

Does Competition Increase Quality? Evidence from the US Airline Industry*

Ricard Gil[†]

Myongjin Kim[‡]

Johns Hopkins Carey Business School

University of Oklahoma

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Abstract

In this paper we study the impact of competition on the provision of quality in the US airline industry. Using changes in competition triggered by LCCs entry and airline mergers, we find that an increase in competition increases the provision of quality of major incumbent and non-merging airlines respectively by increasing the number of flights and seats available in a route as well as improving their on-time performance with less frequent cancellations and flight delays. Contrary to previous findings in the literature, our evidence suggests that an increase in competition unambiguously increases consumer surplus since prices go down and quality goes up.

Keywords: competition, airlines, quality, flight frequency, seat availability, on-time performance.

JEL codes: D22, D43, L11, L13, L93

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[†]Ricard Gil is Associate Professor at The Johns Hopkins Carey Business School, Phone: +1410234948; Fax: +14102349439; email: ricard.gil@jhu.edu.

[‡]Myongjin Kim is Assistant Professor in the Economics Department at the University of Oklahoma, Phone: +14053253326; Fax: +14053255842; email: mjkim@ou.edu.

1 Introduction

While the effect of competition on price is by now well understood in economics and management (Spence, 1975), the nature and consequences of non-price competition between firms remains far from clear (Spence, 1977). While some items such as location or hours in service are observable and unambiguous in consumer preferences, quality is a rather subjective and uncertain product dimension. Because quality provision is costly, firms may react to competition by either increasing or decreasing quality depending on how sensitive consumers are to quality relative to prices. Therefore the impact of competition on quality is uncertain, and requires an empirical answer.

Moreover, understanding the impact of competition on all margins and strategic decisions of the firm is important for various reasons. While an increase in competition may likely decrease prices and therefore unambiguously increase welfare and decrease profits, the impact on quality and other strategic variables offer ambiguous overall effects on firm profits, consumer surplus and most importantly total welfare. Therefore, policy makers and government agencies attempting to regulate entry and competition in any industry should understand the consequences of their policies on both qualitative and quantitative dimensions, and not only on those that are easily observable and quantifiable.

Even though defining quality is always subject to debate and discussion, a few industries provide consensus on how to quantify quality across products and firms. For example, the letter grading system in the hospitality industry allows consumers to distinguish more hygienic restaurants from less so (Jin and Leslie, 2003). In the healthcare industry, it is widely believed that patient time recovery is a good measure of quality (Cutler et al, 2014). Similarly, the airline industry is an optimal setting to investigate the impact of competition on quality provision. On the one hand, consumers value flight frequency because it allows them to be more flexible regarding their travel schedule (Forbes and Lederman, 2013; Berry and Jia, 2010). On the other hand, consumer value reliability and therefore are likely to discount airlines with frequent delays and cancellations (Prince and Simon, 2014a and 2014b). We contribute to this literature by investigating the impact of competition in the US airline industry on quality from both the side of travel flexibility and

reliability. We measure the former through flight frequency, seat availability and average plane size, and the latter through cancellations, arrival and departure delays.

For this purpose, we exploit two plausible sources of exogenous variation on competition in the US airline industry. As documented in the literature (Ito and Lee, 2003; Richard, 2003), over the last 30 years the US airline industry has seen dramatic changes to its structure. On the one hand, the industry saw a significant degree of consolidation through major airlines' mergers (more recently: Delta-Northwest, United-Continental, American Airlines-US Airways), which reduced the number of legacy carriers and thereby alleviated competitive pressures. On the other hand, the airline industry changed significantly through the wide adoption of regional jets¹ and the consequent expansion strategy of multiple low cost carriers (LCCs hereafter), such as Southwest, JetBlue, Virgin America, or Spirit, which increased competition on many routes. Because the lower cost of entry of LCCs (due to the adoption of regional jets) is exogenous to incumbents and so are mergers to non-merging airlines in a given route, we use these two sources of exogenous variation in competition to study the causal effect of entry of LCCs and airline consolidation (through mergers) on quality measures such as flight frequency, available seats, aircraft size, flight cancellations, and delays.²

Note that studying these two sources of variation in the same context is novel because these two types of events change competition and the distribution of firm size in different ways directions. While the former increases competition upon any market that experiences entry by adding a small firm, the latter may increase or decrease competition as the actual number of firms active in a given market decreases by adding a new large firm in substitution of two individually smaller companies. This means that by examining the impact of both sources of changes in competition in an integrated manner, we are able to address issues of potential asymmetry of the impact on non-price variables, which is important to ultimately determine changes in welfare.

Another contribution of this paper to the existing literature is that we disentangle two different

¹See Table 2 in Forbes and Lederman (2013) and <http://www.nbcnews.com/id/24390211/page/2/#.Vbch1Pmzl74> for a description of the wide adoption of the regional jet as a plausible exogenous change in technology.

²We show later in the paper and in the appendix that LCCs entry in a route and mergers were uncorrelated with average airline ticket prices, load factors and ticket sales (Tables A1 to A4) and that incumbent airlines were not likely to acquire regional jets (Figure A1).

consequences of mergers: (1) mergers' effects on non-merging airlines on a route that the merging airlines were flying previously; and (2) mergers' effects on the non-merging airlines in a route that the merging airlines are likely to enter. The former case will be associated with a decrease of competition in a route while the latter will be a potential increase of competition (in line with the case of LCCs entry threats described above).

Our data combines DB1B market and ticket data (flight level and ticket level data), T100 flight characteristics data (seats, number of flights, average number of flights, distance measure, etc.), and OTP (on time performance data including cancellation, departure delay, arrival delay) during the time period of 1993 and 2013. In the end, our final data set has evidence of behavior for 7 major airlines in 7762 markets³ during 84 quarters spread along 21 years. All these data combined comes out to 79692 airline/market/quarter/year data points⁴ that allows us to explore the impact of LCCs entry threats in 1258 routes on major airlines incumbents' behavior and the impact of 5 mergers between major carriers and 1 merger between LCCs in 1207 routes where the merged airlines were previously flying and 997 routes with entry threats by the merged airlines in the 21 years that our data spans.

The findings in this paper extend the literature in several ways. First, this paper shows that incumbent carriers react to more competition by increasing the frequency of flights and number of seats and by decreasing cancellations, departure and arrival delays if there is a threat of an LCC entering the route. Second, we show that carriers react to competition differently at their hubs. An increase in competition results in an increase in flight frequency, the number of seats and aircraft size if there is a threat of an LCC entry in a hub relative to a non-hub airport. Third, we complement the study of Goolsbee and Syverson (2008) by evaluating how quality changes upon the entry threat of LCCs. We consider not only Southwest but all Low Cost Carriers (LCCs) and we extend the sample data period up to the year 2013. In contrast to Goolsbee and Syverson (2008), we find that in response to an LCC entry threat on route the airlines increase the number of flights and the number of available seats while roughly keeping plane size unchanged. Fourth,

³This is the number of routes ever flown by major airlines in the U.S. in our sample.

⁴This is the number of observations before trimming the sample data to look at the 25-quarter window surrounding the quarter in which LCCs appear in both endpoints.

upon a merger between incumbent major airlines, non-merging airlines increase the number of seats and flight frequency, and also increase the number of delays as getting closer to the official merger date. In routes not flown by merging airlines before, incumbent non-merging airlines increase their number of flights and number of seats. In terms of on-time performance, incumbent non-merging airlines also respond to the actual entry of merging airlines by reducing the number of cancellations, departure and arrival delays.

Needless to say, we are not the first people to either study the impact of competition on quality provision or competition in the airline industry overall. If anything, the closest papers to ours are a series of papers by Prince and Simon (2009, 2014a and 2014b respectively) where they study the impact of multimarket contact, LCC entry and mergers on on-time performance of other airlines in the US. Our paper differs from those in that we focus on the impact of competition on quality provided by incumbent major airlines (relative to LCC entry) and non-merging major airlines (relative to merging airlines in Prince and Simon, 2014b). While only Prince and Simon (2014a) uses the methodology in Goolsbee and Syverson (2008), we complement and improve on their evidence in that we use their same methodology to study the impact of both LCC entry and mergers on flight frequency, seat availability and on-time performance of incumbent non-merging airlines in a comprehensive and systematic manner. Our results differ from theirs in that we find that an increase in competition increases quality provision.

The paper is structured as follows. We discuss the relevant literature and our contribution to it in further detail in section 2 below. Section 3 describes our data and background of the US airline industry. In section 4 we present our methodology and results. We provide a discussion of our results and conclude in section 5.

2 Literature Review

This paper directly contributes to the literature on the impact of entry and competition on incumbent behavior. How market concentration and competition shapes firm behavior and market outcomes is a classical question in economics and therefore we would not do justice here if we only cited a few papers as this question has been explored in industries as different as health care,

education, financial services, manufacturing and entertainment. For this reason, in this section we only focus on the literature that studies the impact of regulation and competition in the airline industry and therefore closest to our paper.

Mayer and Sinai (2003) and Mazzeo (2003) examine whether airport concentration leads to better on-time performance. While the latter finds that higher airport concentration leads to better on-time performance as large carriers internalize more of the congestion costs, the former shows with a different sample that higher concentration is correlated with higher prevalence and duration of flight delays. Richard (2003) emphasizes the importance of flight frequency when determining welfare consequences of an airline merger. For that reason, he develops a model of airlines' passenger choice and the supply of number of flights in order to quantify consumer welfare change in airline mergers. Using simulations, Richard (2003) finds that welfare gains may exist despite price increases once flight frequency is taken into account. Therefore, when examining the impact of entry and competition in the US airline industry it is important not only to pay attention to price but also quality dimensions such as on-time performance, flight frequency and seat availability. Similarly, Brander (1990) study market conduct in the airline industry through the use of conjectural variation methodology in duopoly markets. They find that data patterns are consistent with quantity-based competition rather than price-based competition. Their result stresses even further the need to study non-price dimensions when investigating the impact of entry and competition in the airline industry as well as antitrust considerations (see Snider, 2008).

Ito and Lee (2003) document the entry and growth of LCCs in the US airline industry. They find that LCCs are more likely to enter more highly dense markets and that LCCs may compete for network carrier revenue. This is important for our empirical exercise because we and others have used entry of LCCs as a source of exogenous competition for major carrier incumbent airlines.⁵ As a matter of fact, Berry and Jia (2010) present and estimate a structural model of competition of the US airline industry and find that the expansion of LCCs, together with changes in price-sensitivity of airline passengers, explains up to 80 percent of the reduction in profit margins experienced by major incumbent carriers between 1999 and 2006. Prince and Simon (2009) show how multimarket

⁵We define the list of low cost carriers according to their classification in Ito and Lee (2003).

contact between airlines lowers on-time performance by increasing flight delays and that this relation is stronger in more concentrated markets. More recently, Chen and Gayle (2013) study the impact of mergers on quality provision measured as the number of stopovers in a given airticket sale, and find that quality (number of stopovers) goes down (up) when two airlines merge. Ater and Orlov (2013) examine the spread of the internet in airline distribution channels and find that the increase in price competition due to the spread of the internet increased scheduled flight times and delays, lowering quality. Chandra and Lederman (2015) study the impact of competition on airticket price dispersion in the Canadian airline industry. Their evidence shows that competition increases cross-cabin fare dispersion but decreases fare differences between economy travellers.

Finally, the closest papers to ours are perhaps Goolsbee and Syverson (2008), Prince and Simon (2014a) and Prince and Simon (2014b). On the one hand, Goolsbee and Syverson (2008) examines the effect of market entry threat by Southwest on incumbents. They find that the threat of a Southwest entry leads to a decrease in airfares, but they do not find an effect on flight frequency and available seats. On the other hand, Prince and Simon (2014a) uses entry of LCCs to investigate whether incumbent airlines improve on-time performance when competition increases, and Prince and Simon (2014b) measures how merging airlines change their behavior before and after a merger occurs. Interestingly, they find that entry of LCCs worsens on-time performance of incumbent airlines and that merging airlines improve performance in the long-term (3 to 5 years after merger) but not in the short-term (first two years after merger). They justify their first result arguing that airlines prioritize price competition over quality and so when they lower prices they must lower quality as well. Similarly, over time merging airlines may increase prices and therefore increase on-time performance.

We build upon these papers in that we offer a comprehensive study of the impact of competition on quality provision in the airline industry. We borrow the methodology in Goolsbee and Syverson (2008) and study the impact of competition on flight frequency, seat availability and plane size (average number of seats per flight). These are important measures of air travel quality because they provide more flexibility and travel options to passengers. We also provide evidence on the

impact of competition on-time performance as in Prince and Simon (2014a) and Prince and Simon (2014b) to make sure our results are not driven by differences in quality measures. Moreover, we use two different sources of exogenous changes in competition. First, we use entry of LCCs in the same way that Goolsbee and Syverson (2008) and Prince and Simon (2014a). Second, we use the impact of mergers as an exogenous decrease in competition (number of firms decreased) on non-merging airlines. Our findings using both exogenous sources in competition are consistent with each other. Let us now describe our data before presenting our findings.

3 Background and Data

We study the effect of competition on the service quality of incumbents and non-merging airlines using low cost carriers' entry threat and merger announcements as measures of changes in competition in airline markets. Unlike the existing literature, we study the impact of entry threat by all the LCCs on incumbents and also examine the impact of mergers in two different cases: (i) entry threat by the merged airlines' after their mergers has taken place in routes not entered prior to the merger, and (ii) non-merging airlines' responses to the competitors' mergers in the routes that merging airlines had already entered prior to their merger.

The data that we use in this paper is the result of combining several data sets. We obtain airline ticket information from the DB1B ticket and market data from RITA both in the Bureau of Transportation Statistics. These data contain not only information for the ticket carriers but also the operating carriers and reporting carriers of each flight. We complement these data with information on aircraft type, operator information as well as flight frequency from the T100-B43 airline-aircraft data from Department of Transportation. To merge all these together, we checked the ownership of the flight which then allows us to match with DB1B data and calculate concentration measures such as the HHI. We also employ other T100 flight characteristics data (seats, number of flights, average number of flights, group of aircraft, distance flown, number of total passengers, and dummy of freighter flights), and OTP information from BTS (on-time performance data including cancellation, departure delay, and arrival delay).⁶

⁶The final data sample size is smaller due to T100 data set. The number of LCCs entry threats are overall more

We drop the freighter flights and the flights that have 0 passengers. We take a ticketing carrier variable from DB1B market data because of the following two reasons: first to identify and match with the operator from other data sets like DB1B ticket, coupon, and T100-B43, and second in order to avoid overstate the impact of LCCs entry threat by overlooking one of the industrial aspect, i.e. code-sharing between airlines. Our route definition is by its two endpoint airports, and we consider only direct non-stop flights on a route as in Goolsbee and Syverson (2008). We construct our sample to include routes between airports that major airlines and LCCs ever fly. Our sample does not include routes where LCCs appear at a second endpoint airport simultaneously with flying the route indeed because of the difficulty to disentangle the entry threat from the actual entry as discussed in Goolsbee and Syverson (2008).

When we first study the effect of LCCs entry threat on incumbent's behavior, we follow the definition and classification of LCCs suggested in Ito and Lee (2003). Therefore the list of LCCs in our data is as follows: Accessair Holdings, Air South Inc., AirTran Airways Corporation, American Trans Air Inc., Eastwind Airlines Inc., Frontier Airlines Inc., Frontier Flying Service, JetBlue Airways, Kiwi International, Morris Air Corporation, National Airlines, Pro Air Inc., Reno Air Inc., Southwest Airlines Co., Spirit Air Lines, Sun Country Airlines, Valujet Airlines Inc., Vanguard Airlines Inc., Western Pacific Airlines, and Allegiant Air.

We also study how mergers may increase or decrease the intensity of competition in a route. On the one hand, we study the impact of the five mergers between major airlines like American Airlines, Trans World, US Airways, Delta, Northwest, United Airlines, Continental, and a merger between LCCs such as Southwest on the non-merging airlines, that is, the airlines that did not participate in mergers in a route, and that they were present in a market before and after the merger took place. The non-merging airlines in a given route at a given time in our sample are seven major airlines such as American Airlines, Trans World, US Airways, Delta, NorthWest, United Airlines, and Continental. The set of non-merging airlines varies across time within a market (route).

than this number in the DB1B data set before merging with T100. It is well-known that T100 data set has less than perfect coverage for small routes, which are routes that are disproportionately served by low cost carriers. Therefore, our results are likely to underestimate the impact of LCC entry on quality but have no effect on the merger analysis on the provision of quality by non-merging incumbent airlines.

On the other hand, the merger between two airlines may increase the entry threat of the new airline into a market that neither of the merging airlines was operating in prior to the merger. Therefore, we are also able to study the impact of an increase in entry threat by merged airlines on quality service of incumbents in routes the merged airlines enter after the merger.

In particular, the six mergers that we study occurred⁷ since 1993 and all the way to 2014. American Airlines' merged with TWA in 2001; America West merged with US Airways in 2005; Delta merged with Northwest in 2010⁸; United merged with Continental in 2012; American Airlines merged with US Airways in 2013; and Southwest merged with Air Tran in 2014.⁹ We study the behavior of non-merging airlines before and after the merger completion as well as before and after the merger discussion started. See in Table 1A a complete list of mergers between 1993 and 2014 in the US airline industry.

Because we examine the number of flights as outcome, we analyze the sample both including and excluding the slot-controlled airports. The US Department of Transportation requires airlines to acquire the authorization of their number of flights in and out of specific airports in order to control severe air transportation congestions. The slot-controlled airports are as follows: La Guardia airport, JFK airport, Newark, and Reagan National airport. The slot restrictions at Chicago O'Hare have expired in the early period of our sample and are not included in our sample.

Table 1B describes the variables used in our empirical analysis. The average incumbent airline in our sample supplies 7560 seats in a given quarter and route distributed among 470 flights. These two distributions are highly skewed and so the average number of seats comes down to 59 (this is to be understood as the average capacity of a flight in our sample). The routes in our sample are half of them flying in or out of a hub and have an HHI of 0.68 over 1. Arrival and departure delays are on average 6 and 10 minutes respectively (so lots of flights "win" time in the air), while 20% of flights arrive and depart 15 minutes late or later. Finally, in our sample only 1.3 percent of flights get cancelled. The fraction of cancellation varies largely across routes from absolute zero to 7%.

⁷These are merger completion dates. We consider completion as the date of one of the two parties' booking ended.

⁸Although the discussion on the possibility of a merger had started around January 2008.

⁹In our sample, Southwest's merger appears as the merger in process rather than completed merger because our sample spans between 1993 and 2013.

Next we want to define different trends between 1993 and 2013 that shed light on competition in the US airline industry. Figure 1 shows the average number of carriers per route when we exclude small regional airlines. It is important to notice that the average number went from 1.6 major airlines in a route in 2000 to 1.2 in 2005 and it has stayed at 1.2 since then. The graph and trend change a lot when we include all airlines regardless of their size. If anything, there has been an explosion from 1997 (1.6 airlines per route) to 2009 (2.2). Note that since 2009 (possibly as a consequence of the financial crisis) the average number of airlines has gone down from 2.2 to 2 airlines per route.

This trend is even more clear when we look at the average number of LCCs per route in Figure 3. We define here LCC according to our definition above. This figure shows how LCCs have expanded their networks and their average number per route went from close to zero in 1993 to 0.5 in 2013, with almost a linear trend between 1993 and 2010. This pattern is telling of the systematic expansion of these smaller airlines in the last decade. Finally, Figure 4 shows that this increase in the presence of LCCs across routes in the US is almost fully responsible for the increase in average number of airlines per route in the US during the last decade and therefore is not negligible as a competitive threat to major incumbent airlines.

Because we use entry threat in the spirit of Goolsbee and Syverson (2008), it is important for us to define how we measure potential entry in both the case of LCCs and the mergers of major airlines. In the former, we refer to the triangle describing the threat in Goolsbee and Syverson (2008) and define LCCs entry threat as the point in time when an LCC starts operating at both end points of a route but they do not have any service in the route yet. In the latter, we define a variable for when a merger is first announced based on the start of merger discussions between two airlines. The dummy variable “Merger first on route” is based on the date (year and quarter) when one of the two airlines booking ended, meaning that the merger is in process. These two strategies have as a result that we observe entry threats of LCCs in 5247 routes out of a total 7762 routes that appear in the 10% U.S. airline sample data between 1993 and 2013, of which only 1715 saw entry of the LCCs with direct flights by the end of our sample period. We have 2229 routes

that merged airlines have not flown before mergers and of which 1232 routes were entered by the merged airlines after mergers.

Once we have described our data here, the following section presents our methodology and results on the impact of competition on quality provision as measured by number of flights, seat availability and plane size (average number of seats per flight) together with on-time performance measures used by others in the quality provision literature in airlines.

4 Results

In this section, we present our methodology and results of the impact of changes in competition on the number of seats, flights and seats per flight as well as airline on-time performance quality measures. We first provide results of using LCCs entry as an increase in competition, and later we use mergers of two incumbents as changes in competition in a market, on the other incumbent airlines in that particular market. Note that these two cases will differ in that while the former represents an increase in competition by a smaller (potentially more efficient) airline, the latter represents a decrease in the number of existing airlines through the creation of a larger (not always more efficient) airline. We qualify the role of these differences across the two settings in our discussion of the results. Last, we examine the impact of potential entry threat by newly merged airlines.

4.1 Low Cost Carriers' Entry

We follow in spirit the methodology in Goolsbee and Syverson (2008) to estimate the impact of an increase in competition due to LCCs entry in route markets. For that reason, we run

$$\ln y_{ijt} = \sum_{k=1}^8 \alpha_k D_{jt}[T-k] + \sum_{l=0}^3 \beta_l D_{jt}[T+l] + \sum_{g=0}^2 \delta_g Entry_{jt}[T+g] + \gamma X_{ijt} + \theta_{ij} + \theta_{it} + \theta_{jt} + \epsilon_{ijt}$$

where y_{ijt} is the outcome variable (seats per week, flights per week, seats per flight and week) for airline i in route j and quarter t , $D_{jt}[T-k]$ and $D_{jt}[T+l]$ are dummy variables for whether current period t is k quarters before LCCs entry in either endpoint of route j or l quarters after

respectively (and yet not actively flying route j), $Entry_{jt}[T + g]$ is a dummy variable takes value 1 once entry occurs and g periods after entry, and X_{ijt} are variables that may vary over time, airline and location such as the route j HHI in quarter t , whether airline i has a hub in either airport covering route j , and the interaction between these two variables. In addition to these variables, our analysis also introduces carrier-route (θ_{ij}), route-quarter (θ_{jt}) and carrier-quarter (θ_{it}) fixed effects to control for unobservables at that level that drive airline decisions across markets and that are not captured by our independent variables. The introduction of these series of fixed effects is particularly important in our case because this is a good way to control for the endogeneity of entry when good instruments are missing. Finally, we assume the error term ϵ_{ijt} is independent and identically distributed as usual.

We start our analysis with results in Table 2. Using data at the quarter/carrier/route level from 1993 to 2013, we run the specification above for dependent variables $\ln(seat_{ijt})$, $\ln(flight_{ijt})$, and $\ln(avgseat_{ijt})$ with year, carrier-route and carrier-quarter fixed effects. Note that our results in columns (1) to (3) show that major carriers increase the number of seats and the number of flights after the announcement of entry as well as during and after entry occurs. We also find that the average number of seats per flight provided by incumbents decreases upon LCCs entry which basically means that although major carriers react to LCCs entry by providing more flexible schedules to passengers, they do so using in the margin smaller airplanes for any given route. Column (4) to (6) show very similar results and therefore these findings are robust to controlling for the route HHI, whether either end of the route is a hub for the airline, and the interaction between those two variables. If anything, we find that the number of flights is negatively correlated with market concentration and hub status, but airlines operate more flights out of their airport hubs when these show higher levels of market concentration.

Because LCC entry into a route in a specific quarter might be driven by unobservable factors that are not accounted for in the specification in Table 2, we introduce route-quarter fixed effects together with year and carrier-route fixed effects in Table 3. Our findings in Table 3 show that our results are robust to the introduction of route-quarter fixed effects. Major airlines increase the

number of flights and seats upon LCCs entry, but they do so using smaller airplanes. Finally, Table 4 repeats the analysis in Table 2 excluding those observations from slot-controlled airports because these may not have as much room for adjustment in terms of flights, seats or even type of planes. Our results are robust to the exclusion of these airports in the data.¹⁰ If anything, we do not find much of an effect on the average seats per flight. Because we are excluding slot-controlled airports, this lack of a result in columns (3) and (6) may be due to the fact that the remaining sample comes from smaller airports and airlines are already using smaller airplanes in such destinations.

Because Prince and Simon (2014a) examine other quality variables mostly measuring on-time performance, we use the same methodology above to analyze whether their results hold here. We show our finding in Tables 5, 6 and 7. Table 5 examines the impact of LCC entry on on-time performance measures such as average number of cancellations, average 15-minute departure delay, average 15-minute arrival delay, average minutes of departure delay, and average minutes of arrival delay. Our findings show that LCCs entry mostly decreases cancellations, departure and arrival delays (except for the fourth quarter prior to the LCC enter both endpoints of a route). Therefore, when combining these results with those in Table 2, LCC entry not only increases the number of flights and seats available to potential consumers (more flexibility in travel), but also it increases the reliability of travel. These two results unambiguously point at that an increase in competition improves quality of service by incumbent airlines. In Table 6 and 7, we repeat the analysis with route-quarter fixed effects (alleviating route-specific seasonality concerns) and excluding slot-controlled airports (congestion might be a confounder) respectively, and we find that our results are robust to the variation in specification and sample of analysis.

We note that our findings are different in nature to those in Prince and Simon (2014a). Because we basically use the same methodology, our results are likely to be different for a number of reasons.¹¹ First, our sample is much longer and it spans between 1993 and 2013 as opposed to their paper that only covers the time period between 1993 and 2004. Second, Prince and Simon

¹⁰Although not shown here, we replicate results from Goolsbee and Syverson (2008) using data from 1993-2004. Those results are available upon request.

¹¹Note that Prince and Simon (2014a) define a market as directional (ORD-EWR and EWR-ORD are two separate markets). We follow Goolsbee and Syverson (2008) and define a market as non-directional (ORD-EWR and EWR-ORD are the same market).

(2014a) only examines entry by a handful of airlines (legacy carriers and LCCs) while our analysis covers entry of up to 20 LCCs during our period of analysis (even though only 13 survive until 2013). The list of the LCCs that appear in our final sample data is: American Trans Air, Accessair Holdings, AirTran Airways, Allegiant Air, Eastwind Airlines, Frontier Airlines, JetBlue Airways, Kiwi International, Morris Air Corporation, Reno Air, Southwest Airlines, Spirit Air, Sun Country Airlines, Valujet Airlines, Vanguard Airlines, Western Pacific Airlines.

Because our definition of LCC is more comprehensive, our assumption of exogenous entry may be at risk. For this reason, we provide evidence later in the paper that LCC entry was not driven by local demand shocks. We argue that the wide adoption of regional jets as change in technology lower the cost of entry of LCCs in markets was previously overlooked (Forbes and Lederman, 2013). Note that this is consistent with the finding of decreasing prices upon entry of Southwest in Goolsbee and Syverson (2008). We also show in Figure A1 in the appendix that incumbent airlines did not acquire regional jets relative to wide and narrow body airplanes before and during our sample period.

Another advantage of our broader definition of LCCs is that we are able to cover a larger set of markets than others are. Nonetheless, it is fair to say that the US airline industry has changed a lot in the last 10 years of our data and perhaps that has also had an effect in the difference of results between Prince and Simon (2014a) and our paper.

4.2 Mergers As Drivers of Changes in Competition

In this second part of the results section, we use mergers as the source of exogenous variation in two different ways. On the one hand, we use the fact that the number of firms in a market changes when two firms merge and that the merger is exogenous to those incumbent non-merging airlines already operating in a market where the two merging firms were operating.¹² On the other hand, the merger between two airlines that were not operating in a route but that each separately operated in a different extreme of that route increases the probability of entry of the newly formed

¹²Take for example the route OKC-DCA where US Air, AA, SW, and UA operated. Since the merger between US Air and AA, the market has been served by SW, UA, and the newly merged AA. In this particular market, we only evaluate the behavior of SW and UA, that is, the incumbent non-merging airlines.

airline in that route in the same spirit as Southwest in Goolsbee and Syverson (2008). Therefore, our second set of evidence in this section examines the impact of entry of merging airlines on incumbent non-merging carriers.¹³

We created Figure 5 to illustrate both these types of variation due to a merger. Our incumbent in the regression specifications below will be American Airlines which is the major airline flying all routes in the figure (AB, BC, CD and DA). When United Airlines and Continental Airlines merged, this merger had very different consequences for entry and competition in each one of these four routes. Note that CD and AB are virtually unchanged as AA will continue to face one airline in this route, but that AD and BC will change their competition status in different ways. On the one hand, AD will see the number of airlines go from three to two increasing market concentration and softening competition faced by the incumbent non-merging airline American Airlines. On the other hand, the likelihood of entry of the new airline (resulting from the merger between CO and UA) in the BC route is quite high because both airlines had their positions in B and C, respectively. In the spirit of Goolsbee and Syverson (2008), we argue that AA faces more competition in BC due to the merger even if entry has not occurred just yet.

For both exercises, we use the same methodology as in the previous section (see Goolsbee and Syverson, 2008) and run OLS regressions such as

$$\ln y_{ijt} = \sum_{k=1}^8 \alpha_k D_{jt}[T-k] + \sum_{l=0}^3 \beta_l D_{jt}[T+l] + \sum_{g=0}^2 \delta_g \text{onRoute}_{jt}[T+g] + \gamma X_{ijt} + \theta_{ij} + \theta_{it} + \theta_{jt} + \epsilon_{ijt}$$

where y_{ijt} is the outcome variable (seats per week, flights per week, seats per flight and week) for airline i in route j and quarter t , $D_{jt}[T-k]$ and $D_{jt}[T+l]$ are dummy variables for whether current period t is k quarters before merger (or entry threat due to a merger) occurs in market j or l quarters after respectively. $\text{onRoute}_{jt}[T+g]$ is a dummy variable takes value 1 once merged

¹³Take again as an illustrative example the merger between AA and US Air. Prior to the merger, AA operated in La Guardia airport (NY) but not in Manchester (NH). US Air operated in Manchester (NH) but not in La Guardia (NY) with the exception of their shuttle service. Meanwhile, Delta was a monopoly on the route Manchester-La Guardia. After the AA-US Air merger, and according to the definition of entry threat by Goolsbee and Syverson (2008), the probability of entry by the newly merged AA increases in the Manchester-LaGuardia route and it becomes a threat to the only incumbent carrier Delta in the route. In this particular market, we only evaluate the behavior of the incumbent Delta.

airlines' entry occurs (or in case that we analyze the effect of merger in routes that merging airlines flew previously, the dummy takes value 1 once two merging airlines start operating as one entity) and g periods after entry, and X_{ijt} are variables that may vary over time, airline and location such as the route j HHI in quarter t , whether airline i has a hub in either airport covering route j , and the interaction between these two variables. In addition to these variables, our analysis also introduces carrier-route (θ_{ij}), route-quarter (θ_{jt}) and carrier-quarter (θ_{it}) fixed effects to control for unobservables at that level that drive airline decisions across markets and that are not captured by our independent variables. The usual assumption regarding the error term ϵ_{ijt} applies.

Let us first go through the analysis that estimates the incumbent response to mergers in markets where merging airlines were already operating in a market. In this case, a merger may be equivalent to a decrease in competition (the number of airlines goes down and market concentration goes up) or an increase in competition (if non-merging airlines perceive the merging new airline as a threat). We provide evidence of the effect on flight frequency, number of seats and average number of seats in Tables 8, 9, and 10. Table 8 shows that there is an increase in the number of seats and flights offered to consumers by major incumbents. This increase in availability of seats and flights does not translate into a change of the average number of seats offered per flight and therefore there is no apparent change in airplane size. Table 9 repeats this analysis using route-quarter fixed effects and finds similar results. Finally, Table 10 excludes slot-controlled airports and again finds qualitatively similar results. If anything, Table 10 shows that the increase in number of flights statistically appears even before the merger occurs. This could be explained by the fact that non-slot-controlled airports are on average smaller airports and major incumbent airlines have a relatively bigger presence in these smaller airports than they do at bigger hub airports. Their larger market size would trigger a stronger response from these major incumbent airlines.

Tables 11, 12 and 13 replicate the regressions above using as dependent variables on-time performance indicators. Our findings here show that incumbents react to mergers of two airlines already flying in their route with an increase in departure and arrival delays. There is no statistically significant changes in the number and probability of cancellations. This result is robust

to the inclusion of route-quarter fixed effects in Table 12. Interestingly enough, our findings in Table 13 (when we exclude slot-controlled airports) show incumbent major airlines are more likely to decrease the number of delays closer to the official merger date. The impact of this change of behavior is probably undone once the merger takes place as we observe an increase in delays when the merger first comes into place.

Finally, as we have explained above (and in Figure 5) two airlines that merge may be combining resources in a market (two different airports) that neither airline was flying prior to the merger. The merger then will increase the probability of entry of the new airline in that route (route BC in Figure 5) and therefore increasing the likelihood of new competition faced by the incumbent major airline (American Airlines in route BC in Figure 5). We study this impact of mergers on incumbents in Tables 14 to 19. We first analyze the impact of entry of a merging airline on incumbents' flight frequency, number of seats and average number of seats in Tables 14, 15 and 16. Table 14 shows that an increase in the likelihood of entry increases the number of flights and number of seats available but it does not change the airplane size used in a route. Table 15 shows that this results is robust to the inclusion of route-quarter fixed effect, and Table 16 shows robustness when excluding slot-controlled airports.

If anything, it is interesting to highlight the fact that we observe how the number of flights first increases before the new merging airline enters the route and decreases after entry occurs. In less congested airports (those that are not slot-controlled) this decrease in the number of flights does not come along with a decrease in the number of seats available. This means that incumbent airlines increase the size of their airplanes even though they reduce the number of flights leaving the number of available seats unchanged. We can think of two reasons why this happens. First, preemption may fail and therefore once entry occurs incumbents' reoptimize their operations in airports. Second, because these are less congested airports, the competitive conduct between incumbents and entrants may change upon entry accommodating each other in the market.

We conclude this section with Tables 17, 18 and 19 where we repeat the analysis in the previous three tables using as dependent variables the on-time performance indicators. We find that once

the new merging airlines enters the route, incumbent airlines lower the number of cancellations, departure and arrival delays. These results are robust to the inclusion of route-major fixed effects (Table 17), route-quarter fixed effects (Table 18), and the exclusion of slot-controlled airports (Table 19). Note that these analyses and findings differ from those of Prince and Simon (2014b) in that they examine the change in behavior of merging airlines before and after those endogenously choose to merge with each other while our analysis focuses on the change in behavior of incumbent airlines before and after other airlines choose to merge. Their findings show no change in the short-term but a decrease in delays in the long-term. Our results suggest that perhaps their long-term finding is not due to an increase in efficiency due to the merger in the merging airlines but an optimal strategic reaction to a decrease in delays and cancellations by incumbent airlines.

4.3 Alternative Explanations and Robustness Checks

While our results are robust across methodologies and specifications, it is important to investigate further the potential role of alternative explanations and provide additional robustness checks for our assumptions of exogeneity of LCCs entry and mergers on non-merging incumbent airlines.

An alternative explanation is that LCC entry and mergers are not exogenous, but driven by unobservable demand shocks. We investigate whether this is the case by checking whether prices, load factor and ticket sales increase prior to LCC entry and mergers. Table A1 in the appendix shows that average prices in a market are not correlated with LCC entry in column (1), or mergers among incumbent firms in column (2) or mergers among potential entrants in column (3).

Tables A2 and A3 examine whether the load factor (mainly tickets sold divided by number of available seats) with airline-quarter and route-quarter fixed effects respectively. The evidence in both tables shows that if anything the load factor decreased prior to entry and mergers with the increase in the number of airplanes and seats available in a given route. This result is important because it also shows that not only incumbent airlines increased the number of available flights and seats, their load factor also went down and potentially this means that air travel became more comfortable for the average traveller (more space and seat availability per flight). Additionally, Table A4 in the appendix repeats the same analysis of the load factor with ticket sales at the route

level. We find again no evidence that LCC entry or mergers are preceded by increases in demand at the route level.

Another alternative explanation that defies our exogeneity assumption is that the introduction of regional jets lowered the entry costs of both regional airlines and legacy carriers. Figure A1 in the appendix shows the number of newly purchased or acquired airplanes by airline and by body type (wide, narrow and regional jet). We show graphs (a) to (f) for United Airlines, American Airlines, Delta, Northwest, US Airways and Continental respectively. It is easy to see that all six airlines are more likely to acquire wide and narrow airplanes than regional jets in any given year. The only exception would be Continental Airlines in the year 2000 with 60 regional jets but this resembles a similar increase in narrow body planes the year before and a moderate increase of wide body planes during the same period of time. This evidence suggests that even though regional jets were available to all airlines only regional airlines widely adopted this new type of airplane. It is safe then to conclude that the introduction of regional jets decreased entry costs of regional airlines relatively more than entry costs of legacy carriers.

Finally, we show in Table A5 in the appendix how LCC entry at one or both endpoints changes probability of LCC entry in a given route.¹⁴ Similarly to Goolsbee and Syverson (2008) with Southwest entry, we find that entry of any LCC in both endpoints more than triples the probability of entry in a given route from 0.34% to 1.13%. This evidence provides stronger support for our claim about the exogeneity of LCCs entry to market and route characteristics.

5 Discussion and Conclusion

In this paper we study the impact of competition on the provision of quality in the US airline industry. Using methodology previously used by Goolsbee and Syverson (2008) and Prince and Simon (2014a), we find that major incumbent airlines increase the convenience of travel through increasing the number of flights and seats available as a reaction to an increase in competition due to LCCs entry. We also find that the same major airlines also decreased the number of cancellations

¹⁴We follow here Table 1 in Goolsbee and Syverson (2008) where they show how Southwest's entry at the endpoint airports increases the probability of actual entry into the route.

and delays when they faced entry of an LCC. Therefore, one may conclude that entry of LCCs unambiguously increases consumer surplus since prices did not increase (stayed constant in our evidence in Table A1 and went down in Goolsbee and Syverson (2008)) and quality goes up.¹⁵

To contrast this finding of LCC entry, we also use mergers between major airlines both as a decrease and an increase in competition faced by non-merging major airlines at any given point in time. On the one hand, an airline merger decreases competition in those routes that were previously operated by both merging airlines as the merger will reduce the number of airlines flying that route. On the other hand, an airline merger may increase competition in a route if neither of the merging airlines flew previously that route but each one of them operated in different endpoint airports of the route. The merger increases the probability of entry of the new airline on a route that was not previously flown by either of the pre-merger airlines in the same way that Southwest entry in two airports increases the probability of entry in the route that connects both airports (Goolsbee and Syverson, 2008).

Our findings show that while the use of the latter empirical variation (entry due to a merger) yields the same results as LCC entry, the former variation (the number of operating airlines decreases) provides a set of mixed and yet interesting results. A decrease in competition without exit is not associated with an increase in the number of flights or number of seats available to travelers, but it is associated with an increase in the number of cancellations and delays in the route. Then we can draw two main conclusions when we combine all three sets of results. First, the overall evidence suggests that entry is associated with an increase in quality regardless of the identity of the entrant (LCC or merging major airline). Second, a reduction in competition that occurs due to the consolidation of the industry does not seem to lower the number of flights or seats available (if anything they increase) but it does decrease quality through an increase in the number of flight cancellations and number of departure and arrival delays.

Our results complement those in Goolsbee and Syverson (2008) because they show that not only major incumbent airlines react to entry of LCC with a decrease in prices, but also they provide higher quality of travel. They do so from an ex ante point of view in that incumbent

¹⁵Because we do not observe costs of raising quality, we cannot qualitatively evaluate changes in total welfare.

airlines increase the number of flights and number of seats (even if using smaller planes) available to travelers, and also from an ex post perspective by reducing the number of cancellations and delays. However, our results are at odds with evidence in Prince and Simon (2014a) where they find that increase of LCCs drive incumbent airlines to increase delays and therefore lower their on-time performance. Despite using the same methodology, our analysis is slightly different from theirs in three main ways. First, our data set covers ten more years (1993 to 2013) than theirs. Second, our list of LCCs is more comprehensive and contains sixteen LCCs while theirs only three. Third, we complement the LCC entry section with the impact of airline mergers on non-merging incumbent by separating the routes in the sample into two groups, existing route service and new route entry. The growing importance of LCCs and the ever changing nature of the airline industry may be a reason why airlines are changing the way they react to entry when we examine this topic, and yet another reason why future research should study further the impact of competition on quality provision in airlines and other industries.

Our findings offer clear policy and managerial implications. From the policy perspective, it is important to evaluate the impact of competition on both prices and quality. Failing to recognizing the impact of competition on quality may lead policy makers to underestimate or overestimate total gains of changes in regulation and industry liberalization. From the point of view of the manager, our paper highlights the importance of non-price competition and strategic entry deterrence through the use of non-price competitive dimensions. Our results also offer managerial implications on how to strategically prepare for mergers in that it may increase competition through the creation of a new stronger competitor or trigger entry of the newly created company, or decrease competition as market concentration may indeed increase after the merger. In any case, incumbent firms may strategically react to mergers with prices and quality dimensions of competition.

Finally, our evidence suggests the presence of heterogeneity and asymmetries in how incumbents react to changes in competition depending on whether there is consolidation or actual exit or entry. To the best of our knowledge, the heterogeneity of the impact of competition on quality provision has been understudied in the existing literature and therefore remains an interesting topic for future

research. Furthermore, because quality changes may undo gains from price cuts, it is important to understand how competition policy and regulation affect all margins of firm decisions. Our study has focused on a few measures of quality in airline service such as convenience and flexibility with number of flights and seats available and on-time performance with number of flight cancellations and delays. Future research should provide evidence on other quality measures in this industry and even look for new measures that are easily comparable across other transportation sectors and other industries in general.

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Table 1A: Airline Mergers Since 1993

Mergers	Airlines	Year
Merger1	American Airlines TWA	2001
Merger2	America West US Airways	2005
Merger3	Delta Airline Northwest Airline	2010
Merger4	United Airline Continental Airline	2012
Merger5	American Airlines US Airways	2013
Merger6	Southwest Air Tran	2014

Year does not indicate the dates of discussion starts; rather merger completion dates

Table 1B: Summary of main variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Total seats	14355	7560.555	11283.46	0	186559
Total flights	14355	469.301	559.643	0	6847
Average seats	14355	59	191	0	17325
Hubs	14355	.526	.499	0	1
Fraction of hubs	14355	.465	.0510	.291	.587
HHI	14355	.684	.242	0	1
Arrival delay	11701	5.971	6.973	-28	104
Departure delay in minute	11701	9.901	5.463	0	93.896
Arrival delay 15	11701	.204	.091	0	1
Fraction of arrival delay	11701	.207	.053	0	.313
Departure delay 15	11701	.157	.080	0	1
Fraction of departure delay	11701	.162	.0305	.095	.229
Cancellation	11701	.017	.035	0	1
Fraction of cancellation	11701	.0133	.011	0	.068

Figure 1: Industry Features: Average number of carriers per route excluding tiny airlines

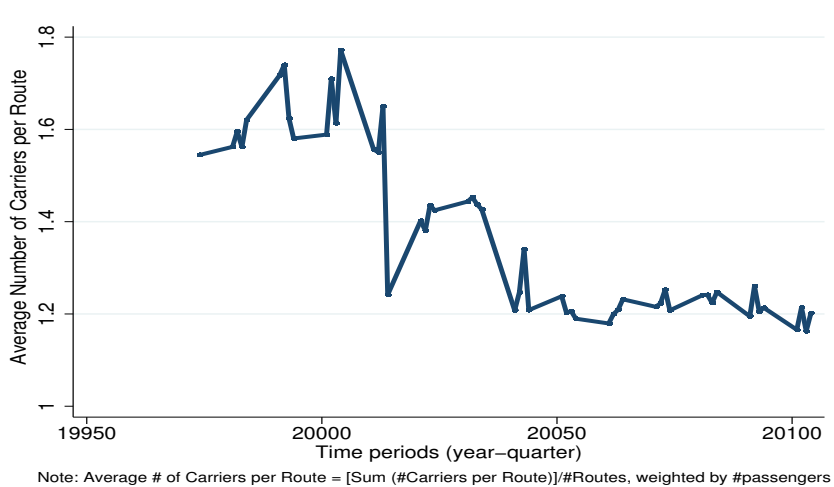


Figure 2: Industry Features: Average number of carriers per route

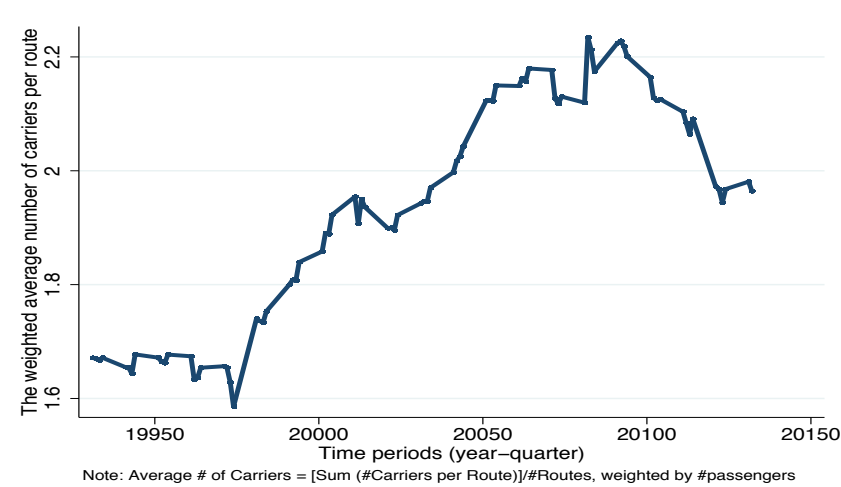


Figure 3: Industry Features: Average number of LCCs per route

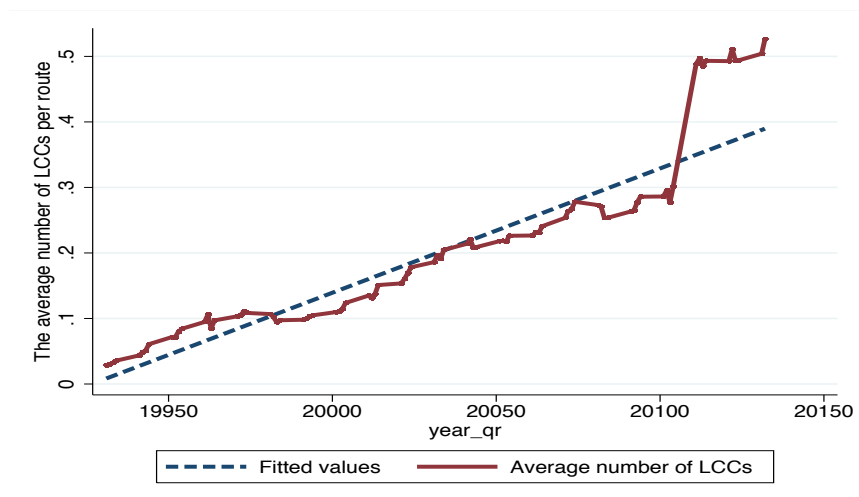


Figure 4: Industry Features: The weighted average number of all carriers vs. LCCs per route

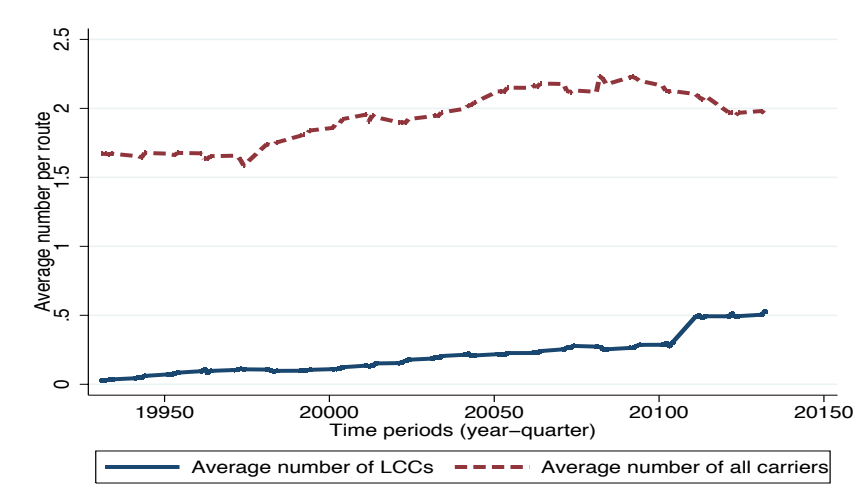


Figure 5. Entry in BC Route More Likely After United & Continental Merger

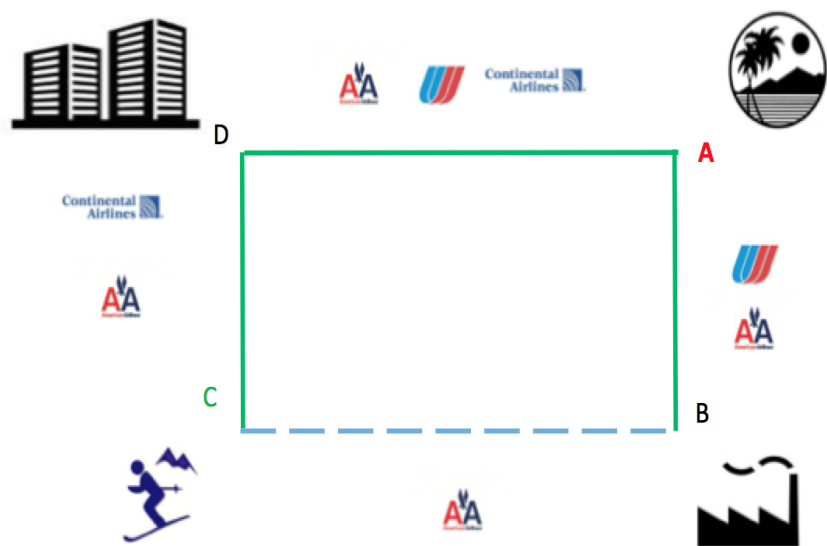


Table 2: Incumbents' response to LCC entry threat: period 1993-2013 extended

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
LCC_first_aba_8_lag	0.07* (0.04)	0.10** (0.04)	-0.03 (0.03)	0.07* (0.04)	0.10** (0.04)	-0.03 (0.03)
LCC_first_aba_7_lag	0.12*** (0.05)	0.16*** (0.05)	-0.04 (0.03)	0.12*** (0.05)	0.16*** (0.05)	-0.04 (0.03)
LCC_first_aba_6_lag	0.09* (0.05)	0.15** (0.06)	-0.06 (0.04)	0.09* (0.05)	0.15** (0.06)	-0.05 (0.04)
LCC_first_aba_5_lag	0.12** (0.06)	0.23*** (0.07)	-0.11*** (0.04)	0.12** (0.06)	0.23*** (0.07)	-0.11*** (0.04)
LCC_first_aba_4_lag	0.09 (0.07)	0.19** (0.08)	-0.10** (0.04)	0.10 (0.07)	0.19** (0.08)	-0.10** (0.04)
LCC_first_aba_3_lag	0.15** (0.07)	0.25*** (0.08)	-0.10** (0.05)	0.15** (0.07)	0.25*** (0.08)	-0.10** (0.05)
LCC_first_aba_2_lag	0.27*** (0.08)	0.39*** (0.09)	-0.12** (0.05)	0.28*** (0.08)	0.39*** (0.09)	-0.12** (0.05)
LCC_first_aba_1_lag	0.26*** (0.09)	0.39*** (0.10)	-0.13** (0.06)	0.27*** (0.09)	0.40*** (0.10)	-0.13** (0.06)
LCC_first_at_both_airports	0.26*** (0.09)	0.37*** (0.11)	-0.12* (0.06)	0.26*** (0.09)	0.38*** (0.11)	-0.12** (0.06)
LCC_first_aba_1_forward	0.30*** (0.11)	0.46*** (0.13)	-0.16** (0.07)	0.31*** (0.11)	0.46*** (0.13)	-0.16** (0.07)
LCC_first_aba_2_forward	0.33*** (0.12)	0.44*** (0.14)	-0.11 (0.08)	0.34*** (0.12)	0.45*** (0.14)	-0.11 (0.08)
LCC.in.both_3to12	0.47*** (0.15)	0.66*** (0.17)	-0.18** (0.09)	0.48*** (0.15)	0.66*** (0.17)	-0.18** (0.09)
LCC_first_on_route	-0.02 (0.10)	-0.01 (0.13)	-0.01 (0.07)	-0.03 (0.10)	-0.04 (0.13)	0.01 (0.07)
LCC_first_on_route_1to2	0.21* (0.12)	0.19 (0.14)	0.02 (0.06)	0.21* (0.12)	0.19 (0.14)	0.01 (0.06)
LCC_first_on_route_3to12	0.08 (0.08)	0.09 (0.09)	-0.01 (0.04)	0.07 (0.08)	0.09 (0.09)	-0.02 (0.04)
route_herfindahl				-0.22** (0.08)	-0.34*** (0.10)	0.12** (0.05)
D_hub				-0.39*** (0.15)	-0.32* (0.18)	-0.07 (0.09)
herfindahl_hub_inter				0.38** (0.15)	0.33* (0.19)	0.06 (0.10)
Observations	14,125	14,125	14,125	14,125	14,125	14,125
R-squared	0.90	0.93	0.80	0.90	0.93	0.80
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Incumbents' response to LCC entry threat: period 1993-2013 extended with **route-quarter FE**

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
LCC_first_aba_8_lag	0.07 (0.06)	0.10 (0.07)	-0.03 (0.04)	0.08 (0.06)	0.10 (0.07)	-0.03 (0.04)
LCC_first_aba_7_lag	0.11* (0.06)	0.18*** (0.07)	-0.07 (0.04)	0.12* (0.06)	0.19*** (0.07)	-0.07 (0.04)
LCC_first_aba_6_lag	0.06 (0.06)	0.11 (0.07)	-0.05 (0.05)	0.07 (0.06)	0.12 (0.07)	-0.05 (0.05)
LCC_first_aba_5_lag	0.11 (0.07)	0.22*** (0.08)	-0.11** (0.05)	0.11 (0.08)	0.22*** (0.08)	-0.11** (0.05)
LCC_first_aba_4_lag	0.10 (0.10)	0.19* (0.11)	-0.08 (0.06)	0.11 (0.10)	0.19* (0.11)	-0.08 (0.06)
LCC_first_aba_3_lag	0.14 (0.09)	0.26** (0.11)	-0.12** (0.06)	0.14 (0.09)	0.27** (0.11)	-0.12** (0.06)
LCC_first_aba_2_lag	0.25*** (0.10)	0.36*** (0.11)	-0.11* (0.07)	0.25*** (0.10)	0.36*** (0.11)	-0.11* (0.07)
LCC_first_aba_1_lag	0.25** (0.11)	0.37*** (0.12)	-0.12* (0.07)	0.26** (0.11)	0.38*** (0.12)	-0.12* (0.07)
LCC_first_at_both_airports	0.25** (0.13)	0.35** (0.15)	-0.10 (0.08)	0.26** (0.13)	0.36** (0.15)	-0.10 (0.08)
LCC_first_aba_1_forward	0.28** (0.14)	0.44*** (0.15)	-0.17* (0.09)	0.28** (0.14)	0.45*** (0.15)	-0.17* (0.09)
LCC_first_aba_2_forward	0.28** (0.14)	0.37** (0.16)	-0.09 (0.10)	0.29** (0.14)	0.38** (0.16)	-0.09 (0.10)
LCC_in_both_3to12	0.46** (0.18)	0.62*** (0.21)	-0.17 (0.11)	0.46** (0.18)	0.63*** (0.21)	-0.17 (0.11)
LCC_first_on_route	-0.10 (0.13)	-0.14 (0.15)	0.05 (0.09)	-0.10 (0.13)	-0.16 (0.15)	0.06 (0.09)
LCC_first_on_route_1to2	0.22 (0.15)	0.20 (0.17)	0.02 (0.08)	0.21 (0.15)	0.20 (0.17)	0.01 (0.08)
LCC_first_on_route_3to12	0.08 (0.09)	0.08 (0.11)	-0.01 (0.05)	0.07 (0.09)	0.08 (0.11)	-0.01 (0.05)
route_herfindahl				-0.19* (0.11)	-0.35** (0.14)	0.16** (0.07)
D_hub				-0.42** (0.17)	-0.34* (0.20)	-0.08 (0.11)
herfindahl_hub_inter				0.42** (0.18)	0.39* (0.22)	0.03 (0.12)
Observations	14,125	14,125	14,125	14,125	14,125	14,125
R-squared	0.91	0.94	0.83	0.91	0.94	0.83
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Route-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Incumbents' response to LCC entry threat: period 1993-2013 excluding **slot-controlled** airports

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
LCC_first_aba_8_lag	0.07* (0.04)	0.08* (0.04)	-0.01 (0.03)	0.08* (0.04)	0.09* (0.04)	-0.01 (0.03)
LCC_first_aba_7_lag	0.12** (0.05)	0.14*** (0.05)	-0.01 (0.03)	0.12*** (0.05)	0.14*** (0.05)	-0.01 (0.03)
LCC_first_aba_6_lag	0.09* (0.05)	0.11* (0.06)	-0.02 (0.04)	0.09* (0.05)	0.11* (0.06)	-0.01 (0.04)
LCC_first_aba_5_lag	0.12* (0.06)	0.20*** (0.07)	-0.08** (0.04)	0.12* (0.06)	0.20*** (0.07)	-0.08** (0.04)
LCC_first_aba_4_lag	0.07 (0.07)	0.12 (0.08)	-0.06 (0.05)	0.07 (0.07)	0.13 (0.08)	-0.05 (0.05)
LCC_first_aba_3_lag	0.12* (0.07)	0.18** (0.08)	-0.06 (0.05)	0.12* (0.07)	0.18** (0.08)	-0.06 (0.05)
LCC_first_aba_2_lag	0.25*** (0.08)	0.32*** (0.09)	-0.07 (0.06)	0.25*** (0.08)	0.32*** (0.09)	-0.07 (0.06)
LCC_first_aba_1_lag	0.24*** (0.09)	0.32*** (0.10)	-0.08 (0.06)	0.25*** (0.09)	0.32*** (0.10)	-0.08 (0.06)
LCC_first_at_both_airports	0.23** (0.10)	0.30*** (0.11)	-0.06 (0.07)	0.24** (0.10)	0.30*** (0.11)	-0.06 (0.07)
LCC_first_aba_1_forward	0.31*** (0.11)	0.41*** (0.13)	-0.10 (0.08)	0.31*** (0.11)	0.41*** (0.13)	-0.10 (0.08)
LCC_first_aba_2_forward	0.33*** (0.13)	0.36*** (0.14)	-0.03 (0.09)	0.34*** (0.13)	0.36*** (0.14)	-0.03 (0.09)
LCC_in_both_3to12	0.47*** (0.15)	0.57*** (0.17)	-0.09 (0.10)	0.48*** (0.15)	0.57*** (0.17)	-0.09 (0.10)
LCC_first_on_route	-0.06 (0.10)	-0.05 (0.13)	-0.01 (0.07)	-0.07 (0.10)	-0.07 (0.13)	0.01 (0.07)
LCC_first_on_route_1to2	0.18 (0.13)	0.16 (0.15)	0.02 (0.07)	0.18 (0.13)	0.17 (0.15)	0.01 (0.07)
LCC_first_on_route_3to12	0.06 (0.09)	0.06 (0.10)	0.01 (0.05)	0.06 (0.09)	0.06 (0.10)	-0.00 (0.05)
route_herfindahl				-0.21** (0.09)	-0.35*** (0.11)	0.14*** (0.05)
D_hub				-0.41*** (0.15)	-0.35* (0.19)	-0.07 (0.10)
herfindahl_hub_inter				0.42*** (0.16)	0.37* (0.20)	0.05 (0.10)
Observations	13,164	13,164	13,164	13,164	13,164	13,164
R-squared	0.90	0.93	0.80	0.90	0.93	0.80
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Incumbents' response to LCC entry threat: period 1993-2013 extended

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
LCC_first_aba_8_lag	-0.00** (0.00)	-0.66 (0.73)	-0.77 (0.67)	-0.00 (0.01)	-0.01 (0.01)
LCC_first_aba_7_lag	-0.01*** (0.00)	-1.08 (0.72)	-0.99* (0.54)	-0.01 (0.01)	-0.01 (0.01)
LCC_first_aba_6_lag	-0.01*** (0.00)	-1.82*** (0.57)	-1.61*** (0.49)	-0.03*** (0.01)	-0.03*** (0.01)
LCC_first_aba_5_lag	-0.00*** (0.00)	-1.80*** (0.69)	-1.49*** (0.48)	-0.03*** (0.01)	-0.03*** (0.01)
LCC_first_aba_4_lag	0.01*** (0.00)	2.72*** (0.70)	2.24*** (0.53)	0.04*** (0.01)	0.03*** (0.01)
LCC_first_aba_3_lag	0.00 (0.00)	0.59 (0.57)	0.36 (0.43)	0.00 (0.01)	0.00 (0.01)
LCC_first_aba_2_lag	-0.01*** (0.00)	-1.94*** (0.50)	-1.90*** (0.41)	-0.03*** (0.01)	-0.03*** (0.01)
LCC_first_aba_1_lag	-0.00** (0.00)	-2.11*** (0.58)	-1.67*** (0.46)	-0.04*** (0.01)	-0.03*** (0.01)
LCC_first_at_both_airports	0.00 (0.00)	0.74 (0.61)	0.65 (0.53)	0.01 (0.01)	0.01 (0.01)
LCC_first_aba_1_forward	-0.01*** (0.00)	-0.65 (0.97)	-0.61 (0.73)	-0.00 (0.01)	-0.00 (0.01)
LCC_first_aba_2_forward	0.00 (0.00)	-0.83 (0.77)	-0.17 (0.63)	-0.01 (0.01)	-0.01 (0.01)
LCC_in_both_3to12	0.00 (0.00)	0.53 (0.59)	0.41 (0.55)	0.01 (0.01)	0.01 (0.01)
LCC_first_on_route	0.00 (0.00)	-0.32 (0.49)	-0.25 (0.40)	-0.01 (0.01)	-0.00 (0.01)
LCC_first_on_route_1to2	0.01* (0.00)	-0.96 (0.84)	-0.74 (0.64)	-0.02 (0.01)	-0.01 (0.01)
LCC_first_on_route_3to12	0.00* (0.00)	0.99 (0.99)	0.27 (0.64)	0.02 (0.01)	0.00 (0.01)
Observations	11,701	11,700	11,701	11,700	11,701
R-squared	0.29	0.36	0.36	0.37	0.37
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Incumbents' response to LCC entry threat: period 1993-2013 extended with **route-quarter FE**

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
LCC_first_aba_8_lag	-0.00 (0.00)	-0.75 (0.68)	-1.05 (0.77)	-0.00 (0.01)	-0.01 (0.01)
LCC_first_aba_7_lag	-0.01*** (0.00)	-1.02 (0.74)	-1.02 (0.63)	-0.01 (0.01)	-0.01 (0.01)
LCC_first_aba_6_lag	-0.01*** (0.00)	-1.83*** (0.68)	-1.57*** (0.58)	-0.02** (0.01)	-0.03*** (0.01)
LCC_first_aba_5_lag	-0.00** (0.00)	-1.62** (0.70)	-1.28*** (0.47)	-0.02** (0.01)	-0.03*** (0.01)
LCC_first_aba_4_lag	0.01*** (0.00)	3.12*** (0.76)	2.50*** (0.55)	0.04*** (0.01)	0.04*** (0.01)
LCC_first_aba_3_lag	-0.00 (0.00)	0.26 (0.62)	0.03 (0.47)	-0.00 (0.01)	-0.00 (0.01)
LCC_first_aba_2_lag	-0.01*** (0.00)	-2.02*** (0.55)	-2.03*** (0.46)	-0.03*** (0.01)	-0.03*** (0.01)
LCC_first_aba_1_lag	-0.00 (0.00)	-1.91*** (0.58)	-1.59*** (0.48)	-0.04*** (0.01)	-0.03*** (0.01)
LCC_first_at_both_airports	0.00 (0.00)	1.22* (0.64)	0.86 (0.56)	0.02* (0.01)	0.02** (0.01)
LCC_first_aba_1_forward	-0.01*** (0.00)	-1.33 (0.99)	-0.87 (0.71)	-0.01 (0.01)	-0.01 (0.01)
LCC_first_aba_2_forward	0.00 (0.00)	-0.29 (0.84)	0.29 (0.60)	-0.00 (0.01)	0.00 (0.01)
LCC_in_both_3to12	0.00 (0.00)	0.67 (0.66)	0.45 (0.60)	0.01 (0.01)	0.01 (0.01)
LCC_first_on_route	0.00 (0.00)	-0.54 (0.52)	-0.35 (0.41)	-0.01 (0.01)	-0.00 (0.01)
LCC_first_on_route_1to2	0.01* (0.00)	-0.10 (0.86)	0.01 (0.69)	-0.01 (0.02)	-0.00 (0.01)
LCC_first_on_route_3to12	0.00 (0.00)	1.16 (0.89)	0.49 (0.56)	0.02 (0.01)	0.01 (0.01)
Observations	11,701	11,700	11,701	11,700	11,701
R-squared	0.35	0.41	0.41	0.42	0.42
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Route-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Incumbents' response to LCC entry threat: period 1993-2013 extended excluding **slot-controlled** airports

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
LCC_first_aba_8_lag	-0.00** (0.00)	0.09 (0.73)	-0.06 (0.52)	0.01 (0.01)	0.00 (0.01)
LCC_first_aba_7_lag	-0.01*** (0.00)	-1.13 (0.83)	-0.60 (0.51)	-0.01 (0.01)	-0.01 (0.01)
LCC_first_aba_6_lag	-0.01*** (0.00)	-2.16*** (0.66)	-1.83*** (0.53)	-0.03*** (0.01)	-0.03*** (0.01)
LCC_first_aba_5_lag	-0.00*** (0.00)	-1.61** (0.80)	-1.37*** (0.52)	-0.02** (0.01)	-0.02*** (0.01)
LCC_first_aba_4_lag	0.00 (0.00)	2.10*** (0.77)	1.85*** (0.54)	0.03*** (0.01)	0.03*** (0.01)
LCC_first_aba_3_lag	0.00 (0.00)	0.50 (0.61)	0.56 (0.46)	0.00 (0.01)	0.01 (0.01)
LCC_first_aba_2_lag	-0.01*** (0.00)	-1.78*** (0.54)	-1.87*** (0.44)	-0.02*** (0.01)	-0.03*** (0.01)
LCC_first_aba_1_lag	-0.00* (0.00)	-2.16*** (0.61)	-1.80*** (0.46)	-0.04*** (0.01)	-0.03*** (0.01)
LCC_first_at_both_airports	0.00 (0.00)	1.08 (0.70)	1.01* (0.59)	0.02 (0.01)	0.02* (0.01)
LCC_first_aba_1_forward	-0.01*** (0.00)	-0.21 (1.16)	-0.35 (0.89)	0.00 (0.02)	-0.00 (0.02)
LCC_first_aba_2_forward	-0.00** (0.00)	-1.36 (0.87)	-0.77 (0.60)	-0.01 (0.01)	-0.01 (0.01)
LCC_in_both_3to12	0.00 (0.00)	0.71 (0.75)	0.62 (0.67)	0.01 (0.01)	0.01 (0.01)
LCC_first_on_route	0.00 (0.00)	-0.22 (0.51)	-0.15 (0.41)	-0.01 (0.01)	-0.00 (0.01)
LCC_first_on_route_1to2	0.01** (0.00)	-1.16 (0.86)	-0.97 (0.66)	-0.02 (0.01)	-0.02 (0.01)
LCC_first_on_route_3to12	0.01** (0.00)	0.80 (0.98)	0.12 (0.67)	0.01 (0.01)	0.00 (0.01)
Observations	10,714	10,713	10,714	10,713	10,714
R-squared	0.28	0.36	0.33	0.36	0.35
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Incumbents' response to mergers in routes of merging airlines flying before merge
Period 1993-2013

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
Merger_first_aba_8_lag	0.01 (0.06)	-0.01 (0.07)	0.01 (0.04)	0.00 (0.06)	-0.01 (0.07)	0.01 (0.04)
Merger_first_aba_7_lag	-0.05 (0.07)	-0.06 (0.08)	0.01 (0.05)	-0.05 (0.07)	-0.06 (0.08)	0.02 (0.05)
Merger_first_aba_6_lag	-0.01 (0.07)	-0.07 (0.08)	0.06 (0.05)	-0.01 (0.07)	-0.07 (0.08)	0.06 (0.05)
Merger_first_aba_5_lag	0.01 (0.07)	-0.05 (0.08)	0.06 (0.05)	0.01 (0.07)	-0.06 (0.08)	0.06 (0.05)
Merger_first_aba_4_lag	0.03 (0.09)	-0.04 (0.11)	0.07 (0.06)	0.03 (0.09)	-0.05 (0.10)	0.08 (0.06)
Merger_first_aba_3_lag	0.05 (0.09)	0.08 (0.10)	-0.03 (0.06)	0.04 (0.08)	0.07 (0.10)	-0.03 (0.06)
Merger_first_aba_2_lag	0.10 (0.10)	0.15 (0.12)	-0.04 (0.06)	0.10 (0.09)	0.14 (0.11)	-0.04 (0.06)
Merger_first_aba_1_lag	0.16* (0.10)	0.16 (0.12)	0.00 (0.06)	0.16 (0.10)	0.15 (0.12)	0.01 (0.06)
Merger_first_announced	0.21* (0.11)	0.26** (0.13)	-0.05 (0.07)	0.20* (0.11)	0.26** (0.13)	-0.05 (0.07)
Merger_first_aba_1_forward	0.21* (0.11)	0.28** (0.14)	-0.07 (0.07)	0.21* (0.11)	0.28** (0.14)	-0.06 (0.07)
Merger_first_aba_2_forward	0.19 (0.12)	0.24 (0.15)	-0.05 (0.08)	0.19 (0.12)	0.23 (0.15)	-0.04 (0.08)
Merger_in_both_3to12	0.18 (0.13)	0.23 (0.15)	-0.05 (0.08)	0.18 (0.12)	0.23 (0.15)	-0.05 (0.08)
Merger_first_on_route	0.18 (0.12)	0.14 (0.14)	0.04 (0.08)	0.18 (0.12)	0.14 (0.14)	0.04 (0.08)
Merger_first_on_route_1to2	0.03 (0.07)	0.08 (0.08)	-0.06 (0.05)	0.03 (0.07)	0.08 (0.08)	-0.06 (0.05)
Merger_first_on_route_3to12	0.01 (0.05)	0.01 (0.06)	-0.01 (0.03)	0.00 (0.05)	0.01 (0.06)	-0.01 (0.03)
route_herfindahl				-0.14 (0.09)	-0.11 (0.11)	-0.03 (0.06)
D_hub				-0.17 (0.12)	-0.20 (0.15)	0.04 (0.07)
herfindahl_hub_inter				0.14 (0.12)	0.09 (0.14)	0.05 (0.08)
Observations	14,396	14,396	14,396	14,396	14,396	14,396
R-squared	0.87	0.90	0.73	0.87	0.90	0.73
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Incumbents' response to mergers in routes of merging airlines flying before merge
Route-quarter FE, period 1993-2013

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
Merger_first_aba_8_lag	0.02 (0.07)	0.01 (0.08)	0.00 (0.05)	0.02 (0.07)	0.01 (0.08)	0.00 (0.05)
Merger_first_aba_7_lag	-0.01 (0.08)	-0.01 (0.09)	-0.00 (0.05)	-0.02 (0.08)	-0.02 (0.09)	-0.00 (0.05)
Merger_first_aba_6_lag	0.04 (0.08)	0.00 (0.10)	0.03 (0.05)	0.03 (0.08)	0.00 (0.09)	0.03 (0.05)
Merger_first_aba_5_lag	-0.00 (0.08)	-0.03 (0.09)	0.03 (0.05)	-0.01 (0.08)	-0.04 (0.09)	0.03 (0.05)
Merger_first_aba_4_lag	0.04 (0.10)	-0.03 (0.13)	0.07 (0.07)	0.03 (0.10)	-0.04 (0.12)	0.07 (0.07)
Merger_first_aba_3_lag	0.04 (0.10)	0.10 (0.12)	-0.06 (0.07)	0.04 (0.10)	0.10 (0.12)	-0.06 (0.07)
Merger_first_aba_2_lag	0.14 (0.11)	0.20 (0.14)	-0.07 (0.07)	0.13 (0.11)	0.19 (0.13)	-0.06 (0.07)
Merger_first_aba_1_lag	0.12 (0.11)	0.14 (0.14)	-0.03 (0.07)	0.11 (0.11)	0.13 (0.14)	-0.02 (0.07)
Merger_first_announced	0.21 (0.13)	0.28* (0.17)	-0.08 (0.09)	0.21 (0.13)	0.28* (0.16)	-0.07 (0.09)
Merger_first_aba_1_forward	0.21 (0.14)	0.30* (0.17)	-0.09 (0.09)	0.21 (0.14)	0.30* (0.17)	-0.09 (0.09)
Merger_first_aba_2_forward	0.20 (0.15)	0.28 (0.18)	-0.09 (0.10)	0.20 (0.15)	0.28 (0.18)	-0.08 (0.10)
Merger_in_both_3to12	0.13 (0.15)	0.21 (0.18)	-0.08 (0.10)	0.12 (0.15)	0.20 (0.18)	-0.08 (0.10)
Merger_first_on_route	0.26* (0.14)	0.23 (0.16)	0.02 (0.10)	0.25* (0.14)	0.22 (0.16)	0.03 (0.10)
Merger_first_on_route_1to2	-0.04 (0.08)	0.04 (0.09)	-0.07 (0.06)	-0.04 (0.08)	0.03 (0.09)	-0.07 (0.06)
Merger_first_on_route_3to12	0.01 (0.06)	0.01 (0.07)	-0.00 (0.03)	0.01 (0.06)	0.01 (0.07)	-0.00 (0.03)
route_herfindahl				-0.16 (0.11)	-0.12 (0.13)	-0.04 (0.07)
D_hub				-0.22 (0.14)	-0.25 (0.18)	0.02 (0.08)
herfindahl_hub_inter				0.20 (0.14)	0.13 (0.16)	0.07 (0.09)
Observations	14,396	14,396	14,396	14,396	14,396	14,396
R-squared	0.89	0.92	0.78	0.89	0.92	0.78
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Route-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Incumbents' response to mergers in routes of merging airlines flying before merge without slot-controlled airports, period 1993-2013

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
Merger_first_aba_8_lag	0.01 (0.06)	-0.00 (0.07)	0.02 (0.04)	0.01 (0.06)	-0.01 (0.07)	0.02 (0.04)
Merger_first_aba_7_lag	-0.00 (0.07)	-0.03 (0.08)	0.02 (0.05)	-0.01 (0.07)	-0.03 (0.08)	0.03 (0.05)
Merger_first_aba_6_lag	0.00 (0.07)	-0.07 (0.08)	0.07 (0.05)	0.00 (0.07)	-0.07 (0.08)	0.07 (0.05)
Merger_first_aba_5_lag	0.03 (0.07)	-0.04 (0.08)	0.08 (0.05)	0.03 (0.07)	-0.05 (0.08)	0.08 (0.05)
Merger_first_aba_4_lag	0.04 (0.09)	-0.04 (0.11)	0.09 (0.06)	0.04 (0.09)	-0.06 (0.11)	0.09 (0.06)
Merger_first_aba_3_lag	0.06 (0.09)	0.08 (0.11)	-0.02 (0.06)	0.06 (0.09)	0.08 (0.11)	-0.02 (0.06)
Merger_first_aba_2_lag	0.11 (0.10)	0.15 (0.12)	-0.04 (0.06)	0.11 (0.10)	0.14 (0.12)	-0.04 (0.06)
Merger_first_aba_1_lag	0.18* (0.10)	0.16 (0.12)	0.02 (0.07)	0.18* (0.10)	0.15 (0.12)	0.03 (0.07)
Merger_first_announced	0.20* (0.11)	0.24* (0.14)	-0.04 (0.07)	0.19* (0.11)	0.23* (0.13)	-0.03 (0.07)
Merger_first_aba_1_forward	0.22* (0.12)	0.27* (0.14)	-0.05 (0.08)	0.22* (0.12)	0.27* (0.14)	-0.05 (0.08)
Merger_first_aba_2_forward	0.20 (0.13)	0.24 (0.16)	-0.04 (0.08)	0.20 (0.13)	0.23 (0.15)	-0.03 (0.08)
Merger_in_both_3to12	0.19 (0.13)	0.25 (0.15)	-0.05 (0.09)	0.19 (0.13)	0.24 (0.15)	-0.05 (0.09)
Merger_first_on_route	0.22* (0.12)	0.16 (0.14)	0.05 (0.08)	0.21* (0.12)	0.16 (0.14)	0.06 (0.08)
Merger_first_on_route_1to2	0.03 (0.07)	0.09 (0.08)	-0.06 (0.05)	0.03 (0.07)	0.09 (0.08)	-0.06 (0.05)
Merger_first_on_route_3to12	0.03 (0.05)	0.04 (0.06)	-0.01 (0.03)	0.03 (0.05)	0.04 (0.06)	-0.01 (0.03)
route_herfindahl				-0.07 (0.10)	-0.04 (0.11)	-0.03 (0.06)
D_hub				-0.14 (0.12)	-0.16 (0.15)	0.02 (0.07)
herfindahl_hub_inter				0.07 (0.12)	-0.00 (0.14)	0.08 (0.08)
Observations	13,348	13,348	13,348	13,348	13,348	13,348
R-squared	0.87	0.91	0.74	0.87	0.91	0.74
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Incumbents' response to mergers in routes of merging airlines flying before merge
Period 1993-2013

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
Merger_first_aba_8_lag	0.08 (0.26)	2.97*** (0.50)	1.67*** (0.35)	0.04*** (0.01)	0.03*** (0.01)
Merger_first_aba_7_lag	-0.05 (0.33)	1.54*** (0.57)	0.83** (0.41)	0.02*** (0.01)	0.02** (0.01)
Merger_first_aba_6_lag	-0.20 (0.36)	1.44*** (0.55)	0.53 (0.39)	0.02*** (0.01)	0.01* (0.01)
Merger_first_aba_5_lag	-0.11 (0.37)	2.68*** (0.72)	0.35 (0.59)	0.02*** (0.01)	0.01 (0.01)
Merger_first_aba_4_lag	-0.51 (0.57)	1.71** (0.75)	-0.21 (0.55)	0.01 (0.01)	0.00 (0.01)
Merger_first_aba_3_lag	-0.39 (0.52)	-0.07 (0.69)	-0.90* (0.52)	-0.01 (0.01)	-0.02* (0.01)
Merger_first_aba_2_lag	-0.52 (0.53)	-0.63 (0.75)	-1.62*** (0.56)	-0.02** (0.01)	-0.03*** (0.01)
Merger_first_aba_1_lag	0.42 (0.62)	2.12** (0.91)	-0.05 (0.69)	0.01 (0.01)	0.01 (0.01)
Merger_first_announced	0.52 (0.63)	3.10*** (1.01)	0.35 (0.77)	0.02* (0.01)	0.00 (0.01)
Merger_first_aba_1_forward	0.40 (0.70)	0.92 (1.11)	-1.31 (0.87)	-0.01 (0.01)	-0.03* (0.01)
Merger_first_aba_2_forward	-0.39 (0.71)	0.62 (1.15)	-1.24 (0.89)	-0.02 (0.01)	-0.04** (0.01)
Merger_in_both_3to12	-0.53 (0.79)	-1.00 (1.36)	-3.00*** (1.04)	-0.04** (0.02)	-0.05*** (0.02)
Merger_first_on_route	2.17*** (0.61)	2.97*** (0.95)	1.85*** (0.56)	0.04*** (0.01)	0.03*** (0.01)
Merger_first_on_route_1to2	0.28 (0.31)	-0.71 (0.65)	-1.04** (0.42)	-0.01 (0.01)	-0.01** (0.01)
Merger_first_on_route_3to12	0.72*** (0.23)	0.87** (0.41)	0.54* (0.29)	0.01* (0.00)	0.01*** (0.00)
Observations	10,420	10,420	10,420	10,420	10,420
R-squared	0.47	0.51	0.53	0.53	0.52
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Incumbents' response to mergers in routes of merging airlines flying before merge
Route-quarter FE, period 1993-2013

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
Merger_first_aba_8_lag	0.33 (0.30)	3.20*** (0.58)	1.83*** (0.40)	0.04*** (0.01)	0.02*** (0.01)
Merger_first_aba_7_lag	0.03 (0.40)	1.71** (0.72)	1.00** (0.50)	0.03*** (0.01)	0.02** (0.01)
Merger_first_aba_6_lag	-0.05 (0.41)	1.30** (0.63)	0.58 (0.43)	0.02** (0.01)	0.01* (0.01)
Merger_first_aba_5_lag	0.22 (0.42)	2.77*** (0.90)	0.31 (0.76)	0.03** (0.01)	0.01 (0.01)
Merger_first_aba_4_lag	-0.07 (0.65)	1.86** (0.91)	-0.03 (0.66)	0.01 (0.01)	-0.00 (0.01)
Merger_first_aba_3_lag	-0.52 (0.60)	0.08 (0.83)	-0.65 (0.61)	-0.01 (0.01)	-0.01 (0.01)
Merger_first_aba_2_lag	-0.52 (0.59)	-0.60 (0.85)	-1.37** (0.59)	-0.02 (0.01)	-0.02** (0.01)
Merger_first_aba_1_lag	0.99 (0.67)	2.63*** (0.97)	0.31 (0.74)	0.02* (0.01)	0.01 (0.01)
Merger_first_announced	0.87 (0.72)	3.61*** (1.12)	0.90 (0.83)	0.03** (0.01)	0.01 (0.01)
Merger_first_aba_1_forward	0.20 (0.80)	1.33 (1.22)	-0.75 (0.88)	-0.00 (0.02)	-0.02 (0.01)
Merger_first_aba_2_forward	-0.22 (0.79)	1.01 (1.25)	-0.76 (0.90)	-0.02 (0.02)	-0.03* (0.02)
Merger_in_both_3to12	-0.23 (0.90)	-0.43 (1.47)	-2.47** (1.10)	-0.03 (0.02)	-0.05** (0.02)
Merger_first_on_route	2.46*** (0.65)	3.43*** (1.12)	1.97*** (0.67)	0.05*** (0.01)	0.03*** (0.01)
Merger_first_on_route_1to2	0.17 (0.32)	-0.44 (0.69)	-0.74* (0.43)	-0.00 (0.01)	-0.01 (0.01)
Merger_first_on_route_3to12	0.76*** (0.24)	0.97** (0.46)	0.60* (0.32)	0.01* (0.01)	0.01*** (0.00)
Observations	10,420	10,420	10,420	10,420	10,420
R-squared	0.56	0.58	0.61	0.60	0.60
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Route-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 13: Incumbents' response to mergers in routes of merging airlines flying before merge
Without slot-controlled airports, period 1993-2013

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
Merger_first_aba_8_lag	0.01 (0.24)	3.24*** (0.51)	1.71*** (0.36)	0.04*** (0.01)	0.03*** (0.01)
Merger_first_aba_7_lag	0.21 (0.29)	2.06*** (0.58)	0.88** (0.43)	0.03*** (0.01)	0.02** (0.01)
Merger_first_aba_6_lag	0.20 (0.33)	2.03*** (0.55)	0.62 (0.40)	0.03*** (0.01)	0.01** (0.01)
Merger_first_aba_5_lag	-0.26 (0.34)	3.25*** (0.73)	0.32 (0.61)	0.03*** (0.01)	0.01 (0.01)
Merger_first_aba_4_lag	-0.47 (0.47)	1.75** (0.72)	-0.60 (0.53)	0.01 (0.01)	-0.00 (0.01)
Merger_first_aba_3_lag	-0.56 (0.49)	-0.27 (0.70)	-1.41*** (0.52)	-0.02* (0.01)	-0.02** (0.01)
Merger_first_aba_2_lag	-0.73 (0.51)	-0.96 (0.77)	-2.15*** (0.56)	-0.02** (0.01)	-0.03*** (0.01)
Merger_first_aba_1_lag	-0.11 (0.57)	1.11 (0.89)	-0.98 (0.68)	0.00 (0.01)	-0.01 (0.01)
Merger_first_announced	-0.07 (0.58)	2.60** (1.01)	-0.41 (0.76)	0.02 (0.01)	-0.01 (0.01)
Merger_first_aba_1_forward	0.01 (0.66)	0.72 (1.13)	-1.80** (0.87)	-0.01 (0.02)	-0.03** (0.02)
Merger_first_aba_2_forward	-0.27 (0.68)	0.98 (1.16)	-1.45* (0.87)	-0.01 (0.02)	-0.04** (0.02)
Merger_in_both_3to12	-0.76 (0.75)	-1.03 (1.37)	-3.54*** (1.02)	-0.03* (0.02)	-0.06*** (0.02)
Merger_first_on_route	1.97*** (0.55)	3.69*** (0.89)	1.97*** (0.56)	0.05*** (0.01)	0.03*** (0.01)
Merger_first_on_route_1to2	-0.03 (0.27)	-0.39 (0.63)	-1.03** (0.44)	-0.01 (0.01)	-0.01* (0.01)
Merger_first_on_route_3to12	0.45** (0.20)	0.53 (0.41)	0.29 (0.28)	0.00 (0.00)	0.01 (0.00)
Observations	9,694	9,694	9,694	9,694	9,694
R-squared	0.55	0.50	0.48	0.51	0.48
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Incumbents' response to potential entry due to mergers
Period 1993-2013

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
Merger_first_aba_8_lag	0.01 (0.06)	-0.00 (0.07)	0.01 (0.04)	0.01 (0.06)	-0.00 (0.07)	0.01 (0.04)
Merger_first_aba_7_lag	-0.04 (0.07)	-0.04 (0.08)	0.01 (0.05)	-0.04 (0.07)	-0.05 (0.08)	0.01 (0.05)
Merger_first_aba_6_lag	0.00 (0.07)	-0.05 (0.08)	0.05 (0.05)	-0.00 (0.07)	-0.05 (0.08)	0.05 (0.05)
Merger_first_aba_5_lag	0.02 (0.07)	-0.03 (0.08)	0.05 (0.05)	0.02 (0.07)	-0.03 (0.08)	0.05 (0.05)
Merger_first_aba_4_lag	0.05 (0.09)	-0.01 (0.10)	0.06 (0.06)	0.05 (0.08)	-0.02 (0.10)	0.06 (0.06)
Merger_first_aba_3_lag	0.08 (0.08)	0.12 (0.10)	-0.05 (0.05)	0.08 (0.08)	0.12 (0.10)	-0.04 (0.05)
Merger_first_aba_2_lag	0.14 (0.09)	0.20* (0.11)	-0.06 (0.06)	0.14 (0.09)	0.19* (0.11)	-0.06 (0.06)
Merger_first_aba_1_lag	0.21** (0.10)	0.22* (0.11)	-0.02 (0.06)	0.20** (0.09)	0.22* (0.11)	-0.01 (0.06)
Merger_first_announced	0.25** (0.11)	0.32** (0.13)	-0.08 (0.07)	0.24** (0.11)	0.32** (0.13)	-0.07 (0.07)
Merger_first_aba_1_forward	0.25** (0.11)	0.34** (0.14)	-0.09 (0.07)	0.25** (0.11)	0.34** (0.13)	-0.09 (0.07)
Merger_first_aba_2_forward	0.23* (0.12)	0.31** (0.15)	-0.08 (0.08)	0.23* (0.12)	0.30** (0.14)	-0.07 (0.08)
Merger_in_both_3to12	0.22* (0.13)	0.30** (0.15)	-0.08 (0.08)	0.22* (0.13)	0.29** (0.14)	-0.08 (0.08)
Merger_first_on_route	-0.18 (0.12)	-0.21 (0.14)	0.02 (0.09)	-0.18 (0.12)	-0.20 (0.14)	0.02 (0.09)
Merger_first_on_route_1to2	-0.08 (0.08)	-0.17* (0.10)	0.09* (0.05)	-0.08 (0.08)	-0.18* (0.10)	0.09* (0.05)
Merger_first_on_route_3to12	-0.08 (0.06)	-0.10 (0.07)	0.01 (0.03)	-0.08 (0.06)	-0.10 (0.08)	0.01 (0.03)
route_herfindahl				-0.13 (0.09)	-0.10 (0.11)	-0.04 (0.06)
D_hub				-0.16 (0.12)	-0.20 (0.15)	0.04 (0.07)
herfindahl_hub_inter				0.13 (0.12)	0.08 (0.14)	0.05 (0.08)
Observations	14,355	14,355	14,355	14,355	14,355	14,355
R-squared	0.87	0.90	0.73	0.87	0.90	0.73
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 15: Incumbents' response to potential entry due to mergers
Route-quarter FE, period 1993-2013

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
Merger_first_aba_8_lag	0.02 (0.07)	0.02 (0.08)	0.00 (0.05)	0.02 (0.07)	0.01 (0.08)	0.00 (0.05)
Merger_first_aba_7_lag	0.00 (0.08)	0.01 (0.09)	-0.01 (0.05)	-0.00 (0.08)	-0.00 (0.08)	-0.00 (0.05)
Merger_first_aba_6_lag	0.05 (0.08)	0.02 (0.09)	0.03 (0.05)	0.05 (0.08)	0.02 (0.09)	0.03 (0.05)
Merger_first_aba_5_lag	0.01 (0.08)	-0.02 (0.09)	0.03 (0.05)	0.01 (0.08)	-0.02 (0.09)	0.03 (0.05)
Merger_first_aba_4_lag	0.06 (0.10)	0.00 (0.13)	0.06 (0.07)	0.05 (0.10)	-0.01 (0.12)	0.06 (0.07)
Merger_first_aba_3_lag	0.08 (0.10)	0.15 (0.12)	-0.07 (0.07)	0.08 (0.10)	0.14 (0.12)	-0.07 (0.07)
Merger_first_aba_2_lag	0.18 (0.11)	0.26* (0.13)	-0.08 (0.07)	0.17 (0.11)	0.25* (0.13)	-0.08 (0.07)
Merger_first_aba_1_lag	0.16 (0.11)	0.20 (0.13)	-0.04 (0.07)	0.16 (0.11)	0.20 (0.13)	-0.04 (0.07)
Merger_first_announced	0.25* (0.13)	0.34** (0.16)	-0.09 (0.09)	0.25* (0.13)	0.34** (0.16)	-0.09 (0.09)
Merger_first_aba_1_forward	0.26* (0.14)	0.37** (0.17)	-0.11 (0.09)	0.26* (0.14)	0.36** (0.17)	-0.11 (0.09)
Merger_first_aba_2_forward	0.25* (0.15)	0.35* (0.18)	-0.11 (0.10)	0.25* (0.15)	0.35** (0.18)	-0.10 (0.10)
Merger_in_both_3to12	0.18 (0.15)	0.27 (0.18)	-0.10 (0.10)	0.17 (0.15)	0.27 (0.18)	-0.09 (0.10)
Merger_first_on_route	-0.27** (0.14)	-0.29* (0.16)	0.02 (0.10)	-0.27** (0.14)	-0.29* (0.16)	0.02 (0.10)
Merger_first_on_route_1to2	-0.03 (0.09)	-0.13 (0.11)	0.10 (0.06)	-0.03 (0.09)	-0.14 (0.11)	0.11* (0.06)
Merger_first_on_route_3to12	-0.08 (0.06)	-0.10 (0.08)	0.02 (0.04)	-0.08 (0.06)	-0.10 (0.08)	0.02 (0.04)
route_herfindahl				-0.15 (0.11)	-0.10 (0.13)	-0.05 (0.07)
D_hub				-0.22 (0.14)	-0.24 (0.18)	0.02 (0.08)
herfindahl_hub_inter				0.19 (0.14)	0.11 (0.16)	0.08 (0.09)
Observations	14,355	14,355	14,355	14,355	14,355	14,355
R-squared	0.89	0.92	0.78	0.89	0.92	0.78
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Route-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 16: Incumbents' response to potential entry due to mergers
Without slot-controlled airports, period 1993-2013

VARIABLES	(1) ln_seat_ijt	(2) ln_flight_ijt	(3) ln_average_seat_ijt	(4) ln_seat_ijt	(5) ln_flight_ijt	(6) ln_average_seat_ijt
Merger_first_aba_8_lag	0.02 (0.06)	0.00 (0.07)	0.01 (0.04)	0.02 (0.06)	-0.00 (0.07)	0.02 (0.04)
Merger_first_aba_7_lag	0.00 (0.07)	-0.01 (0.08)	0.02 (0.05)	0.00 (0.07)	-0.02 (0.08)	0.02 (0.05)
Merger_first_aba_6_lag	0.02 (0.07)	-0.05 (0.08)	0.06 (0.05)	0.01 (0.07)	-0.05 (0.08)	0.06 (0.05)
Merger_first_aba_5_lag	0.05 (0.07)	-0.02 (0.08)	0.07 (0.05)	0.04 (0.07)	-0.03 (0.08)	0.07 (0.05)
Merger_first_aba_4_lag	0.06 (0.09)	-0.01 (0.11)	0.06 (0.06)	0.05 (0.09)	-0.02 (0.10)	0.07 (0.06)
Merger_first_aba_3_lag	0.09 (0.09)	0.13 (0.10)	-0.03 (0.06)	0.09 (0.09)	0.12 (0.10)	-0.03 (0.06)
Merger_first_aba_2_lag	0.15 (0.10)	0.20* (0.12)	-0.05 (0.06)	0.15 (0.10)	0.20* (0.11)	-0.05 (0.06)
Merger_first_aba_1_lag	0.23** (0.10)	0.22* (0.12)	0.01 (0.06)	0.22** (0.10)	0.21* (0.11)	0.01 (0.06)
Merger_first_announced	0.24** (0.11)	0.30** (0.13)	-0.06 (0.07)	0.23** (0.11)	0.29** (0.13)	-0.05 (0.07)
Merger_first_aba_1_forward	0.26** (0.12)	0.34** (0.14)	-0.08 (0.07)	0.26** (0.12)	0.33** (0.14)	-0.08 (0.07)
Merger_first_aba_2_forward	0.24* (0.13)	0.31** (0.15)	-0.07 (0.08)	0.24* (0.13)	0.30** (0.15)	-0.06 (0.08)
Merger_in_both_3to12	0.24* (0.13)	0.31** (0.15)	-0.08 (0.08)	0.23* (0.13)	0.31** (0.15)	-0.07 (0.08)
Merger_first_on_route	-0.17 (0.13)	-0.24 (0.15)	0.06 (0.09)	-0.17 (0.13)	-0.24 (0.15)	0.06 (0.09)
Merger_first_on_route_1to2	-0.09 (0.09)	-0.19* (0.10)	0.10* (0.05)	-0.09 (0.09)	-0.19* (0.10)	0.10* (0.05)
Merger_first_on_route_3to12	-0.10* (0.06)	-0.12 (0.07)	0.01 (0.03)	-0.11* (0.06)	-0.12 (0.07)	0.01 (0.03)
route_herfindahl				-0.07 (0.10)	-0.03 (0.11)	-0.04 (0.06)
D_hub				-0.14 (0.12)	-0.15 (0.15)	0.02 (0.07)
herfindahl_hub_inter				0.06 (0.12)	-0.01 (0.14)	0.08 (0.08)
Observations	13,309	13,309	13,309	13,309	13,309	13,309
R-squared	0.87	0.91	0.74	0.87	0.91	0.74
Year FE	y	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 17: Incumbents' response to potential entry due to mergers
Period 1993-2013

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
Merger_first_aba_8_lag	0.05 (0.27)	3.02*** (0.51)	1.70*** (0.35)	0.04*** (0.01)	0.03*** (0.01)
Merger_first_aba_7_lag	-0.12 (0.34)	1.56*** (0.57)	0.83** (0.40)	0.03*** (0.01)	0.02** (0.01)
Merger_first_aba_6_lag	-0.28 (0.38)	1.51*** (0.58)	0.57 (0.41)	0.02*** (0.01)	0.01* (0.01)
Merger_first_aba_5_lag	-0.20 (0.38)	2.76*** (0.73)	0.39 (0.59)	0.02*** (0.01)	0.01 (0.01)
Merger_first_aba_4_lag	-0.56 (0.59)	1.86** (0.75)	-0.17 (0.57)	0.01 (0.01)	0.00 (0.01)
Merger_first_aba_3_lag	-0.62 (0.55)	-0.19 (0.70)	-0.93* (0.52)	-0.01 (0.01)	-0.02* (0.01)
Merger_first_aba_2_lag	-0.81 (0.57)	-0.82 (0.79)	-1.71*** (0.56)	-0.02* (0.01)	-0.03** (0.01)
Merger_first_aba_1_lag	0.08 (0.65)	1.69* (0.94)	-0.33 (0.70)	0.01 (0.01)	0.00 (0.01)
Merger_first_announced	0.16 (0.67)	2.94*** (1.02)	0.28 (0.76)	0.02* (0.01)	0.01 (0.01)
Merger_first_aba_1_forward	0.03 (0.76)	0.76 (1.15)	-1.39 (0.87)	-0.01 (0.01)	-0.02* (0.01)
Merger_first_aba_2_forward	-0.77 (0.78)	0.45 (1.22)	-1.33 (0.90)	-0.02 (0.02)	-0.03** (0.01)
Merger_in_both_3to12	-0.95 (0.86)	-1.18 (1.42)	-3.10*** (1.05)	-0.03* (0.02)	-0.05*** (0.02)
Merger_first_on_route	-2.41*** (0.60)	-4.29*** (1.03)	-2.53*** (0.58)	-0.06*** (0.01)	-0.04*** (0.01)
Merger_first_on_route_1to2	-0.05 (0.30)	0.22 (0.68)	0.60 (0.42)	-0.01 (0.01)	0.00 (0.01)
Merger_first_on_route_3to12	-0.36 (0.23)	-0.56 (0.43)	-0.32 (0.29)	-0.01 (0.00)	-0.01** (0.00)
Observations	10,420	10,420	10,420	10,420	10,420
R-squared	0.47	0.51	0.53	0.53	0.52
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 18: Incumbents' response to potential entry due to mergers
Route-quarter FE, period 1993-2013

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
Merger_first_aba_8_lag	0.27 (0.31)	3.24*** (0.59)	1.86*** (0.40)	0.04*** (0.01)	0.02*** (0.01)
Merger_first_aba_7_lag	-0.07 (0.42)	1.75** (0.72)	1.02** (0.50)	0.03*** (0.01)	0.02*** (0.01)
Merger_first_aba_6_lag	-0.16 (0.43)	1.40** (0.67)	0.65 (0.45)	0.02** (0.01)	0.01* (0.01)
Merger_first_aba_5_lag	0.11 (0.44)	2.85*** (0.92)	0.36 (0.76)	0.03*** (0.01)	0.01 (0.01)
Merger_first_aba_4_lag	-0.18 (0.66)	1.96** (0.91)	-0.00 (0.68)	0.01 (0.01)	-0.00 (0.01)
Merger_first_aba_3_lag	-0.80 (0.63)	0.02 (0.84)	-0.65 (0.60)	-0.01 (0.01)	-0.01 (0.01)
Merger_first_aba_2_lag	-0.84 (0.64)	-0.71 (0.89)	-1.41** (0.59)	-0.02 (0.01)	-0.02* (0.01)
Merger_first_aba_1_lag	0.64 (0.70)	2.23** (1.01)	0.03 (0.76)	0.02 (0.01)	0.01 (0.01)
Merger_first_announced	0.46 (0.77)	3.53*** (1.13)	0.88 (0.81)	0.03** (0.01)	0.01 (0.01)
Merger_first_aba_1_forward	-0.25 (0.87)	1.25 (1.25)	-0.78 (0.88)	0.00 (0.02)	-0.01 (0.01)
Merger_first_aba_2_forward	-0.68 (0.86)	0.92 (1.32)	-0.80 (0.92)	-0.01 (0.02)	-0.03* (0.02)
Merger_in_both_3to12	-0.73 (0.97)	-0.55 (1.55)	-2.52** (1.12)	-0.02 (0.02)	-0.04** (0.02)
Merger_first_on_route	-2.42*** (0.65)	-4.44*** (1.18)	-2.57*** (0.70)	-0.06*** (0.01)	-0.04*** (0.01)
Merger_first_on_route_1to2	0.15 (0.30)	-0.15 (0.67)	0.24 (0.39)	-0.01 (0.01)	-0.00 (0.01)
Merger_first_on_route_3to12	-0.35 (0.23)	-0.65 (0.48)	-0.37 (0.31)	-0.01 (0.01)	-0.01** (0.00)
Observations	10,420	10,420	10,420	10,420	10,420
R-squared	0.55	0.58	0.60	0.60	0.60
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Route-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 19: Incumbents' response to potential entry due to mergers
Without slot-controlled airports, period 1993-2013

VARIABLES	(1) ln flight cancelled	(2) ln arrival delay	(3) ln departure delay minutes	(4) ln arrival delay15	(5) ln departure delay 15
Merger_first_aba_8_lag	0.02 (0.24)	3.25*** (0.52)	1.73*** (0.36)	0.04*** (0.01)	0.03*** (0.01)
Merger_first_aba_7_lag	0.22 (0.28)	2.10*** (0.57)	0.89** (0.42)	0.03*** (0.01)	0.02*** (0.01)
Merger_first_aba_6_lag	0.22 (0.34)	2.08*** (0.58)	0.66 (0.43)	0.03*** (0.01)	0.02** (0.01)
Merger_first_aba_5_lag	-0.24 (0.34)	3.30*** (0.74)	0.36 (0.61)	0.03*** (0.01)	0.01 (0.01)
Merger_first_aba_4_lag	-0.46 (0.47)	1.75** (0.73)	-0.62 (0.54)	0.01 (0.01)	-0.00 (0.01)
Merger_first_aba_3_lag	-0.56 (0.49)	-0.15 (0.69)	-1.32*** (0.50)	-0.01 (0.01)	-0.02* (0.01)
Merger_first_aba_2_lag	-0.74 (0.53)	-0.83 (0.80)	-2.08*** (0.56)	-0.02 (0.01)	-0.03*** (0.01)
Merger_first_aba_1_lag	-0.18 (0.58)	1.19 (0.93)	-1.01 (0.70)	0.00 (0.01)	-0.01 (0.01)
Merger_first_announced	-0.08 (0.62)	2.73*** (1.04)	-0.35 (0.76)	0.02* (0.01)	-0.00 (0.01)
Merger_first_aba_1_forward	0.00 (0.70)	0.88 (1.14)	-1.71** (0.85)	-0.00 (0.01)	-0.03* (0.01)
Merger_first_aba_2_forward	-0.27 (0.72)	1.14 (1.20)	-1.37 (0.87)	-0.01 (0.02)	-0.03** (0.02)
Merger_in_both_3to12	-0.77 (0.78)	-0.87 (1.41)	-3.46*** (1.01)	-0.03 (0.02)	-0.05*** (0.02)
Merger_first_on_route	-2.17*** (0.52)	-3.75*** (0.94)	-2.13*** (0.55)	-0.05*** (0.01)	-0.04*** (0.01)
Merger_first_on_route_1to2	-0.08 (0.29)	0.13 (0.68)	0.71 (0.43)	-0.01 (0.01)	0.00 (0.01)
Merger_first_on_route_3to12	-0.38* (0.20)	-0.60 (0.44)	-0.29 (0.29)	-0.01 (0.00)	-0.01** (0.00)
Observations	9,694	9,694	9,694	9,694	9,694
R-squared	0.56	0.50	0.48	0.51	0.48
Year FE	y	y	y	y	y
Carrier-Route FE	y	y	y	y	y
Carrier-Quarter FE	y	y	y	y	y
Route Carrier Clustering	y	y	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

1 Appendix

Table A1: Incumbents' response to mergers & to potential entry due to mergers
Route-quarter FE, period 1993-2013

	(1)	(2)	(3)
VARIABLES	ln_aveP	ln_aveP	ln_aveP
Merger (LCC)_first_aba_8_lag	0.04 (0.04)	-0.02 (0.05)	-0.02 (0.05)
Merger (LCC)_first_aba_7_lag	0.04 (0.04)	-0.05 (0.05)	-0.05 (0.05)
Merger (LCC)_first_aba_6_lag	0.05 (0.04)	-0.01 (0.05)	-0.01 (0.05)
Merger (LCC)_first_aba_5_lag	0.03 (0.05)	-0.03 (0.05)	-0.03 (0.05)
Merger (LCC)_first_aba_4_lag	0.08 (0.06)	-0.09 (0.06)	-0.07 (0.06)
Merger (LCC)_first_aba_3_lag	0.07 (0.06)	0.00 (0.06)	-0.01 (0.06)
Merger (LCC)_first_aba_2_lag	0.09 (0.06)	0.04 (0.06)	0.03 (0.06)
Merger (LCC)_first_aba_1_lag	0.06 (0.07)	0.07 (0.06)	0.06 (0.06)
Merger_first_announced (LCC_first_at_both_airports)	0.06 (0.08)	0.01 (0.07)	0.01 (0.08)
Merger (LCC)_first_aba_1_forward	0.08 (0.09)	-0.02 (0.08)	-0.02 (0.08)
Merger (LCC)_first_aba_2_forward	0.07 (0.08)	-0.05 (0.08)	-0.06 (0.08)
Merger (LCC)_in_both_3to12	0.03 (0.11)	-0.04 (0.08)	-0.04 (0.08)
Merger (LCC)_first_on_route	-0.08 (0.07)	0.10 (0.07)	0.05 (0.08)
Merger (LCC)_first_on_route_1to2	0.05 (0.06)	-0.03 (0.05)	0.02 (0.04)
Merger (LCC)_first_on_route_3to12	0.01 (0.04)	0.01 (0.02)	0.01 (0.02)
Observations	9,540	14,276	14,316
R-squared	0.77	0.59	0.59
Year FE	y	y	y
Carrier-Route FE	y	y	y
Route-Quarter FE	y	y	y
Route Carrier Clustering	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

(1) Incumbents' response to potential entry of LCCs

(2) Incumbents' response to potential entry due to mergers

(3) Incumbents' response to mergers in routes of merging airlines flying before merge

Table A2: Incumbents' response to potential entry of LCCs and mergers, period 1993-2013

VARIABLES	(1) ln_loadfactor	(2) ln_loadfactor	(3) ln_loadfactor
Merger (LCC)_first_aba_8_lag	-0.05 (0.05)	0.04 (0.07)	0.04 (0.07)
Merger (LCC)_first_aba_7_lag	-0.03 (0.05)	-0.06 (0.08)	-0.08 (0.08)
Merger (LCC)_first_aba_6_lag	-0.13** (0.06)	-0.08 (0.08)	-0.09 (0.08)
Merger (LCC)_first_aba_5_lag	-0.11* (0.07)	-0.07 (0.08)	-0.08 (0.08)
Merger (LCC)_first_aba_4_lag	-0.12* (0.07)	-0.14 (0.10)	-0.16* (0.10)
Merger (LCC)_first_aba_3_lag	-0.13 (0.08)	-0.15 (0.09)	-0.18** (0.09)
Merger (LCC)_first_aba_2_lag	-0.25*** (0.09)	-0.20** (0.10)	-0.23** (0.10)
Merger (LCC)_first_aba_1_lag	-0.31*** (0.10)	-0.21** (0.11)	-0.26** (0.10)
Merger_first_announced (LCC_first_at_both_airports)	-0.31*** (0.10)	-0.23** (0.11)	-0.27** (0.12)
Merger_first_aba_1_forward (LCC_first_aba_1_forward)	-0.35*** (0.12)	-0.36*** (0.12)	-0.40*** (0.12)
Merger_first_aba_2_forward (LCC_first_aba_2_forward)	-0.28** (0.13)	-0.28** (0.13)	-0.32** (0.13)
Merger (LCC)_in_both_3to12	-0.36** (0.15)	-0.35** (0.14)	-0.39*** (0.14)
Merger (LCC)_first_on_route	0.04 (0.11)	-0.13 (0.16)	0.19 (0.15)
Merger (LCC)_first_on_route_1to2	-0.35*** (0.13)	-0.01 (0.08)	0.11 (0.09)
Merger (LCC)_first_on_route_3to12	-0.12 (0.08)	-0.06 (0.06)	0.15** (0.06)
Observations	14,125	14,396	14,355
R-squared	0.81	0.80	0.80
Year FE	y	y	y
Carrier-Route FE	y	y	y
Carrier-Quarter FE	y	y	y
Route Carrier Clustering	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

(1) Incumbents' response to potential entry of LCCs

(2) Incumbents' response to potential entry due to mergers

(3) Incumbents' response to mergers in routes of merging airlines flying before merge

Table A3: Incumbents' response to potential entry of LCCs and mergers
Route-quarter FE, period 1993-2013

VARIABLES	(1) ln_loadfactor	(2) ln_loadfactor	(3) ln_loadfactor
Merger (LCC)_first_aba_8_lag	-0.03 (0.07)	0.03 (0.09)	0.03 (0.08)
Merger (LCC)_first_aba_7_lag	0.02 (0.07)	-0.11 (0.09)	-0.12 (0.09)
Merger (LCC)_first_aba_6_lag	-0.06 (0.07)	-0.14 (0.09)	-0.15 (0.09)
Merger (LCC)_first_aba_5_lag	-0.13 (0.08)	-0.08 (0.09)	-0.09 (0.09)
Merger (LCC)_first_aba_4_lag	-0.09 (0.10)	-0.16 (0.12)	-0.18 (0.12)
Merger (LCC)_first_aba_3_lag	-0.05 (0.11)	-0.22** (0.11)	-0.25** (0.11)
Merger (LCC)_first_aba_2_lag	-0.19* (0.11)	-0.25** (0.12)	-0.29** (0.12)
Merger (LCC)_first_aba_1_lag	-0.29** (0.12)	-0.24* (0.12)	-0.28** (0.12)
Merger_first_announced (LCC_first_at_both_airports)	-0.24* (0.14)	-0.26* (0.14)	-0.30** (0.14)
Merger (LCC)_first_aba_1_forward	-0.28* (0.15)	-0.39*** (0.15)	-0.44*** (0.15)
Merger (LCC)_first_aba_2_forward	-0.20 (0.16)	-0.31* (0.16)	-0.36** (0.16)
Merger (LCC)_in_both_3to12	-0.28 (0.19)	-0.35** (0.17)	-0.39** (0.17)
Merger (LCC)_first_on_route	0.14 (0.13)	-0.16 (0.18)	0.25 (0.17)
Merger (LCC)_first_on_route_1to2	-0.39*** (0.15)	0.03 (0.09)	0.09 (0.10)
Merger (LCC)_first_on_route_3to12	-0.10 (0.09)	-0.06 (0.06)	0.17** (0.07)
Observations	14,125	14,396	14,355
R-squared	0.84	0.83	0.83
Year FE	y	y	y
Carrier-Route FE	y	y	y
Route-Quarter FE	y	y	y
Route Carrier Clustering	y	y	y

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

(1) Incumbents' response to potential entry of LCCs

(2) Incumbents' response to potential entry due to mergers

(3) Incumbents' response to mergers in routes of merging airlines flying before merge

Table A4: Incumbents' response to potential entry of LCCs and mergers
Route-quarter FE, period 1993-2013

VARIABLES	(1) ln_ticketsales_r	(2) ln_ticketsales_r	(3) ln_ticketsales_r
Merger (LCC)_first_aba_8_lag	0.02 (0.08)	0.04 (0.07)	0.04 (0.07)
Merger (LCC)_first_aba_7_lag	0.10 (0.08)	-0.13* (0.08)	-0.13* (0.08)
Merger (LCC)_first_aba_6_lag	-0.02 (0.09)	-0.14* (0.08)	-0.14* (0.08)
Merger (LCC)_first_aba_5_lag	-0.07 (0.09)	-0.12 (0.08)	-0.11 (0.08)
Merger (LCC)_first_aba_4_lag	0.01 (0.11)	-0.26*** (0.09)	-0.27*** (0.09)
Merger (LCC)_first_aba_3_lag	0.06 (0.12)	-0.13 (0.09)	-0.12 (0.09)
Merger (LCC)_first_aba_2_lag	0.04 (0.12)	-0.15* (0.09)	-0.14 (0.09)
Merger (LCC)_first_aba_1_lag	-0.07 (0.13)	-0.12 (0.10)	-0.12 (0.10)
Merger_first_announced (LCC_first_at_both_airports)	-0.05 (0.16)	-0.04 (0.11)	-0.03 (0.11)
Merger (LCC)_first_aba_1_forward	-0.06 (0.17)	-0.24** (0.12)	-0.23* (0.12)
Merger (LCC)_first_aba_2_forward	0.11 (0.18)	-0.22* (0.13)	-0.21 (0.13)
Merger (LCC)_in_both_3to12	0.11 (0.21)	-0.32** (0.14)	-0.31** (0.14)
Merger (LCC)_first_on_route	0.15 (0.15)	0.18 (0.12)	-0.05 (0.10)
Merger (LCC)_first_on_route_1to2	-0.17 (0.13)	-0.05 (0.09)	0.03 (0.09)
Merger (LCC)_first_on_route_3to12	-0.12 (0.09)	-0.08 (0.06)	0.11** (0.05)
Observations	10,505	10,846	10,812
R-squared	0.78	0.64	0.64
Year FE	y	y	y
Route-Quarter FE	y	y	y
Route Clustering	y	y	y

Robust standard errors in parentheses

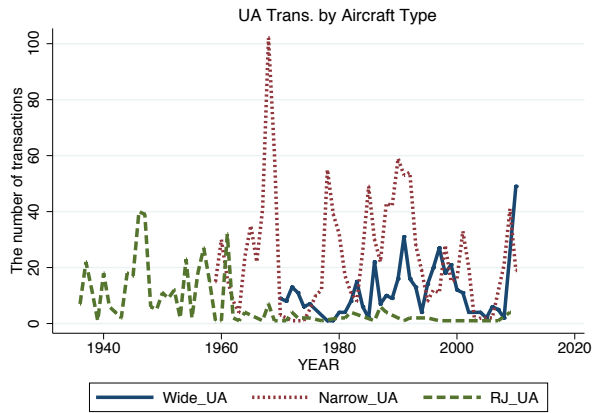
*** p<0.01, ** p<0.05, * p<0.1

(1) Incumbents' response to potential entry of LCCs

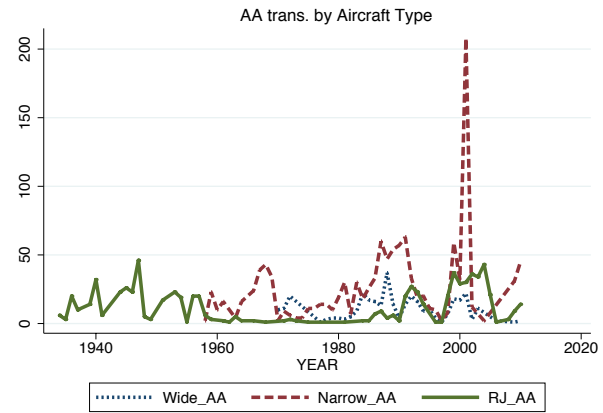
(2) Incumbents' response to potential entry due to mergers

(3) Incumbents' response to mergers in routes of merging airlines flying before merge

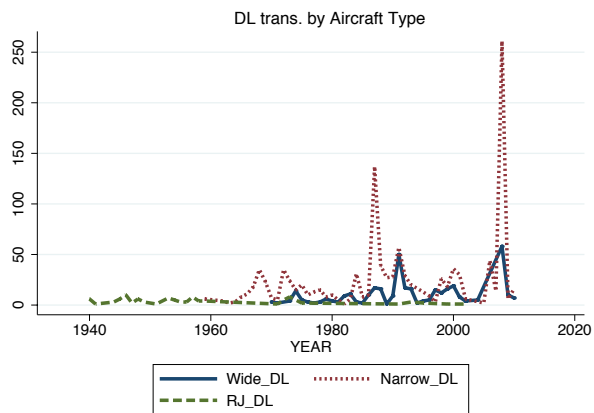
Figure A1: Transportation by Airline & Aircraft Type



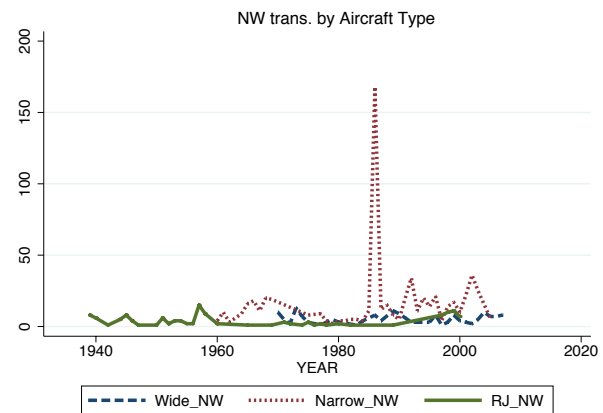
(a)



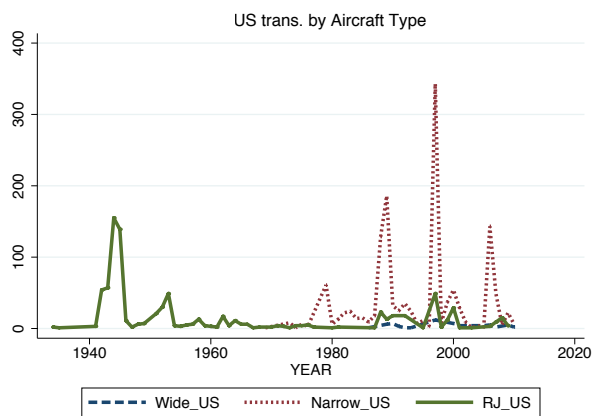
(b)



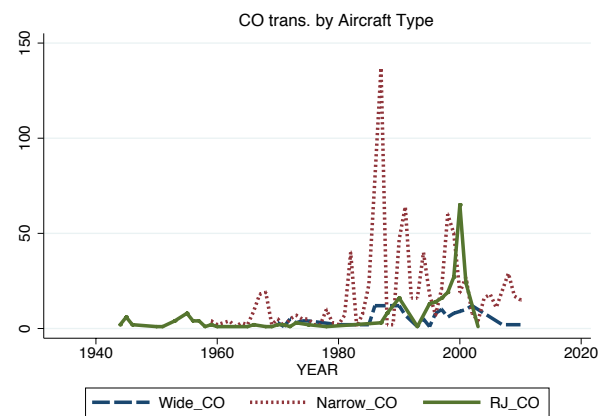
(c)



(d)



(e)



(f)

Table A5: Probability of LCC's entry into a route

LCCs in one endpoint airport in the previous quarter	LCCs in both endpoint airports in the previous quarter
0.0034 (0.0007)	0.0113 (0.0006)
N=433,098	N=433,098
including Quarter f.e.	including Quarter f.e.
Robust standard errors in parentheses similar to the Table 1 in Goolsbee & Syverson (2008)	