Bankruptcy and product-market competition: Evidence from the airline industry

Federico Ciliberto, Carola Schenone

1. Introduction

In the past few years thousands of firms have filed for bankruptcy protection under Chapter 11 of the United States Bankruptcy Law. Firms filing for bankruptcy protection belong to a wide range of industries, from Lehman Brothers to Chrysler and GM. The unprecedented number of filings has led to a renewed interest in the economics of bankruptcy. Most of the previous work has examined the direct costs of bankruptcy proceedings, such as legal and administrative expenses, as well as their indirect costs, such as lost sales (Bebchuk, 2002; Bris et al., 2006; Franks and Torous, 1989; Hennessy and Whited, 2007; Thorburn, 2000). There is also work on the effects of bankruptcy on firm survival (Hotchkiss, 1995), on equity returns (Jorion and Zhang, 2009), and on innovation (Acharya and Subramanian, 2009). Nonetheless, there is surprisingly little work on the effects of bankruptcy filings on product market competition.

This paper uses data from the US airline industry to investigate the effect of Chapter 11 filings on prices, capacity choices, and networks. These data are from one single industry for which we have data from a cross-section of local markets. This allows an examination of how bankruptcy filings affect the strategic decisions of firms, holding industry fixed. In this sense, our approach is in the same spirit as Chevalier (1995a, 1995b), who uncovers basic stylized patterns in the relationship between leverage buyouts and the pricing behavior of firms and their rivals using cross-section data from the US supermarket industry.

The airline industry provides an interesting empirical framework for several additional reasons. First, air transport is arguably the most important means of transportation in the US. Second, the airlines seeking protection under Chapter 11 of the United States Bankruptcy Law have also been an outstanding number of personal bankruptcy filings. See White (2007) for more on this.

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bankruptcy protection form a heterogeneous group, including low cost carriers such as ATA, and national carriers such as United and US Air. The range of variation in the identities of the bankrupt airlines ensures that our empirical analysis provides insights on other industries as well. Third, because it is one industry where carriers interact over many distinct markets and over time, we can identify the effects of bankruptcy on product market competition, independent of potentially confounding market, firm, and time effects. Finally, because there are bankrupt and non-bankrupt carriers serving the same market, we can investigate different carriers’ price reactions to one carrier’s bankruptcy.

We start our analysis by looking at how bankruptcy filings affect the network of the bankruptcy carrier and of its rivals. We find that at the US national level, the bankruptcy carrier permanently drops approximately 25% of its pre-bankruptcy routes. We also look at airport specific networks. Not surprisingly, we find similar results. The bankrupt carrier reduces its average number of markets out of an airport by 26% while under bankruptcy protection, and by 24 after its emergence from Chapter 11 relative to its pre-bankruptcy numbers. Its rivals increase the average number of markets they serve at the US national level, but this result is not very robust across specifications and we do not confirm it when we look at changes in the number of markets out of airports. Next, we investigate how bankruptcy filings affect the flight frequency and capacity decisions. We find that the bankrupt firm lowers by 21% the average frequency of flights within a route while operating under court protection, and by 32.8% once the carrier emerges from bankruptcy. We also find that bankruptcy filings have an equally significant effect on the bankrupt’s average capacity (measured by seats in a route) both during and following a bankruptcy filing. We do not find robust evidence of any significant changes by the bankrupt airline’s competitors along any of the dimensions above. We conclude our analysis with a study of the effects of bankruptcy filings on airline market mean prices. We find that the insolvent carrier’s price drops by 3.1% while under bankruptcy protection, and increases by almost 5% after emerging, both of these numbers relative to pre-bankrupt airline market mean prices. We conclude our analysis with a study of the effects of bankruptcy filings on airline market mean prices. We find that the insolvent carrier’s price drops by 3.1% while under bankruptcy protection, and increases by almost 5% after emerging, both of these numbers relative to pre-bankruptcy prices. Again, we do not find evidence of any significant changes by the bankrupt airline’s competitors along any of the dimensions above.

This article contributes to the sparse empirical literature on product-market competition and bankruptcy. Borenstein and Rose (1995, 2003) also study the relationship between bankruptcy filings and product-market competition. In looking at the effect on prices and on frequency, they find that in the quarter during which a carrier files for Chapter 11 protection, the number of flights at the airports where the bankrupt carrier operates declines by about 20% relative to the pre-bankruptcy level. Borenstein and Rose (1995) do not find any systematic evidence that either bankrupt firms or their competitors changed prices after a bankrupt firm’s Chapter 11 filing. Mainly, our analysis differs from theirs along four dimensions. First, we look at multiple strategic decisions (airport and national network structure, capacity choices, prices). Thus, we can provide a unified framework to understand the effect of bankruptcy filings. Instead, Borenstein and Rose (1995, 2003) limited their analysis just to changes in prices and in number of markets out of airports. We show that the most important changes concern capacity choices in the markets that airlines continue to serve and the size of the network served by the bankrupt airline after exiting from bankruptcy. Second, we investigate the effects during and after a competitor’s bankruptcy filing. The post-emergence analysis adds to our understanding of what the ‘permanent’ changes are in the set of services offered following a firm’s bankruptcy filing. This conforms to the notion that the main purpose of bankruptcy filings should be to allow firms time to reorganize themselves and that the evaluation of the economic success of a bankruptcy filing should be made after the firm’s exit from bankruptcy. Third, we show that the effects are fundamentally different for the bankrupt firms and their rivals. In contrast, Borenstein and Rose (1995, 2003) estimate the average effect across both filing and non-filing carriers, and therefore they do not identify the effect on the filing carrier separately from that on its competitors. This is important because bankruptcies do not only affect the bankrupt firm but also its competitors. It is quite emblematic that all the legacy carriers in the United States have now filed at least once for Chapter 11. Fourth, we include specifications that control for such unobserved heterogeneity using route-carrier fixed effects, since it is likely that there are heterogeneous route-carrier unobservables that might confound the results in Borenstein and Rose (1995, 2003). Including route-carrier fixed effects rather than just carrier fixed effects and route fixed effects has been shown to be of fundamental importance in empirical studies of the airline industry.

This work is also related to a growing theoretical literature that examines whether a firm’s capital structure impacts competition in the market for the firm’s products. This literature focuses on how financial distress impacts the competitive interaction of distressed and non-distressed firms in an industry (Bolton and Scharfstein, 1990; Brander and Lewis, 1986; Dasgupta and Titman, 1998; Hendel, 1996). Several empirical papers followed providing evidence of the interaction between financial distress and product market competition (Bhagat et al., 2005; Bolton and Scharfstein, 1990; Campello, 2006; Chevalier, 1995a, 1995b; Chevalier and Scharfstein, 1995, 1996; Kovenock and Phillips, 1997; Phillips, 1995), and between bankruptcy filings and stock market performance (Ferris et al., 1997). Within this literature, the closest paper to ours is Chevalier (1995a). Our paper differs from hers along one important dimension: we have data on the individual price of the firm, while Chevalier only has data on the average price in a market. This additional information is of crucial importance in our empirical analysis since we do not find evidence of almost any reaction by the rivals of a firm that files for Chapter 11 protection.

2. Bankruptcies in the airline industry

Several factors that can alter the competitive interaction between firms in an industry come into play when one of the firms reorganizes under Chapter 11. First, the bankrupt firm faces cost shocks inherent to operating under court protection, such as the ability to renege and renegotiate contracts. Furthermore, the bankrupt firm faces demand shocks that can result in reduced demand for its products, as in Opler and Titman (1994). Finally, reorganization might entail changes in the firm’s product quality (see Maksimovic and Titman, 1991).
whether the carrier emerged from bankruptcy or not, the date and the way in which they might still possess. If the carrier's management is unsuccessful at filing to Chapter 7, after filing to Chapter 11, or liquidation under Chapter 7). We cross check this data with the Bankruptcy Research Database from Professor Lynn LoPucki. The remaining information is obtained from news searches in Lexis-Nexis and Factiva.

We expect the competitive behavior to change differently when carriers abandon the Dallas/Fort Worth airport as one of its hubs. This led to the carrier's operating plan during bankruptcy, and the type of protection that the airline requested (reorganization under Chapter 11 or liquidation under Chapter 7). We cross check this data with the Bankruptcy Research Database compiled by Professor Lynn LoPucki. For each of the airlines filing for Chapter 11 between 1992 and 2007, we manually search Factiva and Lexis-Nexis for news reports relating to about one year prior to and two years after the firm's filing. This allows us to include items such as whether the filing was voluntary or not, whether the airline originally filed for Chapter 11 but was forced to convert its filing to Chapter 7, whether the carrier emerged from bankruptcy or not, and the date in which the carrier's operating plan during bankruptcy.

Table 1 summarizes some stylized facts.8 Consistent with Bris et al. (2006) and Schoar and Chang, 2007, this table reveals significant heterogeneity among bankruptcies. This is most evident in the range of emergence from bankruptcy.

2.1. Stylized facts of airline bankruptcies

Table 1 summarizes some stylized facts.8 Consistent with Bris et al. (2006) and Schoar and Chang, 2007, this table reveals significant heterogeneity among bankruptcies. This is most evident in the range of emergence from bankruptcy. There is no clear relationship between the duration and the probability of emergence from bankruptcy.

2.2. The economics of airline industry bankruptcy filings

The reorganization of the firm's operating plan during bankruptcy can result in changes in the markets served, as well as in the way these markets are served. For example, after filing for bankruptcy protection on September 14, 2005, Delta Airlines implemented several major changes. One of the most important ones was its decision to abandon the Dallas/Fort Worth airport as one of its hubs. This led to fewer non-stop destinations out of Dallas, and fewer flights on the routes that were still served. During reorganization, the insolvent firm

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8 Airlines that have filed for bankruptcy in the last two decades are identified using the Air Transportation Association (ATA) website. This website provides a list of the names of air carriers that have filed for protection, the date of the bankruptcy filing, and the type of protection that the airline requested (reorganization under Chapter 11 or liquidation under Chapter 7). We cross check this data with the Bankruptcy Research Database compiled by Professor Lynn LoPucki. For each of the airlines filing for Chapter 11 between 1992 and 2007, we manually search Factiva and Lexis-Nexis for news reports relating to about one year prior to and two years after the firm's filing. This allows us to include items such as whether the filing was voluntary or not, whether the airline originally filed for Chapter 11 but was forced to convert its filing to Chapter 7, whether the carrier emerged from bankruptcy or not, and the date in which the carrier's operating plan during bankruptcy.

9 Lessors forced an involuntary liquidation of Sun Country Airlines. The FAA grounded Kiwi Airlines, MarkAir, and ProAir for safety concerns, training and maintenance violations. Unless the airline is already under court protection, the FAA grounding precipitates a bankruptcy filing.
might downsize operations in markets burdened with excess capacity and in the least profitable markets. Carriers can also downsize capacity within a market by adjusting the number of seats offered and the number of performed departures. The freed capacity can be reallocated to markets that are more profitable.

Under bankruptcy, the insolvent carrier can implement cost-cutting strategies that are illegal outside of court protection, thus facilitating the firm's return to profitability. Under Section 1110 of Chapter 11, a bankrupt carrier that has defaulted on its aircraft lease payments has a 60-day grace period to make lease payments and keep the aircraft. If after 60 days the carrier has not paid its outstanding lease, the lessor can repossess the aircraft. Rarely have lessors repossessed aircrafts.11 Most lessors are willing to renegotiate payments with the bankrupt carrier because a lessor who repossesses a plane would have to redeploy it elsewhere, and if the industry is in distress, that might be more costly than extending payment schedules or renegotiating payment terms. Furthermore, since rescinded leases become a general unsecured claim on the carrier, the carrier has a strong bargaining position with their lessor.12 In rare instances, lessors force a Chapter 11 filing over missed lease payments. One of the largest burdens affecting most carriers is obligation to employees and retirees through defined benefit pension programs. Most legacy carriers under bankruptcy protection use their bankruptcy filings to renegotiate or renege on their defined benefit pension obligations. Doing so transfers the burden of pension obligations to taxpayers via the Federal Pension Benefit Guarantee Corporation (PBGC).14 Cost reductions resulting from changes in defined benefit pension programs should outlast the firm's stay under bankruptcy protection. Labor union contracts heavily burden the airline industry. Negotiations with unions and employees are a key cost-saving strategy in which airlines engage while operating under protection. The threat that the carrier can be forced into liquidation, leaving employees jobless, makes labor unions and employees more willing to renegotiate than they would otherwise be. Under Section 1113 of Chapter 11, an airline can unilaterally modify labor agreements if negotiations turn out to be unsuccessful.15 Just the threat that the bankrupt carrier can turn to Section 1113 shifts most of the bargaining power to the airline.

A bankruptcy filing can affect consumers' willingness to pay for the services that the insolvent firm provides. Such a negative demand shock might reverse once the carrier exits bankruptcy. Reputation costs associated with a bankruptcy filing can reduce the demand for the carrier's flights. Opler and Titman (1994) show that highly leveraged firms lose substantial market share to their more conservatively financed competitors during industry downturns. Similarly, bankrupt firms (which represent the extreme case of excessive leverage) might lose significant market share to competitors. Safety considerations aside, passengers might still prefer to fly non-bankrupt carriers if they are concerned that the insolvent firm will not honor its frequent flyer obligations. Passengers have voiced concerns that, even if the carrier emerges from bankruptcy, frequent flier miles might not be honored.16 This can drive demand away from the distressed carrier to its non-distressed competitor.

3. Data Description

Our data is an original compilation from several sources. From the Air Transportation Association Web site, Lynn LoPucki's Bankruptcy Database, and Factiva and Lexis–Nexis reports, we obtain the identity of carriers filing for bankruptcy, the dates on which each carrier entered and exited court protection, and the specific way in which each carrier emerged from protection. We merge this dataset with data from The “On-Time Performance Schedule” gathered by the Bureau of Transportation Statistics (BTS); the T-100 Domestic Segment of Form 41 reported by the BTS; the Origin and Destination Surveys (DB1B), which is a ten percent sample of airline tickets sold by airlines within a quarter.

3.1. Carriers, markets, and routes

We consider nine national carriers between 1997 and 2007: American (identified by its airline code, AA), Continental (CO), Delta (DL), America West (HP, until the third quarter of 2005), Northwest (NW), Trans World Airlines (TWA, until the second quarter of 2001), United (UA), USAir (US), and Southwest (WN). Low-cost carriers are grouped in a category labeled LCC (e.g., Jet Blue and Frontier are in the LCC group).17 This allows us to keep small carriers that are present in only a few markets or for a few quarters when we include route–carrier fixed effects. Furthermore, it allows us to use a meaningful grouping that captures the impact of small carrier presence in the market. In the LCC category we exclude three low-cost carriers which we choose to study independently: Airtran (FL), ATA (TJ), and National (N7). We do this because they either had a strong presence (Airtran) or they filed for Chapter 11 during our sample period (ATA and National).18 Next, we identify airlines that have filed for bankruptcy protection between 1997 and 2007. There are six carriers operating under bankruptcy protection during our sample period: United Airlines (December 9, 2002 through February 2, 2006), USAir (August 11, 2002 through March 31, 2003 and then again September 12, 2004 through September 27, 2005), ATA (October 26, 2004 through February 28, 2006), Delta (September 14, 2005 through May 1, 2007), and Northwest (September 14, 2005 through May 31, 2007). Some small carriers operated under court protection for a small time window, and thus we cannot consider...
these carriers independently (E.g., Independence Air operated under court protection between November 7, 2005 and January 5, 2006).19

We define a market, denoted by m, as an airport-to-airport trip, irrespective of the number of connections.20 A route, denoted by r, is a non-stop airport-to-airport trip. We consider all airport-to-airport pairs between the top 50 Metropolitan Statistical Areas (MSAs), ranked by population size.

We have four units of observation, which vary by the dataset used in each regression. First, to study the frequency of services, seats, and load factor, the unit of observation is a carrier, route, year, quarter, combination. Second, we study prices using a carrier, market, year, quarter unit of observation. Third, to study a carrier’s network extent out of an airport, the unit of observation is carrier, airport, year, quarter specific. Finally, for the analysis of the number of markets served in a given quarter, by a given carrier, we use a carrier, year, quarter unit of observation.

We denote carriers by j; airports by a = 1, ..., A; airport-to-airport routes by r = 1, ..., R; airport-to-airport markets by m = 1, ..., M; and time period by t = 1, ..., T. For example, the combination jrt indicates that airline j (e.g. American) transports its passengers on route r (Chicago O’Hare to Fort Lauderdale Airport) at time t (e.g. the second quarter of 2002). In the rest of the analysis, we let g denote the geographical scope of the analysis: thus, g = (r, m, a, n), where n indicates that the information is at the national level and the unit of observation is a carrier-year-quarter. When g = n there is no cross-section variation across markets, and we only have time-series variation.

3.2. Bankruptcy categorical variables

We define the set of K carriers that filed for bankruptcy protection at some point as K = {UA, US(1), US(2), NW, DL, TZ, N7}. Notice that USAir filed for Chapter 11 twice. We use the subscript k = 1, ..., K to denote a bankrupt firm (K is equal to 7). We want to distinguish the effect that bankruptcy filings have on the quality measures we consider, for the bankrupt firm, and for its competitors, during the time when the bankrupt firm operates under Chapter 11, as well as after the firm emerges from bankruptcy protection. To measure these effects, we construct the following categorical variables. First, we define Bktgt; equal to 1 if there is at least one carrier under bankruptcy protection at time t and that carrier provides service in g (for example, if g = r, then it provides service in route r), otherwise, Bktgt; is equal to zero. For each quality measure, we study the average effect of bankruptcy across markets and across bankrupt and non-bankrupt carriers. Next, we ask whether any observed price changes during bankruptcy persist once the bankrupt firm emerges from court protection. To do this, we define the categorical variable AftBktgt; equal to 1 if there is at least one carrier that was under bankruptcy protection at a time before t, and that carrier currently serves g. Otherwise, AftBktgt; is equal to zero.

3.3. Networks, capacity, and prices

We measure the extent to which a carrier’s downsizing affects the number of markets served at the national level. We use the scheduling database to construct the count of origin-destination airport pairs by operating carrier, year, and quarter. We call NationalNetworkg the total number of airport-airport combinations served by carrier j during year-quarter t.21 Table 2 shows that on average a carrier serves 446.14 markets over the US.

We build a measure of a carrier’s network out of the airport of origin using the scheduling data. The variable AirportNetworkg equals the number of routes served out of airport a, by carrier j, in year-quarter t.22 Table 2 shows that on average a carrier serves 19 markets out of an airport.

We evaluate the flight frequency for each specific route. There has been extensive research on the importance of flight frequency as a determinant of air travel demand.23 An airline that provides a single flight per day between two airports is forcing a large fraction of travelers to fly at a time which is going to be less attractive than the one offered by an airline that provides two or more flights per day between the same two airports. To construct a measure of the flight frequency between two airports, we use the scheduling database which provides information on the number of flights that each carrier schedules and performs in each market, during a year-quarter period. We compute the sum of the number of scheduled departures between two airports by operating carrier, route, year, and quarter. Frequencygjt= equals the total number of departures performed in route r, on year-quarter t, by carrier j. Table 2 shows that on average firms offer 362.29 flights per quarter in each route.

The T-100 Domestic Segment of Form 41 reported by the BTS provides data on an airline’s capacity, measured by available seats, denoted by Seatsgjt. Table 2 shows that on average a carrier transports 45,846.46 seats per quarter.

We define a carrier’s load factor on a route during a year-quarter as the ratio of the sum of all passengers transported in a market during a year-quarter to the sum of all available seats for sale on that market, during that year-quarter. We denote the load factor by LoadFactorjt.

To summarize the airline pricing behavior we use the median prices in a market m, denoted by Farem, to exploit information on the distribution of prices available from the DB1B dataset while using as few statistics as possible.24 We code a round-trip ticket as one directional trip ticket, which costs half the full round-trip ticket fare. Fares are measured in 1993 dollars. Table 2 shows that the average fare for a one-way ticket is 126.46 dollars.

4. Identification and empirical specification

The objective of our paper is to compare route structure, prices, and capacities before, during, and after bankruptcy. The main concern is the following: As the firm sinks deeper into financial distress, it might change its strategic decisions, like prices, capacity, and network extent to generate the cash it needs to avoid bankruptcy, but this can lead the firm deeper into financial distress, and ultimately to a Chapter 11 filing. This strategy is likely to be the firm’s desperate attempt

22 This is a very important variable in the empirical literature of the airline industry. In particular, it captures the relative attractiveness of an airline’s frequent flyer program and its other services at the origin and destination airports (the number of ticket counters, customer service desks, etc.). See Berry (1990,1992), Berry et al. (2006), Bamberger and Carlson (2003), Bruenckner et al. (1992), Ciliberto and Tamer (2009), Ciliberto and Williams (2010).

23 Previous work looking at flight frequency as a means for airlines to differentiate their products have looked at the relationship between flight frequency and mergers (Richard, 2003), market competition (Borenstein and Netz, 1999), the nature of airline networks (Bruenckner and Zhang, 2001), and economies of traffic density (Bruenckner and Spiller, 1994).

24 We drop: tickets that are neither one-way nor round-trip travel, such as open-jaw trip tickets; tickets involving a US-nonreporting carrier flying within North America and foreign carrier flying between two US points; tickets that are part of international travel; tickets including travel on more than one airline on a directional trip (known as interline tickets); tickets involving non-contiguous domestic travel (Hawaii, Alaska, and Territories); tickets with fares less than 20 dollars or larger than 9999 dollars; and tickets whose fares were in the bottom and top 5 percentile percentile in their year; tickets with more than 6 coupons. We then merge this dataset with the T-100 Domestic Segment (US Carriers) and drop tickets for flights that have less than 12 departures over a quarter in one direction (this means less than 1 departure every week in one direction).
to raise cash to avoid the bankruptcy filing, and therefore, it is likely
to occur in the period immediately preceding bankruptcy. As a result
of this pre-bankruptcy behavior, we might estimate a lower pre-
bankruptcy average price just because of the rapid drop in prices in
the quarters before the bankruptcy filing.

This problem is conceptually the same as the one in Ashenfelter
(1978). In a study of the effect of training programs on earnings
Ashenfelter noted that all trainees suffered unpredicted earning
debits in the year prior to entering a training program (see
Ashenfelter, 1978, page 51). This stylized fact has become known as
declines in the year prior to entering a training program (see
Ashenfelter noted that all trainees suffered unpredicted earning
(1978)). In a study of the effect of training programs on earnings
the bankrupt airlines relative to that in markets served by other airlines.
We include linear market time trends to control for such market-specific
unobservable correlations across time. Further, price changes triggered
by demand changes spurring from seasonal or exogenous shocks
(e.g. increases in fuel costs or 9/11) can confound the effects of bank-
ruptcy on prices. Serially correlated industry-specific shocks to demand
can also confound the effects of bankruptcies on prices. To address this,
we include year–quarter fixed effects. Furthermore, a carrier flying on a
certain time schedule might benefit business travel in some markets but
not in others, affecting the price behavior of that carrier in those
markets, but not in others.26 Ignoring these sources of unobservable
heterogeneity associated with an airline's pricing behavior can con-
found the effects of bankruptcy filings on prices. To address this, we
include route–carrier fixed effects. Finally, a carrier’s presence in a mar-
ket can have an effect on the behavior of other carriers in that market,
regardless of whether the carrier is bankrupt. Thus, we differentiate
the effect of a bankruptcy filing from the effect just the presence
of a firm in the market has by including the categorical variable INGT.
The variable INGT switches on when at least one bankrupt
firm is in g (recall that if g = r, then we would say that at least one bankrupt
firm is in route r) at time t. This variable is likely a function of the same
unobservables that affect the pricing decisions. This leads us to discuss
the issue of sample selection.

Table 2
Summary statistics for the market competition variables.

<table>
<thead>
<tr>
<th></th>
<th>Full sample</th>
<th>Subsample with a bankrupt firm</th>
<th>Subsample without a bankrupt firm</th>
<th>Subsample with a firm that was previously bankrupt</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td>National-carrier route structure (count of origin–destination airport pairs)</td>
<td>373 201.22</td>
<td>376.42 234.89</td>
<td>376.25 200.22</td>
<td>328.03 161.09</td>
<td>443</td>
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<tr>
<td>Airport-carrier route structure (number of routes served out of airport)</td>
<td>18.89 13.03</td>
<td>19.12 13.63</td>
<td>18.79 12.91</td>
<td>19.99 13.75</td>
<td>26,115</td>
</tr>
<tr>
<td>Route-carrier flight frequency (number of departures in a route)</td>
<td>362.29 379.01</td>
<td>348.10 267.05</td>
<td>365.71 391.01</td>
<td>318.50 257.38</td>
<td>194,709</td>
</tr>
<tr>
<td>Route–carrier number of Seats (number of seats transported)</td>
<td>45846.46 43101.19</td>
<td>44451.93 42729.6</td>
<td>46170.05 43540.18</td>
<td>41753.89 39444.12</td>
<td>194,709</td>
</tr>
<tr>
<td>Route–carrier load factor (passengers per seats)</td>
<td>0.671 0.142</td>
<td>0.741 0.125</td>
<td>0.662 0.142</td>
<td>0.753 0.124</td>
<td>194,709</td>
</tr>
<tr>
<td>Market–carrier median fare ($/1993)</td>
<td>126.19 39.41</td>
<td>118.919 34.114</td>
<td>126.878 40.175</td>
<td>126.82 34.74</td>
<td>493,436</td>
</tr>
<tr>
<td>USAir is under Chapter 11 bankruptcy protection (0/1)</td>
<td>0.02 0.14</td>
<td>0.03 0.16</td>
<td>0.10 0.30</td>
<td>0.07 0.25</td>
<td>0.00 0.05</td>
</tr>
<tr>
<td>Delta Airlines is under Chapter 11 bankruptcy protection (0/1)</td>
<td>0.10 0.30</td>
<td>0.10 0.30</td>
<td>0.10 0.30</td>
<td>0.10 0.30</td>
<td>0.01 0.10</td>
</tr>
<tr>
<td>Northwest Airlines is under Chapter 11 bankruptcy protection (0/1)</td>
<td>0.07 0.25</td>
<td>0.10 0.30</td>
<td>0.07 0.25</td>
<td>0.07 0.25</td>
<td>0.00 0.05</td>
</tr>
<tr>
<td>ATA is under Chapter 11 bankruptcy protection (0/1)</td>
<td>0.01 0.10</td>
<td>0.01 0.10</td>
<td>0.01 0.10</td>
<td>0.01 0.10</td>
<td>0.01 0.10</td>
</tr>
<tr>
<td>National Airlines is under Chapter 11 bankruptcy protection (0/1)</td>
<td>0.00 0.05</td>
<td>0.00 0.05</td>
<td>0.00 0.05</td>
<td>0.00 0.05</td>
<td>0.00 0.05</td>
</tr>
</tbody>
</table>

25 We repeat the analysis excluding the preceding 4 quarters and find qualitatively similar results.
26 Another example: A carrier in a given market might use more modern planes than other carriers in that market, affecting the price that all carriers in that market can charge.
We estimate the following econometric specification:

\[
\ln Q_{jgt} = \alpha^{OWN} Bktrt + \alpha^{OTH} Bktg + \beta^{OWN} AftBktrt + \beta^{OTH} AftBktg + \epsilon_{jgt},
\]

where \( \epsilon_{jgt} \) is the remaining component of the regression to be discussed in detail below. Here, \( Q_{jgt} \) is one of the measures discussed in Section 3.2: NationalNetworks, AirportNetworks, Frequency, SeaOps \( \text{Fare}_{ij}^{exp} \) and \( \text{LoadFactor}_{ij} \). These dependent variables are run on two sets of bankruptcy categorical variables. The first indicates whether a competitor in a market currently operates under bankruptcy protection, and the second indicates whether any of the firms competing in a market previously operated under bankruptcy.

The coefficient \( \alpha^{OWN} \) measures the current effect of a bankruptcy filing on the bankrupt firm’s variable \( Q_{jgt} \). The current effect on the bankrupt firm’s competitors is measured by \( \alpha^{OTH} \). The post-bankruptcy effects are measured by \( \beta^{OWN} \) and \( \beta^{OTH} \). Table 3 illustrates how we identify the parameters of the regression. Note that changes after a firm’s bankruptcy are computed over all quarters from the firm’s bankruptcy emergence until the end of the sample period, and in the case of USAir that has multiple bankruptcy filings over quarters from one bankruptcy emergence until the next bankruptcy filing. Similarly, the pre-bankruptcy period is defined as all quarters between the beginning of the sample period until the firm’s bankruptcy filing; and for the second USAir bankruptcy it is the quarters between bankruptcy filings. We let \( \epsilon_{jgt} \) be defined as follows:

\[
\epsilon_{jgt} = \eta_{jgt} \text{ if } \text{year}=n \text{ (unit of observation is year-quarter)};
\]

\[
\epsilon_{jgt} = \eta_{jgt} + \theta_{jgt} \text{ if } \text{carrier} + \gamma_{jgt};
\]

\[
\epsilon_{jgt} = \eta_{jgt} + \theta_{jgt} \text{ if } \text{market} \text{ or } \text{carrier} \text{ and } \theta_{jgt} \text{ a trend}; \text{ if } \text{g} = \text{r}. m.
\]

\[
\ln Q_{jgt} = \eta_{jgt} + \theta_{jgt} \text{ if } \text{carrier} \text{ and } \theta_{jgt} \text{ a trend}; \text{ if } \text{g} = \text{a}.
\]

In addition, we report the marginal effect corresponding to the coefficient of the dummy variables in the semilogarithmic regression equations.27

5. The effect of bankruptcy filings on airline networks

5.1. National networks

The dependent variable for Eq. (1) in Table 4, is the natural logarithm of NationalNetworks and equals the number of origin and destination airport pairs served by carrier \( \text{J} \) at time \( t \). In this specification we do not include year-quarter fixed effects because we cannot use variation in the identity and number of participants in a local market to identify the effect of bankruptcy filings. Here, the level of geographical detail is the whole US.

Column 1 presents the main specification, where we include carrier fixed effects and we drop observations corresponding to two quarters prior the filings. We estimate \( \alpha^{OWN} \) equal to \(-0.233; \alpha^{OTH} \) equal to \(0.256; \beta^{OWN} \) equal to \(-0.471; \) finally, \( \beta^{OTH} \) equal to \(0.259 \). They are all precisely estimated.

The economic significance of each coefficient can be gauged by looking at the corresponding square bracket, which reports the transformed coefficient as described above. In particular, \( \alpha^{OWN} \) equal to \(-0.233 \) means that on average firms reduce the number of markets that they serve by 20.8 percentage when they are under Chapter 11.28 Now consider the effect of bankruptcy filings on the number of markets served by the rivals of the bankrupt firms. We find that the rivals increase the number of the markets they serve by almost 30%. This change is permanent. Again this effect is very large. In the other columns we will see that such effect is closer to 20%. Column 3 presents the results when we do not use Ashenfelter’s solution, that is we do not drop observations corresponding to two quarters prior the filings. The results are similar to those in Column 1, which is the first piece of evidence that the endogeneity of the bankruptcy dummies is not empirically significant. Column 4 presents the results when we also exclude the carrier fixed effects. Notice that the parameters are estimated almost equal to those in Column 3, suggesting that firm specific heterogeneity is not a concern in the empirical question that we address in this paper.

We conclude the table with Column 5, where we follow a dynamic program evaluation approach. Instead of dropping observations corresponding to two quarters prior to the filing, we add lag values of the bankruptcy categorical variables. Formally, we estimate the coefficients of \( Bktrt \text{ on } Q_{jgt} \text{ is } \alpha^{OWN} \text{ exp}(\alpha^{OTH}) \text{ and } Bktg \text{ on } Q_{jgt} \text{ is } \alpha^{OWN} \text{ exp}(\alpha^{OTH}) \text{ as well}. \text{We report the estimated coefficient and the correct percentage effect in the tables.}
Looking at these results we need to keep in mind that no time specific controls (i.e. year-quarter fixed effects) are included in the estimation because we cannot separately estimate the effect of the time variables and that of the bankruptcy dummies. Next, we will consider the case where we use variation in local markets and then we can see how robust this first set of results is to more controls.

5.2. Airport networks

In Table 5 the dependent variable is the natural logarithm of AirportNetwork\textsubscript{t}, Recall that this is the natural logarithm of the total number of markets served by carrier j out of airport a at time t.

Column 1 presents the results under the main specification, where we include airport-carrier fixed effects; year-quarter fixed effects; origin specific time trends; and we drop observations corresponding to airport combinations served by bankrupt firms in the year-quarter t.

Table 4
The impact of Chapter 11 filings on national-carrier route structure. The dependent variable is the natural logarithm of the total number of markets served by bankrupt firm j out of airport a at time t.

<table>
<thead>
<tr>
<th>α&lt;sub&gt;n&lt;/sub&gt;, in-bankruptcy effect on bankrupt firm's route structure</th>
<th>−0.595** (0.095)</th>
<th>−0.530** (0.079)</th>
<th>−0.307** (0.068)</th>
<th>−0.154 (0.128)</th>
<th>−0.548** (0.081)</th>
</tr>
</thead>
<tbody>
<tr>
<td>α&lt;sub&gt;n-max&lt;/sub&gt;, post-bankruptcy effect on bankrupt firm's route structure</td>
<td>−1.063** (0.109)</td>
<td>−1.013** (0.103)</td>
<td>−0.647** (0.083)</td>
<td>−0.336* (0.148)</td>
<td>−1.035** (0.104)</td>
</tr>
<tr>
<td>β&lt;sub&gt;n&lt;/sub&gt;, in-bankruptcy effect on the national route structure of the rivals</td>
<td>0.122 (0.213)</td>
<td>0.147 (0.173)</td>
<td>0.115** (0.038)</td>
<td>0.008 (0.079)</td>
<td>0.150 (0.173)</td>
</tr>
<tr>
<td>β&lt;sub&gt;n-max&lt;/sub&gt;, in-bankruptcy effect on the national route structure of the rivals</td>
<td>−0.074 (0.130)</td>
<td>−0.099 (0.158)</td>
<td>0.376** (0.122)</td>
<td>0.217* (0.008)</td>
<td>−0.112 (0.161)</td>
</tr>
</tbody>
</table>

Table 5
The impact of Chapter 11 filings on airport-carrier route structure. The dependent variable is the natural logarithm of the total number of markets served out of airport a at carrier j in the year-quarter t.

<table>
<thead>
<tr>
<th>α&lt;sub&gt;n&lt;/sub&gt;, in-bankruptcy effect on bankrupt firm's route structure</th>
<th>−0.320 (0.037)</th>
<th>−0.291 (0.034)</th>
<th>−0.286** (0.034)</th>
<th>−0.176 (0.031)</th>
<th>−0.308 (0.035)</th>
</tr>
</thead>
<tbody>
<tr>
<td>α&lt;sub&gt;n-max&lt;/sub&gt;, post-bankruptcy effect on bankrupt firm's route structure</td>
<td>−0.270** (0.065)</td>
<td>−0.283** (0.061)</td>
<td>−0.278** (0.061)</td>
<td>−0.213** (0.052)</td>
<td>−0.286** (0.062)</td>
</tr>
<tr>
<td>β&lt;sub&gt;n&lt;/sub&gt;, in-bankruptcy effect on the route structure of the rivals</td>
<td>−0.136** (0.027)</td>
<td>−0.127** (0.022)</td>
<td>−0.108** (0.022)</td>
<td>0.095** (0.014)</td>
<td>−0.127** (0.022)</td>
</tr>
<tr>
<td>β&lt;sub&gt;n-max&lt;/sub&gt;, in-bankruptcy effect on the route structure of the rivals</td>
<td>0.080 (0.037)</td>
<td>0.076** (0.030)</td>
<td>0.083** (0.037)</td>
<td>0.109** (0.015)</td>
<td>0.071** (0.031)</td>
</tr>
</tbody>
</table>

Standard errors in parentheses; **p<0.01, *p<0.05. Standard errors clustered by airport.
two quarters prior the filings. With AirportNetwork$_{ij}$ as the dependent variable we estimate $\alpha^{OWN}_{ij}$ equal to $-0.242$ and $\beta^{OWN}_{ij}$ equal to $-0.270$. Both of these parameters are estimated precisely, and they should be interpreted as corresponding to a 25% drop in the bankrupt carrier’s network extent out of airports during and after the filing. Interestingly the rivals of the bankrupt carrier also lower their network extent during bankruptcy filings, but increase it by 8% after the emergence of the bankrupt firm from Chapter 11. The effects on the rivals are thus much smaller than what we found in Table 4. This suggests that aggregate time shocks, such as 9/11, are important determinants of the number of markets served by carriers.

Column 2 reports the results when we do not drop observations corresponding to two quarters prior the filings. The results are analogous to those in Column 1, again confirming that the potential endogeneity of the bankruptcy dummies, while in theory a serious concern, in practice is not empirically significant. Column 3 reports estimates from a regression that excludes origin–time trends. We notice that the results are the same as those in Columns 1 and 2, suggesting that, at least for this dependent variable there is no reason to be concerned about persistent correlation of negative unobserved current and expected demand shifts (that extend beyond the pre-bankruptcy period we eliminate) at airports served by the bankrupt airlines relative to other airports. In Column 4 we exclude carrier–origin fixed effects. So this is a random effect regression, where the random component is a carrier–origin unobservable. Notice that the estimated coefficients are remarkably smaller in this column than in Columns 1–3, where we include fixed effects. This confirms the finding of Table 4 that heterogeneity across carriers is significant. In Column 5 we implement a dynamic program evaluation approach, along the same lines as in Column 5 of Table 4. First, we observe that the estimates of $\alpha^{OWN}_{ij}$, $\beta^{OWN}_{ij}$, $\alpha^{OWN}_{ij}$, and $\beta^{OWN}_{ij}$ are the same as in Column 1. This again suggests that the estimated coefficients are not biased by the potential endogeneity of the bankrupt firm’s time trends. Instead, Column 5 shows that bankruptcy filings on the route structure of airline $j$ at time $t$ (a year-quarter).

6. The effect of bankruptcy filings on capacity choices

6.1. Flight frequency

The dependent variable for the regression Eq. (1) in Table 6 is the natural logarithm of Frequency$_{ij}$, where frequency is defined as the total number of flights served by carrier $j$ in the route $i$ at time $t$ (a year-quarter).

Column 1 presents the results of the main specification, when we include route–carrier fixed effects, year–quarter fixed effects, origin and destination specific time trends, and we drop observations corresponding to two quarters prior the filings. We estimate $\alpha^{OWN}_{ij}$ equal to $-0.242$ and $\beta^{OWN}_{ij}$ equal to $-0.397$, both statistically significant. In contrast, $\alpha^{OWN}_{ij}$ and $\beta^{OWN}_{ij}$ are small and imprecisely estimated. The estimates of $\alpha^{OWN}_{ij}$ and $\beta^{OWN}_{ij}$ show that bankrupt carrier drops the number of flights in the routes they serve by 21.5% during the bankruptcy filing and by 32.8 after their emergence from Chapter 11. The results in Column 2, where we do not drop observations corresponding to two quarters prior the filings, suggest that there is no much evidence of an endogeneity bias of the bankruptcy dummies, since the results are the same as in Column 1. Similarly, the results in Column 3, where we exclude the origin and destination specific time trends are also essentially the same as in Column 1. The results in Column 4 show that year–quarter fixed effects are crucial to identify the effect of bankruptcy filing on flight frequency. If we do not include year–quarter fixed effects, we find that frequency drops by 13.7% instead of 21.5% during the filing. We find that frequency drops by 23.3% instead of 32.8% after the emergence from bankruptcy. Thus, there are temporal shocks that play an important role in determining the frequency decisions, which can confound the effect of bankruptcy filings on frequency. Instead, Column 5 shows that route–carrier fixed effects are not crucial for the results. Thus, unobserved heterogeneity across route–carriers is not as

|Table 6|
The impact of Chapter 11 filings on route–carrier flight frequency. The dependent variable is the natural logarithm of the number of departures performed in route $i$, on year–quarter $t$, by carrier $j$.

<table>
<thead>
<tr>
<th></th>
<th>$\alpha^{OWN}_{ij}$, in-bankruptcy effect on bankrupt firm’s frequency</th>
<th>$\alpha^{OWN}_{ij}$, post-bankruptcy effect on bankrupt firm’s frequency</th>
<th>$\beta^{OWN}_{ij}$, in-bankruptcy effect on the frequency of the rivals</th>
<th>$\beta^{OWN}_{ij}$, in-bankruptcy effect on the frequency of the rivals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$-0.242^*$</td>
<td>$-0.243^*$</td>
<td>$-0.247^*$</td>
<td>$-0.147^*$</td>
</tr>
<tr>
<td></td>
<td>(0.0164)</td>
<td>(0.015)</td>
<td>(0.015)</td>
<td>(0.012)</td>
</tr>
<tr>
<td></td>
<td>$-0.215^*$</td>
<td>$-0.216^*$</td>
<td>$-0.219^*$</td>
<td>$-0.171^*$</td>
</tr>
<tr>
<td></td>
<td>$-0.039^*$</td>
<td>$-0.040^*$</td>
<td>$-0.205^*$</td>
<td>$-0.392^*$</td>
</tr>
<tr>
<td></td>
<td>$-0.242^*$</td>
<td>$-0.243^*$</td>
<td>$-0.247^*$</td>
<td>$-0.147^*$</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.024)</td>
<td>(0.021)</td>
<td>(0.020)</td>
</tr>
<tr>
<td></td>
<td>$-0.328^*$</td>
<td>$-0.328^*$</td>
<td>$-0.328^*$</td>
<td>$-0.328^*$</td>
</tr>
<tr>
<td></td>
<td>$-0.014*</td>
<td>$-0.013</td>
<td>$0.005</td>
<td>$0.079*</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.014)</td>
<td>(0.014)</td>
<td>(0.014)</td>
</tr>
<tr>
<td></td>
<td>$0.019</td>
<td>$0.018</td>
<td>$0.019</td>
<td>$0.017</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.019)</td>
<td>(0.019)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>One period lag in-bankruptcy effect on bankrupt firm</td>
<td>-0.037*</td>
<td>(0.011)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two periods lag in-bankruptcy effect on rivals</td>
<td>0.000</td>
<td>(0.016)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two periods lag in-bankruptcy effect on bankrupt firm</td>
<td>0.051</td>
<td>(0.012)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Observations</th>
<th>188,610</th>
<th>194,709</th>
<th>194,709</th>
<th>194,709</th>
<th>188,610</th>
<th>194,709</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of route–carrier groups</td>
<td>7328</td>
<td>7344</td>
<td>7344</td>
<td>7344</td>
<td>7328</td>
<td>7344</td>
<td></td>
</tr>
<tr>
<td>Route–carrier fixed effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>2 prior quarters excluded</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Origin &amp; destination time Trends</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Year–quarter fixed effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Within R²</td>
<td>0.074</td>
<td>0.074</td>
<td>0.029</td>
<td>0.013</td>
<td>0.073</td>
<td>0.074</td>
<td></td>
</tr>
</tbody>
</table>

Standard errors in parentheses; *p<0.01. Standard errors clustered by route.
The dependent variable for the regression Eq. (1) in Table 8 is the natural logarithm of Fare\textsubscript{j,mt}, which is the median price charged by carrier \textit{j} in market \textit{m} at time \textit{t}. Column 2 reports the results when we do not drop observations corresponding to two quarters prior the filings. Our estimate of \( \alpha\text{OWN} \) equals \(-0.031\) and \( \beta\text{OWN} \) equals \( 0.044\). This means that firms lower their prices by 3\% while under bankruptcy protection, and raise them by 4.4\% after their emergence from Chapter 11. We find that the rivals do not change their price in any statistically or economically significant way, and this result is robust across the six specifications in Table 8.

The most surprising result here is that prices actually increase after the emergence from bankruptcy protection. That is the first indication that bankruptcy filings might not effectively reduce the (marginal) costs of operation.

Column 2 reports results when we include market–carrier fixed effects, year–quarter fixed effects, origin and destination specific time trends, and we drop observations corresponding to two quarters prior the filings. The dependent variable for the regression Eq. (1) in Table 7 is the natural logarithm of Seats\textsubscript{t,rt}, which is the total number of seats served by carrier \textit{j} in the route \textit{r} at time \textit{t}.

Column 1 presents the results of the main specification, when we include route–carrier fixed effects, year–quarter fixed effects, origin and destination specific time trends, and we drop observations corresponding to two quarters prior the filings. We estimate \( \alpha\text{OWN} \) equal to \(-0.351\) and \( \beta\text{OWN} \) equal to \(-0.426\), both statistically significant. \( \alpha\text{OWN} \) is estimated equal to \(-0.036\) and \( \beta\text{OWN} \) equal to \(-0.059\), and both are precisely estimated. In economic terms this means that bankrupt firms drop their capacity (seats) by 29.6\% during the bankruptcy filing and by 34.7\% after the emergence from Chapter 11. Their rivals drop some of their capacity, but the effect is much smaller, around 5\% both during and after the bankruptcy filing. Columns 2–5 show that the results do not change if we do not drop observations corresponding to two quarters prior the filings, if we drop the origin and destination time trends, if we drop year–quarter fixed effects, and if we drop route–carrier fixed effects. Columns 6 shows that a dynamic program evaluation approach leads to identical results. Again, there is no evidence that the bankruptcy dummies are endogenous, or, at the very least, their endogeneity is not empirically important.

7. The effect of bankruptcy filings on prices

In this section we reconcile the evidence on the effects of Chapter 11 on capacity and network structure with the evidence on prices. We ask the following questions: How do prices change? What happens to the demand faced by the bankrupt firm? Finally, what are the effects of the bankruptcy filings on the marginal costs of transporting a passenger?

The dependent variable for the regression Eq. (1) in Table 8 is the natural logarithm of Fare\textsubscript{j,mt}, which is the median price charged by carrier \textit{j} in market \textit{m} at time \textit{t}.

Column 2 reports results when we include market–carrier fixed effects, year–quarter fixed effects, origin and destination specific time trends, and we drop observations corresponding to two quarters prior the filings. The dependent variable for the regression Eq. (1) in Table 7 is the natural logarithm of Seats\textsubscript{t,rt}, which is the total number of seats served by carrier \textit{j} in the route \textit{r} at time \textit{t}.

Table 7

<table>
<thead>
<tr>
<th>( \alpha\text{OWN} ), in-bankruptcy effect on bankrupt firm’s route-carrier capacity</th>
<th>(-0.351^{***})</th>
<th>(-0.340^{***})</th>
<th>(-0.344^{***})</th>
<th>(-0.315^{***})</th>
<th>(-0.350^{***})</th>
<th>(-0.339^{***})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.017)</td>
<td>(0.019)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>( \alpha\text{OWN} ), post-bankruptcy effect on bankrupt firm’s route-carrier capacity</td>
<td>(-0.426^{***})</td>
<td>(-0.410^{***})</td>
<td>(-0.377^{***})</td>
<td>(-0.324^{***})</td>
<td>(-0.417^{***})</td>
<td>(-0.418^{***})</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.026)</td>
<td>(0.026)</td>
<td>(0.022)</td>
<td>(0.027)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>( \beta\text{OWN} ), in-bankruptcy effect on the route-carrier capacity of the rivals</td>
<td>(-0.036^{**})</td>
<td>(-0.031^{**})</td>
<td>0.008</td>
<td>0.024</td>
<td>-0.047**</td>
<td>-0.029**</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.016)</td>
<td>(0.015)</td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>( \beta\text{OWN} ), in-bankruptcy effect on the route-carrier capacity of the rivals</td>
<td>(-0.059^{***})</td>
<td>(-0.067^{***})</td>
<td>0.020</td>
<td>0.068**</td>
<td>-0.077**</td>
<td>-0.067**</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.020)</td>
<td>(0.023)</td>
<td>(0.020)</td>
<td>(0.021)</td>
<td>(0.021)</td>
</tr>
</tbody>
</table>

One period lag in-bankruptcy effect on the bankrupt firm’s route-carrier capacity

One period lag in-bankruptcy effect on the route-carrier capacity of the rivals

Two periods lag in-bankruptcy effect on the bankrupt firm’s route-carrier capacity

Two periods lag in-bankruptcy effect on the route-carrier capacity of the rivals

Observations

188,610

184,799

194,709

194,709

194,709

188,610

194,709

Number of route–carrier groups

7324

7324

7344

7344

7328

7344

Route–carrier fixed effects

Yes

Yes

Yes

Yes

Yes

Yes

2 prior quarters excluded

Yes

No

No

No

Yes

Yes

Origin & destination time trends

Yes

Yes

No

No

Yes

Year–quarter fixed effects

Yes

Yes

Yes

No

Yes

Within \( R^2 \)

0.095

0.098

0.029

0.023

0.094

0.094

Standard errors in parentheses; ***p<0.01, **p<0.05, *p<0.1. Standard errors clustered by route.
would conclude that bankruptcy filings lead to lower prices both during and after the time when a firm is under Chapter 11 protection. In Column 5 we report results for a specification with route-carrier random effects. The results are essentially identical to those in Column 1. This means that the changes in prices are estimated to be the same whether we use variation in prices in markets where bankruptcy airlines are present before, during, and after a bankruptcy filing or whether we use variation in prices in all markets. This is important for two reasons. First, it suggests that there are no selection problems since the results are the same whether or not we include route-carrier fixed effects. Second, this eliminates the unlikely but potentially troubling possibility that identification is just off routes that airlines keep while in bankruptcy but drop them upon emerging. Column 6 presents the results when we follow a dynamic program evaluation approach. Recall that this approach is useful to see the extent to which prices set by bankrupt firms are different on time-varying unobservables that are not adequately captured by either the year-quarter fixed effects or origin/destination linear trends. Given the magnitude of the results for prices, we include three lags, instead of two as in the fi

Table 8
The impact of Chapter 11 filings on market-carrier prices. The dependent variable is the natural logarithm of the median fare charged in market m, in year-quarter t, by carrier j.

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>α^{OWN}, in-bankruptcy effect on the bankrupt firm’s market–carrier prices</td>
<td>-0.031***</td>
<td>-0.030***</td>
<td>-0.056***</td>
<td>-0.093***</td>
<td>-0.031***</td>
</tr>
<tr>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>α^{INTRA}, post-bankruptcy effect on the bankrupt firm’s market–carrier prices</td>
<td>0.044***</td>
<td>0.045***</td>
<td>-0.010***</td>
<td>-0.032***</td>
<td>-0.041***</td>
</tr>
<tr>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>β^{OWN}, in-bankruptcy effect on the market–carrier prices of the rivals</td>
<td>-0.005*</td>
<td>-0.005</td>
<td>-0.015***</td>
<td>-0.057***</td>
<td>-0.003</td>
</tr>
<tr>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>β^{INTRA}, in-bankruptcy effect on the market–carrier prices of the rivals</td>
<td>0.008</td>
<td>0.006</td>
<td>-0.011***</td>
<td>-0.010***</td>
<td>0.007***</td>
</tr>
<tr>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.003)</td>
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<tr>
<td>One period lag in-bankruptcy effect on the bankrupt firm</td>
<td>-0.028***</td>
<td></td>
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<tr>
<td>(0.003)</td>
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<tr>
<td>One period lag in-bankruptcy effect on the rivals</td>
<td>-0.012***</td>
<td></td>
<td></td>
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<tr>
<td>(0.002)</td>
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<td></td>
<td></td>
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<tr>
<td>Two periods lag in-bankruptcy effect on the bankrupt firm</td>
<td>-0.023***</td>
<td></td>
<td></td>
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<tr>
<td>(0.003)</td>
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<tr>
<td>Two periods lag in-bankruptcy effect on the rivals</td>
<td>-0.005</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(0.002)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Three period lag in-bankruptcy effect on the bankrupt firm</td>
<td>-0.019***</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(0.003)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One period lag in-bankruptcy effect on the rivals</td>
<td>-0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(0.002)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Observations</td>
<td>448,683</td>
<td>493,436</td>
<td>493,436</td>
<td>493,436</td>
<td>448,683</td>
</tr>
<tr>
<td>Number of market-group groups</td>
<td>21,688</td>
<td>21,844</td>
<td>21,844</td>
<td>21,844</td>
<td>21,844</td>
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<tr>
<td>Market-carrier fixed effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2 prior quarters excluded</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Origin &amp; destination time trends</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Year–quarter fixed effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Within R²</td>
<td>0.159</td>
<td>0.165</td>
<td>0.125</td>
<td>0.030</td>
<td>0.157</td>
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Standard errors in parentheses; ***p<0.001, **p<0.01, *p<0.05, p>0.1. Standard errors clustered by market.
price fall was not enough to generate a high capacity utilization rate (load factor). The load factor of the competitors increases, suggesting an unambiguous shift in demand towards non-bankrupt carriers. The effect on the bankrupt carrier’s demand is somewhat reversed after the firm emerges from bankruptcy, since the emerging carrier is able to increase prices by more than 5% even though its planes are not as fully utilized as before the filing.

7.1. Prices and marginal costs

To investigate further why prices do not change much during and after bankruptcy filings, we study the marginal cost of transporting a passenger. Recall that a Chapter 11 filing can grant the bankrupt firm a cost advantage over its competitors, potentially explaining the marginal fall in prices observed while the firm operates under bankruptcy. Cost savings are expected to last even after the firm emerges from bankruptcy, or at least for a short time following the firm’s emergence. To investigate the explanatory power of cost driven price changes, we study changes in the marginal cost of a seat before, during, and after each bankruptcy filing. Before we discuss this alternative explanation, it is useful to discuss in more detail the nature of marginal costs in the airline industry, and the distinction between accounting and economic opportunity cost.

The accounting marginal cost of a seat is just the passenger cost associated with issuing tickets, processing passengers through the gate, in-flight food and beverages, and insurance and other liability expenses. This cost is very small relative to the fixed costs faced by an airline to fly a plane on a route. However, as Elzinga and Mills, 2000 convincingly argue, the economic opportunity cost is the price of the ticket that could have been charged to another passenger to fly on that same plane but through a connection between two different airports. This measure of the economic marginal cost is not observable because we do not have the information to know what passengers the airline could have flown on that same seat. Yet, we know the lowest price that the airline charged in a quarter. The idea here is that a reasonable approximation of the economic marginal cost is the lowest ticket fare that a carrier charged across all of its routes. Notice that our definition of economic marginal cost of a seat is very helpful to clarify an apparent paradox of the role of bankruptcy filings in the airline industry. On one hand, while under bankruptcy protection an airline might be able to decrease the usual business overhead costs, such as costs associated with staff functions, general administration, brand marketing, and common-use property. On the other hand, the same airline might still be unable to lower its operating costs, which are associated with route-specific marginal costs, such as aircraft maintenance costs or fuel costs. Thus, a bankruptcy filing can be very successful at lowering the fixed overhead costs, but not the marginal cost of a seat. The failure of the airlines to lower their operating marginal cost is exactly what we show next.

First, we consider the traditional cost measure used in the airline industry, average cost per seat mile (CSM). The average cost to carry one passenger for one mile is known in the airline industry as the average cost per seat mile. It is constructed using the ratio of the quarterly operating expenses over the quarterly total of the product of the number of seats transported and of the number of miles flown by the airline. We gather data on operating expenses from the Air Carrier Financial Reports (Form 41 Financial Data) and on the total number of seats and miles flown from the Air Carrier Statistics (Form 41 Traffic). The mean of the average cost per seat mile is approximately 9 cents per seat mile, and can be as low as 4 cents and as high as 13 cents. This variable is not market specific. Panel I of Table 10 presents the mean CSM for each bankrupt carrier, across markets and year-quarters observations, for the periods before, during and after its bankruptcy (measured in US dollars). There is no evidence of persistent cost declines during or after a carrier’s filing. In the case of United Airlines, the average CSM prior to the bankruptcy filing is 9.4 cents, marginally rising during bankruptcy to 9.8 cents, and continuing to rise after United’s exit from bankruptcy, to 10.6 cents. Similar results hold for USAir’s first filing, where average CSM pre- and during bankruptcy was 12.1 cents, rising marginally to 12.5 cents post-bankruptcy. For ATA, Delta, and Northwest we observe that the average CSM increases while the firms operate under bankruptcy. ATA and Northwest marginally lowered average CSM after exiting bankruptcy relative to the bankruptcy CSM, yet Delta continues to increase its CSM. It is only in the case of USAir’s second filing that we observe a decline in average CSM: pre-bankruptcy this was 12.5 cents, dropping to 11.4 during bankruptcy, and continued to fall after USAir exited court protection. The unusual cost pattern observed after USAir’s second filing can be explained by the carrier’s exit strategy: USAir emerged after merging with low cost carrier America West. Following our discussion above, for each of the bankrupt carriers, we compute the lowest ticket fare across markets and year-quarters

<table>
<thead>
<tr>
<th>Table 10</th>
<th>Accounting and economic cost before, during, and after the bankruptcy filing.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before bankruptcy</td>
</tr>
<tr>
<td>United</td>
<td>0.094</td>
</tr>
<tr>
<td>US Airways, first bkt</td>
<td>0.121</td>
</tr>
<tr>
<td>US Airways, Second bkt</td>
<td>0.125</td>
</tr>
<tr>
<td>ATA</td>
<td>0.068</td>
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<tr>
<td>Delta</td>
<td>0.088</td>
</tr>
<tr>
<td>Northwest</td>
<td>0.095</td>
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</tbody>
</table>

Panel II: The economic opportunity cost: costs before, during, and after the bankruptcy filing
These are lowest prices for a ticket that a carrier charges in a quarter-year. They are averaged across the markets, year, and quarters.

Panel III: | Accounting and economic cost before, during, and after the bankruptcy filing.

|          | Before bankruptcy | During bankruptcy | After bankruptcy |
| United   | 50.560            | 53.594            | 55.563           |
| US Airways, first bkt | 52.137          | 54.215            | 55.331           |
| US Airways, second bkt | 53.014          | 49.667            | 51.643           |
| ATA      | 68.507            | 57.523            | 61.293           |
| Delta    | 50.436            | 49.796            | 54.086           |
| Northwest| 50.340            | 46.285            | 49.470           |

Another way to look at this issue is to consider the numerator and denominator of the CSM separately. The numerator is given by the total operating costs. In the case of United, for example, the total operating costs were, on average, equal to $1,259,900,000 before the bankruptcy filings, and equal to $1,660,385,000 after the exit from bankruptcy. So the total operating costs increased by 30%. As for the denominator, the number of seat-miles before filing for bankruptcy protection was equal to 1.3b±10 seat-miles and equal to 1.5b±10 after the exit from bankruptcy. So the denominator increased by 13%. Overall the CSM for United increased.

In Figures that are available from the authors, we report a time series of CSM for United Airlines and USAir for the period pre-, during, and post-bankruptcy. Consistent with the above findings, we do not observe any significant cost decline during or following the firm’s bankruptcy filing. Evidence from the average CSM does not support the hypothesis that firms filing for bankruptcy protection can significantly reduce costs and thereby impact product market competition.
and summarize it in Panel II of Table 10. As with the evidence for average CSM, we do not find significant changes in the economic opportunity costs during or after the bankruptcy filing. Except for United Airlines’ bankruptcy, all other bankrupt carriers temporarily lower economic costs during bankruptcy, only to increase it again once it emerges from bankruptcy. The pre-bankruptcy economic cost for USAir’s first filing was 54.14 dollars, falling to 51.22 dollars during bankruptcy, and rising to 55.33 dollars after the carrier exited bankruptcy protection. For Delta, pre-bankruptcy economic cost was 50.44 dollars, barely falling to 49.80 dollars during bankruptcy, only to rise above its pre-bankruptcy cost to 54.09 dollars after exiting bankruptcy. In the cases of ATA and USAir second filing, the post-bankruptcy economic cost is above the in-bankruptcy cost, but still slightly below the pre-bankruptcy one; for instance, ATA’s pre-bankruptcy cost was 68.51 dollars, falling to 49.67 dollars during bankruptcy, and rising to 51.64 post-bankruptcy (relative to the in-bankruptcy cost). These results on economic costs, pre-, during, and post-bankruptcy, do not support the hypothesis that firms operating under Chapter 11 significantly and permanently lower operating cost.

8. Conclusions

Our paper empirically examines whether a firm’s bankruptcy filing affects product market competition, using evidence from the US airline industry. We find that bankruptcy filings lead to a reduction of capacity and prices in the industry. Together with the fact that we do not find any evidence of changes in the marginal cost of transporting a passenger, our results suggest that bankruptcy filings are effective at reducing fixed costs but not marginal costs.

To our knowledge, there is no simple theoretical connection between bankruptcy filings and market competition. Nonetheless, our results are consistent with the idea, often repeated in the mass media, that bankruptcy filings are effective at reducing capacity cutbacks. Since capacity cutbacks are a public good that must be provided privately, each firm waits for its competitors to cut capacity first. Unless the industry outlook improves, the firm generating the lowest cash flows and with the weakest financial position becomes unable to meet its debt obligations, ultimately having to seek bankruptcy protection. Firms engage in such a war of attrition when Chapter 11 of the US Bankruptcy Code is an option, since this law protects the insolvent firm from liquidation by creditors, and allows the firm to void contracts and reorganize its business strategy, effectively granting the firm a second chance at life. Operating under Chapter 11, the insolvent firm reduces capacity and downsizes its network, which can lead to higher product-market prices. This is the channel through which we link bankruptcy filings to product market price, capacity, and network effects.

Our analysis is restrictive in a number of aspects and suggests numerous extensions, which constitute themes for future research. First, our paper focuses on the effect of bankruptcy filings on product market competition, but it would be equally interesting to investigate the determinants of bankruptcy filings. That new research might look in more detail into the role of the entry and expansion of low cost carriers. On the other hand, it is doubtful that it was the advent of low cost carriers per se that led to bankruptcy filings since bankruptcies were pervasive at the beginning of the 1990s, before the surge in the number of LCCs. On the other hand, the expansion of low cost carriers in the contemporary US airline industry might have accelerated the number and frequency of bankruptcy filings as well as their duration.

Second, another important feature of a bankruptcy filing is the shift of control from equity to debt holders. We do not incorporate such a change in our paper, as we assume that the objective of the firm is to maximize profits, regardless of the ownership structure. Future research might look into the bargaining between different agents. Eraslan (2008) and Eraslan and Yilmaz (2008) have made important contributions on this topic while looking at personal bankruptcies.

Finally, our paper uncovers stylized empirical patterns and suggests a unifying explanation. An interesting and challenging line of research would be to estimate a structural dynamic model of competition that incorporates the possibility of wars of attrition among that line firms along with the possibility to file for bankruptcy protection. An important contribution in this direction has been made by Takahashi (2010), who estimates the impact of competition and exogenous demand decline on the exit process of movie theaters in the US from 1950 to 1965. Takahashi shows that theaters that are making negative profits may choose to remain in the market if they expect to outlast their competitors, because at that point their profits would increase. Takahashi shows that this creates a significant delay in the exit process.

References


