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ON THE PERSISTENT FINANCIAL LOSSES OF U.S. AIRLINES: A PRELIMINARY EXPLORATION

Severin Borenstein

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In 2010, I was a member of the USDOT's Future of Aviation Advisory Committee. I also advised the U.S. Department of Justice in its analysis of the proposed merger between Continental and United Airlines. For helpful comments and discussions, I am grateful to Silke Forbes, Will Gillespie, Ken Heyer, Paul Joskow, Nancy Rose and Catherine Wolfram. A short version of this paper is forthcoming in the May 2011 American Economic Review Papers and Proceedings under the title "Why Can't U.S. Airlines Make Money?".

This paper is dedicated to the memory of Alfred E. Kahn who passed away on December 27, 2010. I was lucky enough to work for Fred at the Civil Aeronautics Board in 1978 and to speak with him occasionally since then about the airline industry and government regulation. His approach to industrial organization and regulation, and the application of research to non-partisan policy making, set a standard to which all IO economists should aspire. His insights continue to influence the best research on economic regulation. He was the very model of a modern (and thoughtful) IO economist. The views expressed herein are those of the author and do not necessarily reflect the views of the National Bureau of Economic Research.

On the Persistent Financial Losses of U.S. Airlines: A Preliminary Exploration
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ABSTRACT

U.S. airlines have lost nearly $60 billion (2009 dollars) in domestic markets since deregulation, most of it in the last decade. More than 30 years after domestic airline markets were deregulated, the dismal financial record is a puzzle that challenges the economics of deregulation. I examine some of the most common explanations among industry participants, analysts, and researchers -- including high taxes and fuel costs, weak demand, and competition from lower-cost airlines. Descriptive statistics suggest that high taxes have been at most a minor factor and fuel costs shocks played a role only in the last few years. Major drivers seem to be the severe demand downturn after 9/11 -- demand remained much weaker in 2009 than it was in 2000 -- and the large cost differential between legacy airlines and the low-cost carriers, which has persisted even as their price differentials have greatly declined.

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In 2008 and 2009, U.S. passenger airlines reported aggregate net losses, before extraordinary income and charges, of $14 billion on revenues of $270 billion.[1] About 76% of the losses were on domestic U.S. operations, which have been deregulated since the fall of 1978. Most international routes remain more heavily regulated, and generally more lucrative for those carriers that are permitted to serve them. The very poor financial results in 2008-2009 again sparked discussions of why the airline industry has fared so badly since deregulation. From 1979 through 2009, U.S. airlines lost $59 billion (in 2009 dollars) on domestic operations.[2]

Figure 1 shows net income on domestic operations for the industry since 1979, scaled by the size of operations (available seat-miles).[3] It illustrates that the losses have been dramatically worse in the last ten years than in the previous two decades of deregulation. In fact, in 2009 dollars, domestic passenger airline operations lost $10 billion from 1979 to 1989, made profits of $5 billion in the 1990s and lost $54 billion from 2000 to 2009. To put these numbers in context, at the end of 2009, the entire book value of U.S. passenger carriers' assets was about $163 billion and the book value of shareholder equity was $10 billion. Even at the end of the 2000, after six consecutive profitable years, their assets were $159 billion and shareholder equity was $40 billion (all in 2009 dollars).[4]

Three decades after deregulation the industry's financial track record is dismal. This isn't what economists, analysts or industry participants predicted in 1978. It is a puzzle to industrial organization economists and a challenge to the views of deregulation advocates. The puzzle is compounded by the fact that the industry saw robust investment until 2001 and has seen only modest disinvestment in the financially disastrous 2000s. From 1979 to 2001, the U.S. airline passenger fleet grew in every year, by an average of 4.9% per year

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[1] The earnings figures I report throughout this paper exclude asset writedowns, pension settlements, reorganization costs and "fresh start" accounting adjustments, which are often associated with bankruptcies and mergers. Including these adjustments does not change the basic picture, but causes large swings in year-to-year reported earnings that are not attributable to market activities in the specific year. Capital gains and losses from fuel hedging are generally included in operating expenses (evident in average fuel purchase prices that differ substantially from the market price), not extraordinary income and charges. These data include only U.S. carriers that receive at least $1 million per quarter from passenger revenues, so they exclude cargo carriers such as UPS and Fed Ex. See the Appendix for a list of the carriers included. The net income before extraordinary charges does include debt payments and taxes. All references here to earnings, net income, profits and losses use this measure. In terms of DOT income statement accounting, this is "net income" minus "other net income".

[2] The losses are slightly larger, $67 billion, when international operations are included.

[3] See the appendix for details of all calculations for figures.

[4] Carriers' assets include aircraft and other facilities on long-term lease.

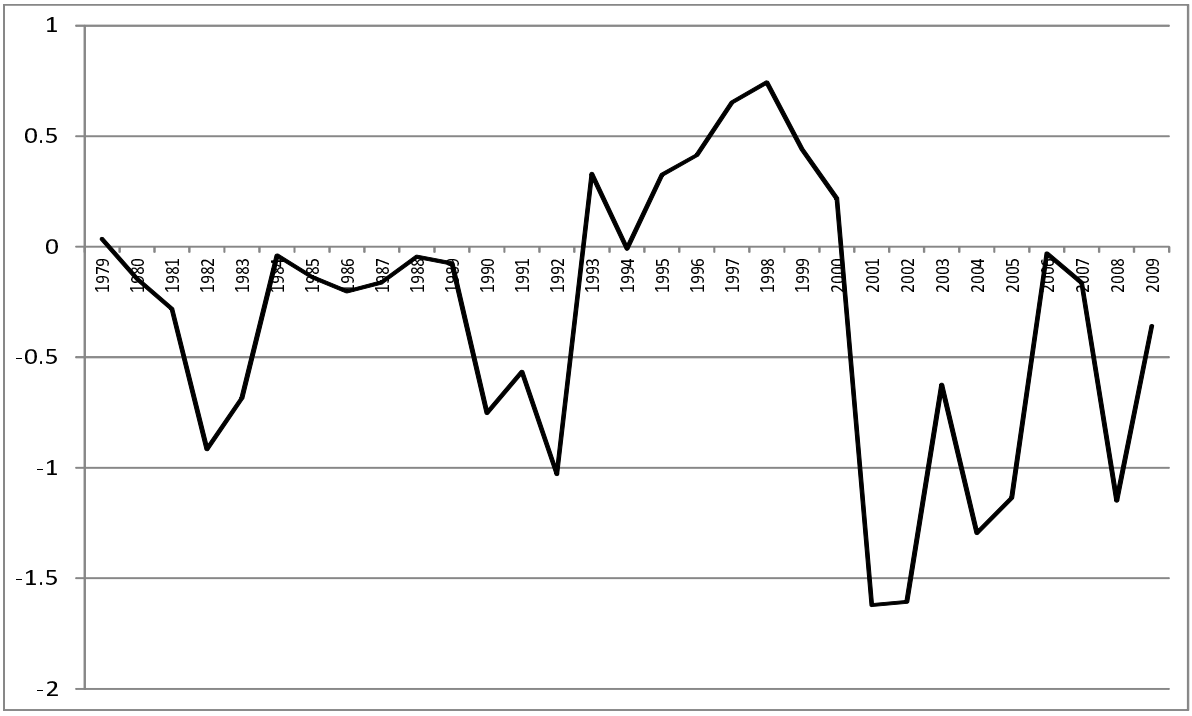

Figure 1: Net Income (¢2009) per Available Seat-Mile: U.S. Domestic Markets

measured by aircraft and 3.6% per year measured by aircraft-seats.[5] The fleet size peaked in 2001. From the end of 2001 to the end of 2008 (latest available date), aircraft and aircraft-seats declined by 1.7% and 1.4% per year respectively.

Borenstein & Rose (2008, henceforth "BR") addressed the volatility of airline profits, showing that fluctuations in demand and fuel prices along with fixed capital costs and sticky labor costs can explain the industry's earnings volatility. But that analysis did not address the *level* of profits, the fact that the domestic airline industry has reported negative net income in 23 of 31 years since deregulation and a strongly negative aggregate net present value of earnings. There is no conventional long-run equilibrium explanation for an industry that perpetually loses money, but there are a number of disequilibrium theories that have been suggested by industry participants, financial analysts, and researchers. In this short paper I discuss these theories and attempt to narrow down the range of plausible explanations.

[5] These aircraft data cover domestic and international operations of nearly all U.S. passenger airlines operating 19-seat and larger aircraft. As suggested by this difference, the average size of commercial aircraft in the U.S. declined during this period, due in part to the growth of regional jets.

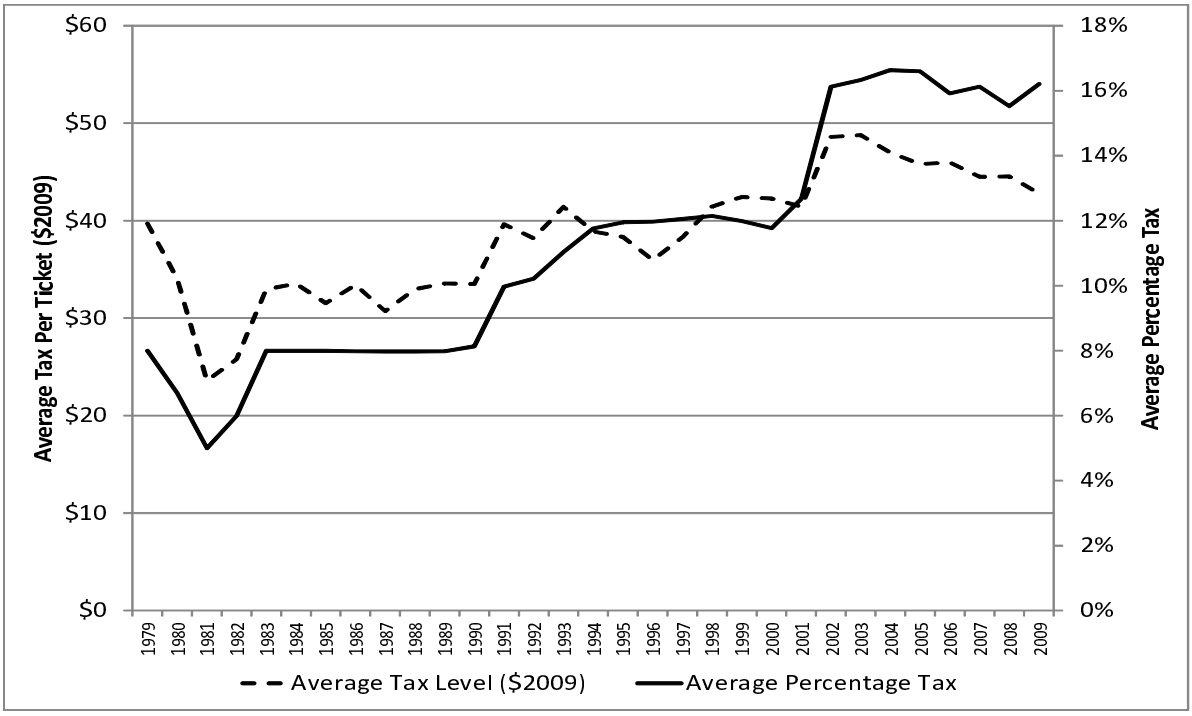

Figure 2: Average Ticket Tax

I. Exogenous cost drivers: taxes and fuel

Industry leaders argue that the tax and fee burden on airline tickets is excessive, today including a 7.5% ticket tax and fees of $6.20 per segment flown. In addition, many airports impose passenger facilities charges (PFCs) of up to $4.50 on each passenger boarding a flight at the airport. One can argue about whether these taxes are excessive given the government costs of supporting the industry, but it is difficult to see how these would lead to losses for more than a short transitional period. Figure 2 shows that the average tax (including federal ticket taxes and PFCs) as a percentage of the base ticket price has climbed steadily, and is today about twice as high as when it was 8% through most of the 1980s.[6] But the average dollar tax per ticket (in 2009 dollars) is today at about the same level it was in the profitable late 1990s.

Over the last 30 years, the primary form of taxation has transitioned from strictly a percentage excise tax to a mix of percentage and per-segment taxes. In the 1980s, the entire ticket tax was a percentage of the ticket value. The passenger facility charges were added in the early 1990s, the segment tax in 1997 and the September 11 security fee in

[6] The calculation of average tax as a percentage of price includes baggage and ticket-change fees in base price.

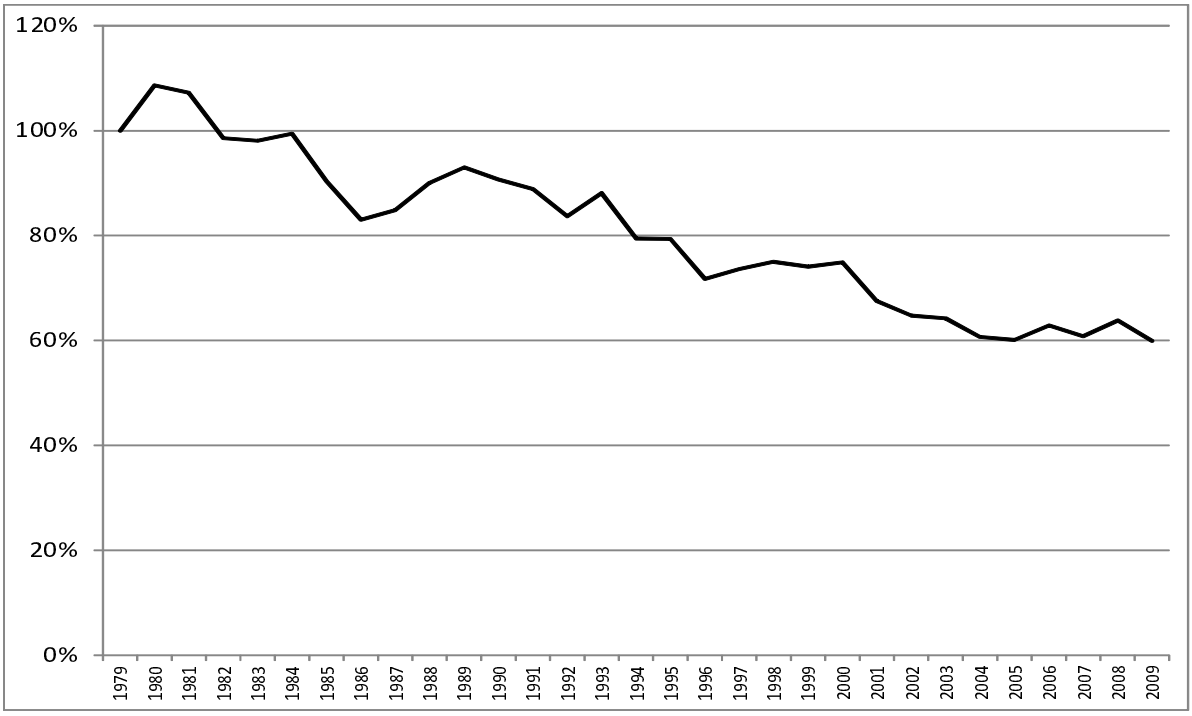

Figure 3: Real Average Ticket Price Relative to 1979 (adjusted for average trip distance) (inclusive of government taxes/fees and average airline baggage and ticket-change fees)

early 2002, all based on the number of flights the passenger boards, regardless of the fare paid. As a result, as real fares have declined, dropping significantly after the September 11 attacks, the tax burden increased as a percentage of the base fare.[7]

The problem seems to be not that taxes have risen, but that the base fares have fallen and stayed so low. Even the post-9/11 tax increase has mostly reverted in real terms. Figure 3 shows the average ticket price relative to 1979, adjusted for inflation and trip distance (which has increased substantially over time).[8] While taxes and fees have changed incrementally, the industry scale has changed massively. In the standard long-run adjustment dynamics, it seems that the industry should have been able to achieve the scale change necessary to incorporate and pass through these taxes. My own research in progress suggests that changes in passenger facilities charges are nearly entirely passed through to customers within two quarters.

[7] The substantial fee increase in early 2002 raised revenue for significantly expanding security services after 9/11.

[8] See the appendix for details of this calculation.

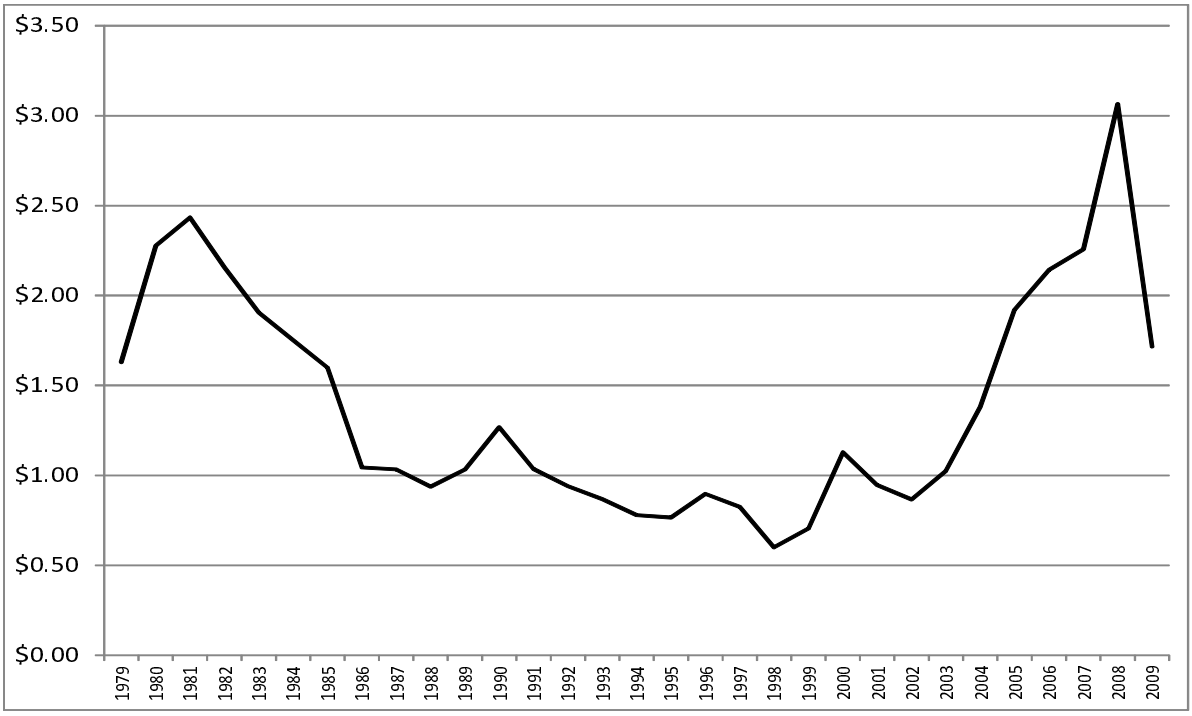

Figure 4: Jet Fuel Price ($2009)

Fuel costs increases have certainly been a significant component of losses in some years, most obviously 2008. Over the deregulation era, however, oil costs were highest in the first 7 years and the most recent 5 years, over $40 per barrel in 2009 dollars, and much lower during the 19 intervening years. Figure 4 shows that from 1986 to 2004 the average jet fuel price was below $1.40 per gallon – relatively stable and much lower than in the early period of deregulation. Yet, the industry still lost money in 13 of those 19 years and on net lost $31 billion in 2009 dollars.

While there is no question that the airlines earnings are affected in the short run by extreme oil price fluctuations such as occurred in the last few years, there doesn't appear to be a barrier to capacity adjustment over 3 to 6 months in response to oil price changes. The rapid reductions in schedules in the second half of 2008 make that clear.

Still, reducing flight schedules doesn't eliminate costs if those costs are fixed or sticky. In times of growing demand, carriers can adjust fairly smoothly to unanticipated cost increases by growing more slowly, without having to ground aircraft or reduce workforce size. When demand is stagnant or declining, however, rescaling operations in response to upward cost shocks is more difficult and costly.

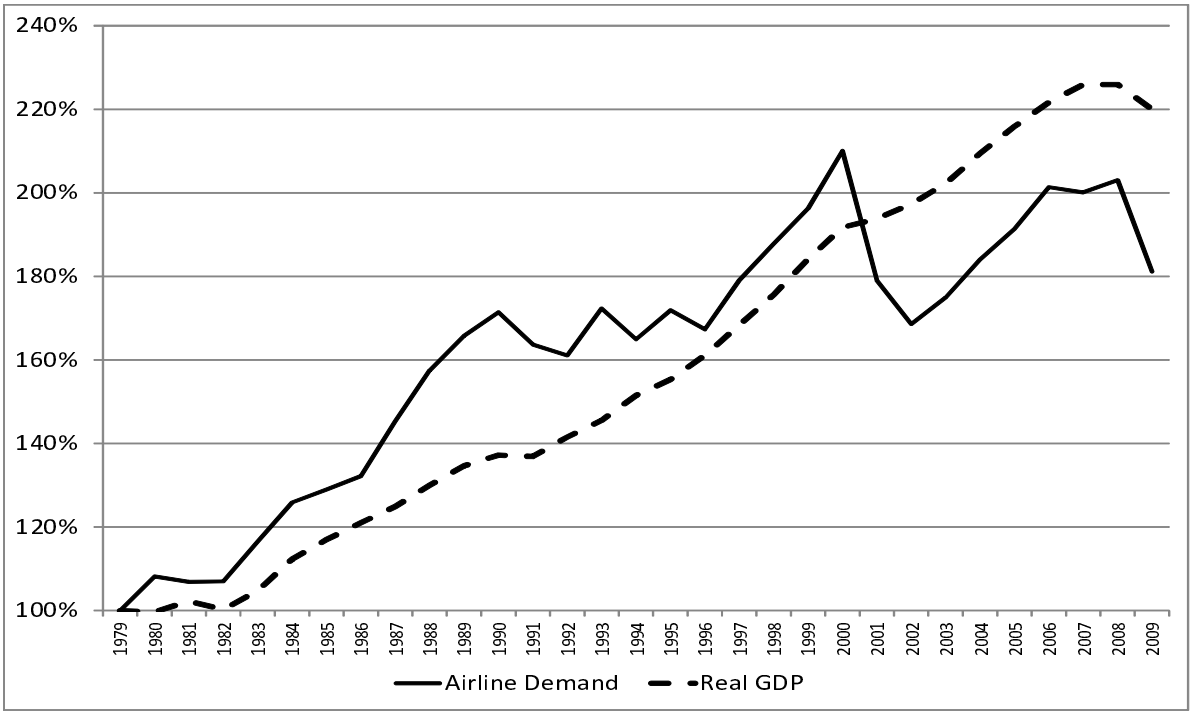

Figure 5: Implied Domestic Airline Demand and Real GDP, Relative to 1979

II. Exogenous demand shocks

The role of demand shocks in airline losses is most notable in 2001-02 and in 2008-09. Prior to 9/11, however, it appears that domestic demand grew fairly steadily. Inferring demand shifts from average yield and revenue passenger-miles, demand changes are presented in figure 5.[9] Demand increased by 110% from 1979 to 2000, growing in 16 of those 21 years. Yet, the industry made money in only 8 of those years and overall lost $3 billion ($2009) over this period. The economic downturns during this period certainly affected airline industry profits, but we wouldn't expect investors to believe that demand growth would be completely constant and steady. It is hard to see how unanticipated demand shocks during this time could be a credible explanation for the overall poor performance.

Demand shocks are a more plausible explanation for the losses of the 2000s. The post-9/11 demand drop, which was about 20% from 2000 to 2002, was unprecedented. By 2008, demand was still about 3% lower than it had been in 2000, and then it dropped about 11% in 2009. Because of the fixed capital costs and sticky labor costs, the decade of depressed demand was accompanied by a decade of depressed prices. In real terms prices were 20%

[9] I follow the same basic approach as in BR, but use a price measure that adjusts for average trip distance. See the appendix for further explanation.

lower in 2009 than in 2000 (adjusted for trip distance) despite the fact that jet fuel prices were about $0.59 per gallon (52%) higher, which, based on 2009 revenue passenger-miles per gallon of fuel, raised overall costs by about 9%.

The other notable change in domestic service over this period was the increase in average passenger load factor from 71% in 2000 to 81% in 2009. This was a continuation of the very steady increase in the 1990s from about 60% in 1990 (and most of the 1980s). The increases are mostly independent of demand shocks, rising or holding constant in every year except a 2% downward tick after September 11, which was completely reversed by 2003. Increased fuel costs would make higher load factors more economic, but there is no evidence that the load factor increases have been greater during periods of rising than periods of falling fuel costs. More likely, load factor increases have been a result of improving yield management technologies.

III. Entry and expansion of low-cost carriers

Many industry observers and participants point to low-cost (and low-fare) carriers (LCCs) as part of the reason for low industry profits, but there is wide disagreement on what the connection is. If LCCs are simply offering a lower-quality product, then their differentiated product should find its niche in the market if there is sufficient demand for that quality level, yielding an equilibrium with both types earning normal returns.

Among industry and labor leaders, a common view is that new low-cost entrants and LCC incumbents have made excessive capacity investments during growth periods, and sometimes even during downturns, that have depressed prices for all. In order to discourage excessive investment, the largest airline pilots union has called for increasing capital requirements as part of FAA licensing of new airlines.[10]

But the evidence doesn't appear to support the idea that new entrants or older LCCs are more prone to over-investment than the legacy airlines. Figure 6 presents the aircraft-seat fleet size of LCCs and non-LCCs (including legacy carriers and regional carriers who generally operate as codeshare partners to the legacy carriers). Two things are clear from this figure. First, LCCs in aggregate have experienced no more erratic fleet size adjustments despite being less well-established on average.[11] In fact, they continued to

[10] If LCC's were more inclined to overinvestment, we would expect their financial performance to be worse on average and to be more volatile than legacy carriers. That doesn't seem to be the case as discussed below.

[11] The declines in 1987 and 1988 are caused by the purchases of PSA by US Airways and Air California

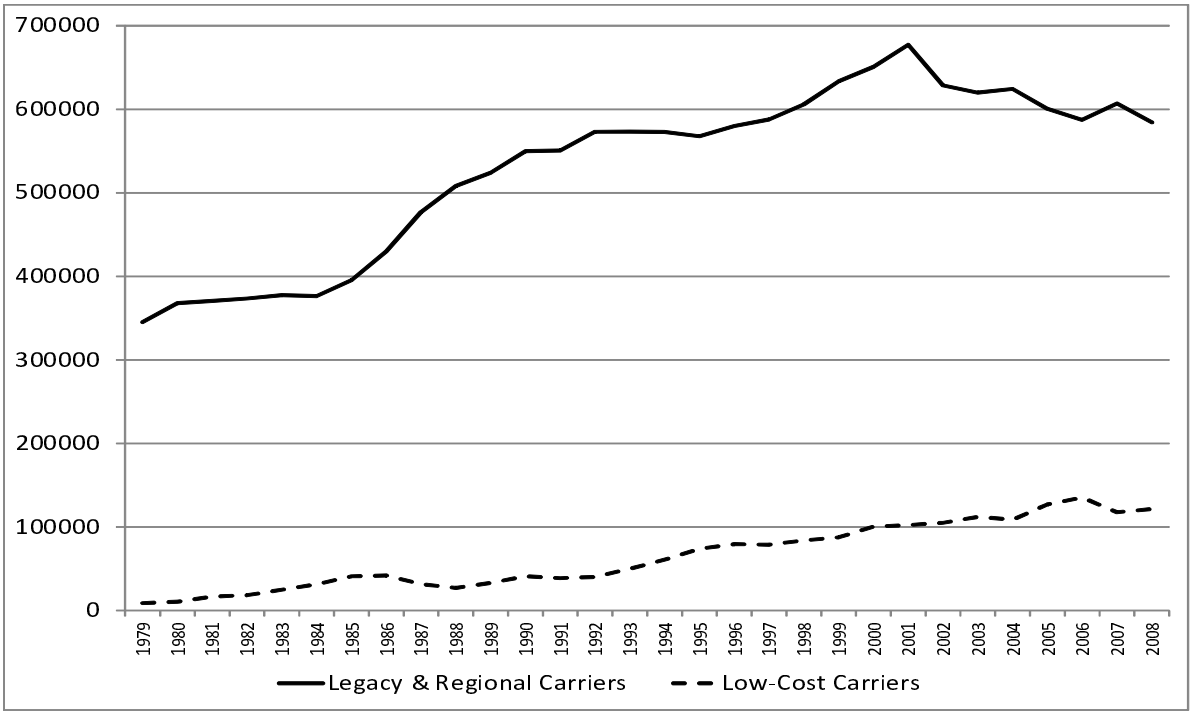

Figure 6: Aircraft-Seats in Fleet

grow gradually even after 9/11 while remaining much less unprofitable than the legacy carriers, as shown later. If anything, it appears to be the legacy carriers who are more prone to over-investment relative to the growth of their traffic. Second, the changes in fleet size of the LCCs is dwarfed by the variation of the non-LCC fleet, suggesting that LCC investment decisions have not been the primary driver in industry capacity changes.[12]

An alternate view of LCCs is that they have been gradually chipping away at the entrenched positions of legacy carriers that have much higher costs. The change has been gradual, because the legacy carriers are also protected by network marketing programs and other activities that raise barriers to entry by more efficient firms. Potentially exclusionary activities of legacy carriers include frequent-flyer and corporate discount programs that exchange discounts for customer loyalty on a portfolio of unrelated routes,[13] as well as

by American Airlines, in both cases transferring LCC fleets to the control of legacy carriers. Similarly, the decline in 2007 is a result of the US Airways-America West merger.

[12] These figures include entire carrier fleets, some of which are used on international routes, but the conclusion is not changed if the analysis is limited to narrow-body aircraft, which are used primarily for flights within North America.

[13] Severin Borenstein (1996) discusses the potential anti-competitive effects of such repeat-buyer programs in more detail. Mara Lederman (2007, 2008) presents evidence on the impact of FFPs.

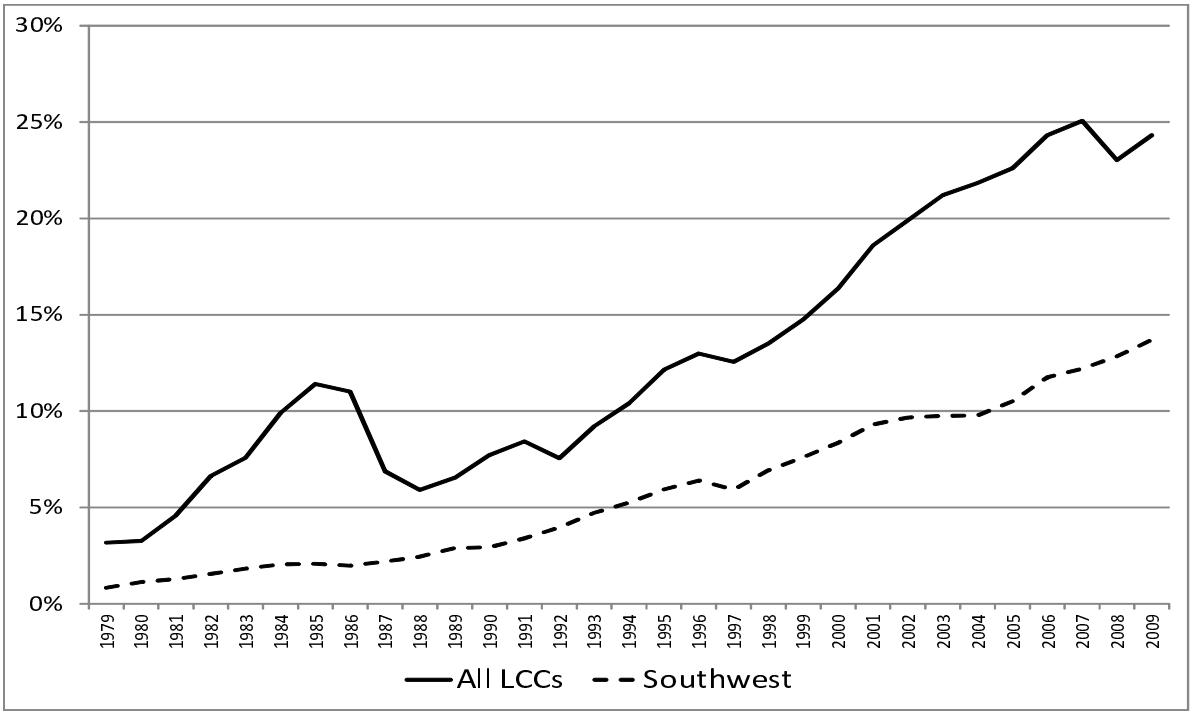

Figure 7: Domestic Market Share of Low-Cost Carriers (by revenue passenger-miles)

relationships with airports that allow large incumbents to restrict the availability of gates, landing slots and other resources to potential entrants.

LCCs have been growing steadily since the early 1990s. Figure 7 shows their domestic market share, by revenue passenger-miles since 1979.[14] LCCs now compete (defined as at least 10% passenger share) on over 60% of all airport pairs, and over 80% of all city-pairs if one assumes that the different airports in Dallas, Houston, Chicago, San Francisco, Los Angeles, New York, and Washington DC are in the same markets.

And LCCs have much lower costs than the legacy carriers. Figure 8 shows the operating cost per available seat-mile adjusted for average flight distance (or "haul") length.[15] Adjusted for the average flight distance, legacy carrier costs have remained 30%-60% higher than the LCCs for nearly all of the deregulation era, averaging about 40% higher in the last decade.

The cause of this persistent cost difference is an area in need of further research. Fuel

[14] The downticks in 1986, 1987 and 2008 are from legacy carriers absorbing the operations of LCCs.

[15] Details of the adjustment are presented in the appendix.

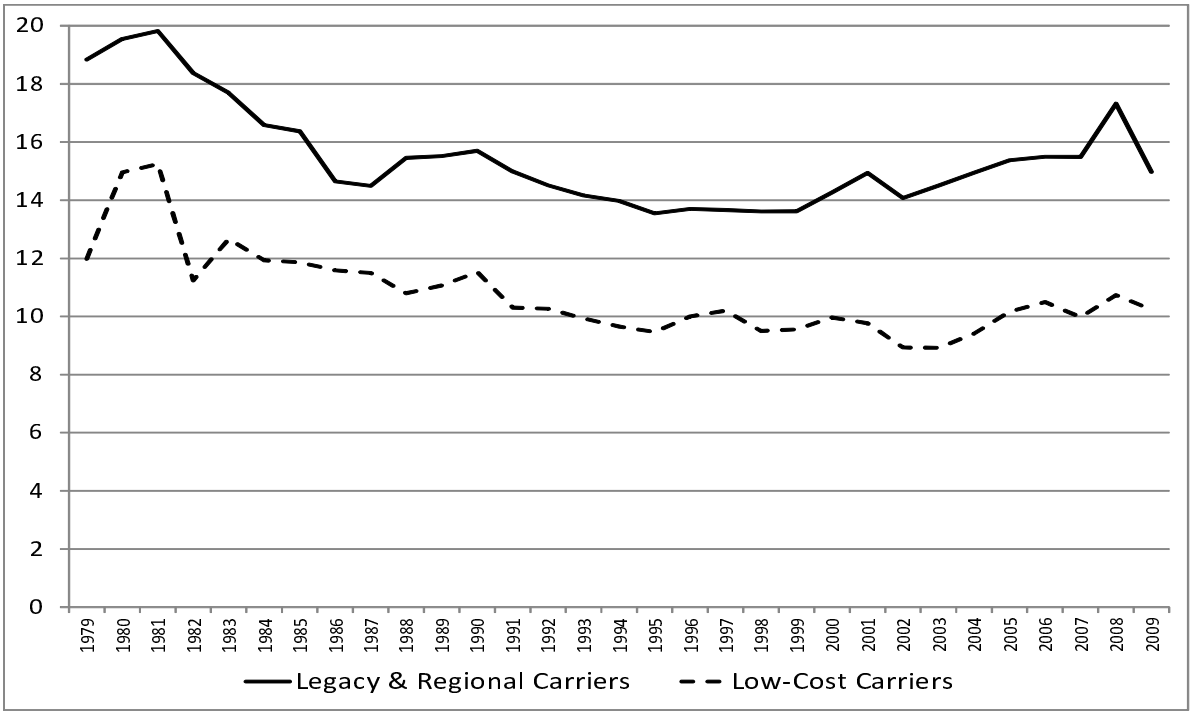

Figure 8: Average Operating Costs (¢2009) per Available Seat-Mile
(adjusted for average flight length)

costs are approximately the same for all airlines. Wages for flight attendants and ground crew at Southwest airlines are about comparable to those for similar staff at legacy carriers, and pilots of comparable aircraft are paid about the same. That may not be true for some of the other LCCs, however. I am not aware of an analysis that incorporates full benefits packages including pensions. Work rules are clearly more flexible at Southwest and the other LCCs, and employees in general are assigned to a wider array of activities, probably leading to higher labor utilization. Aircraft utilization is higher at Southwest than at legacy carriers, though it would be valuable to study how that has changed as Southwest has expanded to airports with more congestion and weather disruptions. Quality factors also differ – on-time rates, passenger complaint rates, legroom, seat assignment policies, among other factors. When all of these factors are considered, however, it is not clear which carriers have the high-quality product in domestic markets.

While the cost differential between LCCs and non-LCCs has remained large, the average price differential has been shrinking, as shown in figure 9. Figure 9 is adjusted for the average trip distance of passengers flying on each type of carriers.[16] LCC fares have

[16] Details of the adjustment are presented in the appendix.

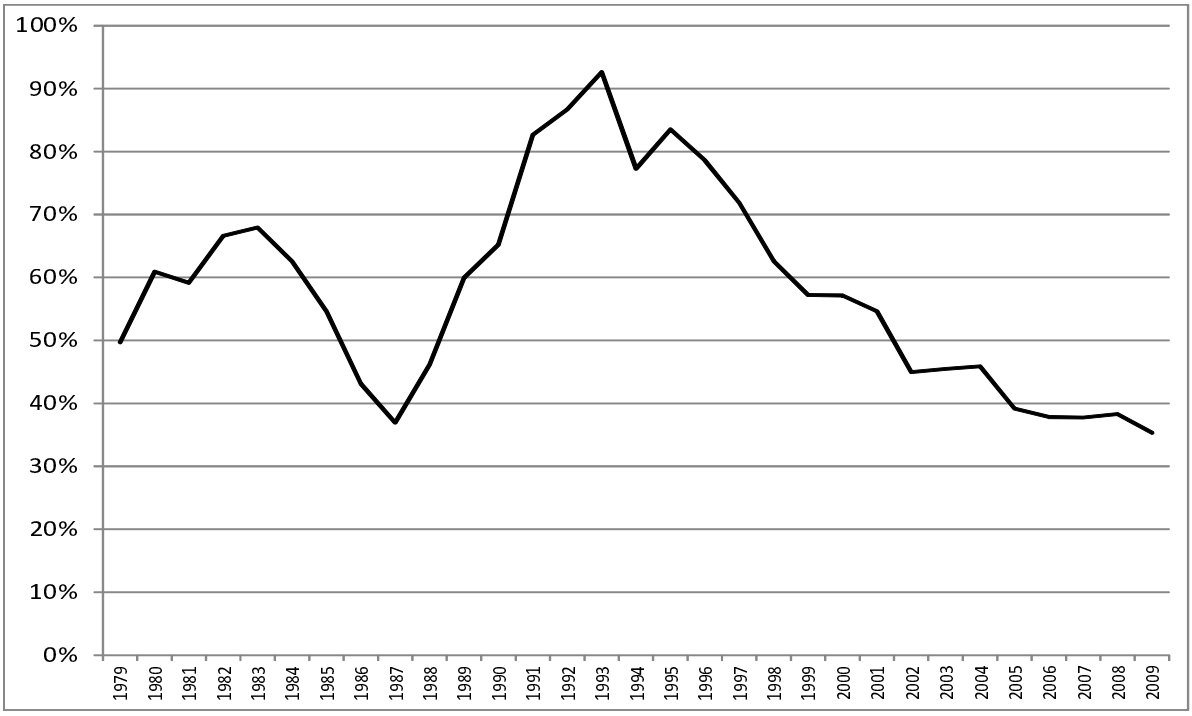

Figure 9: Price Premium of Non-LCCs Over LCCs (adjusted for trip distance)

declined much less than those of legacy carriers in the 2000s, reflecting in part their lower burden of excess aircraft capacity. This is no doubt a large part of the reason that LCCs have suffered much milder losses in the 2000s, as shown in figure 10.[17]

IV. A series of unfortunate events?

Demand and cost shocks have certainly played a significant role in the airline industry's poor financial results, but there is little reason to think those disruptions will be less frequent in the future. Furthermore, after more than 30 years, it seems unlikely that airline losses are due entirely to a series of unfortunate exogenous events relative to what management and investors should have expected.

Throughout deregulation, the legacy carriers have maintained much higher costs than LCCs, but the price premia they have been able to charge have gradually declined over the last 20 years, shrinking by more than 60% over that time. As a result, while the

[17] These data include the roughly $2 billion Southwest airlines net profits during 2006-2009 from hedging fuel prices. Removing those savings makes the difference somewhat smaller, but doesn't change the qualitative conclusion.

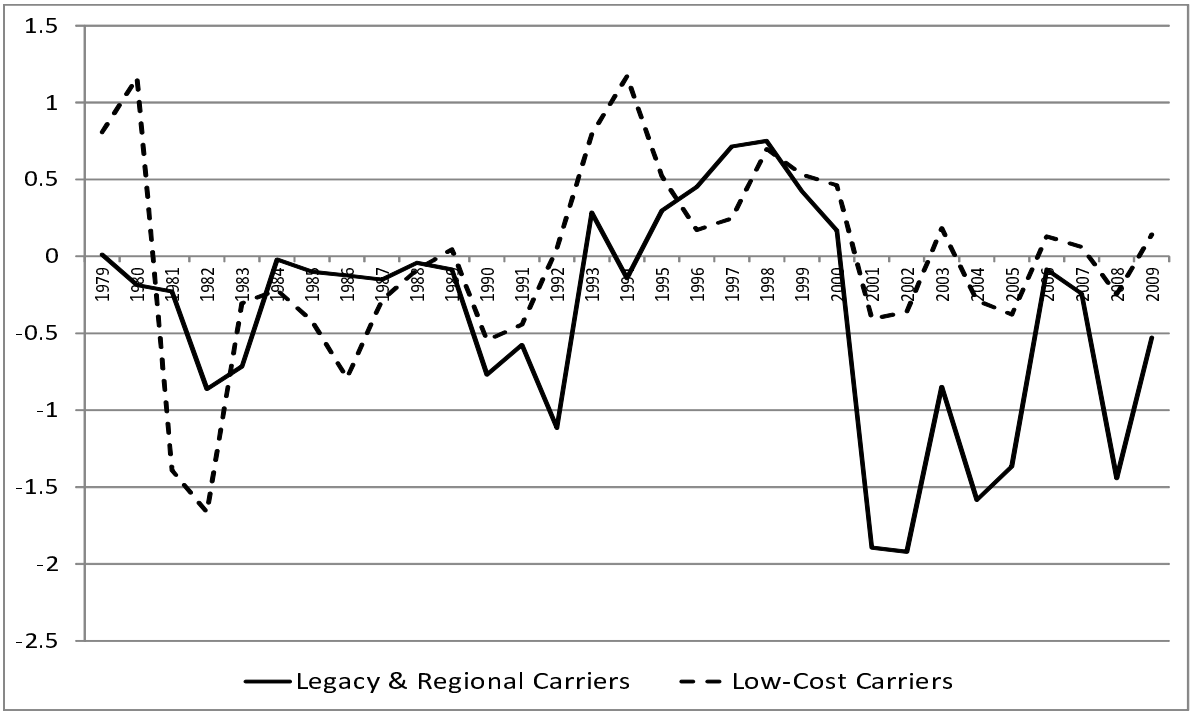

Figure 10: Domestic Net Income (¢2009) per Available Seat-Mile for Non-LCCs and LCCs

exogenous demand and cost shocks have affected all carriers, the legacy airlines have fared much worse financially, and LCCs have grown steadily.

The response of legacy carriers has been to expand their networks through mergers and alliances. There is little evidence that such moves narrow the cost gap with LCCs, but network expansion may help differentiate their products and improve service. It also may increase their ability to use network marketing devices to dampen LCC competition.[18]

The airline financial performance has improved substantially in 2010 and the industry seems likely to be close to break-even on domestic operations for the year. Still, the experience of the last decade suggests that until legacy carriers can either close the cost gap with LCCs or increase the price premium they maintain, they will likely have difficulty earning consistent profits through the typical cycles in the airline business environment.

This short paper obviously doesn't settle the issues surrounding airline profitability. I believe that the topic would benefit from much more investigation by industrial organization economists.

[18] There is a lengthy literature on the impact of airline alliances that expand network effects. See Armantier & Richard (2008) and citations therein.

Appendix

For the analysis in this paper, I include the following carriers: **Legacy:** (American, Alaska, Braniff (pre-1990), Continental, Delta, Eastern (pre-1992), Frontier (pre-1987), Frontier (post-1994), Northwest, Ozark (pre-1987), Pan Am, Piedmont (pre-1998), Republic (pre-1998), TWA, United, US Airways, Western, Trump, National (pre-1983), Hawaiian, Aloha, **Regional:** Air Midwest, Air Wisconsin, American Eagle, Atlantic Coast, Atlantic Southeast, Business Express, CCair, Chautaqua, Colgan, Comair, Commutair, Continental Express, Express Airlines, Great Lakes Aviation, Gulfstream Int, Mesa, Mesaba, PSA Airlines, Skywest, Trans States Airlines, Midwest Express, Horizon, Pinnacle, Business Express, Westair, Republic, Shuttle America, GoJet, Compass, and **Low-Cost Carrier:** Pacific Southwest (pre-1989), Air California (pre-1988), Air Florida (pre-1985), Airtran, America West, JetBlue, Midway, Morris, New York Air, People Express, Southwest, Spirit, Sun Country, Valujet, Reno Air, Jet America, Virgin America, Allegiant, USA3000, American Trans Air, Kiwi, National (post-1998), Western Pacific, World). All airlines are included in aircraft capacity data. Some of the very small airlines are not included in the financial and traffic data.

All price level adjustments are to 2009q4 using the all-urban Consumer Price Index.

Figure 1: USDOT Bureau of Transportation Form P-12 for income statements and Form T-1 for ASMs. See http://www.transtats.bts.gov/.

Figure 2: Author's calculations from USDOT BTS Origin & Destination Survey (DB1A and DB1B) and effective dates of ticket tax changes. PFC changes are available at http://www.faa.gov/airports/pfc/monthly_reports/media/airports.xls . See figure 3 description for adjustment made to account for baggage and change/cancellation fees.

Figure 3: Based on the "Market Data" Dataset, which is derived from DB1A/DB1B and is described at http://faculty.haas.berkeley.edu/borenste/mktdata.htm. After adjusting all prices to 2009q4, for every quarter, I estimate the OLS regression

$$AvgPrice_{rcnt} = \alpha_{0t} + \alpha_{1t} NSDist_r + \alpha_{2t} NSDist_r^2 + \epsilon,$$

where an observation is all of the passengers flying route r on "carrier set" c with n coupons in the trip during quarter t. Each trip is a one-way journey between two airports that may be one-coupon (no change-of-plane) or two-coupon (one change-of-plane at an intermediate airport. Both directions on the route are collapsed into the same observation. Round-trips are broken into two one-way observations. The carrier set is a single carrier observation for one-coupon trips. It is the pair of carriers for two-coupon trips (which are often the same carrier on both coupons). $NSDist_r$ is non-stop distance between the airports. The regression is weighted by passengers in each observation. On average, each regression includes 80,000 observations covering about 7 million passengers, with more observation and passengers in later years I then calculate the fitted values for the tickets sold in the same quarter one year later,

$$\hat{A}vgPrice_{rcnt} = \hat{\alpha}_{0t-4} + \hat{\alpha}_{1t-4} NSDist_r + \hat{\alpha}_{2t-4} NSDist_r^2,$$

and calculate the ratio of aggregate revenues actually paid to the aggregate revenues customers would have paid if they had paid the fitted value price based on the year-earlier regression parameters. These price do not include baggage fees or ticket change/cancellation fees. So, for each quarter, I calculate $\frac{Ticket\ Revenues+Baggage\ Fees+Change/Cancellation\ Fees}{Ticket\ Revenues}$ for domestic operations of all passenger carriers included in the analysis (from Form P-12). The change in this ratio from one quarter to the same quarter in the following year is used to rescale the revenue change for each quarter. I aggregated the revenue difference over each year to get the annual change in prices.

Figure 4: USDOE Energy Information Administration, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=A503600002&f=M

Figure 5: Demand is assumed to be $Q = A_t P^{\epsilon}$ for all years, t with $\epsilon = -1$. Real P is taken from the calculations for figure 3. Q is aggregate domestic revenue passenger-miles (from USDOT BTS Form T-1). Figure 5 presents A_t by year.

Figure 6: USDOT BTS Form B-43

Figure 7: USDOT BTS Form T-1

Figure 8: USDOT BTS Form P-12 for income statements and Form T-1 for ASMs. The adjustment is done by first estimating the regression

$$ln(opexp/ASM)_{ct} = \alpha_0 + \alpha_1 ln(AvgHaul)_{ct} + \alpha_2 (ln(AvgHaul)_{ct})^2 + \sum_c \delta_c + \sum_t \gamma_t + \epsilon$$

on annual carrier-year data (for all commercial passenger airlines with at least 20 departures per day in the year) for 1979-2009 where δ are fixed carrier effects and γ are fixed year effects. The opexp/ASM for LCCs is then normalized to the average haul length of legacy carriers in the same year by multiplying by $\frac{\hat{\alpha}_0+\hat{\alpha}_1 ln(AvgHaul_{leg,t})+\hat{\alpha}_2*(ln(AvgHaul_{leg,t}))^2}{\hat{\alpha}_0+\hat{\alpha}_1 ln(AvgHaul_{LCC,t})+\hat{\alpha}_2*(ln(AvgHaul_{LCC,t}))^2}$ for each year, where $\hat{\alpha}_0 = 5.16$, $\hat{\alpha}_1 = -1.92$ and $\hat{\alpha}_2 = 0.122$. The adjustment for haul length makes a significant difference up to the mid-1980s when LCCs flew much shorter distances than legacy/regional carriers, but makes almost no difference in the last decade.

Figure 9: Author's calculations based on "Market Data" dataset (see figure 3 description). This calculation corrects for route distance in much the same way as for figure 3, but the regression is run only on legacy plus regional carrier observations and the out-of-sample prediction and comparison is for LCC carriers. For every quarter, I estimate an OLS regression of average fare on route distance and distance squared using only data from legacy and regional carriers. I then calculate the fitted values for the LCC observations and the aggregate revenue difference if LCC customers had paid the fitted value price instead of the actual LCC price they did pay. The correction for baggage and change/cancellation fees is similar to figure 3.

Figure 10: USDOT BTS Form P-12 for income statements and Form T-1 for ASMs

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