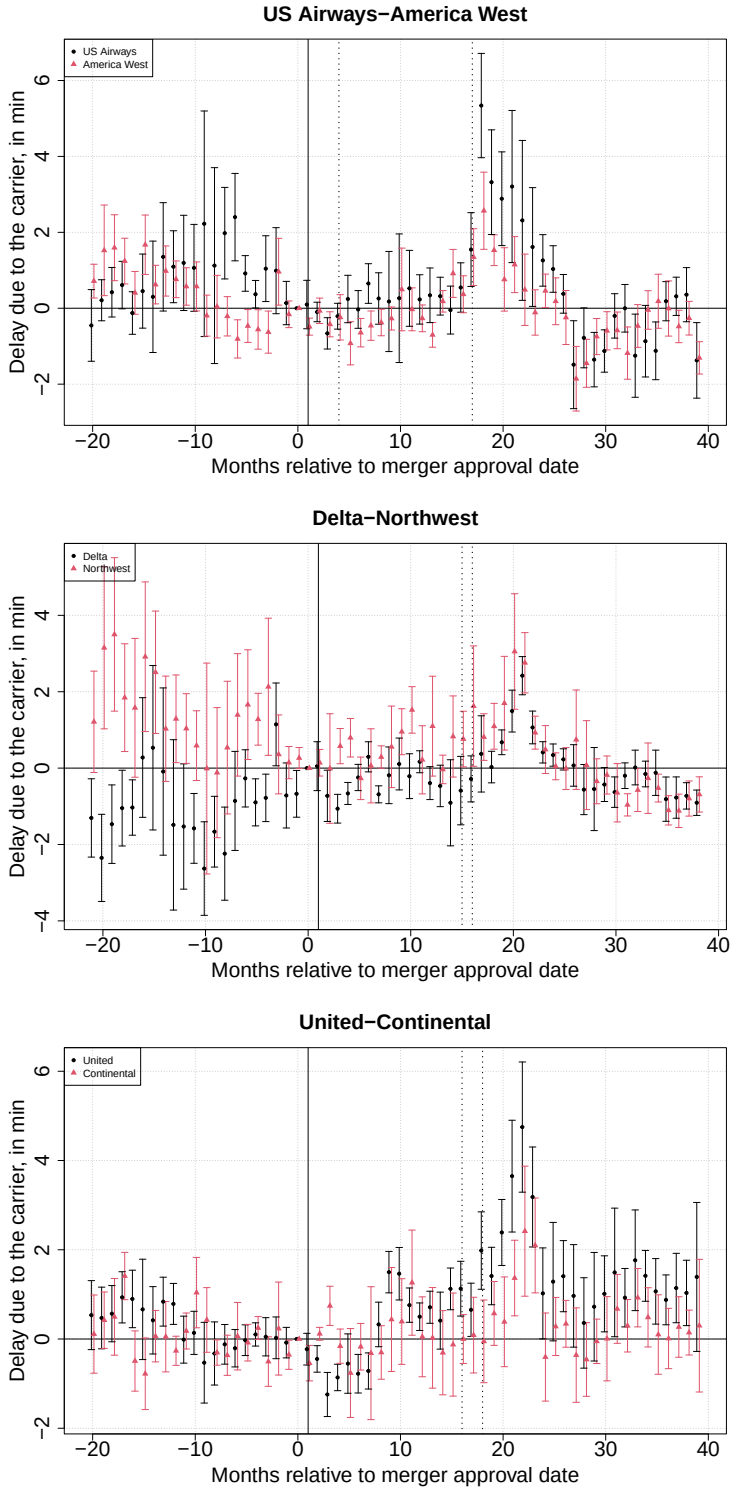
Note: Standard errors clustered at the route level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an individual flight. The dependent variable is carrier delay (min.), as defined in Section 3. All regressions include flight code and date–destination fixed effects, as defined in Section 4. The coefficients reported in column (I) are β_s^m from equation (3) and those in column (II) are β_s^m and β_c^m from equation (4) with $m = UA$, DN, UC, and $\{UA, DN, UC\}$ for Panels A, B, C, and D, respectively. See Section 4 for variable definitions.

Table 5: Number of competitors, aircraft utilization, and hub flights.

	(I)	(II)	(III)	(IV)
	Delay due to the carrier, in min.			
After approval * merged	-0.073*	-0.056	-0.176***	0.017
	(0.043)	(0.044)	(0.054)	(0.051)
After comb. op. * merged	0.593***	0.664***	0.667***	0.588***
	(0.045)	(0.044)	(0.065)	(0.051)
After approval * merged * comp. (demeaned)	0.072**			
	(0.033)			
After comb. op. * merged * comp. (demeaned)	0.095***			
	(0.034)			
Number of competitors (demeaned)	-0.137***			
	(0.018)			
Air time		-0.114***		
		(0.003)		
Aircraft's years of service		0.000		
		(0.000)		
After approval * merged * hub			0.239***	
			(0.081)	
After comb. op. * merged * hub			-0.047	
			(0.088)	
After approval * merged * big airport				-0.156*
				(0.080)
After comb. op. * merged * big airport				0.133
				(0.082)
R^2	0.0498	0.0593	0.0498	0.0498
Observations	54,803,940	45,035,873	54,803,940	54,803,940
$\bar{Y}$	3.241	3.170	3.241	3.241

Note: Standard errors clustered at the route level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an individual flight. The dependent variable is carrier delay (min.), as defined in Section 3. All regressions include flight code and date–destination fixed effects, as defined in Section 4. Results in column (II) also incorporate aircraft model fixed effects. "Number of competitors" is the number of airlines that had at least one flight in a route–month (demeaned). "Air time" is an aircraft's total air time in a given month (in thousands of minutes). "Hub" is an indicator for flights that depart from (arrive at) the main hub of the airline.

Figure 6: Monthly on-time performance and the effect of mergers by pre-merger carrier.



Note: The graph plots coefficients β_i^m from equation 5 together with 95-percent confidence intervals using standard errors clustered at the route level, for each airline involved in each merger. A unit of observation is an individual flight. All regressions include flight code and date–destination fixed effects, as defined in Section 4. Solid vertical line: merger approval date (month 1); first dashed vertical line: combination of operations date (relative to the merger approval date); second dashed vertical line: date when reservation systems were combined (relative to the merger approval date). See Table 1 for the exact dates.

Table 6: Correlation of time effects for merging airlines.

	UA	DN	UC
Before	-0.151	-0.090	0.197
After	0.810	0.804	0.892

Note: Figures are the correlation coefficients between the estimates from equation 5 plotted in Figure 6 for each merger. Correlations are reported before and after the combination of operations.

Table 7: Effect of mergers on other measures of on-time performance. All mergers.

	(I) Carrier delay (max.)	(II) Travel time	(III) Carrier canceled	(IV) Late aircraft
After approval * merged	-0.059	0.222	-0.002***	-0.321***
	(0.045)	(0.141)	(0.000)	(0.055)
After comb. op. * merged	0.634***	2.691***	0.002***	0.801***
	(0.051)	(0.147)	(0.000)	(0.048)
R^2	0.0523	0.8201	0.0510	0.1181
Observations	54,803,940	54,803,940	55,950,604	54,803,940
$\bar{Y}$	4.564	130.873	0.007	4.396

Note: Standard errors clustered at the route level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an individual flight. The dependent variables are indicated in column heads (see definitions in Section 3). All regressions include flight code and date–destination fixed effects, as defined in Section 4. The coefficients reported are β_s^m and β_c^m from equation (4) with $m = \{UA, DN, UC\}$. The regressions pool all mergers. See Table A.2 in the Online Appendix for the individual merger results.

Online Appendix: Not For Publication

Mergers and Organizational Disruption: Evidence from the US Airline Industry

Julia González, Jorge Lemus, and Guillermo Marshall

A Other Exercises

Table A.1: Effect of mergers on quality provision in routes with and without overlap: difference-in-differences analysis.

	(I) Routes with overlap	(II) Routes without overlap
	Delay due to the carrier, in min	
Panel A: US Airways & America West		
After date of merger approval * UA	-0.241	-0.851***
	(0.253)	(0.077)
After date of combined operations * UA	1.078**	0.507***
	(0.423)	(0.081)
R^2	0.0672	0.0648
Observations	23,508,983	25,986,972
$\bar{Y}$	3.340	3.302
Panel B: Delta & Northwest		
After date of merger approval * DN	0.735*	-0.001
	(0.408)	(0.086)
After date of combined operations * DN	0.222	0.379***
	(0.245)	(0.065)
R^2	0.0630	0.0556
Observations	23,390,893	26,731,895
$\bar{Y}$	3.345	3.384
Panel C: United Airlines & Continental		
After date of merger approval * UC	0.288	-0.092*
	(0.195)	(0.051)
After date of combined operations * UC	0.971***	1.070***
	(0.219)	(0.076)
R^2	0.0561	0.0538
Observations	22,455,936	24,437,418
$\bar{Y}$	3.122	3.093

Note: Standard errors clustered at the route level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an individual flight. A route has overlap if both merging airlines were serving the route prior to the merger approval date. All regressions include flight code and date–destination fixed effects, as defined in Section 4.

Table A.2: Other measures of on-time performance as outcome variable by merger.

	(I) Carrier delay (max.)	(II) Travel time	(III) Carrier canceled	(IV) Late aircraft
Panel A: US Airways & America West				
After date of merger approval * UA	-0.987***	-2.194***	-0.002***	-0.725***
	(0.082)	(0.240)	(0.000)	(0.102)
After date of combined operations * UA	0.704***	2.610***	0.002**	0.568***
	(0.086)	(0.264)	(0.001)	(0.114)
R^2	0.0676	0.8138	0.0576	0.1416
Observations	26,066,737	26,066,737	26,663,607	26,066,737
$\bar{Y}$	4.702	125.069	0.008	4.495
Panel B: Delta & Northwest				
After date of merger approval * DN	-0.144	1.247***	-0.001**	-0.079
	(0.089)	(0.236)	(0.000)	(0.096)
After date of combined operations * DN	0.259***	1.661***	0.001***	0.633***
	(0.067)	(0.185)	(0.000)	(0.077)
R^2	0.0578	0.8012	0.0574	0.1246
Observations	27,056,202	27,056,202	27,649,086	27,056,202
$\bar{Y}$	4.703	129.034	0.007	4.428
Panel C: United Airlines & Continental				
After date of merger approval * UC	0.003	-0.734***	-0.003***	-0.643***
	(0.057)	(0.180)	(0.000)	(0.074)
After date of combined operations * UC	1.023***	3.863***	0.004***	0.924***
	(0.101)	(0.305)	(0.000)	(0.079)
R^2	0.0555	0.8240	0.0607	0.1159
Observations	24,927,474	24,927,474	25,413,335	24,927,474
$\bar{Y}$	4.329	132.696	0.006	4.482

Note: Standard errors clustered at the route level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an individual flight. The dependent variables are indicated in column heads (see definitions in Section 3). All regressions include flight code and date–destination fixed effects, as defined in Section 4. The coefficients reported are β_s^m and β_c^m from equation (4) with $m = UA$, DN, and UC for Panels A, B, and C, respectively. See Section 4 for variable definitions and regression ranges.

Table A.3: Other measures of quality as outcome variable.

	(I) Complaints	(II) Mishandled baggage
Panel A: US Airways & America West		
After merger approval · UA	-0.095	0.464
	(0.278)	(0.756)
After combining of operations · UA	0.716***	0.236
	(0.267)	(0.613)
R^2	0.4069	0.7972
Observations	1,032	1,032
$\bar{Y}$	0.957	6.674
Panel B: Delta & Northwest		
After merger approval · DN	0.310***	1.197***
	(0.116)	(0.355)
After combining of operations · DN	-0.142	-0.448
	(0.138)	(0.284)
R^2	0.6074	0.8403
Observations	1,056	1,056
$\bar{Y}$	1.037	5.015
Panel C: United Airlines & Continental		
After merger approval · UC	0.485***	0.251
	(0.092)	(0.168)
After combining of operations · UC	1.139***	0.857***
	(0.409)	(0.148)
R^2	0.5065	0.8013
Observations	984	984
$\bar{Y}$	1.068	3.628
Panel D: All mergers		
After merger approval · merged	0.468***	1.201***
	(0.069)	(0.169)
After combining of operations · merged	0.446**	0.217
	(0.173)	(0.179)
R^2	0.4306	0.7745
Observations	2,016	2,016
$\bar{Y}$	1.011	5.187

Note: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an airline–month–year combination. The dependent variables are indicated in column heads. All regressions include airline and month–year fixed effects. The reported coefficients are β_s^m and β_c^m from equation (4) with $m = UA$, DN, UC, and $\{UA, DN, UC\}$ for Panels A, B, C, and D, respectively. See Section 4 for variable definitions and regression ranges.

Table A.4: Effect of mergers on-time performance using alternative sets of fixed effects. All mergers.

	(I)	(II)
	Delay due to the carrier, in min	
After date of merger approval * merged	-0.100**	-0.082
	(0.041)	(0.065)
After date of combined operations * merged	0.853***	1.050***
	(0.050)	(0.077)
Carrier–Route FE	Yes	Yes
Year–Quarter FE	Yes	No
Route–Day FE	No	Yes
Major airline–Day FE	No	Yes
R^2	0.0068	0.1591
Observations	54,850,564	54,687,032
$\bar{Y}$	3.242	3.237

Note: Standard errors clustered at the route level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an individual flight. The coefficients reported are β_s^m and β_c^m from equation (4) with $m = \{UA, DN, UC\}$. The regressions pool all mergers.

B Evidence from Annual Financial Reports (10-K)

We downloaded annual financial reports (form 10-K) for each airline involved in the mergers in our sample. We collected annual reports for the year of the merger approval and up to five years afterward. From the statements in these reports, it is clear that integrating operations is a costly and risky enterprise.

US Airways and America West (2005)

In its 2005 annual financial report (issued on December 31, 2015), US Airways warns investors of the risk of consolidating two organizations: "US Airways Group and America West Holdings will face significant challenges in consolidating functions, integrating their organizations, procedures and operations in a timely and efficient manner and retaining key Company personnel. The integration of US Airways Group and America West Holdings will be costly, complex and time consuming, and management will have to devote substantial effort to that integration that could otherwise be spent on operational matters or other strategic opportunities. We expect that the merger will result in certain synergies, business opportunities and growth prospects. We, however, may never realize these expected synergies, business opportunities and growth prospects."

In its 2006 annual financial report, US Airways they continue acknowledge these issues: "Integration of automated airline systems is difficult, and we have encountered complications and difficulties in integrating some of our automated systems and have not completed those integration efforts, including efforts to combine our two computerized airline reservations systems. Any disruption in these systems could result in the loss of important data, increase our expenses and generally harm our business, and any sustained disruption in these systems could have a material adverse effect on our business."

"US Airways Group and America West Holdings face significant challenges in consolidating functions and integrating their organizations, procedures and operations in a timely and efficient manner. The integration of US Airways Group and America West Holdings has been and will continue to be costly, complex and time consuming, and management will continue to devote substantial effort to that integration and may have its attention diverted from ongoing operational matters or other strategic opportunities."

The problems continued in 2007, although some of the issues at this point had been resolved: "We faced major operational challenges during the first half of 2007 resulting from adverse

weather conditions in the northeast, heavy air traffic congestion in many of our hubs and difficulties associated with the migration to a single reservation system in early March 2007."

Furthermore, integration was costly. US Airways reports the following transition and merger integration costs: $28 million in 2005, $131 million in 2006, and $99 million in 2007.

Delta and Northwest (2008)

In the annual financial report of 2008, Delta warn investors of the risk involved in integrating operations with North West Airlines. Most of the concerns in this case came from labor integration:

"The integration of Delta and NWA workforces will be challenging in part because approximately 80% of the pre-merger Northwest employees are represented by labor unions while, among U.S. based pre-merger Delta employees, only the Delta pilots and flight dispatchers (who combined constitute approximately 17% of the total pre-merger Delta employees) are represented by labor unions.

Completing the integration of the workforces of the two airlines will require the resolution of potentially difficult issues relating to representation of various work groups and the relative seniority of the work groups at each carrier. Unexpected delay, expense or other challenges to integrating the workforces could impact the expected synergies from the combination of Delta and NWA and affect our financial performance."

In 2008, Delta also reports issues related to the integration of technology systems:

"In addition, we may face challenges associated with integrating complex systems and technologies that support the separate operations of Delta and NWA. If we are unable to manage these challenges effectively, our business and results of operation could be negatively affected."

In 2009, the some labor-force issues were resolved while others continued:

"While integration of a number of the workgroups (including pilots and aircraft maintenance technicians) has been successfully completed, completion of the integration of certain workgroups (including flight attendants, airport employees and reservations employees) of the two pre-merger airlines will require the resolution of potentially difficult issues, including but not limited to the process and timing for determining whether the combined post-merger workgroups wish to have union representation. Unexpected delay, expense or other challenges to integrating the workforces could impact the expected synergies from the merger and affect

our financial performance."

In 2010, Delta anticipated problems and large integration costs:

"Our merger with Northwest involved the combination of two companies which operated as independent public companies prior to the merger. We are devoting significant attention and resources to integrating our business practices and operations in order to achieve the benefits of the merger, including expected synergies. If we are unable to integrate our business practices and operations in a manner that allows us to achieve the anticipated revenue and cost synergies, or if achievement of such synergies takes longer or costs more than expected, the anticipated benefits of the merger may not be realized fully or at all or may take longer to realize than expected. In addition, it is possible that the integration process could result in the loss of key employees, diversion of management's attention, the disruption or interruption of, or the loss of momentum in our ongoing businesses or inconsistencies in standards, controls, procedures and policies, any of which could adversely affect our ability to maintain relationships with customers and employees or our ability to achieve the anticipated benefits of the merger, or could reduce our earnings or otherwise adversely affect our business and financial results. We expect to incur total cash costs of approximately $500 million over approximately three years to integrate the two airlines."

In 2011, Delta reported that the integration with Northwest was expected to be completed in 2012:

"Integration of a number of the workgroups following our merger with Northwest Airlines (including pilots, aircraft maintenance technicians, dispatchers, meteorologists, simulator technicians, and office and clerical staff) has been completed. Completion of the integration of other workgroups (including flight attendants, airport employees and reservations employees) will be completed during 2012 following the final resolution of representation issues during the latter part of 2011. The flight attendants, airport employees and reservations employees each rejected representation by unions."

"During the June 2012 quarter, we reached an agreement with the Air Line Pilots Association, International ("ALPA") to modify the existing collective bargaining agreement covering Delta's pilots. The agreement, which was ratified by the pilots in June 2012, provides career growth opportunities as well as pay and benefits improvements for our pilots including increases to base pay and changes to our profit sharing program."

In terms of costs, Delta reports costs associated with "merger-related items" of $275 million in 2009 and $233 million in 2010.

United and Continental (2011)

In United's 2011 annual financial report, the airline explains integration costs and anticipates risks:

"The Company will incur substantial expenses in connection with the Merger. The Company incurred approximately $450 million of integration-related cash costs in 2011 and expects to incur a similar amount in 2012 in categories generally consistent with 2011. There are many factors that could affect the total amount or the timing of those expenses, and many of the expenses that will be incurred are, by their nature, difficult to estimate accurately."

The report warns investors of many risks including

- "we may be unable to successfully integrate the businesses and workforces of United and Continental"
- "we may be unable to successfully manage the expanded business with respect to monitoring new operations and associated increased costs and complexity"
- we may be unable to avoid potential liabilities and unforeseen increased expenses or delays associated with the Merger and integration;
- we may be unable to successfully manage the complex integration of systems, technology, aircraft fleets, networks and other assets of United and Continental in a manner that minimizes any adverse impact on customers, vendors, suppliers, employees and other constituencies.
- we may experience disruption of, or inconsistencies in, each of United's and Continental's standards, controls, procedures, policies and services.

As in the case of other mergers, labor unions posed a problem for the integration:

"United and Continental are both highly unionized companies. As of December 31, 2011, the Company and its subsidiaries had approximately 87,000 active employees, of whom approximately 72% were represented by various U.S. labor organizations.

The successful integration of United and Continental and achievement of the anticipated benefits of the combined company depend in part on integrating United and Continental employee groups and maintaining productive employee relations. In order to fully integrate the pre-Merger represented employee groups, the Company must negotiate a joint collective bargaining agreement covering each combined group. The process for integrating the labor groups of United and Continental is governed by a combination of the RLA, the McCaskill-Bond Amendment, and where applicable, the existing provisions of each company's collective bargaining agreements and union policy. A delay in or failure to integrate the United and Continental employee groups presents the potential for delays in achieving expected Merger synergies, increased labor costs and labor disputes that could adversely affect our operations. "

Labor contracts were renegotiated in 2012. The merger was quite costly for the airline, which reports merger and integration-related costs of $564 million in 2010, $517 million in 2011, $739 million in 2012, and $205 million in 2013, and $96 million in 2014.

Integration-related costs incurred during 2013 and 2012 included compensation costs related to systems integration and training, branding activities, write-off or acceleration depreciation on systems and facilities that are either no longer used or planned to be used for significantly shorter periods, as well as relocation for employees and severance primarily associated with administrative headcount reductions. In 2011, these costs also included costs to terminate certain service contracts, costs to write-off system assets, payments to third-party consultants assisting with integration planning and organization design and compensation costs related to the systems integration.

C Non-organizational Effects

Table B.1: Aircraft utilization

	(I) Distance	(II) Elapsed time	(III) Air time
Panel A: US Airways & America West			
After merger approval · UA	-2.234***	-0.250**	-0.248***
	(0.742)	(0.108)	(0.094)
After combining of operations · UA	2.799**	0.342*	0.268
	(1.331)	(0.198)	(0.171)
R^2	0.2295	0.2060	0.2331
Observations	286,222	286,222	286,222
$\bar{Y}$	89.635	15.404	12.614
Panel B: Delta & Northwest			
After merger approval · DN	1.983***	0.454***	0.347***
	(0.725)	(0.100)	(0.089)
After combining of operations · DN	1.332*	0.161	0.080
	(0.702)	(0.101)	(0.087)
R^2	0.2248	0.2075	0.2336
Observations	278,368	278,368	278,368
$\bar{Y}$	87.449	14.957	12.262
Panel C: United Airlines & Continental			
After merger approval · UC	-4.109***	-0.605***	-0.497***
	(0.550)	(0.080)	(0.070)
After combining of operations · UC	4.115***	0.547***	0.447***
	(0.880)	(0.122)	(0.110)
R^2	0.2118	0.1903	0.2180
Observations	269,964	269,964	269,964
$\bar{Y}$	87.169	14.663	12.105

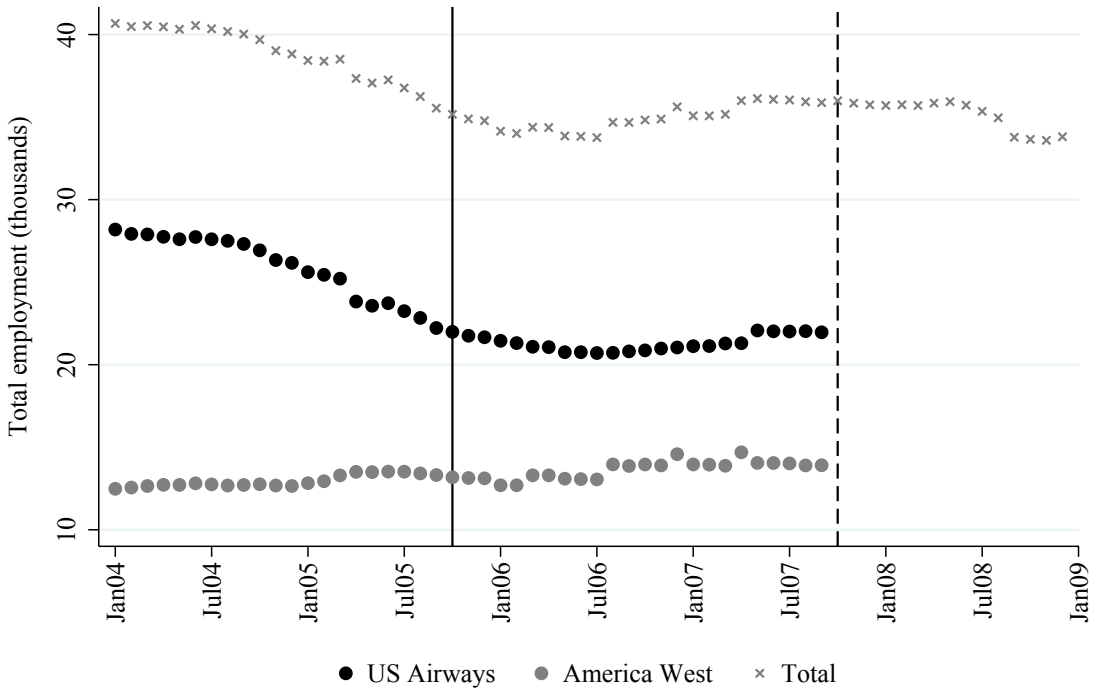
Notes: Standard errors clustered at the aircraft level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an aircraft–airline–month–year combination. The dependent variables are: monthly distance traveled (in thousands of miles), monthly actual elapsed time (i.e., from departure to arrival, in thousands if minutes), and monthly air time (i.e., from wheels off to wheels on, in thousands of minutes). All regressions include month–year and airline fixed effects. See Section 4 for variable definitions and regression ranges.

Table B.2: Number of aircraft

	(I) UA	(II) DN	(III) UC
After merger approval · merged	-0.043	-0.042***	-0.027*
	(0.029)	(0.010)	(0.014)
After combining of operations · merged	-0.217***	-0.015*	-0.149***
	(0.026)	(0.009)	(0.015)
R^2	0.9798	0.9920	0.9776
Observations	1,027	1,010	960
$\bar{Y}$	5.188	5.266	5.293

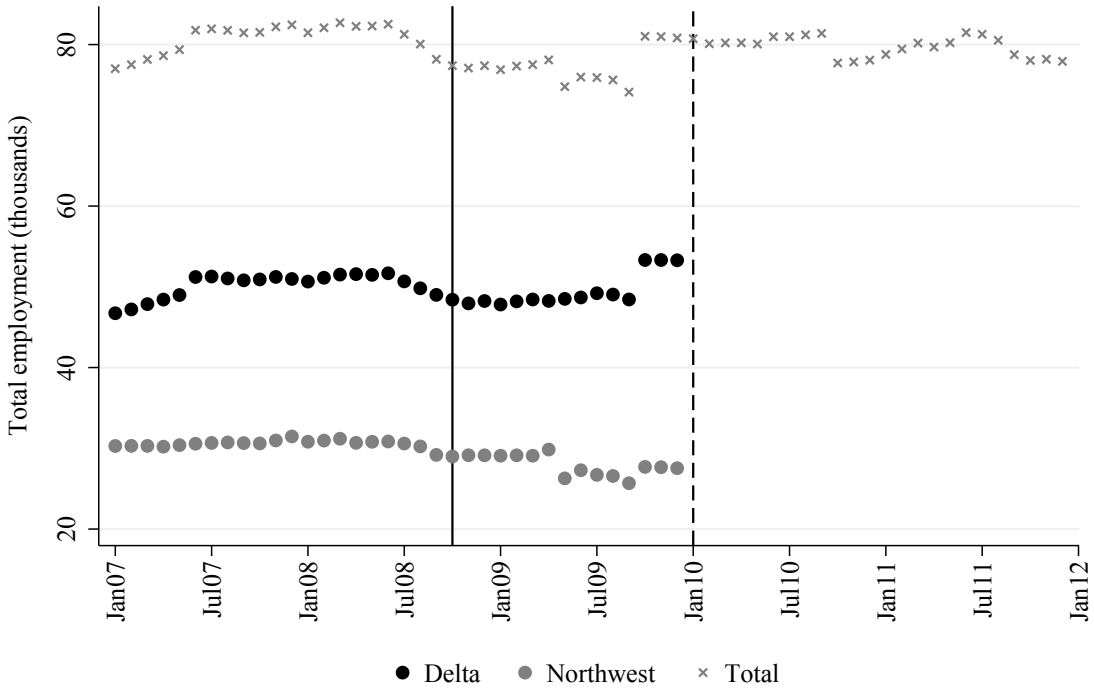
Note: Standard errors clustered at the aircraft level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. A unit of observation is an airline–month–year combination. The dependent variable is the monthly number of aircraft used for at least one flight. All regressions include month–year and airline fixed effects. See Section 4 for variable definitions and regression ranges.

Figure B.1: Employment, US Airways and America West.



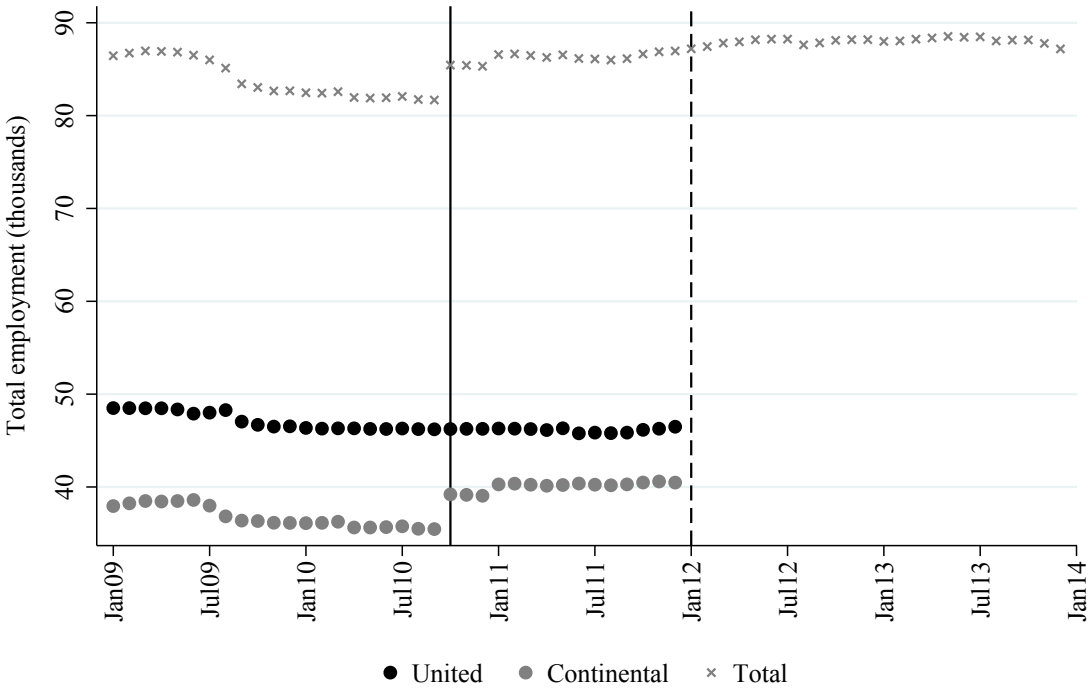
Notes: Authors' calculations based on BTS data. Solid line: merger approval; dashed line: joint report of information to the BTS, as reported in Table 1.

Figure B.2: Employment, Delta and Northwest.



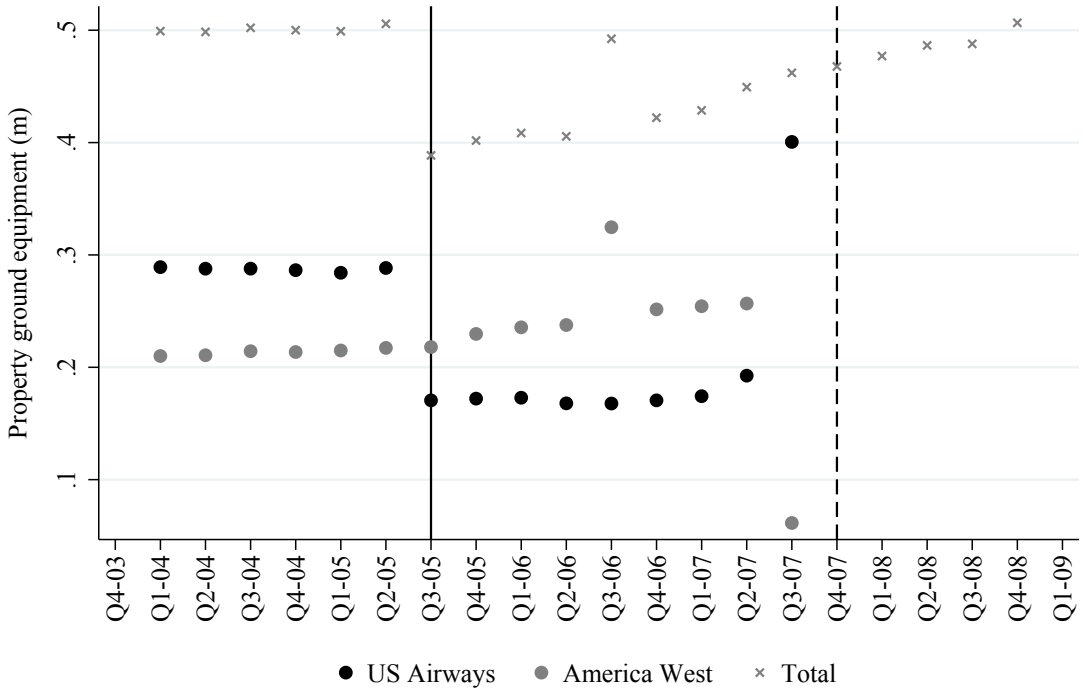
Notes: Authors' calculations based on BTS data. Solid line: merger approval; dashed line: joint report of information to the BTS, as reported in Table 1.

Figure B.3: Employment, United and Continental.



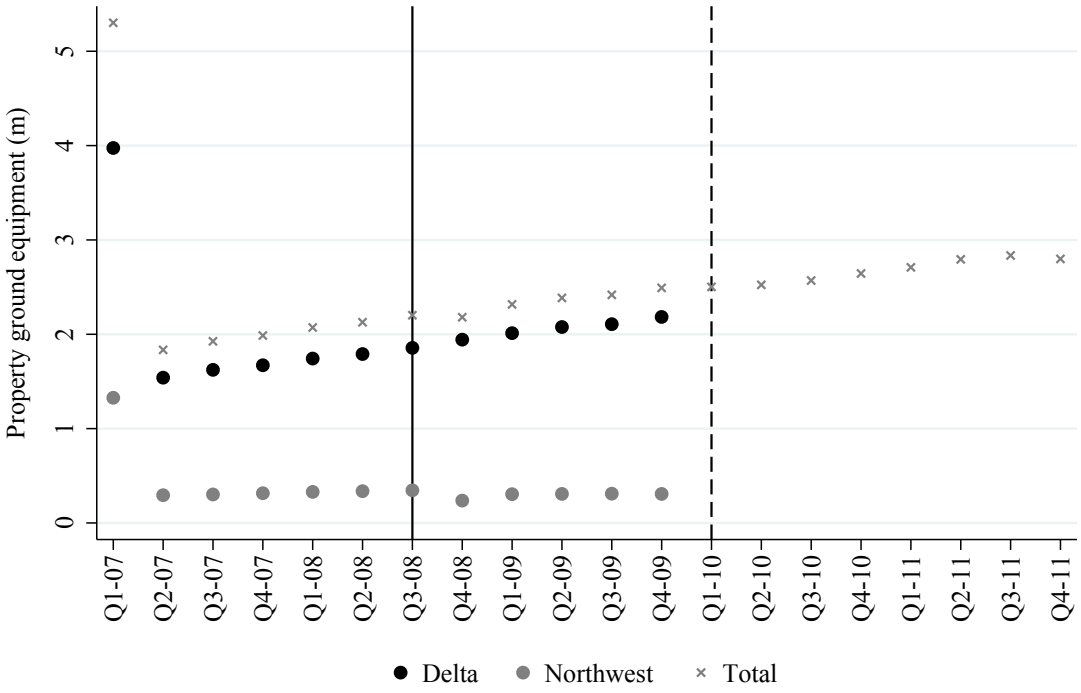
Notes: Authors' calculations based on BTS data. Solid line: merger approval; dashed line: joint report of information to the BTS, as reported in Table 1.

Figure B.4: Equipment, US Airways and America West.



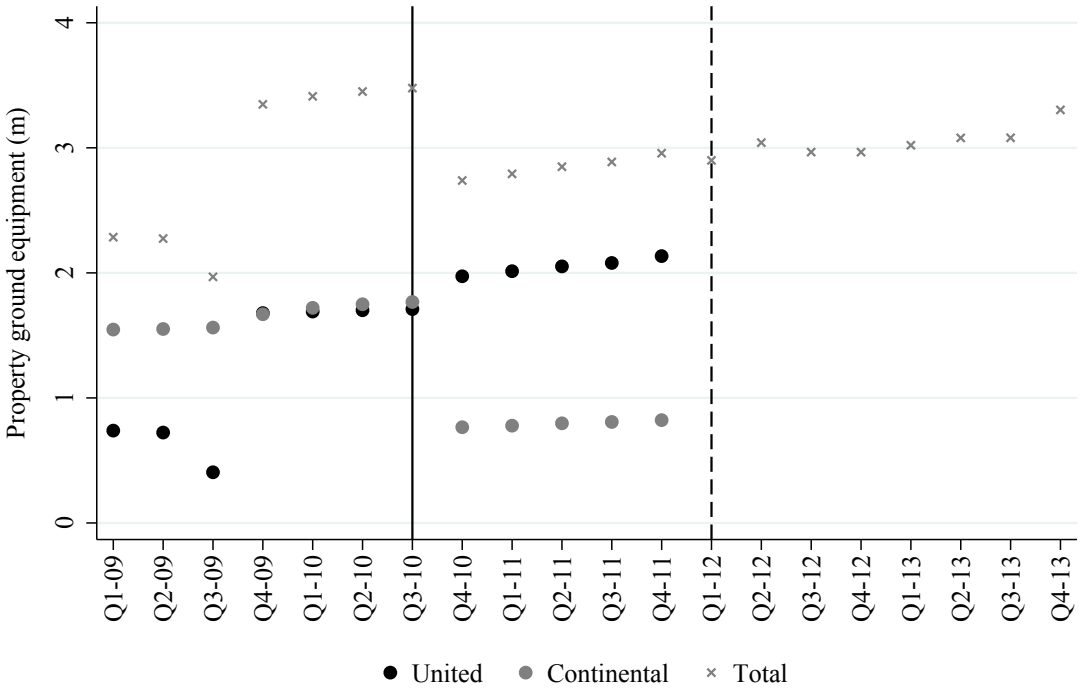
Notes: Authors' calculations based on BTS data. Solid line: merger approval; dashed line: joint report of information to the BTS, as reported in Table 1.

Figure B.5: Equipment, Delta and Northwest.



Notes: Authors' calculations based on BTS data. Solid line: merger approval; dashed line: joint report of information to the BTS, as reported in Table 1.

Figure B.6: Equipment, United and Continental.



Notes: Authors' calculations based on BTS data. Solid line: merger approval; dashed line: joint report of information to the BTS, as reported in Table 1.